A Cross-Sectional Observational Study on Prescription Pattern, Self Medication, and Pharmacoeconomics of Pain Medications in Kerala and Tamilnadu

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ABSTRACT

Introduction: Medicines account for 30-40% of health expenditure in developing countries and many of these payments are for self medications. There is an increasing importance of prescription pattern studies because of boosted marketing of new drugs. An economic evaluation of pain management is essential because of its importance in health care. Many brands, as well as generic drugs of the same formula, are available with a significant cost variation. This study analyzed the prescribing pattern and pharmacoeconomics of analgesic drugs to take a further study in rational use of the drug. **Data collection:** Details were collected using self-prepared questionnaires, face-to-face interviews, and an online platform. Descriptive studies were used to analyze the results **Result:** In the study among 400 prescriptions only 203 people (50-75%) only brought the full course of prescribed medication.1446 were the total number of prescribed medications, out of which 622 drugs were used to control pain. About 13.25% of people replaced the prescribed medicine with their self-medication and 120.45 rupees was calculated as the average cost of pain medication per prescription **Conclusion:** Drug prescribing pattern and pharmacoeconomic analysis of drugs form an important part of drug utilization studies. NSAID and their combinations were the most prescribed medications. 1446 were the total number of prescribed medications. About 13.25% of people replaced the prescribed medicine with their self-medication and 120.45 rupees was the average cost of pain medication per prescription. A significant difference was found between the total cost of prescribed and alternative brands.

INTRODUCTION

Pain is a vital function of the nervous system in providing the body with a warning of potential or actual injury. It is both a sensory and emotional experience, affected by psychological factors such as past experiences, beliefs about pain, fear, or anxiety (An introduction to pain pathways and mechanisms).

Pain is defined by the International Association for the Study of Pain as an "unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" (IASP 1979). Accordingly, pain is a multidimensional issue with both emotional and physical components that are characterized as pain distress and pain severity, respectively[Pain and Analgesia]. There is no internationally agreed classification of analgesics. (Joseph F. Dasta et al., 2001)

MEASUREMENT OF PAIN

There is no single way of measuring pain. The severity of a particular pain is based on what is verbally or non-verbally communicated about the experience   Patients often express difficulty in describing pain, and two people may have very different descriptions for pain that accompanies a similar injury.

In assessing pain, its intensity emotional distress, and associated disability are important and cannot be captured with one scale or questionnaires. Pain severity can be estimated by using grades such as Visual Analog Scale (VAS). A VAS consists of a 10 cm line on which 0 cm is "no pain" and 10 cm is "pain as bad as it could be". The patient indicates the point along the line that properly portrays his/her pain, and the score is ranked from the "No pain" end of the scale. (Sonia Kothari et al., 2017)

NOCICEPTORS

Nociceptors are the specialized sensory receptors responsible for the detection of noxious (unpleasant) stimuli, transforming the stimuli into electrical signals, which are then conducted to the central nervous system. They are the free nerve endings of primary afferent Aδ and C fibers. Distributed throughout the body (skin, viscera, muscles, joints, meninges)

Inflammatory mediators (eg bradykinin, serotonin, prostaglandins, cytokines, and H+) are released from damaged tissue and can stimulate nociceptors directly. They can also act to

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reduce the activation threshold of nociceptors so that the stimulation required to cause activation is less. This process is called primary sensitization (K.Bannister et al., 2020).

PRIMARY AFFERENT FIBRES

In addition to the Aδ and C fibers that carry noxious sensory information, there are primary afferent Aβ fibers that carry non-noxious stimuli. Each of these fiber types possesses different characteristics that allow the transmission of particular types of sensory information.

Aβ fibers are highly myelinated and of large diameter, therefore allowing rapid signal conduction. They have a low activation threshold and usually respond to light touch and transmit nonnoxious stimuli. Aδ fibres are lightly myelinated and have smaller diameters, and hence conduct more slowly than Aβ fibres. They respond to mechanical and thermal stimuli. They carry rapid, sharp pain and are responsible for the initial reflex response to acute pain.

C fibres are unmyelinated and are also the smallest type of primary afferent fibre. Hence, they demonstrate the slowest conduction. C fibres are polymodal, responding to chemical, mechanical and thermal stimuli. C fibre activation leads to slow, burning pain.

DORSAL HORN OF THE SPINAL CORD

Aδ and C fibres synapse with secondary afferent neurons in the dorsal horn of the spinal cord. The dorsal horn can be divided histologically into ten layers called Rexed laminae. Aδ and C fibres transmit information to nociceptive specific neurons they can be stimulated by mechanical, thermal, or chemical stimuli in Rexed lamina I and II, in addition to projections to other laminae. Primary afferent terminals release several excitatory neurotransmitters including glutamate and substance P.

Complex interactions occur in the dorsal horn between afferent neurons, interneurons, and descending modulatory pathways These interactions determine the activity of the secondary afferent neurons. Glycine and gamma-aminobutyric acid (GABA) are important neurotransmitters acting by inhibiting Ascending tracts in the spinal cord two main pathways carry nociceptive signals to higher centers in the brain.

