STUDY ON DRUG UTILIZATION PATTERN OF NON - STEROIDAL ANTI – INFLAMMATORY DRUGS AT A TERTIARY CARE TEACHING HOSPITAL

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CERTIFICATE

This is to certify that the M.Pharm dissertation entitled **"Study on Drug Utilization Pattern of Non- Steroidal Anti – Inflammatory Drugs at a tertiary care teaching hospital"** being submitted to College of Pharmacy – Sri Ramakrishna Institute of paramedical sciences, Coimbatore was carried out by **Mr. ARABIND.B.PILLAI (Reg. No:261740105)** in the Department of Pharmacy Practice, College of Pharmacy, Sri Ramakrishna Institute of Paramedical Sciences, Coimbatore which is affiliated to The Tamil Nadu Dr. MGR Medical University, Chennai, under my direct supervision and guidance to my fullest satisfaction.

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CONTENTS

LIST OF ABBREVIATION

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NSAID	Non – Steroidal Anti – Inflammatory Drug
OA	Osteo Arthritis
COX	Cyclo Oxygenase
RA	Rheumatoid Arthritis
PG	Prostaglandins
ACE	Angiotensin Converting Enzyme
PUD	Peptic Ulcer Disease
GI	Gastro Intestine
CV	Cardio Vascular
DM	Diabetes Mellitus
CT	Computed Tomography
ADR	Adverse Drug Reaction
CVD	Cardio vascular Disease
FDA	Food and Drug Administration
CKD	Chronic Kidney Disease
BA	Bronchial Asthma
BD	Twice Daily
BMI	Body Mass Index
BP	Blood Pressure
CAD	Coronary Artery Disease
CHF	Congestive Heart Failure
CNS	Central Nervous System
ARF	Acute Renal Failure
ECG	Electrocardiogram
Hb	Hemoglobin
IHD	Ischemic Heart Disease
LFT	Liver Function Test
RFT	Renal Function Test
PO	Per Oral
UTI	Urinary Tract Infection

ABSTRACT

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A prospective observational study was carried out for a period of 10 months in the general medicine department of a 1000 bedded multispecialty tertiary care teaching hospital inorder to understand the drug utilization pattern of non – steroidal anti – inflammatory drugs and to identify the possible drug – drug interactions involving NSAIDs. Both the aims were achieved and the results are assessed. Hundred cases prescribed with atleast one NSAID were selected for the study. Patients of either sex admitted in general medicine ward of any age group who are prescribed with NSAIDs and those willing to participate were included in the study. Intensive care patients, pregnant and lactating women and those who are not willing to participate are excluded from the study. There was a high percentage of NSAID prescription in the general medicine ward and the most commonly prescribed NSAID was Paracetamol followed by Aspirin, Aceclofenac, Ibuprofen, Diclofenac. Most of the patients are prescribed with individual NSAIDs and fixed dose combinations are prescribed less. Most of the NSAIDs are prescribed along with specific gastro - intestinal agents and majority of NSAIDs were administered orally. It was found that the most common indication for prescribing NSAIDs was Pain followed by fever and inflammation. 47 prescriptions were having drug – drug interactions and the identified drug interactions are evaluated using Micromedex drug database for the prevalence and management of the drug interactions. In the current study, pharmacist plays a major role by monitoring, identifying, and preventing drug interactions, thereby providing better pharmaceutical care to the patients. Pharmacist can make necessary interventions with the physician and can prepare periodic guideline for the safe use of NSAIDs use. Hence this study helps to promote appropriate NSAID usage and serve as a check mark to the health care professionals thereby promoting rational drug usage.

INTRODUCTION

INTRODUCTION

Drug utilization evaluation was defined by the world health organization in 1977 as the marketing, distribution, prescription and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences. A DUR program is an intervention in the form of an authorized, structured, and ongoing system for improving the quality of drug use within a given health care institution. The quality of drug prescribing is evaluated by employing predetermined standards for initiating administrative or educational interventions to modify patterns of drug use which are not consistent with these standards. The measurement of the effectiveness of these interventions is an integral part of the program.

Adverse drug reactions and drug noncompliance are important causes of adult and pediatric hospital admissions. Many of these drug related admissions are preventable, through the existing principles and data. Drug use evaluation (DUE) helps us to understand how and why drugs are used as they are, so that drug use and health outcomes can be improved. DUE can play a key role in helping the health care system to understand, interpret and improve the prescribing, administration and use of medications. DUE information may assist healthcare systems and hospitals to design educational programs that may improve prescribing and drug use.

The ultimate goal of drug utilization research must be to assess whether drug therapy is rational or not. To reach this goal, methods for auditing drug therapy towards rationality are necessary. The early work did not permit detailed comparisons of the drug utilization data obtained from different countries because the source and form of the information varied between them.[1]

Rational use of medicines defined as patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community. Prescriptions hold a special importance regarding the rational use

of drug related to cost, safety, and efficacy. Prescriptions permit the identification of the products by its scientific names. Prescribing and dispensing pattern studies are one of the best methods to determine rational prescribing.

Prescription writing is a science and art, as because it conveys the message from the prescriber to the patient. A prescription by a doctor is taken as a reflection of the physician's attitude to the disease and the role of drug in the treatment. Periodic evaluation of drug utilization patterns need to be done to enable suitable modification in prescription of drugs to increase the therapeutic

benefits and decrease the adverse effects. Drug therapy is the most commonly used method in disease treatment in general drug therapy. However the pattern of drug prescription is often inappropriate and need for registration for this pattern is essential in an effort to improve prescribing standard. The study of prescribing pattern seeks to monitor, evaluate and if necessary suggest modification in the prescribing behavior of medical practitioner to make care rational and cost effective. The impact of inappropriate prescription of drug also leads to an increase in the incidence of adverse drug events and emergence of drug resistance. Inappropriate prescriptions increase the cost of medical treatment and increases morbidity and mortality.[2]

The non-steroidal anti-inflammatory drugs (NSAIDs) are widely used for the treatment of minor pain and for the management of edema and tissue damage resulting from inflammatory joint disease (arthritis). A number of these drugs possess antipyretic activity in addition to having analgesic and anti-inflammatory actions, and thus have utility in the treatment of fever. Most of these drugs express their therapeutic actions by inhibition of prostaglandin biosynthesis.

When employed as analgesics, these drugs usually are effective only against pain of low to moderate intensity, such as dental pain. Although their maximal efficacy is generally much less than the opioids, NSAIDs lack the respiratory depression and the development of physical dependence seen with opiates. NSAIDs do not change the perception of sensory modalities other than pain. It seems logical to select an NSAID with rapid onset for the management of

fever associated with minor illness in adults. NSAIDs find their chief clinical application as anti – inflammatory agents in the treatment of musculoskeletal disorders, such as rheumatoid arthritis and osteoarthritis. In general, NSAIDs provide only symptomatic relief from pain and inflammation associated with the disease, do not arrest the progression of pathological injury to tissue, and are not considered to be "disease modifying". A number of NSAIDs are FDA approved for the treatment of ankylosing spondylitis and gout. The use of NSAIDs for mild arthropathies, together with rest and physical therapy, generally is effective.

Analgesic effect of NSAIDs is associated with the peripheral inhibition of prostaglandin production, and it can also occur in the subcortical site due to the inhibition of pain stimuli. The inhibition of interleukin-1 and interleukin-6 induced production of prostaglandin in the hypothalamus which is related to antipyretic effect and also in resetting of thermoregulatory system which can lead to vasodilation. The prescription of the individual patients were collected

to assess the therapeutic management plan. The advantageous of correct pattern of prescribing NSAIDs is to elevate the therapeutic benefit and to minimize the adverse drug reactions through periodic evaluations of drug utilization patterns. Drug utilization studies do help in finding a new way to implement the rational drug therapy and areas of improvement in terms of better, effective and economic treatment with lesser adverse effects.[3]

The World Health Organization (WHO) defined rational drug prescribing as patients receiving "medications appropriate to their clinical needs, in doses that meet their own individual requirements for an adequate period of time, and the lowest cost to them and their community." Globally, irrational drug prescribing is a great challenge for health care systems and a widespread phenomenon in developing countries. Some irresponsible practices such as: polypharmacy, irrational prescribing of medicines, abuse of injectable medicine and non-compliance to prescribing strategies are the most common.

Non-steroidal anti-inflammatory drugs (NSAIDs) are considered among the most every day used medicine all over the world. NSAIDs are prescribed

irrationally in the outpatient department (OPDs). NSAIDs are associated with side effects that range from mild to severe and sometimes fatal. Nevertheless, there is a need for recurrent assessment of medicinal prescribing manner in order to provide appropriate adjustment in prescription of medicine to enhance curative benefits and reduce the side-effects.[4]

Serious side effects are less common than mild ones, and the likelihood of any side effect varies between people. People taking drugs in high doses or over a long term are more likely to have side effects. Prescription NSAIDs generally have a greater risk and greater painkilling power when compared with OTC NSAIDs.

Less severe side effects experienced by some people include:

- Indigestion and other gut complaints
- Headaches
- Dizziness
- Drowsiness

Adverse events rarely associated with NSAIDs include problems with:

- Fluid retention
- Kidneys (see below)
- Liver

Blood pressure - NSAIDs can increase blood pressure. They reduce blood flow to the kidneys, meaning that they work less hard. In turn, this causes a fluid build-up in the body. If there is more fluid in the bloodstream, blood pressure rises. In the long term, this can cause kidney damage.

Long-term or high-dose use of NSAIDs could also lead to ulcers developing in the gut, known as peptic ulcers. NSAIDs reduce the actions of prostaglandins, which reduces inflammation; however, prostaglandins also protect the stomach lining by helping it to produce mucus. In this way, NSAIDs leave the stomach open to the effects of acid.

People who take NSAIDs for a long time or at high doses should consult their doctor about ulcer prevention. One option is to take separate drugs that reduce acid production in the stomach. Using a different type of painkiller is another option.

Also, the risk of heart attack and stroke is slightly increased by taking NSAIDs, although not when taking low-dose aspirin.

Physicians should take precautions based on the patient's risk, once they prescribe NSAIDs. NSAIDs have a wide range of adverse effects, such as upper and lower gastrointestinal disturbances, blood pressure elevation, and increased risk of cardiovascular disorders. It has been previously found that NSAIDs cause adverse effects in 25% of patients.[4]

Important factors that can contribute to adverse effects include availability of NSAIDs as over-the-counter (OTC) medicines, duration of treatment, dose, coadministration with other drugs, especially in elderly, and exclusion of proton-pump inhibitors (PPIs) as gastroprotective agents (GPAs). NSAIDs account for approximately 10% of hospitalizations among elderly patients in the United States. Elderly are using NSAIDs more than other age groups. Age-related changes in NSAID pharmacodynamics predispose the elderly to NSAID-related adverse effects. Furthermore, the increasing risk of adverse drug reactions in the elderly may be due to pharmacological interactions among multiple drugs prescribed to deal with concomitant multiple diseases. The highest risk for children taking NSAIDs is dosage errors (especially overdose), which can cause significant morbidity and mortality. Appropriate use and safe prescription of these drugs can lead to maximum potential benefits and minimum adverse events.

Numerous studies have reported inappropriate prescription of NSAIDs. Irrational prescribing has further exacerbated the adverse effects of NSAIDs. Hence, rational use and safe prescription of NSAIDs, in combination with other drugs, are crucial in preventing or minimizing the adverse effects.[5]

Mechanism of Action

The actions of NSAIDs are most likely explained by their inhibition of prostaglandin synthesis by COX – 2. The COX – 2 isoform is the predominant COX involved in the production of prostaglandins during inflammatory processes. Prostaglandins of the E and F series evoke some of the local and systemic manifestations of inflammation, such as vasodilation, hyperemia, increased vascular permeability, swelling, pain, and increased leukocyte migration. In addition, they intensify the effects of inflammatory mediators, such as histamine, bradykinin, and 5 – hydroxytryptamine. All NSAIDs except the COX – 2 selective agents inhibit both COX isoforms; the degree of inhibition of COX – 1 varies from drug to drug. No one NSAID is empirically superior for the treatment of inflammatory disease; instead, each individual's response to and tolerance of a drug determines its therapeutic utility.[5]

NSAIDs make up one of the largest groups of pharmaceutical agents used worldwide. In the past, NSAIDs are used by 20% or more of the population. NSAIDS are also one of the most common causes of adverse drug reaction reported to drug regulatory agencies as well as in many clinical and epidemiological studies. NSAIDs represent a most widely prescribed class of medications and are used as over the counter drugs. Despite the wide clinical use of classical NSAIDs as analgesics, antipyretic, and anti- inflammatory agents, their gastrointestinal toxicity is a major clinical limitation. This adverse effect is associated with their ability to inhibit COX- 1 in the gastrointestinal tract. Subsequently, the selective COX- 2 inhibitors emerged as potentially gastro- friendly NSAIDs, and it was conceptualized that sufficient therapeutic benefits are achieved by selective COX- 2 inhibition. At first glance, these COX- 2 inhibitors looked like a solution to NSAIDs-related GI complication. However, post-marketing experience unmarked various adverse cardiovascular effects. Recent evidence of adverse cardiovascular events with the use of COX- 2 selective inhibitors has created a sense of insecurity not only among prescribers but also among consumers. New developments in medical research and practice pertinent to

each guideline will be reviewed at an established time and indicated at the publication to assure continued validity.[6]

NSAIDs are valuable agents in the treatment of arthritis and other musculoskeletal disorders, and as analgesics in a wide variety of clinical scenarios. Unfortunately, their use has been limited by their association with mucosal injury to the upper gastrointestinal tract, including the development of peptic ulcer disease and its complications, most notably upper gastrointestinal hemorrhage, and perforation. NSAIDs are the most commonly used drugs for managing surgical pain and inflammation. The role of steroids as adjunctive measures to reduce postoperative inflammation, swelling, and pain has also received importance in recent years.