The spinothalamic tract: secondary afferent neurons decussate within a few segments of the level of entry into the spinal cord and ascend in the contralateral spinothalamic tract to nuclei within the thalamus. Third-order neurons then ascend to terminate in the somatosensory cortex. There are also projections of the periaqueductal grey matter (PAG). The

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spinothalamic tract transmits signals that are important for pain localization. The spinoreticular tract: fibers also decussate and ascend the contralateral cord to reach the brainstem reticular formation, before projecting to the thalamus and hypothalamus. There are many further projections to the cortex. This pathway is involved in the emotional aspects of pain or interneurons.

PAIN PROCESSING IN THE BRAIN

The experience of pain is complex and subjective and is affected by factors such as cognition (eg distraction or catastrophizing), mood, beliefs, and genetics. The somatosensory cortex is important for the localization of pain. However, imaging techniques such as functional magnetic resonance imaging (fMRI) have demonstrated that a large brain network is activated during the acute pain experience. This is often called the 'pain matrix. The commonest areas activated include the primary and secondary somatosensory (S1 and S2), insular, anterior cingulate cortex and prefrontal cortex, and the thalamus, demonstrating that these areas are all important in pain perception. (K. Bannister et al., 2020)

INHIBITION OF PAIN TRANSMISSION

Some mechanisms act to inhibit pain transmission at the spinal cord level and via descending inhibition from higher centers. Gate control theory of pain The gate control theory of pain was proposed by Melzack and Wall in 1965 to describe a process of inhibitory pain modulation at the spinal cord level. It helps to explain why when we bang our head, it feels better when we rub it. By activating Aβ fibers with tactile, non-noxious stimuli inhibitory interneurons in the dorsal horn are activated leading to inhibition of pain signals transmitted via C fibers.

Descending inhibition - The periaqueductal grey (PAG) in the midbrain and the rostral ventromedial medulla (RVM) are two important areas of the brain involved in descending inhibitory modulation. Both these centers contain high concentrations of opioid receptors and endogenous opioids, which helps explain why opioids are analgesic These pathways are monoaminergic, utilizing noradrenaline and serotonin as neurotransmitters.

VISCERAL PAIN

Visceral pain is pain arising from the internal organs. The viscera are largely innervated by C fibers. Visceral pain is typically diffuse and poorly localized, often described as deep, dull, or dragging. It can be associated with autonomic changes such as nausea, vomiting, and changes

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in heart rate or blood pressure. It can also evoke strong emotional responses. In contrast to somatic pain, which is felt due to stimuli such as burning or crushing, visceral pain is triggered by smooth muscle distension or contraction, stretching of the capsule surrounding an organ, ischemia, and necrosis, or irritation by chemicals produced during inflammatory processes. It is due to the convergence of different afferents onto the same dorsal horn neurons in the spinal cord.

MATERIALS AND METHODS

This was a cross-sectional study conducted in the states of Tamilnadu and Kerala in India. This cross-sectional survey was conducted among the residents of Tamilnadu and Kerala from September 2020 to December 2020; the three months when the government started to implement the first unlock measures. For example, shoulder pain can be felt due to diaphragmatic irritation that occurs following laparoscopic surgery that can stretch the diagram. (H T Ong, et al., 2013)

NEUROPATHIC PAIN

Neuropathic pain is caused by damage to nerves in the central or peripheral nervous system. Damage can be due to several mechanisms including trauma or surgery, diabetes mellitus, chemotherapy, radiotherapy, ischemia, infection, or malignancy.
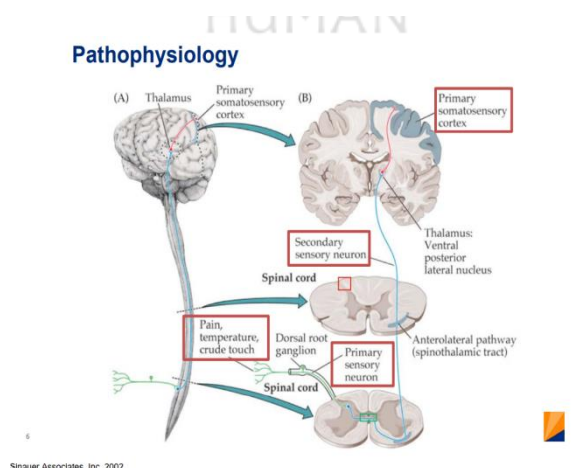

Figure No. 1: Neuropathic pain

Classification of Pain

ACUTE PAIN

• Predicted physiological response to stimulus

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• Self-limiting

• < 3 months duration

• Associated with surgery, traumatic injury, tissue damage, and inflammation.

CHRONIC PAIN

• Intractable pain

• Does not resolve in response to treatment

• ≥ 3 months duration

• Cause may or may not be known.

Gross undertreatment of acute pain has been well chronicled over the last quarter-century and likely continues today [Patient-Controlled Analgesia. The correct diagnosis and proper treatment of pain is an important public health concern. Millions of people in the world with severe acute and chronic pain sufferers because of the ignorance of doctors and the lack of a standardized scientific approach. Pain is a direct or indirect consequence of several diseases (WHO Normative Guidelines on Pain Management 2011).

Pain management is extremely complex because pain presents in different ways (e.g., acute, chronic, acute on chronic), develops from different sources (e.g., somatic, visceral, neuropathic, psychogenic), and is perceived and tolerated in a highly variable manner The choice of analgesic agent depends on a variety of patient factors, including the type, duration, and severity of the pain; hemodynamic status; prior response or tolerance to therapy; the presence of organ dysfunction and other comorbidities; potential for harmful drug interactions and adverse drug events; and the required onset and duration of pain relief[Pain and Analgesia]. (Robert .G. et al., 1984)

MANAGEMENT

(Therapeutic Goals, Documentation, and Response)

The primary goal of pain management is to acutely provide patient comfort and safety; secondary goals are to prevent the immediate and long-term complications of pain. The complexity of pain management mandates a comprehensive systematic multidisciplinary approach. Pain assessments should be routinely performed and documented (at least four times per nursing shift and within 30 minutes of administering pain-relieving interventions),

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together with simultaneous efforts to mitigate many of the factors that initiate, sustain, or heighten the awareness of pain. Efforts should include preemptive strategies initiated before painful procedures, identification of outpatient issues such as chronic pain or history of substance abuse, and tolerance with a low threshold to restart medications, if appropriate.

Analgesics including NSAIDs are commonly prescribed groups of drugs in clinical practice for the management of pain and inflammation 1 - 4. Nonsteroidal anti-inflammatory drugs (NSAIDs) are commonly available over the counter 1, 5. The common adverse drug effects with this group of drugs are the gastrointestinal tract (GIT) toxicity 6, 7. Therefore, periodic evaluation of drug utilization patterns needs to be done to enable suitable modifications in the prescription to increase therapeutic benefits and decrease the adverse effects. (Joychandra et al., 2017.) Pharmacists can help patients live meaningful and productive lives with adequately managed pain (Taking Care: The Pharmacist's Role in Caring for Patients pain).

TYPES OF ANALGESICS

Analgesics can be broadly classified into two categories:

NON-NARCOTIC (NON-ADDICTIVE) ANALGESICS

This type of drug is generally used for relieving skeleton interneurons, happen due to arthritis. Aspirin and paracetamol are the most common drugs in this case. When you take aspirin, it acts by inhibiting the synthesis of the chemical known as prostaglandins by chemical reactions which causes inflammation in the tissues, and as a result, the sensation of pain is felt.

NARCOTIC ANALGESICS

These types of analgesic drugs are taken for medical use in prescribed doses, where they act by relieving the pain and producing sleep. If the dose of this analgesic drug increases then it can lead to coma, convulsion, and finally result in death.

Morphine is the most common type of narcotic analgesic used nowadays, they are also referred to as opiates since they are obtained from the opium poppy.

The narcotic analgesics or painkillers are mostly used for relieving postoperative pain, cardiac pain, and the pain of terminal cancer. (Charles E. et al., 2002)

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CLASSIFICATION OF ANALGESIC:

NON OPIOID ANALGESIC

A. Nonselective COX inhibitors (traditional NSAID'S)

1. Salicylates: Aspirin

2. Propionic acid derivatives: Ketoprofen, Ibuprofen, Naproxen, Flubiprofen

3. Fenamate:Mefenamic acid

4. Enolic acids derivatives: Piroxicam, Tenoxicam

5. Acetic acid derivatives: ketorolac, Indomethacin, Nabumetone

6. Pyrazolone derivatives: Phenylbutazone, oxyphenbutazone

B. Preferential COX – 2 inhibitors

Nimesulide, Diclofenac, Acelofenac, Meloxicam, Etodolac

C. Selective COX - 2 inhibitor

Celecoxib, Etoricoxib, parecoxib

D. Analgesic-Antipyretic with poor anti-inflammatory action

Paraaminophenol derivative: Paracetamol

Pyrazolone derivatives: Metamizol, Propiphenazone

Benzoxazocine derivatives: Nefopam

Naturally occurring compounds – Morphine, Codeine, Thebaine, Papaverine

SDihydromorphone, Buprenorphine, Oxycodone

Synthetic – Pethidine, Fentanyl, Methadone, Alfentanil, Remifentanil, Tapentadol

NSAID'S

Prostaglandins are a family of chemicals that are produced by the cells of the body and have several important functions. They promote inflammation that is necessary for healing but also results in pain, and fever; support the blood clotting function of platelets, and protect the lining of the stomach from the damaging effects of acid. Prostaglandins are produced within

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the body's cells by the enzyme cyclooxygenase (COX). There are two COX enzymes, COX-1 and COX-2. Both enzymes produce prostaglandins that promote inflammation, pain, and fever. However, only COX-1producesprostaglandins that support platelets and protect the stomach.

Nonsteroidal anti-inflammatory drugs (NSAIDs) block the COX enzymes and reduce prostaglandins throughout the body. As a consequence, ongoing inflammation, pain, and fever are reduced. Since the prostaglandins that protect the stomach and support platelets and blood clotting also are reduced, NSAIDs can cause ulcers in the stomach and promote bleeding. (Christopher et al ., 2012)

PREFERENTIAL COX-2 INHIBITORS

Nimesulide: weak inhibitor of PG synthesis and COX-2 selectivity. Antiinflammatory action may be exerted by other mechanisms as well, e.g. reduced generation of superoxide by neutrophils, inhibition of PAF synthesis and TNFa release, free radical anti-inflammatory bition of metalloproteinase activity in cartilage. • The analgesic, antipyretic and anti-inflammatory activity of nimesulide has been rated comparable to other NSAIDs. It has been used primarily for short-lasting painful inflammatory conditions like sports injuries, sinusitis, and other ear-nose-throat disorders, dental surgery, bursitis, low backache, dysmenorrhoea, postoperative pain, osteoarthritis, and fever.