Although the role of NSAIDs and steroids has been very beneficial in terms of pain relief, these drugs also have an associated risk of side effects and adverse drug reactions. Inhibit the activity of both cyclooxygenase-1 (COX-1) and cyclooxygenase-2 (COX-2), and thereby, the synthesis of prostaglandins and thromboxanes. It is thought that inhibiting COX2 leads to the anti-inflammatory, analgesic and antipyretic effects and that those NSAIDs also inhibiting COX-1, particularly aspirin, may cause gastrointestinal bleeding and ulcers. For this reason, the advantages of COX-2 selective inhibitors may be indicated.[5]

It was found that parenteral routes (IV/IM) are preferred routes of administration for the patients in emergency, ICU and other In-patient wards like orthopedics, surgery. Similarly, oral routes are preferred during later days of recovery. NSAIDs in spraying form are popular in athletic injury. Several studies concluded that, in India, more than 400 formulations of NSAIDs are marketed in either single or combination form, resulting in wide spread exposure of patients to this class of drugs and its adverse effects.[6]

Recently, many fixed dose combinations of NSAIDs are banned by Health Ministry of India due to concurrent drug-drug interactions and adverse effects. Alterations in renal function, hepatic injury, effect on blood pressure and platelet inhibition which may result in bleeding and gastrointestinal (GI) problems are the

most common side effects associated with NSAID use. NSAID use has been shown to increase the risk of peptic ulcer disease by 3-5 folds. Approximately, 15% of NSAID users will have dyspepsia and 1-4% will have significant GI complications each year (e.g., perforated ulcers or GI bleeding requiring hospitalization). Cardiovascular adverse events are significant with Cox-2 inhibitors which need attention to prescriber before prescribing. For all these reasons, studies that evaluate the pattern, extent and frequency of NSAID prescriptions are valuable. Hence, this study is proposed to promote safe use of NSAIDs. Reducing the risks for NSAID-induced adverse effects, especially GIT, CVS related side effects and preventive co-therapies, will lead to safer & more effective treatment.[7]

Classification of NSAIDs

A. Nonselective COX inhibitors

1. Salicylates: Aspirin
2. Propionic acid derivatives: Ibuprofen, Naproxen, Ketoprofen, Flurbiprofen
3. Anthranilic acid derivatives: Mephanamic acid
4. Aryl aceticacid derivatives: Diclofenac, Aeclofenac
5. Oxicam derivatives: Piroxicam,Tenoxicam
6. Pyrrolo – pyrrole derivatives: Ketorolac
7. Indole derivatives: Indomethacin
8. Pyrazolone derivatives: Phenylbutazone, Oxyphenbutazone

B. Preferential COX – 2 inhibitors

Nimesulide, Meloxicam, Nabumetone

C. Selective COX – 2 inhibitors

Celecoxib,Etoricoxib, ParecoxiB

D. Analgesic – antipyretic with poor anti – inflammatory action

1. Paraaminophenol derivative: Paracetamol (Acetaminophen)
2. Pyrazolone derivative: Metamizol, Propiphenazone
3. Benzoxazocine derivative: Nefopam[8]

ADVERSE EFFECTS OF NSAIDS

Gastrointestinal effects

Gastrointestinal (GI) side effects are common and potentially serious, with as many as 60% of people who use traditional NSAIDs experiencing some type of adverse effect. Per year, upper-GI complications will develop in 1% to 2% of people using these NSAIDs. This rate is three to five times higher than in people who do not use these NSAIDs. The risk of severe complications is even higher in individuals with established risk factors, with a potential case-fatality rate of 5%.

Damage to the GI tract can occur when the production of prostaglandins is decreased by NSAID inhibition of COX-1. This leads to a decrease in epithelial mucus, the secretion of bicarbonate, mucosal blood flow, epithelial proliferation, and mucosal resistance to injury. As a result, the normally protective defence mechanisms of the GI mucosa are overwhelmed by such factors as gastric acid, pepsin, and bile salts. NSAIDs also can damage the gastric mucosa through a direct toxicity to the gastric mucosa itself. One of the mechanisms of this injury may be the acidic nature of these medications.

The GI toxicity associated with nonselective NSAIDs appears to be primarily due to their systemic, not topical, effects. As a result, enteric coating on these medications or delivery of the medication in another form (e.g., suppository) would not be expected to decrease their potential for GI toxicity. In addition, use of lower doses of NSAIDs may not decrease GI adverse events. Aspirin doses as low

as 30 mg have been shown to decrease prostaglandin synthesis in the gastric mucosa. Ibuprofen appears to produce the least risk among older NSAIDs, whereas piroxicam and ketorolac are the worst. Newer NSAIDs such as etodolac, meloxicam, and nabumetone are thought to cause less injury to the GI tract.

A variety of risk factors that may increase the likelihood of developing GI side effects secondary to NSAIDs and aspirin have been identified, including prior history of GI event (ulcer, hemorrhage); age greater than 60 years; high dose; concurrent use of corticosteroids; and concurrent use of anticoagulants. Other possible risk factors are concomitant use of aspirin and NSAIDs or COXIBs; multiple NSAID use; duration of NSAID use; and Helicobacter pylori status *Strategies to Reduce GI Toxicity:* Various strategies can be employed to help reduce adverse GI outcomes secondary to traditional NSAIDs. First, the use of non-NSAID analgesics should be considered, if feasible. Regular use of acetaminophen has been shown to provide similar analgesia compared with NSAIDs in patients with musculoskeletal conditions.

Misoprostol, a prostaglandin E analog, can help prevent gastric and duodenal ulcers. Doses necessary to prevent NSAID-induced gastric ulcers have been associated with intolerable abdominal discomfort and diarrhoea, however; up to 20% of patients in one study reported diarrhoea, and up to a third of patients in another discontinued the medication.

Proton-pump inhibitors (PPIs) are effective for reducing symptomatic and endoscopic ulceration. A trial evaluating lansoprazole versus misoprostol for preventing recurrence of gastric ulcers in long-term users of NSAIDs found that efficacy was similar in both groups. It was noted that PPIs offer a distinct advantage in that they are dosed once daily and are associated with fewer adverse events. Another study compared the efficacy of esomeprazole 20 mg or 40 mg versus placebo for preventing gastric or duodenal ulcers in high-risk patients receiving long-term NSAID treatment, including COX-2–selective NSAIDs. For both doses, approximately 95% of patients were ulcer-free at six months.

Since the primary effect on the gastric mucosa is associated with COX-1, it has been proposed that selective inhibition of COX-2 by COXIBs would provide effective analgesic or anti-inflammatory therapy with minimal effects on the gastric mucosa. Several trials have evaluated the efficacy and toxicity of the COXIBs. Although they are safer than nonselective NSAIDs, COXIBs are not without GI risk, and this risk may be increased when COXIBs are used concurrently with aspirin. Even when used at a low dose, aspirin has been shown to block COX-1 sufficiently to minimize any GI protection provided by the COXIB. Further, COXIBs may be significantly more expensive than traditional NSAIDs plus misoprostol or a PPI. Thus, costs associated with treatment must be assessed before an option is recommended to the patient. Finally, before COXIB therapy is initiated, the patient's cardiovascular (CV) risk must be determined.

CV Effects

NSAIDs can affect the CV system in numerous ways. They can interfere with the antiplatelet activity of aspirin, worsen heart failure (HF), increase blood pressure (BP), and increase the risk of CV disease.

When aspirin binds to COX-1, it acetylates a serine residue that irreversibly inhibits COX-1 for the life of the platelet. This decreases the level of COX-1–produced thromboxane A_2, a proaggregatory, vasoconstrictive substance. When given prior to aspirin, certain NSAIDs can compete with aspirin for the platelet COX-1 binding site. The presence of the NSAID prevents the aspirin from binding.

NSAIDs can cause a decrease in serum thromboxane A_2 levels, but not irreversibly and only for a portion of the entire dosing interval. Thus, if an NSAID were to be given at the same time as aspirin, this would serve to decrease the complete antiplatelet effect previously invoked by aspirin. In a study evaluating the effect of ibuprofen on aspirin's antiplatelet ability, the inhibitory effects of daily low-dose aspirin on platelets were competitively inhibited by the prolonged use of multiple daily doses of ibuprofen (tid dosing), even when aspirin was administered before the first dose of the NSAID. Single doses of ibuprofen given two hours before aspirin did not have any sustained effect on platelet activity. A similar effect

has been demonstrated with naproxen. This has yet to be demonstrated with other NSAIDs (such as diclofenac), COXIBs, or acetaminophen. It has been postulated to occur with indomethacin.

NSAIDs do not cause HF, but they can worsen pre-existing HF. NSAID inhibition of prostaglandin synthesis can cause a decrease in renal blood flow and compensatory retention of sodium and water; this increased volume can decrease the effects of diuretics used for HF. Systemic vasoconstriction also may occur that can potentially exacerbate the preexisting HF. These are the same mechanisms that can increase BP in patients being treated for hypertension. COXIBs have mechanisms similar to those of traditional NSAIDs in the kidney, leading to sodium retention and edema. Therefore, COXIBs would not offer any advantage over traditional NSAIDs in the patient with HF.

Prostaglandins are converted into a number of prostanoids. One of these prostanoids, prostacyclin (produced in the endothelium), causes local smooth-muscle relaxation and vasodilation and also can interact with platelet prostacyclin receptors, thereby antagonizing aggregation. COX-2–selective inhibitors prevent the formation of prostacyclin, but they do not prevent the formation of thromboxane A_2 (also a proaggregatory, vasoconstrictive product), since only COX-1 enzymes are present on the platelet. It has been postulated that this imbalance of hemostatic compounds may be the reason for the increased risk of CV disease with COXIBs. Whether nonselective NSAIDs may cause this same imbalance is not yet known.

Four clinical trials, although not principally designed to assess the effects of COX-2 inhibitors on CV outcomes, provide some approximation of risk associated with the use of these agents in various populations. An increased risk of adverse cardiac events was first seen in the Vioxx GI Outcomes Research (VIGOR) study, which compared rofecoxib with naproxen. One finding of the study was that rofecoxib was associated with more myocardial infarctions (MIs) than naproxen. The Adenomatous Polyp Prevention on Vioxx (APPROVe) study validated VIGOR's results; compared with placebo, rofecoxib had roughly twice

the rate of CV events at 18 months, even though APPROVe investigators tried to exclude patients with increased CV risk. A trial of two doses of celecoxib (400 mg/day and 800 mg/day) to prevent colorectal adenomas found that 2.3% of patients receiving 400 mg per day experienced a composite CV endpoint of death from CV causes, nonfatal MI, nonfatal stroke, or nonfatal HF; a 3.4% composite CV endpoint was found in patients taking 800 mg per day. Finally, a study of post–coronary artery bypass graft patients comparing valdecoxib or parecoxib with placebo determined that CV events were more common in the COXIB group (2.0%) than in the placebo group (0.5%).

Traditional NSAIDs, through their ability to increase BP, theoretically could increase the risk of CV events, but the full extent of this potential risk has not been determined. A nested case-control study evaluated the use of celecoxib, rofecoxib, ibuprofen, diclofenac (including combination preparations), naproxen, and other selective (meloxicam, etoricoxib, etodolac, valdecoxib) and nonselective NSAIDs in 9,218 patients to determine the risk of MI. An increased risk of MI was evident in patients taking rofecoxib, diclofenac, and ibuprofen despite adjustment for potential confounders, including comorbidities and concurrent use of other drugs. Naproxen was not associated with an increased risk; however, it was not found to be cardioprotective, as was speculated in the VIGOR study.

In summary, traditional NSAIDs and COXIBs can increase the risk of adverse events in patients who have a history of, or who are at high risk for, CV disease. Evidence is more compelling for the COXIBs, but data do indicate a possible risk with traditional NSAIDs. Until more conclusive data are available, the use of any COX inhibitor or traditional (including OTC) NSAID for a long period of time or at a higher dose should be initiated only in consultation with a physician.

Renal Effects

NSAIDs can bring about two different forms of renal failure. These are hemodynamically mediated failure (due to a reduction in prostaglandin synthesis induced by the NSAID) and acute interstitial nephritis (from a direct toxicity of the drug on the renal parenchyma).