SELECTIVE COX-2 INHIBITORS

They cause little gastric mucosal damage; the occurrence of peptic ulcers and ulcer bleeds is lower than with traditional NSAIDs. They do not depress TXA2 Production by platelets (COX-I dependent); do not inhibit platelet aggregation or prolong bleeding time but reduce PGI2 production by vascular endothelium. • It has been concluded that selective COX-2 inhibitors should be used only in patients at high risk of peptic ulcer, perforation, or bleeds. If selected, they should be administered in the lowest dose for the shortest period. Moreover, they should be avoided in patients with a history of ischaemic heart disease/ hypertension/ cardiac failure/ cerebrovascular disease, who are predisposed to CV events.

Elecoxib: It exerts anti-inflammatory, analgesic, and antipyretic actions with low effectiveness as naproxen or diclofenac, without affecting COX- 1 activity in gastroduodenal mucosa. Platelet aggregation in response to collagen exposure remained intact in celecoxib recipients and serum TXB2 levels were not reduced. Though tolerability of Celecoxib is

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better than traditional NSAIDs, still, abdominal pain, dyspepsia, and mild diarrhea are the common side effects. Rashes, edema, and a small rise in BP have also been noted. • Celecoxib is slowly absorbed, 97% plasma protein-bound, and metabolized primarily by CYP2C9 with a t1/2 of 10 hours. It is approved for use in osteo- and rheumatoid arthritis in a dose of 100-200 mg BD.

ANTIDEPRESSANTS FOR PAIN

Antidepressants were originally developed to improve symptoms of depression, but some of these medications have been recognized for their ability to relieve chronic pain. In particular, chronic neuropathic pain caused by the damage to the nerves in the pain pathways is responsive to some antidepressant medications.

Physical pain is one of the most common somatic symptoms in patients that suffer from depression and conversely from chronic pain of diverse origins are often depressed.

While these data strongly suggest that depression is linked to altered pain perception, pain management has received little attention to date in the field of psychiatric research. The monoaminergic system influences both mood and pain and since many antidepressants modify the properties of monoamines, these compounds may be effective in managing chronic pain of diverse origins in non-depressed patients and elevating pain in depressed patients. (Randy A. et al.,2008)

ANTICONVULSANTS USED TO CONTROL PAIN

Anticonvulsants are a class of drugs widely used in the treatment of pain. In general, they are usually associated with analgesic, antiinflammatory, alternative therapies, or non-pharmacological integrative therapies the atc acts by potentiating the inhibitory action of neurotransmitters called gamma-aminobutyric (GABA) and easily cross the blood-brain barrier and membrane. The most common drugs used to treat this kind of chronic are anticonvulsants such as phenytoin, carbamazepine, gabapentin, topiramate, and benzodiazepine-like diazepam and clonazepam which in addition to anxiolysis activity, can also exercise anticonvulsant function. Anticonvulsant drugs have been used in pain arrangement. Soon after they were first used to revolutionize the management of epilepsy.

Anticonvulsant drugs are effective in the treatment of chronic neuropathic pain but were, not until recently thought to be useful in more acute conditions such as postoperative pain. Similar to nerve injury, surgical tissue injury is known to produce neuroplastic changes

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leading to spinal sensitization and the expression of stimulus-evoked hyperalgesia. Pharmacological effects of anticonvulsant drugs which may be important in the modulation of these post-operative neutral changes include suppression of sodium channel, calcium channel, and glutamate receptor activity of peripheral, spinal, and supraspinal sites. Anticonvulsants may reduce spontaneous and movement evoked pain, as well as decrease spinal requirement prospectively. (IW TREMONT et al., 2000)

PROTEOLYTIC ENZYMES

Plant extracts with a high content of proteolytic enzymes have been used in traditional medicine for a long time. besides herbal proteinases 'modern' enzyme therapy include pancreatic enzymes. the use of proteolytic enzymes in rheumatoid disorder have been mostly carried out on enzyme preparation consisting of a combination of bromelain, papain, trypsin and chymotrypsin. there is numerous alteration of cytokine composition during therapy with orally administered enzymes resulting from immunomodulatory effects, which might be an indication of the efficacy of enzyme therapy. the patient with rheumatic diseases suggest that the oral therapy with proteolytic enzymes produces certain analgesic and anti-inflammatory effects

ANALGESICS IN THE MEDIA

Advertising may play an important role in the consumer's choice of analgesic product, with numerous advertisements appearing on the television promoting the various brands.So media has nowadays an important role in influencing people to select the analgesic. Reports in the media can focus on the beneficial and harmful effects of analgesics. Television reports can highlight both harmful effects, for example, that ibuprofen is linked to the onset of a heart attack,14 or beneficial effects for example that aspirin can reduce the incidence of breast cancer by 13.0%.15 A newspaper report Suggested that drugs, which include codeine such as PHENSYDYL T cause a dependency effect, which can lead to addiction. Patient information leaflets, which by law have to be provided with all such medication, should be important in providing clear information to patients.