Renal prostaglandins are vasodilatory in nature. Under normal conditions, they appear to exert little influence on renal blood flow and glomerular filtration rate; thus, in healthy patients, NSAIDs probably have minimal effect on renal function. However, in volume-depleted or edematous states, these prostaglandins are necessary to compensate for angiotensin- and nor epinephrine-induced renal vasoconstriction. When NSAIDs block the production of these prostaglandins in these situations, unopposed vasoconstriction occurs that can lead to acute renal failure. Characteristics that may put individuals at increased risk for NSAID-induced renal dysfunction include being elderly; having diabetes, HF, or cirrhosis; dehydration; and blood or fluid loss. Specific drugs known to be problematic when combined with anti-inflammatory agents are diuretics, angiotensin-converting enzyme inhibitors, and angiotensin-receptor blockers.

Interstitial nephritis can occur in association with traditional NSAIDs and COXIBs, perhaps due to allergic reaction, direct cellular toxicity, alteration of metabolic pathways, or obstruction. Spontaneous recovery usually occurs within weeks to a few months after therapy is discontinued.

Hepatic Effects

Elevation of liver enzymes can occur with NSAID use, but liver failure is rare.[49] Most NSAIDs have been documented to cause liver injury, and the damage tends to be hepatocellular in nature. The mechanism is not precisely known, but is thought to be immunologically idiosyncratic. Diclofenac and, in particular, sulindac are reported to be more commonly associated with hepatotoxicity. The COXIBs also are linked to hepatotoxicity, although celecoxib is believed to have a lower risk. Hepatotoxicity secondary to NSAIDs can occur at any time, but is most

likely to happen six to 12 weeks after administration. Risk factors for NSAID-induced idiosyncratic hepatotoxicity include female sex, age greater than 50 years, and underlying autoimmune disease. Importantly, it is not known whether these are truly risk factors or simply represent the population most likely to use NSAIDs. Another risk factor is concomitant exposure to other hepatotoxic drugs.

If liver toxicity occurs, the NSAID being used should be discontinued immediately. Once liver function has stabilized, acetaminophen (which has been used in patients who were jaundiced) or aspirin can be used as an alternative. Aspirin is an option because it lacks the diphenylamine ring molecular structure present in NSAIDs that is believed to contribute to their toxicity.

Hematologic Effects

Hematologic side effects from NSAIDs are related primarily to their antiplatelet activity. As there is no COX-2 enzyme on the platelet, COXIBs would not be expected to produce the same effect. Long-term administration of low-dose aspirin is enough to block platelet thromboxane A_2 production by more than 95% and to inhibit platelet aggregation ex vivo. Conventional non aspirin NSAIDs inhibit platelet COX reversibly; thus, as stated previously, their effects on platelet aggregation and bleeding time reflect their different half-lives in the circulation.

Aspirin and other NSAIDs do not cause clinically significant bleeding in most people who use them; this usually occurs in patients with specific conditions (e.g., GI bleed), on certain medications (e.g., anticoagulants), or undergoing elective surgical procedures. Nonselective NSAIDs probably should be avoided in patients with underlying qualitative platelet–vessel-wall abnormalities (e.g., von Willebrand's disease or a myeloproliferative disorder), thrombocytopenia, or other inherited coagulation-factor deficiencies (e.g., hemophilia).

Whether to discontinue aspirin and other NSAIDs preoperatively is controversial, as is whether nonselective NSAIDs cause postoperative bleeding complications. Some reports indicate that any significant clinical impact of excessive surgical blood loss after preoperative use of aspirin and other NSAIDs is

lessened by cell-salvaging techniques, transfusion, and the use of adjuvant hemostatic agents. Recent guidelines suggest that patients on long-term aspirin therapy for coronary or cerebrovascular disease and those who are at risk for coronary events should not discontinue aspirin in the perioperative period unless hemorrhagic complications of the procedure outweigh the risk of an acute thrombotic event. It is recommended that aspirin be continued in patients at high risk for cardiac events who are undergoing noncardiac surgery or percutaneous coronary intervention. Aspirin can be continued in patients undergoing minor dental procedures, minor dermatologic procedures, or cataract surgery. It is recommended that aspirin be continued in patients requiring surgery within six weeks of having a bare metal coronary stent placed or within 12 months of having a drug-eluting stent placed. In patients not at high risk for cardiac events who are undergoing a noncardiac procedure, it is recommended that aspirin and aspirin-containing medications be stopped seven to 10 days before surgery. Non – aspirin, non – selective NSAIDs (and probably COXIBs) should be discontinued five half-lives before surgery.

Neutropenia is another, albeit rare, complication of NSAID therapy. A case-control study indicated an increased risk of neutropenia with NSAID use; however, no particular risk factors were determined, and no specific NSAID was identified as being the main cause.

Effects on Pregnancy

The use of NSAIDs around the time of conception may be associated with a risk of miscarriage. The proposed mechanism is that, by blocking prostaglandin production, NSAIDs can interfere with prostaglandins' role in implantation, thus possibly leading to abnormal implantation and miscarriage. For women who are trying to conceive, it would be prudent to avoid NSAID use and to consider alternative analgesics, such as acetaminophen, instead. Finally, it is important that these agents be discontinued during the third trimester of pregnancy. This helps prevent problems such as prolonged gestation and labor, increased bleeding, and premature closure of the ductus arteriosus.

Role of the Pharmacist

One of the most important areas a pharmacist can act on with regard to the safe and effective use of NSAIDs is risk management. This is perhaps most evident in patients who have GI or CV risk factors. Once the pharmacist has determined that NSAID therapy is appropriate, he or she should counsel the patient to facilitate the prevention or mitigation of other adverse events. Finally, NSAIDs can interact with many medications. It is important for pharmacists to know their patients well, be familiar with which medications they are taking, and understand how these medications can potentially interact with NSAIDs.[9]

LITERATURE REVIEW

LITERATURE REVIEW

1. **Mohammed et al (2018)**[11] conducted a study to assess non-steroidal anti-inflammatory drug prescription patterns. The result indicated irrational/inappropriate prescribing of NSAIDs, low practice of international nonproprietary names in prescriptions and high rate of NSAIDs prescription. In addition, some informational shortage was notable among prescribers concerning prescribing rules.

2. **Greeshma et al (2018)**[12] carried out a study to assess the drug utilization pattern of NSAIDs in the orthopedic department of a tertiary care teaching hospital. The study was conducted in 65 patients under all age group. A standard data collection form was designed for data collection which includes details like commonly prescribed NSAIDs, dosage, concomitant medications etc. The results suggest that Etoricoxib was most commonly used NSAIDs in the OPD, almost all of the NSAIDs were prescribed as monotherapy in brand name.

3. **Vaishnavi et al (2018)**[13] conducted a cross-sectional study for the assessment of nonsteroidal anti-inflammatory drug use pattern using World Health Organization indicators in a tertiary care teaching hospital. The results of this study showed a varied prescription pattern of NSAIDs in a tertiary care teaching hospital. Noncompliance was also observed with reference to rational use of medicine. NSAIDs, which constitute 30% of total prescriptions, almost equate with a prescribed percentage of antibiotics. The results of this study identified a few areas where corrective measures can be taken to improve prescribing practices.

4. **Oraluck et al (2017)**[14] carried out a study applied on the association rule model (ARM) to estimate rational NSAIDs and gastro-protective agents use in an outpatient prescriptions dataset. Data included patient demographics, diagnoses, and drug utilization review report. Around one-third of occasions these medications co-prescribed were inconsistent with

guidelines. Results concluded that with the rapid growth of health datasets, data mining methods may help assess quality of care and concordance with guidelines and best evidence.

5. **Rahman et al (2016)**[15] studied on prescribing pattern of NSAIDs in the orthopedic department to monitor, evaluate and suggest modification in the prescribing behavior of the medical practitioner to make it rational and cost effective. Study was performed on 300 prescriptions from both admitted and outpatients of the orthopedic department. The results showed that non-steroidal anti-inflammatory drugs were the main prescription drug for both indoor and outdoor patients in the orthopedic department. Aceclofenac in outdoor and ketorolac in indoor were the most common NSAIDs drug used.

6. **Kumar et al (2016)**[16] carried out a prospective study which was carried out in 400 inpatients during the 6 months period which was aimed to assess appropriateness of NSAIDs use with secondary objectives of assessment of co-prescription with gastro-protective agents, the nature and severity of adverse drug reactions and drug-drug interactions. The results of the study showed that moderate drug interactions were found between NSAIDs and antibiotics and no adverse drug reactions were reported during the study. The study concluded that, prescription of NSAIDs was found to be rational.

7. **Nitin et al (2016)**[17] studied on prescribing pattern of analgesics in the Department of Pedodontics. Prescriptions were randomly collected from the department and drugs were recorded on a customized data collection sheet. The results concluded that Ibuprufen was the most commonly prescribed analgesic drug followed by paracetamol, diclofenac and nimesulide. Commonly prescribed fixed dose combinations were (Aceclofenac + Paracetamol) and (Ibuprufen + Paracetamol).

8. **Jayakumari et al (2016)**[18] conducted a study to evaluate and analyze the prescription pattern of anti-inflammatory drugs given in the general medicine and surgery department at a tertiary care hospital. A total of 84 patients were included in this study. The results obtained in this research work were helpful to increase awareness of the limitations and difficulties on the translation of these recommendations into clinical practice, but also to stimulate the creation of strategies or tools to increase the appropriate therapy.

9. **Awodele et al (2016)**[19] conducted a study to evaluate the Prescribing Pattern of Non-Steroidal Anti-Inflammatory Drugs at the Outpatient Pharmacy Department of a University Teaching Hospital. A total of 3800 prescriptions containing NSAIDs were analyzed for information like the drug name and strength, the quantity prescribed, the number of NSAIDs per prescription, the total number of each NSAID prescribed, the presence of ACE inhibitors and diuretics alongside with NSAIDs, the presence of anticoagulants in the prescriptions, and NSAIDs prescribed in generic or brand names. The results showed that there is obvious need for adequate training in rational prescribing to inculcate in the prescribers the appropriate habits tailored towards rational prescription and use of drugs.

10. **Pravinkumar et al (2015)**[20] studied on the prescribing pattern of non-steroidal anti-inflammatory drugs in outpatient of orthopedic hospitals. A total of 237 prescriptions containing NSAIDs were evaluated for their distribution according to the classification of NSAIDs and World Health Organization core indicators for prescribing practices and patient care. The study showed more use of traditional NSAIDs and underutilization of COX2 inhibitors. The study suggested that there is the immense scope of improvement for prescribing in the hospitals.

11. **Maheshwari et al (2014)**[21] carried out a study to evaluate the usage of Analgesics in a multi-specialty tertiary care teaching hospital. The secondary objectives were to obtain the extent of usage of Analgesics in the hospital, to prevent inappropriate use of Analgesics. The results showed that ketorolac and diclofenac were found to be the most used Analgesics .The average duration of use of Analgesics was mostly found to be lesser than 5 days. Ketorolac has been widely used as STAT dose which lead to the conclusion that drug use problems are common and have significant clinical and economic implications.

12. **Zoltán et al (2013)**[22] retrospectively analyzed the administration of NSAIDs in a group of 428 patients in need of analgesic treatment hospitalized at a department of internal medicine. Data were evaluated using descriptive statistics, Student´s t-test and chi-squared test. The results suggested that the majority of patients treated with NSAIDs have factors indicating increased risk of development of adverse effects, most commonly arterial hypertension (58.2% of patients). The results of the questionnaire study showed limited knowledge of NSAID users about the risk of the therapy. Nearly half of the respondents were unaware of any adverse effects.

13. **Kulkarni et al (2013)**[23] conducted a study of prescription pattern of Non - steroidal anti-inflammatory drugs in Medicine out-patient clinic of a rural teaching hospital. A prospective, non – interventional, cross sectional (observational) study was carried out in Medicine Out-patient Department for a period of 5 months. The results showed that non-selective NSAIDs were commonly prescribed, followed by preferential COX-2 inhibitors.

14. **Niyaz et al (2012)**[24] carried out a simple randomized prospective study to evaluate the drug utilization of the Non-Steroidal anti-inflammatory drugs. The study was done on 300 subjects for a period of six months. The results indicated that NSAIDs users were more prevalent in middle age groups (40yrs) patients and in male.

15. **Jyothi et al** (2012)[25] conducted a study to determine the pattern of NSAID prescribing for arthritic and non-arthritic conditions in Orthopedic OPD. The study was done by collecting 100 prescription duplicates and analyzed prospectively for the pattern of NSAID prescription for arthritic and non-arthritic conditions. The results showed that NSAIDs were prescribed empirically for various arthritic and non-arthritic conditions, frequently as FDCs with various adjuvants, as per the standard guidelines.

SCOPE OF THE STUDY

SCOPE OF THE STUDY

Non – steroidal anti-inflammatory drugs (NSAIDs) are among one of the most frequently prescribed classes of drugs. They have a wide range of therapeutic application including treating conditions such as arthritis, to relieve pain, reduce inflammation and lower fever and also prevent blood from clotting.