PRESCRIPTION PATTERN ANALYSIS

Periodic evaluation of prescribing patterns is beneficial in redefining guidelines as per the current pattern of drug use. Prescription pattern monitoring studies are drug utilization studies with the main focus on prescribing, dispensing, and administering drugs**.** Prescription pattern

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analysis is an essential tool to provide insight regarding the existing drug usage and to ensure rational drug therapy. Even though drugs used for the analgesic purpose are one of the commonly used, they are least studied in terms of prescribing patterns. Hence the present study was planned to analyze the prescribing pattern among a certain number of patients.

People tend to forget the details of the advice given or fail to purchase all the drugs that are prescribed because they lack the financial means to do so. Patients sometimes stop taking the prescribed drugs or take the wrong dosage. There is the increasing importance of prescription pattern monitoring studies because of a boost in marketing of the new drug, variation in the pattern of prescribing and consumption of drug, adverse effect, cost of drug and volume of prescription. Prescribing pattern monitoring studies also guide and support prescribers, dispensers and the general public on the appropriate use of drug, collaborate and develop working relationships with other key organizations to achieve a rational use of drug. (Pardeep Kumar et al ., 2019)

PHARMACOECONOMIC STUDIES

The economic evaluation of pain management is essential because of its important role in health care. Cost-benefit analysis is used to determine which pain management strategies best achieve their objectives despite the scarcity of monetary resources. The costs of chronic pain control are expected to increase in the coming years because the survival of these patients is improving. (Surendra G. et al., 2009)., In today's time, many branded, as well as generic drugs of same formulation of analgesic drugs, are available in the Indian market with significant variations in their costs.

Cost Minimization Analysis (CMA)

Cost-Minimization Analysis (CMA). Cost-minimization is a tool used in pharmacoeconomics and is applied when comparing multiple drugs of equal efficacy and equal tolerability. This is done when the outcomes are the same for the two interventions. In this, only the input, i.e. the cost, is considered. The option that has the least cost is selected, e.g. if a hospital decides to introduce compulsory prescribing of generic names of drugs instead of their brand names, then the pharmacoeconomic evaluation of this would be done by CMA (Rawlins et al., 1999). The objective of this method is to select the least costly among multiple equivalent interventions. It cannot be used to evaluate programs or therapies that lead to different outcomes.

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Cost-Effective Analysis (CEA)

CEA is a technique designed to assist a decision-maker in identifying a preferred choice among possible alternatives. Generally, cost-effectiveness is defined as a series of analytical and mathematical procedures that aid in the selection of a course of action from various alternative approaches.

CEA evaluates multiple drug treatments for the same condition. The cost of the drug treatments is weighed against the effectiveness of the drug (Thwaits et al., 1998). The costs of drug treatments include acquisition costs, physician involvement, and nursing costs for the administration of the drug. The effectiveness of drug treatment is measured by intangible measures such as length of hospital stay, duration of treatment required, and mortality rate. The results of a CEA are expressed as cost/outcome for both therapies. Pharmacoeconomic analysis should be incorporated in the clinical trial itself. However, for the majority of drugs, CEA is done based on pre-existing data available in the medical literature. CEA is the most commonly applied form of economic analysis in the literature, and especially in drug therapy.

It does not allow comparisons to be made between two different areas of medicine with different outcomes.

Cost-Utility Analysis (CUA)

CUA is a type of evaluation in which drugs/interventions with different outcomes can be compared. CUA is the most appropriate method to use when comparing programs and treatment alternatives that are life-extending with serious side effects (e.g., cancer chemotherapy), those which produce reductions in morbidity rather than mortality (e.g., medical treatment of arthritis), and when HRQOL is the most important health outcome being examined.

(Bootman et al., 1995). CUA is employed less frequently than other economic evaluation methods because of a lack of agreement on measuring utilities, difficulty comparing QALYs (quality-adjusted life-years) across patients and populations, and difficulty quantifying patient preferences.

Pharmacoeconomists sometimes want to include a measure of patient preference or quality of life when comparing competing treatment alternatives. CUA is a method for comparing treatment alternatives that integrates patient Preferences and HRQOL.

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CUA can compare cost, quality, and the number of patient years. Cost is measured in dollars, and therapeutic outcome is measured in patient-weighted utilities rather than in physical units (Hepler et al., 1990). Often the utility measurement is a quality-adjusted life-year (QALY) gained. QALY is a common measure of health status used in CUA, combining morbidity and mortality data. Results of CUA are also expressed in a ratio, a cost-utility ratio (C: U ratio).

QALYs represent the number of full years at full health that is valued equivalently to the number of years as experienced. For example, a full year of health in a disease-free patient would equal 1.0 QALY, whereas a year spent with a specific disease might be valued significantly lower, perhaps as 0.5 QALY, depending on the disease.

Cost-Benefit Analysis (CBA)

CBA is the most comprehensive and the most difficult of all economic evaluation techniques. In this technique, the benefits are also assigned a monetary value so that costs and benefits can be easily compared. Thus, different interventions can be compared, making it a useful tool (like CUA) for resource allocation by policy-makers. It is a basic tool that allows for the identification, measurement, and comparison of the benefits and costs of a program or treatment alternative.

CBA should be employed when comparing treatment alternatives in which the costs and benefits do not occur simultaneously. CBA also can be used when comparing programs with different objectives because all benefits are converted into dollars and to evaluate a single program or compare multiple programs. The benefits realized from a program or treatment alternative are compared with the costs of providing it. Both the costs and the benefits are measured and converted into equivalent dollars in the year in which they will occur. Future costs and benefits are discounted or reduced to their current value.

(Bootman et al., 2005). The most difficult and challenging part of CBA lies in calculating the benefits in economic terms. Some benefits are easy to convert, others need subjective judgment. CBA may ignore intangible benefits (pain, anxiety, stress) that are difficult to express in monetary terms.

SELF MEDICATION

Self-medication with prescription drugs is especially a problem where pharmacies freely supply medicines over-the-counter, as do informal drug shops and small groceries. Sometimes people even self-medicate with prescription drugs on the advice of traditional

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healers. People keep stocks of leftover medicines in their homes, and re-use them or give them to neighbours or relatives who request them. The possibility of buying prescribed medicines through the Internet means is also a major factor. This study was planned to analyse the prescribing pattern and pharmacoeconomics of analgesic drugs so as to take a step further in the rational use of drugs. (Seher et al.,2018)

One of the preventive measures from coronavirus is to maintain the safe social distance. To follow it, the study is organized using online google forms. The link which proceeds to the questionnaire is prepared and shared through various social media like WhatsApp, Facebook, Telegram etc. and email id of the participants after informing the objectives and confidentiality to the participants. The informed consent is obtained from the individuals who marked "Yes" option for the section detailing the consent. A total of 1311 responses were recorded. Responses of participants were recorded and entered in Microsoft Excel 2016^R. Data were analyzed for frequency and percentage responses.

RESULT

Statistics

A descriptive statistic is used in this observational cross over study mainly, mean, standard deviation, percentage, graphs and pie charts. Descriptive statistics are brief descriptive co efficients that summarize a given data set, which can be either representation of the entire population or a sample of the population The statistical tool used here is Microsoft excel.
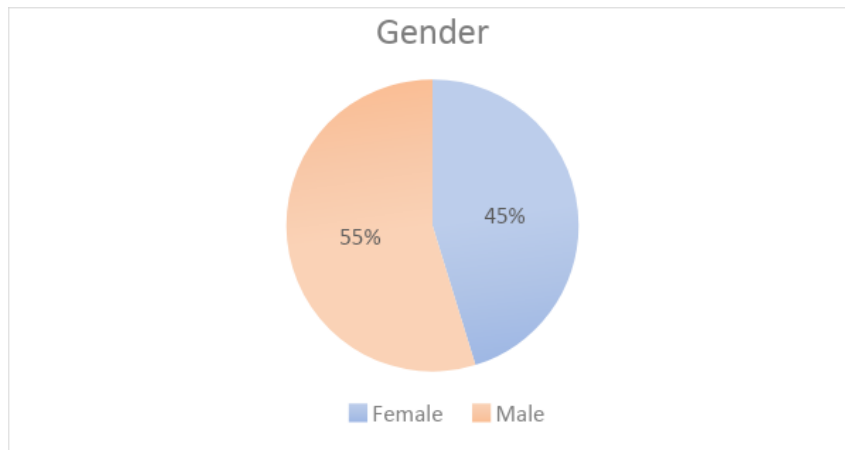
PART 1: A Data Collection Form collected from various pharmacies based on prescriptions during pharmacy duty.

Total of 400 prescriptions with drugs used to control pain were collected from outpatient pharmacies. Evaluation of various variables such as age, gender etc showed the following results.

GENDER

Gender wise data is reported as follows.

Altogether 400 prescriptions were analysed and from that 181 were prescriptions of the female patient and 219 were of male patients. (i.e. From the analysis 54.75% were males and 45.255 were females).
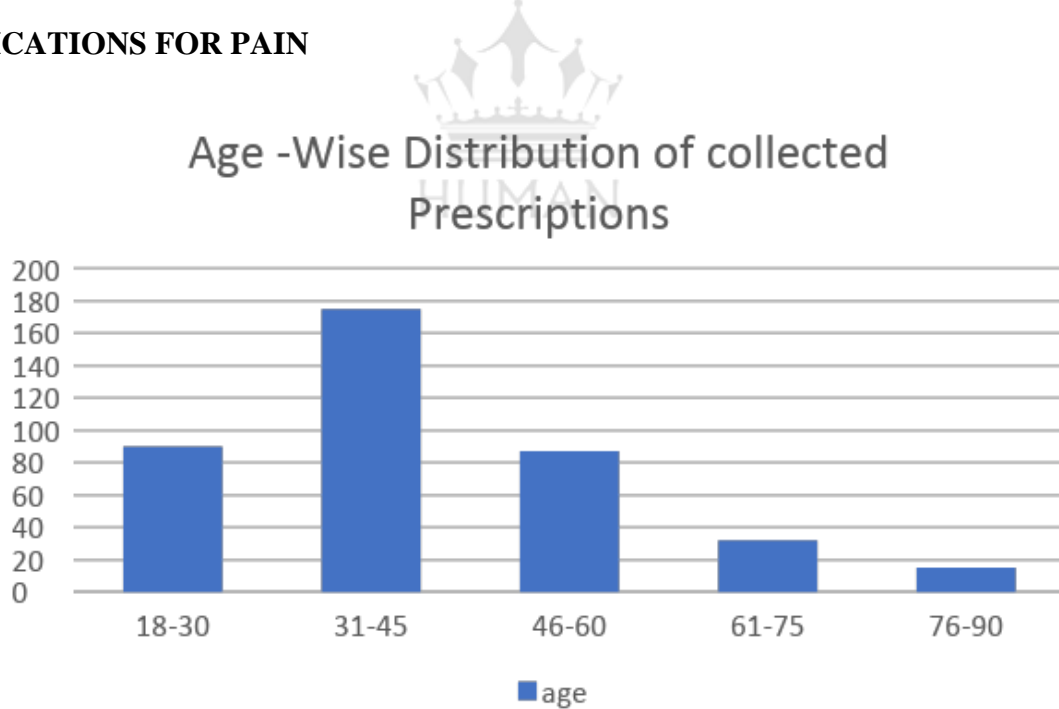
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Gender