In Canada more than 19 million prescriptions are written for analgesics and about 4.5 billion OTC pain medications are purchased every year. NSAIDs are widely used in treating acute musculoskeletal injuries and for chronic musculoskeletal pain. Evidences suggest that NSAIDs have an ability to provide symptomatic relief of conditions like acute low back pain.[26]

Most rheumatologists believe the NSAIDs remain as the baseline treatment for both osteoarthritis and rheumatoid arthritis. In UK, osteoarthritis is responsible for an estimated 2.4% of GP consultation. Traditional NSAIDs are preferred mostly and are found to be effective in relieving pain and inflammation. Over 111 million prescriptions being dispensed each year and the value of treatment with NSAIDs can be judged by their widespread use.[27]

Even though NSAIDs are commonly prescribed, they carry the risk of side effects, which can be serious and life – threatening. It has been reported by FDA that serious adverse events may occur in 1 – 3% of patients taking NSAIDs for three months and 3 – 5% of patients taking NSAIDs for one year.[28] There are several well documented reports suggesting that dyspepsia and gastrointestinal complications are more in patients on NSAID therapy. NSAIDs also associated with various other side effects including hypertension, water retention, heart failure and renal insufficiency. About 10 – 60% of patients are reported to have minor side effects including nausea, anorexia, abdominal pain, flatulence and diarrhoea, due to the concurrent administration of two or more NSAIDs.[29]

Gastro intolerance is the most common adverse effect of NSAIDs and the risk of dyspepsia has increased by 36%. About 103,000 hospitalizations and 16,500 deaths occur every year in United States due to NSAID-associated upper GI

adverse effects. A nationwide study was done in Spain, which revealed that the death rate attributed to NSAID/aspirin use was 15.3 deaths per one million NSAID/aspirin users.[30] The risk of GI bleeding is mainly caused by long term therapy with non – selective NSAIDs which affect both the upper and lower GI tracts. In a research done on gastro intestinal risk associated with NSAIDs states that ulcers were developed in about 20 – 30% of patents using NSAIDs regularly. Reports reveal that 80% of patients who die due to ulcer complications were on NSAID therapy.[31]

NSAID use has also been associated with an increased risk for CV events, including thrombotic events, myocardial infarction, and stroke. The cardiovascular toxicity is associated with the use of COX – 2 inhibitors and even with traditional NSAIDs use. Several clinical trials showed a 41 – 57% reduction in the rate of GI toxicities with the use of selective COX – 2 inhibitors but the rate of CV risk is increased. About three per thousand patients given with coxib therapy for almost an year experience cardiovascular risk and coxibs are contra indicated in patients with established CV disease. A recent analysis on newly diagnosed myocardial infarction cases, suggest that there was an increased risk of MI in NSAIDs users.[32]

Additionally, NSAIDs are also associated with acute nephrotoxicity and disease progression of chronic kidney disease. A study reports that 10.2% of patients with moderate to severe CKD were on NSAID therapy and 66.10% used for 11 year or longer.[33]

Despite of all these adverse effects, comparative studies about safety, efficacy and tolerability of NSAIDs is less and most physicians rely on their own clinical experience. Even though NSAIDs are very frequently prescribed in India, only few epidemiological data and studies related to NSAID use are available. The information obtained on the risk of NSAIDs use and the need for appropriate prescription of NSAIDs assured us to investigate on the prescription pattern and risk assessment of NSAIDs among our study population.[40]

PLAN OF THE STUDY

PLAN OF STUDY

The proposed study was planned to be carried out under 4 phases.

Phase I:

- Submission of protocol and obtaining consent from hospital authorities.
- Literature review
- Designing of structured data entry format, Patient information and consent form.

Phase II:

- Data collection
- Literature survey (continued)

Phase III:

- Screening of the prescriptions
- Analysis of the data
- Graphical representation of the data
- Interpretation of the data

Phase IV:

- Preparation of the project report and submission to the study department.

OBJECTIVES

OBJECTIVES

- To study the prescribing pattern of NSAIDs in prescriptions.
- To assess the drug – drug interaction in the prescriptions.

METHODOLOGY

METHODOLOGY

STUDY SITE:

The proposed work entitled "Study on drug utilization pattern of Non – steroidal anti – inflammatory drugs at a tertiary care teaching hospital" was carried out in a 1000 bedded multi-specialty hospital located in Coimbatore. The hospital is unique and well known for its services to people who come from various parts of the country. The institution excels in diverse specialties like General Medicine, General Surgery, Obstetrics, Gynecology, Pediatrics and Neonatology, Orthopedics, Psychiatry, Neurology, Radiology, Cardiology, Cardiothoracic surgery, Pulmonology and Critical care, Gastroenterology, Urology, Nephrology, E.N.T, Ophthalmology, Oncology, Dentistry, Plastic surgery and department of physical rehabilitation. The hospital has well-staffed Pharmacy and a Drug Information Centre.

The hospital is well equipped with modern diagnostic facilitates like somatic sensation (CT scan), MRI scan, Ultrasound sonography, digital substation angiography, ECG, tread mill, color Doppler, etc. The hospital also have well equipped Hi – tech operation theatres, Intensive Care Units, Intensive Cardiac Units, Intensive pulmonary care units, Neonatal Intensive care unit, Catheterization laboratory performing diagnostic cardiac catheterization, balloon valvuloplasty, coronary stenting, kidney transplantation unit with hemodialysis machines, assisted reproductive technology center, 24 hours microbiological and pathological services, round the clock causality and pharmacy services etc.

The department selected for the study is General Medicine. The reason for selection of this department is more prevalent use of NSAIDs. The Department of pharmacy practice provides services to this department and also have a good co – operation from medical team added up reasons for selecting this department for conducting the study. Knowledge on the prescribing pattern, rational use and risk factors associated with use of NSAIDs will help the health care professionals to ensure safer and better treatment outcomes.

STUDY DESIGN:

Prospective observational study

STUDY PERIOD:

10 Months (January 2019 to October 2019)

CONSENT FROM HOSPITAL AUTHORITIES

Every project work carried out in the hospital by the Pharmacy Practice department students has to be approved by the ethical committee of the hospital. A protocol of the study which includes the objectives, methodology, etc were presented to the members of the hospital ethical committee. The authorization from the ethical committee was procured through the letter [EC/2019/0503/CR/09 dated 15 April 2019] and the same is attached for reference in the **[Annexure I]**. The study was conducted with the expert guidance of senior and junior physicians of the study departments. The author was permitted to utilize the hospital facilities to make a follow up of the cases, in the selected departments. All the health care professionals were well informed through ethical committee's official circular.

LITERATURE SURVEY

An extensive literature survey was done regarding the evaluation of prescription pattern, rational use and risk assessment of use of NSAIDs. These include the various risk factors associated with use of NSAIDs, utilization patterns of NSAIDs etc. The necessary information quoted on the literatures was well documented. The literatures supporting the study were gathered from various sources such as:

1. American Journal of Therapeutics
2. The American Journal of Gastroenterology
3. Canadian Medical Association Journal
4. Indian Journal of Pharmacology

5. The British Journal of General Practice
6. World Journal of Gastroenterology
7. Oman Medical Journal
8. Journal of Korean Academy of Medical Sciences.

PATIENT SELECTION

Inclusion Criteria

- Patients of either sex admitted in general medicine ward of any age group who are prescribed with NSAIDs and those willing to participate were included in the study.

Exclusion Criteria

- The outpatient, intensive care patient, pregnant and lactating women and those not willing to participate in the study and patient with insufficient data in their record were excluded from the study.

PATIENT CONSENT FORM

A patient consent form has also been prepared and written consent was collected from all the patients or from the care givers by using patient consent form after providing the information in the format. The format contains details like address, date, place, provision for signature of the patient or caregivers, investigator and supervisor. The same is given in the **Annexure no.III** for reference.

DESIGN OF PATIENT INFORMATION FORM

A patient information form has been prepared, to inform the patients or the care givers about the purpose and the necessity of the study by providing the patient information form and assured them that the confidentiality will be strictly maintained and also it will help the betterment of patient's health. The model of the information form is given in the **Annexure no. II** for reference.

DATA ENTRY FORM

A specially designed data entry format was prepared and used to record the patient's details. Data entry format has the provision to record laboratory investigations, co – morbidities, Diagnosis, Drug chart, Drug interaction chart and non-steroidal anti – inflammatory drugs prescribed. The same is given in the **Annexure no. IV** for reference.

METHOD

The data were collected during the regular ward round participation from the inpatients. Standard data entry format was used to enter all the patient details collected during ward rounds. Patient informations such as their social history, body mass index, eating habits, hereditary, co morbid conditions, laboratory investigations – Systolic and diastolic blood pressure, fasting blood sugar, Postprandial blood sugar and random blood sugar, lipid profile- triglycerides, total cholesterol, LDL, HDL, HbA1c, Creatinine levels and the drugs prescribed for the patients were noted down from the patients record in the data entry format. The prescriptions with NSAIDs were recorded and the patients were followed till discharge. The prescriptions were individually screened to assess the prescribing pattern of NSAIDs. Micromedex drug data base was used to identify the drug-drug interactions and their severity in the prescriptions.

REPORT SUBMISSION

The report on the study result was prepared and the same was submitted to the study department for necessary modification on future therapy for a safe and effective treatment.

RESULTS

RESULTS

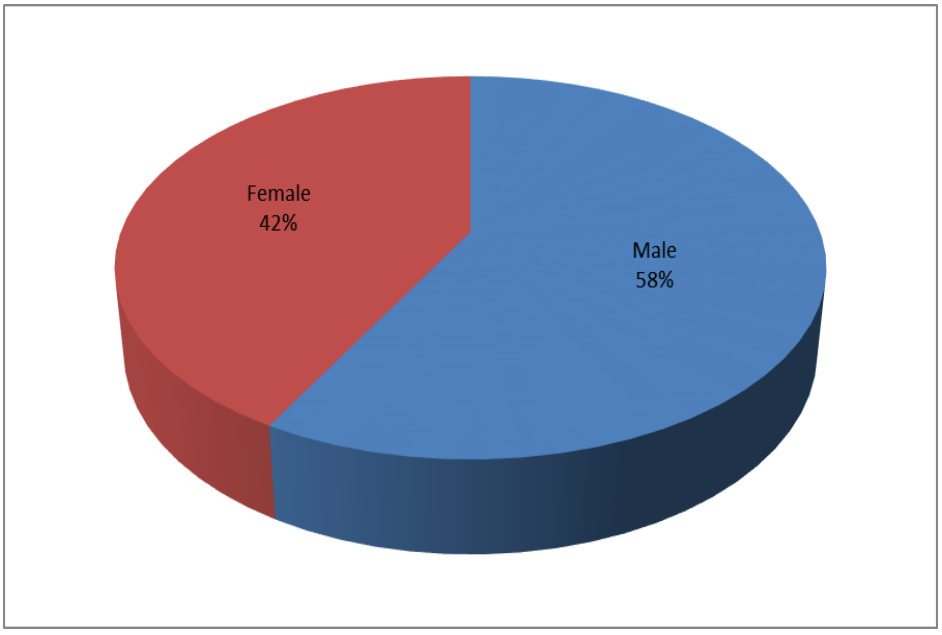
GENDER CATEGORIZATION
TABLE NO.1

(n=100)

Sl. No	Gender	Number of patients	Percentage %
1.	Male	58	58%
2.	Female	42	42%

GENDER CATEGORIZATION

FIGURE NO:1



The study results shows that 58% of the patients were male and 42% were female.

AGE DISTRIBUTION

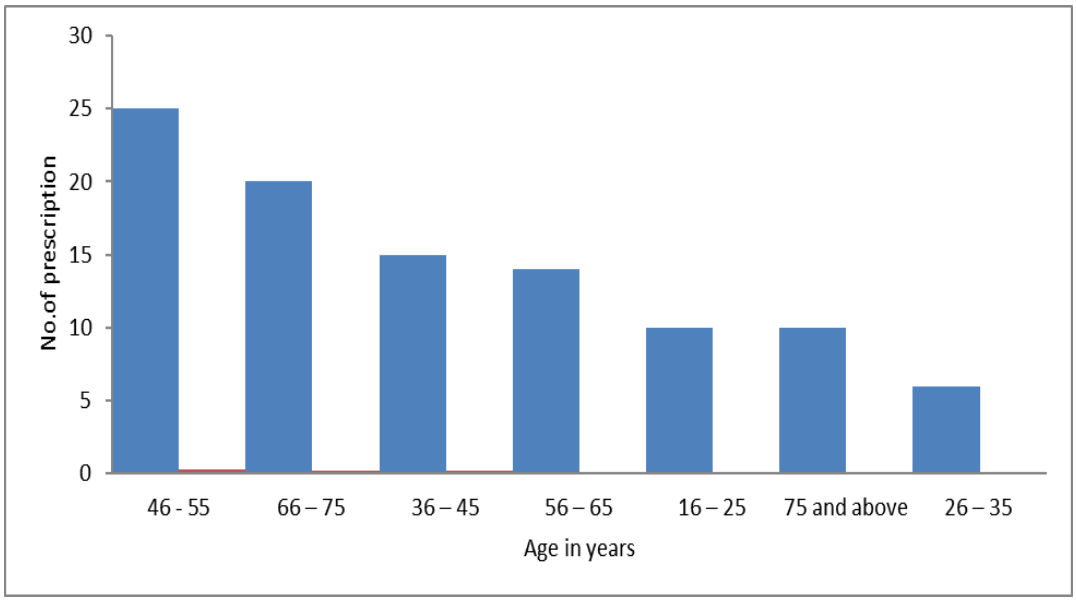
TABLE NO. 2

(n=100)

Sl.No	AGE (in years)	No. of prescription	Percentage (%)
1.	16 - 25	10	10%
2.	26 - 35	6	6%
3.	36 – 45	15	15%
4.	46 - 55	25	25%
5.	56 – 65	14	14%
6.	66 – 75	20	20%
7.	75 and above	10	10%

AGE DISTRIBUTION

FIGURE NO.2



The age distribution of patients were analyzed and it was found that 10% of patients were in the age group of 16 - 25 years, 6% were in the age group 26 - 35 years, 15% in 36 – 45 years, 25% in 46 - 55 years, 14% in 56 – 65 years, 20% in 66 - 75 years and 10% patients in the age group of 75 and above.