AGE

Prescriptions were collected between the age group of 18 and 90.

Mean	42.53
Median	40
Minimum	18
Maximum	90

PERCENTAGE OF PATIENTS WHO BOUGHT FULL COURSE OF PRESCRIBED MEDICATIONS FOR PAIN

Age -Wise Distribution of collected Prescriptions

From 400 prescriptions only 203 persons bought the full course of prescribed medication. The remaining persons refused, omitted or replaced the Prescribed medications.

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Percentage who bought full Course of prescribed Drugs
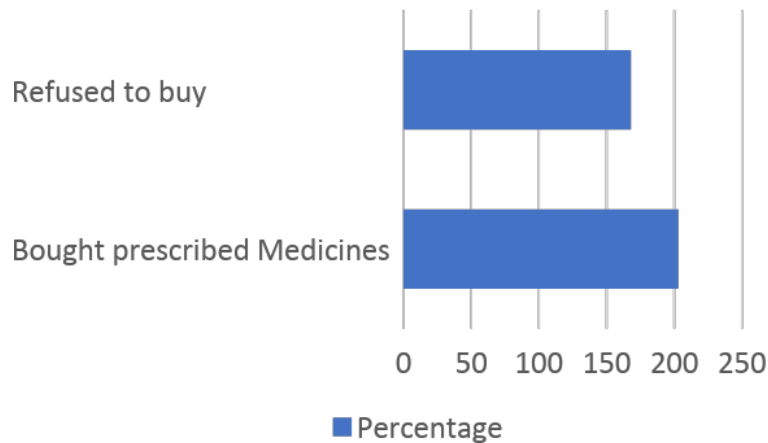
i.e. only 50.75% of the people bought a full course of pain medications.

MEDICATIONS USED FOR PAIN

A total count of 1446 drugs were present in 400 prescriptions, out of which a total number of 622 medicines were used to control pain. Different classes of prescribed pain medicines are given in the following graph.

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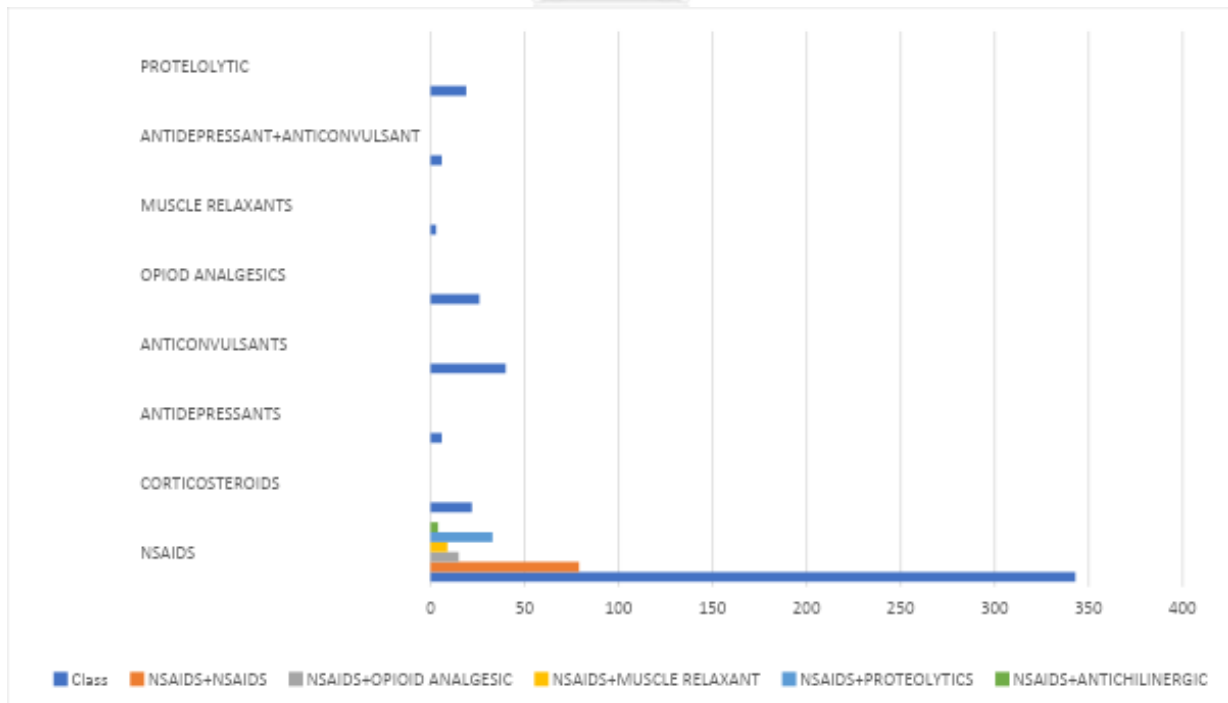
PERCENTAGE OF EACH CLASS OF PAIN MEDICATIONS PRESCRIBED AS PER PRESCRIPTION