REASON FOR ADMISSION

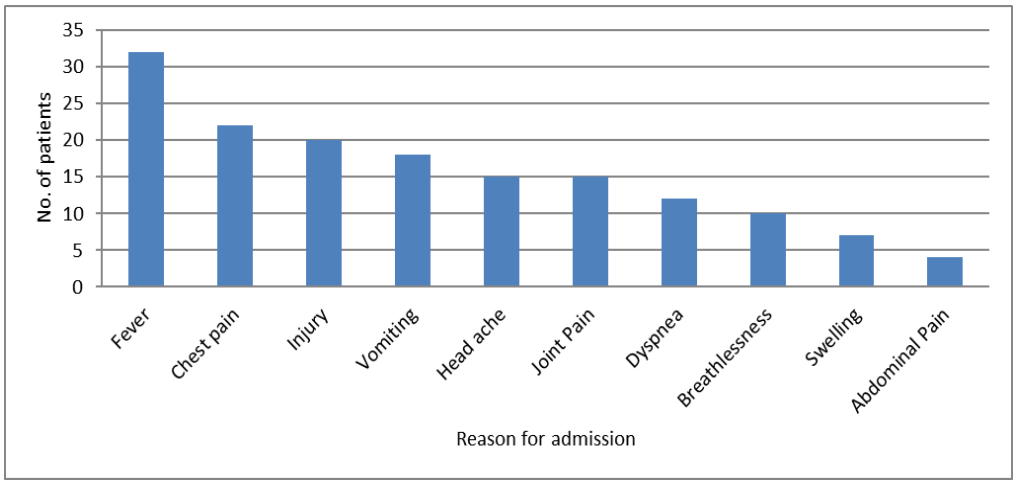
TABLE NO.3

(n=100)

Sl. No	Reason	Number of Patients	Percentage (%)
1	Fever	32	32%
2	Chest pain	22	22%
3	Injury	20	20%
4	Vomiting	18	18%
5	Head ache	15	15%
6	Joint Pain	15	15%
7	Dyspnea	12	12%
8	Breathlessness	10	10%
9	Swelling	7	7%
10	Abdominal Pain	4	4%

REASON FOR ADMISSION

FIGURE NO. 3



The study shows that most number of patients were admitted due to fever (32%) followed by chest pain (22%), injury (20%). Vomiting (18%), head ache (15%), joint Pain (15%), dyspnea (12%), breathlessness (10%), swelling (7%) and abdominal pain (4%).

PRESCRIBING PATTERN OF NSAIDS

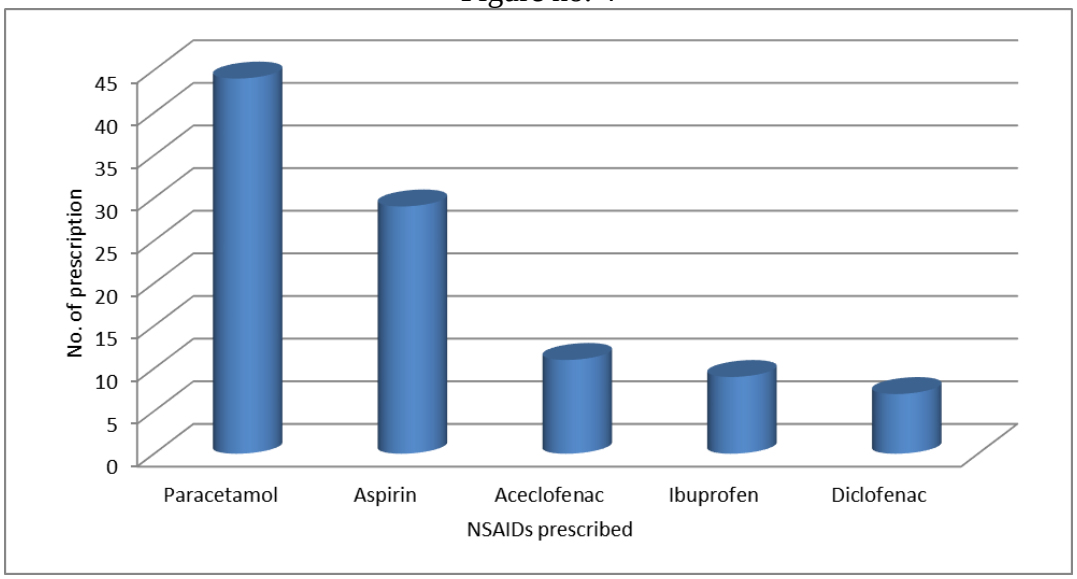
TABLE NO.4

(n=100)

Sl. No	Drugs	No. of Prescriptions	Percentage (%)
1	Paracetamol	44	44%
2	Aspirin	29	29%
3	Aceclofenac	11	11%
4	Ibuprofen	9	9%
5	Diclofenac	7	7%

PRESCRIBING PATTERN OF NSAIDs

Figure no. 4



The study reports that Paracetamol (44%) was the most commonly prescribed NSAID followed by Aspirin (29%), Aceclofenac (11%), Ibuprofen (9%) and Diclofenac (7%).

FIXED DOSE COMBINATION OF NSAIDS PRESCRIBED

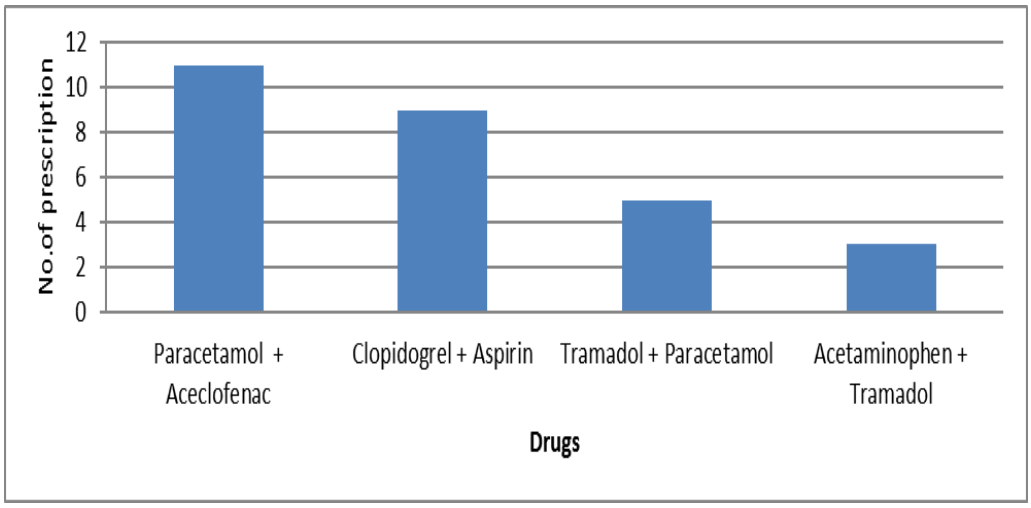
TABLE NO.5

(n=100)

Sl. No	Combination therapy	No. of Prescriptions	Percentage (%)
1.	Paracetamol + Aceclofenac	11	11%
2.	Clopidogrel + Aspirin	9	9%
3.	Tramadol + Paracetamol	5	5%
4.	Acetaminophen + Tramadol	3	3%

FIXED DOSE COMBINATION OF NSAIDS PRESCRIBED

FIGURE NO.5



The results reveal that the most commonly prescribed combination therapy was Paracetamol + Aceclofenac (11%) followed by the combination of Clopidogrel + Aspirin (9%), Tramadol + Paracetamol (5%) and Acetaminophen + Tramadol (3%).

ROUTE OF ADMINISTRATION

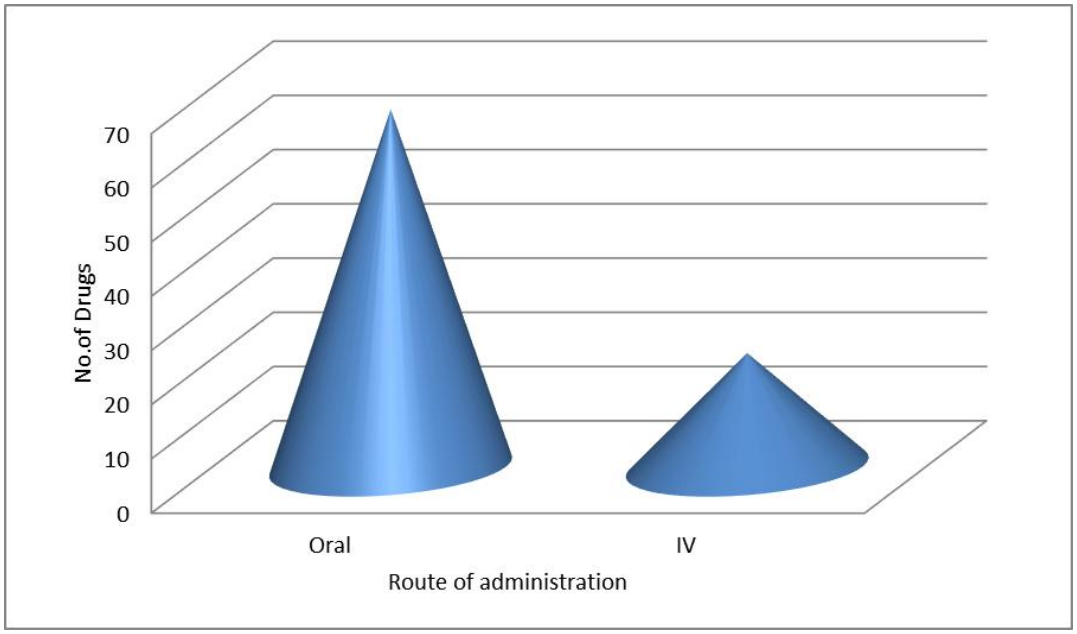
TABLE NO.6

(n=100)

Sl.No	Route	No. of Drugs	Percentage (%)
1.	Oral	66	66%
2.	IV	34	34%

ROUTE OF ADMINISTRATION

FIGURE NO. 6



The results shows that 66% NSAIDs were administered via oral route and 34% were administered through intravenous route.

DURATION OF NSAIDs PRESCRIBED

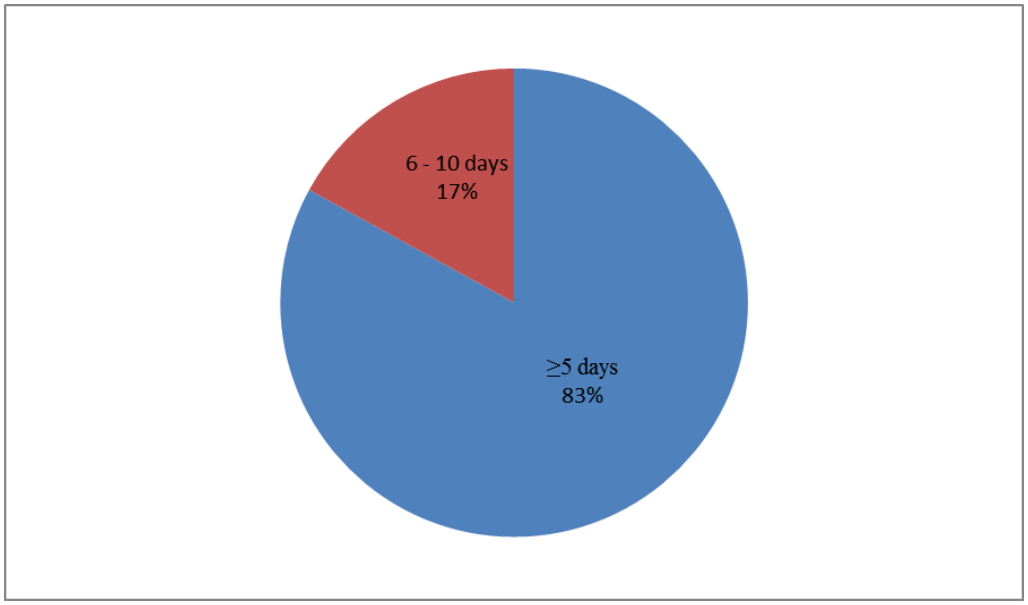
TABLE NO.7

(n=100)

Sl. No	Duration of therapy	No. of patients	Percentage (%)
1.	≤ 5 days	83	83%
2.	6 – 10 days	17	17%

DURATION OF NSAIDS PRESCRIBED

FIGURE NO.7



The study result shows that 83% of patients were prescribed with NSAIDs for ≤5 days and 17% of patients for 6 – 10 days.

VARIOUS INDICATIONS FOR PRESRIBING NSAIDS

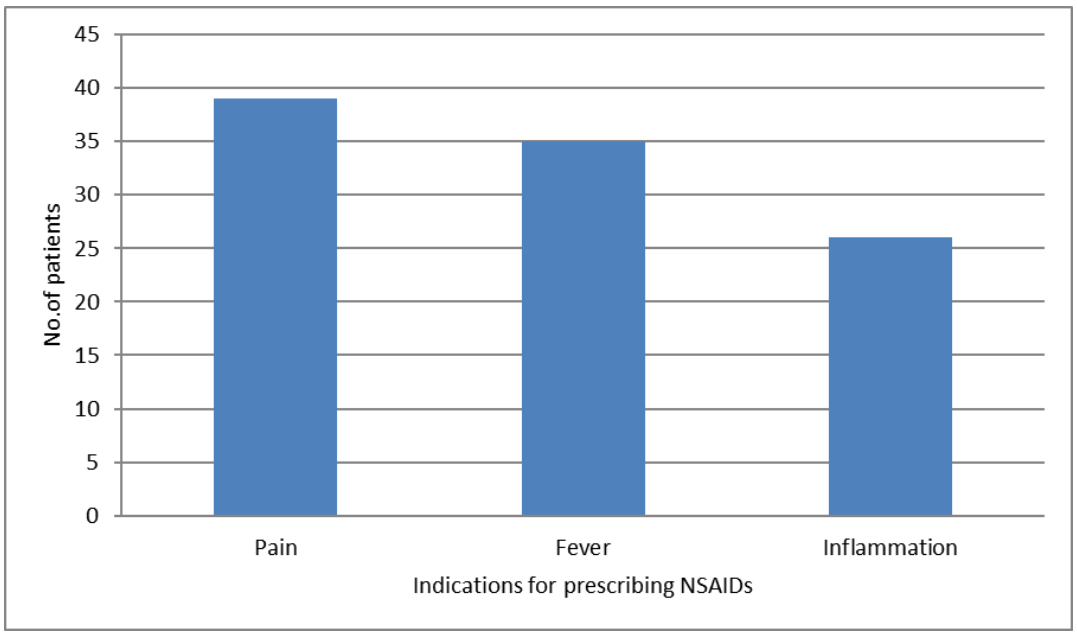
TABLE NO.8

(n=100)

Sl.No	Indications	No.of patients	Percentage (%)
1.	Pain	39	39%
2.	Fever	35	35%
3.	Inflammation	26	26%

VARIOUS INDICATIONS FOR PRESRIBING NSAIDs

FIGURE NO.8



The results shows that main indication for which NSAIDs prescribed was for pain (39%) followed by fever (35%) and inflammation (26%)

GASTROPROTECTIVE AGENTS

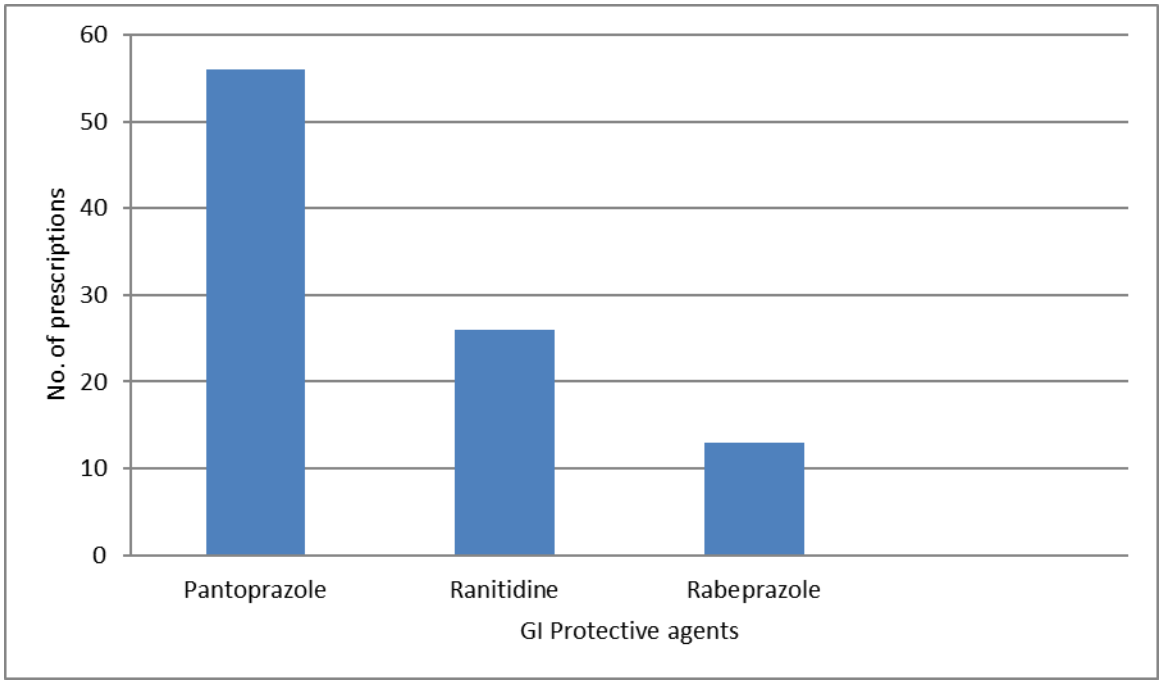
TABLE NO.9

(n=100)

Sl. No	GI Protective Agents	No. of prescriptions	Percentage (%)
1.	Pantoprazole	56	56%
2.	Ranitidine	26	26%
3.	Rabeprazole	13	13%

GASTROPROTECTIVE AGENTS

FIGURE NO. 9



Major gastro – protective agents used in the current study were Pantoprazole (56%), Ranitidine (26%), Rabeprazole (13%).

CO – MORBID CONDITIONS

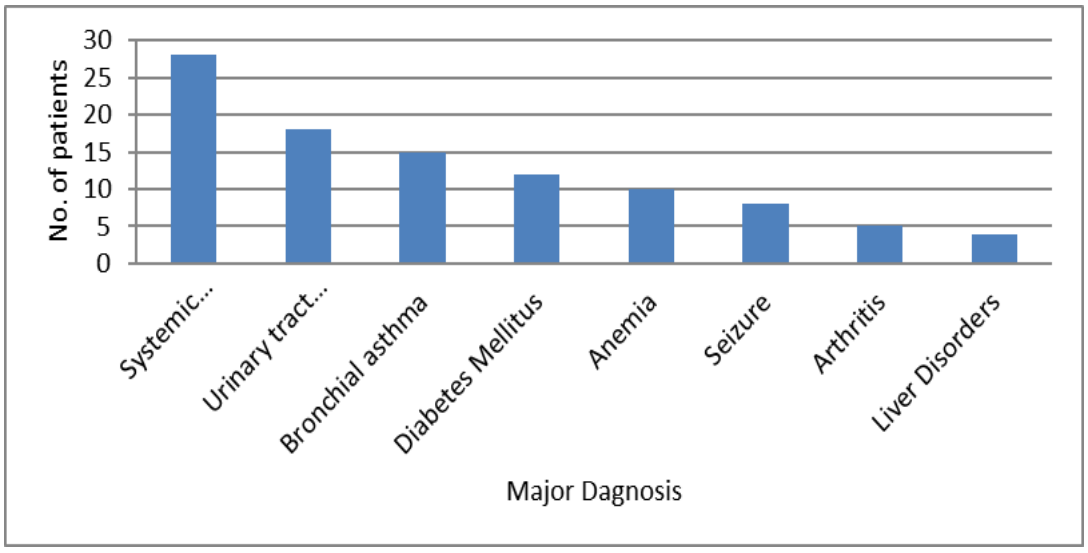
TABLE NO.10

(n=100)

Sl. No.	Major Diagnosis	No. of Patients	Percentage (%)
1	Systemic hypertension	28	28%
2	Urinary tract infections	18	18%
3	Bronchial asthma	15	15%
4	Diabetes Mellitus	12	12%
5	Anemia	10	10%
6	Seizure	8	8%
7	Arthritis	5	5%
8	Liver Disorders	4	4%

CO – MORBID CONDITIONS

FIGURE NO.10



Major co – morbid conditions observed in the study were Systemic hypertension (28%), Urinary tract infection (18%), Bronchial asthma (15%), Diabetes Mellitus (12%), Anemia (10%), Seizure (8%), Arthritis (5%) and Liver Disorders (4%).

CATEGORIES OF DRUGS PRESCRIBED

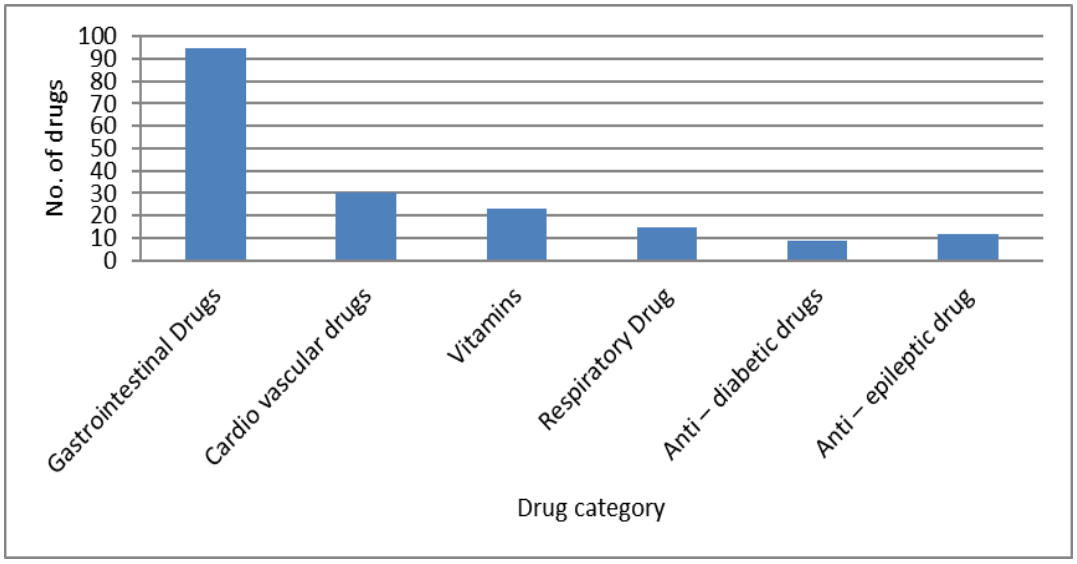
TABLE NO.11

(n=100)

Sl.No	Drug Category	No. of drugs	Percentage
1	Gastrointestinal Drugs	95	95%
2	Cardio vascular drugs	30	30%
3	Vitamins	23	23%
4	Respiratory Drug	15	15%
5	Anti – diabetic drugs	9	9%
6	Anti – epileptic drug	12	12%

CATEGORIES OF DRUGS PRESCRIBED

FIGURE NO. 11



The major categories of drugs in the prescription were Gastro intestinal drugs (95%), Cardiovascular drugs (30%), Respiratory drugs (15%), Vitamins (23%), Respiratory drugs (15%), Anti – diabetic drugs (9%) and Anti – epileptic drug (12%).

DRUG INTERACTONS

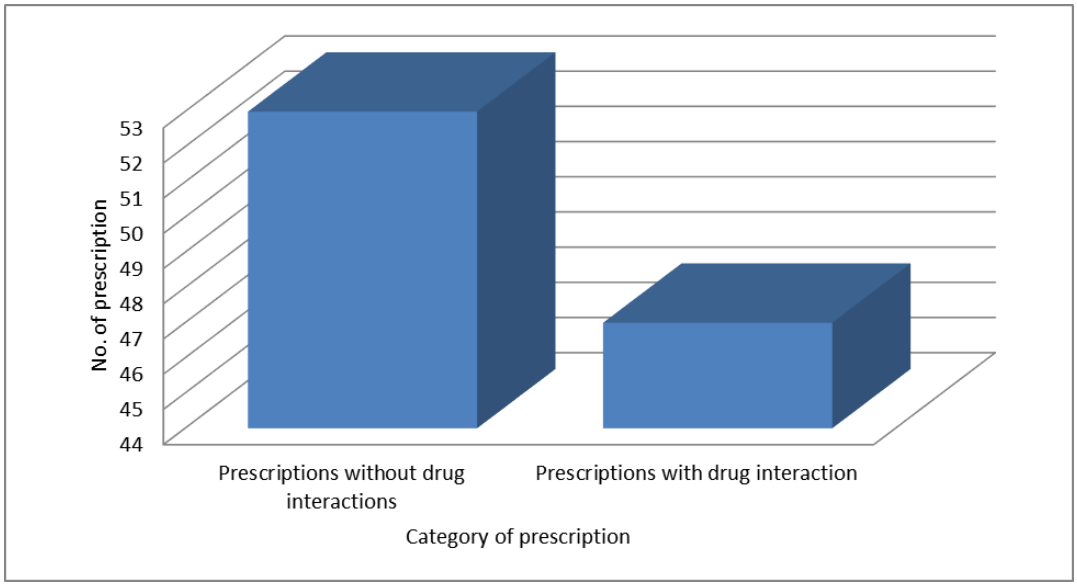
TABLE NO.12

(n=100)

Sl. No	Category of prescription screened	No. of Prescription	Percentage(%)
1.	Prescriptions without drug interactions	53	53%
2.	Prescriptions with drug interaction	47	47%

DRUG INTERACTONS

FIGURE NO.12



The study reports 47% of prescription had drug – drug interactions and 53% had no drug interactions.

SEVERITY OF DRUG INTERACTIONS

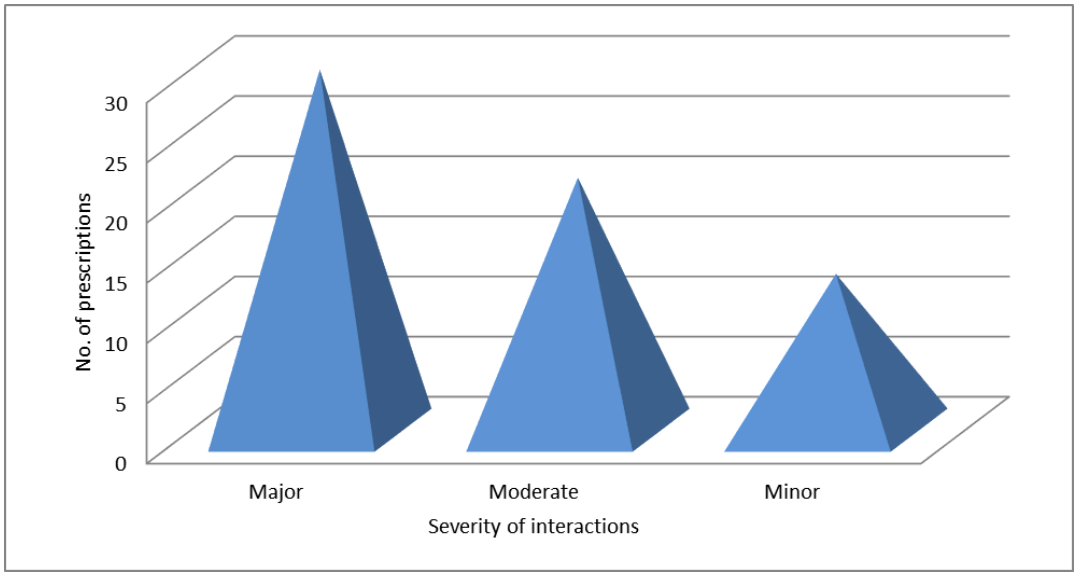
TABLE NO.13

(n=47)

Sl.No	Severity	Number of interactions	Percentage (%)
1.	Major	30	30%
2.	Moderate	21	21%
3.	Minor	13	13%

SEVERITY OF DRUG NTERACTIONS

FIGURE NO.13



The severity of drug interactions was identified to be around 30% with major severity followed by moderate 21% and minor 13%.

DRUG INTERACTIONS

Table no.14

Sl No	Drug 1	Drug 2	Effect	Severity	Management
1.	Aspirin	Clopidogrel	Increased risk of bleeding	Major	Monitoring of blood counts may be warranted.
2.	Aspirin	Heparin	Increased risk of bleeding	Major	Monitor patients closely and evaluate any signs or symptoms of blood loss that occur in a patient treated concomitantly.
3.	Aspirin	Ramipril	Decreased Ramipril effectiveness	Moderate	Weigh the benefits against the risks of combining these two agents.
4.	Aspirin	Naproxen	Increased risk of bleeding	Major	Monitor closely for GI bleeding.
5.	Dexamethasone	Diclofenac	Inflammation in GI tract	Major	If co – administration is necessary, monitor for signs of bleeding.
6.	Ticagrelor	Aspirin	Decreases ticagrelor efficacy	Major	After the initial loading dose of 325 mg, maintain aspirin with a dose of 75 to 100 mg

Sl No	Drug 1	Drug 2	Effect	Severity	Management
7.	Aspirin	Torsemide	Decreased diuretic effect and possible nephrotoxicity	Major	Monitor signs of worsening renal function and assure diuretic efficacy.
8.	Aspirin	Carvedilol	Decreased blood pressure	Moderate	Monitor BP when co – administration is required.
9.	Aspirin	Ranitidine	Decreased anti – platelet effect	Minor	Use caution with co – administration of both drugs.
10.	Aspirin	Telmisartan	Decreases effects of telmisartan by pharmacodynamic antagonism and decreased antihypertensive effects.	Moderate	Monitor while concomitant use is required.
11.	Aspirin	Metoprolol	Decreases effect of metoprolol	Moderate	Monitor while concomitant use is required.
12.	Aspirin	Insulin	Risk if hypoglycemia	Moderate	Monitor glucose levels frequently and adjust the dose of insulin if necessary.

Sl No	Drug 1	Drug 2	Effect	Severity	Management
13.	Aspirin	Furosemide	Causes nephrotoxicity	Major	Monitor signs of worsening renal function and assure diuretic efficacy.
14.	Aspirin	Metformin	Increased risk of hypoglycemia	Major	Monitor blood sugar level carefully during concomitant use.
15.	Diclofenac	Digoxin	Increased digoxin plasma concentration	Major	Monitoring of serum digoxin level.
16.	Aceclofenac	Spironolactone	Increased serum potassium level	Major	Monitor signs of worsening renal function and assure diuretic efficacy.
17.	Aceclofenac	Methotrexate	Methotrexate toxicity	Major	Monitor closely for toxicity
18.	Paracetamol	Ranitidine	Hepatotoxicity of paracetamol	Minor	Monitor closely for hepatotoxicity.
19.	Diclofenac	Naproxen	Increased GI toxicity and inflammation	Moderate	Concomitant use of more than one NSAID at a time should be avoided.
20.	Aspirin	Warfarin	Increased risk of bleeding	Major	Monitor for excessive anticoagulation and overt and occult bleeding.

DISCUSSION

DISCUSSION

Evaluation of drug utilization pattern of NSAIDs in the general ward of a tertiary care teaching hospital was carried out among 100 patients who has satisfied the inclusion criteria.

The total number of patients included in the study was 100. It was found that more number of males were prescribed with NSAIDs than females. A similar study conducted by Maheswari et al(2014) and Pravinkumar et al (2015) reported that males were taking NSAIDS more than females.

By analyzing the age criteria, majority of the patients belonged to the age group of 46 – 55 years. This study was in par with the study conducted by Kumar et al (2016) reported that NSAIDS were frequently prescribed in the age group of 46 - 55 years.

Out of 100 cases collected, the highest number of patients were admitted due to fever followed by chest pain, injury, vomiting, head ache, joint pain, breathlessness and swelling respectively.

The prescribing pattern of NSAIDs was assessed. It was found that more number of patients were prescribed with Paracetamol. The results correlates with the study conducted by Maheshwari et al (2014) reported that the most commonly prescribed NSAID was Paracetamol.

The fixed dose combination prescribed in the current study were Paracetamol + Aceclofenac, followed by Clopidogrel + Aspirin combination, Tramadol + Paracetamol combination and Acetaminophen + Tramadol combination.

The route of administration of NSAIDs was analysed. The study reports more number of patients were administered through oral route when compared with IV route. This result was similar to the study carried out by Niyaz et al (2012) showing that NSAIDs was prescribed mostly through oral route.

The duration of NSAIDs prescribed were assessed. It was observed that more number of patients were prescribed with NSAIDs for ≥5 days when compared to patients prescribed with NSAIDs for about 6 – 10 days. This study was in par with the study conducted by Maheswari et al (2014) reported that maximum number of patients treated with NSAIDs was for ≥5 days.

The various indications for prescribing NSAIDS were assessed. The results proves majority of patients were prescribed with NSAIDs for pain. This result correlates with the previous study carried out by Mohammed et al (2018) which states that NSAIDS were commonly prescribed for pain.

The gastro protective agents prescribed along with the NSAIDs were evaluated. It was found that more number of patients were prescribed with Pantoprazole followed by Ranitidine and Rabeprazole. A similar study conducted by Kumar et al (2016) reported that most commonly prescribed gastroprotective agent along with NSAIDs was Pantoprazole.

Among the co – morbid conditions observed hypertension was predominantly seen in patients which was comparable with the study conducted by Maheswari et al (2014).

The major categories of drugs prescribed along with NSAIDs are assessed and the most commonly prescribed category of drugs were gastro intestinal drugs followed by cardio vascular drugs, vitamins, respiratory drugs, anti – diabetic drugs, anti – epileptic drugs decreasing order respectively.

Polypharmacy increases the probability of drug interactions with NSAIDs. Interactions between NSAIDs and commonly prescribed drugs such as anticoagulants are a concern in our study. There appears to be a need for increased awareness on the part of clinicians and pharmacists about adverse effects of NSAIDs and drug – drug interaction.

CONCLUSION

CONCLUSION

The present study gives an overview of the pattern of use of NSAIDs in the general medicine department of the hospital and the drug – drug interactions in the prescriptions. There was a high percentage of NSAID prescription in the general medicine ward.

In the current study, pharmacist plays a major role by monitoring, identifying, and preventing drug interactions, thereby providing better pharmaceutical care to the patients. Pharmacist has a key role in monitoring and assessing the risk factors during the long term NSAIDs use. The scope for improving the rationality signifies the essential need for monitoring the NSAIDs therapy for better patient care. Pharmacist can make necessary interventions with the physician and can prepare periodic guideline for the safe use of NSAIDs. Rational use of NSAIDs can bring better health related quality of life in patients with chronic NSAID therapy. Hence this study helps to promote appropriate NSAID usage and serve as a check mark to the health care professionals thereby promoting rational drug usage of NSAIDs.

FUTURE OUTLOOK

FUTURE OUTLOOK

The future studies can be focused on preparing and establishing a guideline for the appropriate use of NSAIDs. Studies on monitoring and documentation of self-medication of NSAIDs will provide information on the risk associated with inappropriate use of NSAIDs. The study can be extended to large population, so that the number of adverse effects and drug interactions can be avoided. Pharmacoeconomic studies can be done to establish the cost effective NSAIDs therapy. Proper intervention is recommended that could lead to the reduction in NSAIDs overuse which includes health education campaign and adoption of international standard guidelines. Studies on health related quality of life can be performed to assess the need for periodic monitoring of NSAIDs therapy by pharmacist.

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BIBLIOGRAPHY

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ANNEXURES

Annexure I

Sri Ramakrishna Hospital

Medical Service : M/s. S.N.R. SONS CHARITABLE TRUST

SRI RAMAKRISHNA HOSPITAL ETHICAL COMMITTEE

395, SAROJINI NAIDU ROAD, SIDHAPUDUR, COIMBATORE - 641 044.

Phone : 0422 - 4500000, E-mail : ec@sriramakrishnahospital.co.in website : sriramakrishnahospital.com

Ethics Committee Registration No. ECR/690/Inst/TN/2014/RR-18

EC/2019/0503/ CR /09 **15.04.2019**

ETHICAL CLEARANCE CERTIFICATE

Project title: "PROPOSED TITLE: STUDY ON DRUG UTILISATION PATTERN OF NON - STEROIDAL ANTI – INFLAMMATORY DRUGS AT A TERITIARY CARE TEACHING HOSPITAL"

Researcher: Mr.ARABIND.B.PILLAI
M.PHARM 2nd YEAR,
Sri Ramakrishna Hospital, Coimbatore

The following members of the Ethics Committee were present at the meeting held on 05.03.2019 at 2.30pm at Auditorium, Sri Ramakrishna Hospital Campus, Coimbatore.

S.No	Members Name	Qualification	Designation	Address	Affiliation to the Institution (Yes/ No)
1.	Dr. Vimal Veereshwarayya	PhD, RAC.,	Vice Chairperson	Founder & MD, Gradvalley Data Science, 277/1A Annamalai Industrial Park SITRA, Kalapatti Main Rd, Kalapatti, Coimbatore, Tamil Nadu 641048.	No
2.	Dr. Isaac Christian Moses	MD., FICP, FACP.,	Member Secretary	Sri Ramakrishna Hospital, 395, Sarojini Naidu road, Sidhapudur, Coimbatore 641044.	Yes
3.	Dr. Paramasivan.N	MBBS., MD (Pharma).,	Basic Scientist	Sri Ramakrishna Dental College, S.N.R. College Road, Coimbatore – 641006.	Yes
4.	Dr. Karthikesh.K	MS., FRCS., DNB., M.Ch,	Clinical Scientist	Consultant Surgical Oncologist, Sri Ramakrishna Hospital,	Yes

				No. 395, Sarojini Naidu Road, Siddhapudur, Coimbatore.	
5.	Dr. Loganathan.N	MBBS., MD (GM)., DM (Pulmonary critical care & Sleep Medicine).,	Clinical Scientist	Consultant Pulmonologist, Sri Ramakrishna Hospital, No. 395, Sarojini Naidu Road, Siddhapudur, Coimbatore.	Yes
6.	Dr. Lokeshwaran.S	(MBBS., MD., DNB (Anaesthesia), EDIC, PDCC (cardiac Anaesthesia)	Clinical Scientist	Intensivist, Sri Ramakrishna Hospital, No. 395, Sarojini Naidu Road, Siddhapudur, Coimbatore.	Yes
7.	Mr. Sivakumar.V,	B.Sc., B.L.,	Legal Expert	9 Ground Floor, Parsn Trade Plaza, 156, Dr.Nanjappa Road, Coimbatore 641 018.	No
8.	Mr. Subramanian.V,	BA	Layperson	Supreme mills, ERA Mohan Nagar, Kalapatti Road, Coimbatore	No
9.	Dr. Nagalingam.M,	MSW, Ph.D.,	Social Scientist	Assistant Professor, Department of Social Work, Indira Gandhi National Tribal University, Amarkantak, Lalpur, Anuppur, MadhyaPradesh–484 886	No
10.	Dr. T.K.Ravi	M.Pharm., Ph.D	Subject Expert	Principal, Sri Ramakrishna College of Pharmacy, 395, Sarojini Naidu Road, Sidhapudur, Coimbatore	Yes
11.	Dr. Saravanakumar	MS	Subject Expert	Consultant- Surgery, Sri Ramakrishna Hospital, 395, Sarojini Naidu road, Sidhapudur, Coimbatore 641044.	Yes
12.	Dr. Banumathy.M	DGO.,DNB., MICOG	Subject Expert	Consultant- OBG, Sri Ramakrishna Hospital, 395, Sarojini Naidu road, Sidhapudur, Coimbatore	Yes

				641044.	
13.	Dr. Ramasamy	MD	Subject Expert	Consultant (General Medicine) Sri Ramakrishna Hospital, 395, Sarojini Naidu road, Sidhapudur, Coimbatore 641044.	Yes
14.	Dr. Subramanian.K	M.Sc., M.Phil., PhD	Statistician	Associate Professor & Head Department of Statistics PSG College of Arts & Science Coimbatore - 641014	No

This is to certify that the research work entitled **"PROPOSED TITLE: STUDY ON DRUG UTILISATION PATTERN OF NON - STEROIDAL ANTI – INFLAMMATORY DRUGS AT A TERITIARY CARE TEACHING HOSPITAL"**

placed before the Institutional Ethical Committee and has been approved as there is no objection to hold this research work.

The Ethics committee expects to be informed about the progress of the study, any changes in the protocol and patient information / informed consent and asks to be provided a copy of the final report.

The Ethics committee wishes for the research.

Yours truly,

Member Secretary,

Institutional Ethics Committee.

MEMBER SECRETARY
SRI RAMAKRISHNA HOSPITAL ETHICAL COMMITTEE
No: 395, SAROJINI NAIDU ROAD,
SIDDHAPUDUR, COIMBATORE - 641 044

Annexure II

College of Pharmacy

Sri Ramakrishna Institute of Paramedical Sciences,
Coimbatore-44
Ph: 0422- 4500297, Email: pharmacy_practice@rediffmail .com

PATIENT INFORMATION FORM

Dissertation Title: STUDY ON DRUG UTILIZATION PATTERN OF NON - STEROIDAL ANTI – INFLAMMATORY DRUGS AT A TERTIARY CARE TEACHING HOSPITAL

I, (**Mr.Arabind.B.Pillai**) is a **II Year** M. Pharm., Pharmacy Practice student of College of Pharmacy, SRIPMS, Coimbatore which is attached to Sri Ramakrishna Hospital Coimbatore, pursuing a dissertation work, entitled **"Study on Drug Utilization Pattern of Non - Steroidal Anti - Inflammatory Drugs at a tertiary care teaching hospital"** which has to be submitted to the Tamil Nadu Dr. M.G.R Medical University, Chennai for partial fulfillment for the award of degree of Master of Pharmacy. The details about the patient and the treatment are required by the investigator for carrying out the dissertation. It is here by assured that the details collected are only for the purpose of research and it will helpful to the patient and care giver. It is also assured that the information obtained from the patient will be maintained confidentially. We hope you will provide us the necessary co-operation for the above mentioned work by providing a written consent.

Thanking you

Signature of the Supervisor

Dr. B.Chitra, M.Pharm.,Ph.D.,
Academic Guide
Assist. Professor, Dept. of Pharmacy Practice,
College of Pharmacy, SRIPMS,
Coimbatore – 641044.

Signature of the Investigator

Mr.Arabind.B.Pillai
II Year M. Pharm., Pharmacy Practice,
College of Pharmacy, SRIPMS,
Coimbatore-44

Annexure III

College of Pharmacy
Sri Ramakrishna Institute of Paramedical Sciences,
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Ph.: 0422- 4500297,
Email: pharmacy_practice@rediffmail.com

Patient Consent Form

Dissertation Title: STUDY ON DRUG UTILIZATION PATTERN OF NON- STEROIDAL ANTI – INFLAMMATORY DRUGS AT A TERTIARY CARE TEACHING HOSPITAL

I have been made understood the necessity of the work entitled **"Study on drug utilization pattern of non- steroidal anti – inflammatory drugs at a tertiary care teaching hospital"** that is being carried out by **Mr. Arabind.B.Pillai** of II Year M. Pharm., Pharmacy Practice, College of Pharmacy, SRIPMS, Coimbatore. I voluntarily hereby agree by giving my consent to participate in this study and provide the necessary co-operation for the same.

Place: Coimbatore - 44

Date: 10/1/2019

Signature of the Patient/Bystander:

Name of the Patient: Sridhar. M

Name of the Bystander: Vijay

Signature of the Investigator:
II year M. Pharm., Pharmacy Practice,
College of Pharmacy, SRIPMS,
Coimbatore-44

Signature of the Supervisor:

Dr. B.Chitra, M.Pharm.,Ph.D.,
Academic guide
Assistant Professor,
Department of Pharmacy Practice,
College of Pharmacy, SRIPMS,
Coimbatore-44

Annexure IV

DEPARTMENT OF PHARMACY PRACTICE
College of Pharmacy, SRIPMS, Coimbatore - 44

DATA ENTRY FORM

Case No. 11

DISSERTATION TITLE: STUDY ON DRUG UTILIZATION PATTERN OF NON - STEROIDAL ANTI – INFLAMMATORY DRUGS AT A TERITIARY CARE TEACHING HOSPITAL

PATIENT DETAILS

Name	Age	Gender.	Wt.	Ht.	BMI	IP No.	Dept.	DOA	DOD
Mrs. Yesamma	68 yrs	F				201906115	GM	18/6/19	23/6/19

REASONS FOR ADMISSION Right shoulder pain, arm pain and neck pain since yesterday.

PAST MEDICAL HISTORY SHT, DM

PAST MEDICATION HISTORY T. Glucanorm, 500 mg 1-0-1
T. Revolol AM 5/5 1-0-1

FAMILY HISTORY

Marital status :

SOCIAL HISTORY: ☐ None ☐ Smoker : Y / ~~N~~ ☐ Alcoholic : Y/~~N~~ Tobacco in any other form : Y / ~~N~~ (Qty:) **Known allergies:**

Educational Status : ☐ Illiterate ☐ Primary School ☐ High School ☐ Graduate

Economic Status : ☐ Less than one lakh ☐ Between 1-5 Lakhs ☐ Above 5 lakhs

Occupation :

Patient Knowledge : ☐ Disease State ☐ Drug Compliance ☐ Risk Factors

LABORATORY INVESTIGATIONS

Date	D_1	D_2	D_3	D_4	D_5						Blood sugar (mg %)			
Temp.	N	N	N	N	N						F.B.S (60-90)			
BP	140/80	130/80	130/80	130/80	130/80						P.P.S(80-150)			
Pulse	120	92	72	90	90						R.B.S(90-110)	316		

BLOOD COUNTS

Hemoglobin (g/dl) M:12-16 F: 11-14	TLC (Cells/cumm) (5000-10000)	ESR (mm/hr.) (M<10;F<20)	Differential Leukocyte Count (%)			
13.8	9600		Polymorphs (40-60)	82.6		
			Lymphocytes (20-30)	16.1		
Platelets(1-3 lakhs)	Clotting Time(3-5 min)	Bleeding Time (1-3 min)	Basophils (0-1)	5.1		
			Eosinophils (1-4)	0.3		
			Monocytes (1-2)	0.9		

LIVER FUNCTION TEST								RENAL FUNCTION TESTS			
Total bilirubin (<1mg %)				Alk. Phosphatase (84-306 U/L)				Urea (mg%)(15-45)	23		
								Uric acid (mg%) F-2-5, F-2-7			
P.T. Time (14 Sec.)				SGPT (7-56 U/L) SGOT(5-40U/L)				Sr Creatinine (mg %) (0.6-1.4)	0.40		

General Examination

Conscious, Oriented, afebrile

CVS : $S_1 S_2^+$

C_S : B/LAE$^+$

P/A : Soft

$P^- I^- C^- C^- L^- E^-$

Discharge Medication

1. T. Ecospirin 150 mg 0-1-0
2. T. Deplatt 75 mg 1-0-0
3. T. Amlong 5mg 1-0-1
4. T. Prolomet XL 50mg 1-0-1
5. T. Flavedon MR 35mg 1-0-1
6. T. Envlet 40 mg 0-0-1
7. T. Pan 40 mg 1-0-0

Follow up

Review after 2 days.

DEPARTMENT OF PHARMACY PRACTICE
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DATA ENTRY FORM

Case No.

PLASMA LIPID PROFILE			
Triglycerides < 150 mg/dl Normal		LDL Cholesterol < 100-129 mg/dl Optimal	
Cholesterol < 200mg/dl Desirable		LDL Cholesterol < 160-189 mg/dl High	
HDL Cholesterol < 40mg/dl Low		VLDL Cholesterol (15-35 mg/dl)	
HDL Cholesterol ≥ 60mg/dl High		T. Cholesterol / HDL Cholesterol	
LDL Cholesterol < 100 mg/dl Desirable		Ratio 2.2 – 4.5	

ELECTROLYTES (m.Eq/l)					URINE EXAMINATION	
Sodium (130-150)	135				Colour	Sugar
Potassium (3.5-5.8)	3.9				Bile Salts	WBC
Chloride (98-100)	105				Bile Pigment	RBC
Bicarbonate(22-36)	20				Albumin	Casts
C/S : Y/S Organism Isolated :					No. of organisms isolated : Sensitive to :	

Other Investigations : ECG

Diagnosis: ACS - Lateral Ischemia

DRUGS PRESCRIBED

No.	Name of the medication		Qty. of drug to be administered	Frequency	Route	Days of treatment						
	T. Name & Strength	G. Name				D_1	D_2	D_3	D_4	D_5		
01	Inj. Heparin	Heparin				✓	✓	✓	✓	✓		
02	Inj. Pan	Pantoprazole				✓	✓	✓	✓	✓		
03	T. Ecospirin	Aspirin				✓	✓	✓	✓	✓		
04	T. Deplatt	Clopidogrel				✓	✓	✓	✓	✓		
05	T. Crevast	Rosuvastatin				✓	✓	✓	✓	✓		
06	T. Sorbitrate	Isosorbide Dinitrate				✓	✓	✓	✓	✓		
07	T. Prolomet	Metoprolol				✓	✓	✓	✓	✓		
08	T. Flavedon MR	Trimetazidine				✓	✓	✓	✓	✓		
09	T. Amlong	Amlodipine				✓	✓	✓	✓	✓		
10	T. Eritel	Telmisartan				✓	✓	✓	✓	✓		

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DATA ENTRY FORM

Case No.

DRUG INTERACTIONS

Drug 1	Drug 2	Effects	Severity	Management
Imbodipin	Clopidogrel	Used antiplatelet effect	Major	Monitor while concomitant
		Red risk of thrombotic		use is required
		event.		
Clopidogrel	Aspirin			Monitoring of blood counts
Clopidogrel	Aspirin	Used risk of bleeding	Major	is warranted.
Heparin	Aspirin			Evaluate signs and symptoms of
				blood loss.
Metoprolol	Aspirin	Used BP	Moderate	Monitor while concomitant use.

ADVERSE DRUG REACTIONS (ADRs)

Name of the drug	Reaction

Any Other Interventions Made:

Name of Investigator: Anabind. B. Pillai

Name of the Guide: Dr.B.Chitra

Signature of the Investigator:

Signature of the Guide:

Date: 25/6/19