1446 were the total no. of prescribed medicines from 400 prescriptions with an average of 3.65 drugs per prescription. Out of the 1446 prescriptions, 622 were drugs used to control pain, with an average of 1.55 drugs per prescription.

Class	No. of Medicines	Percentage of drugs in prescription
NSAID'S	343	55.14
Corticosteroids	22	3.53
Proteolytic enzymes	19	3.05
Anticonvulsants	40	6.43
Opiod Analgesics	27	4.34
Muscle relaxants	3	0.4
Fixed Dose Medications (combination)		
Combination Drugs	165	26.52
NSAIDS +NSAIDS	79	12.7.
NSAIDS+Thiocholchiside	23	3.69
NSAIDS+Opioid Analgesics	15	2.4
Anticonvulsants +Antidepressants	3	0.4
NSAIDS+Proteolytics	33	5.30
NSAIDS+Anticholinergics	4	0.6

NSAIDS and combinations of NSAIDs with other classes were the most commonly prescribed drugs by the physicians compared to other classes of pain medications.

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REASON FOR REFUSAL OF PRESCRIBED PAIN MEDICATIONS (Table)

IF YES, WHY THEY MISSED THE DOSE

REASON FOR REFUSAL	NO.OF PRESCRIPTIONS	PERCENTAGE
Found expensive	145	36.25
Due to more number of medicines	9	2.25
No belief in system	3	0.75
Shortage of medicines in Pharmacy	2	0.5
Due to long duration	3	0.75
No interest in buying medicines	6	1.5
TOTAL	168	42%

Out of 400 Prescriptions 168 persons, ie 42% refused to buy the full course of prescribed medications.

PERCENTAGE OF PEOPLE WHO FOUND THE PRESCRIBED MEDICINES EXPENSIVE
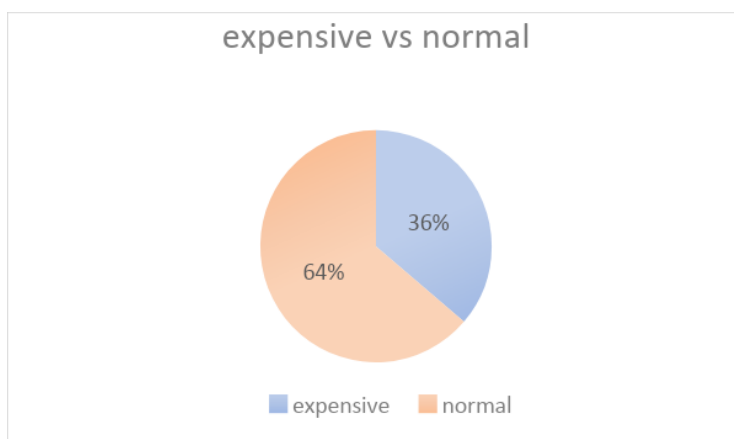
In the study 145 people ie . 36.25% believed that the prescribed medicines were expensive.

Of people were found it hard to meet up their expenses with the cost of prescribed medications.

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TOTAL NO. OF PEOPLE WHO OMITTED MEDICINES FROM THE PRESCRIPTION
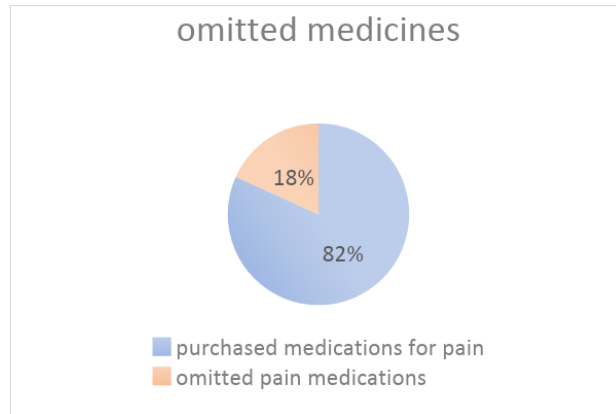
Here out of 400 prescriptions, 73 persons omitted pain medications from their prescriptions. ie.**18.25%**percentage of people omitted prescribed pain medications.

In these 73 people 49 people, **i.e., 67.12%** omitted the drugs since they are found expensive.

PERCENTAGE OF PEOPLE WHO WERE BUYING CHEAPER ALTERNATE BRANDS WITH THE SAME COMPOSITION
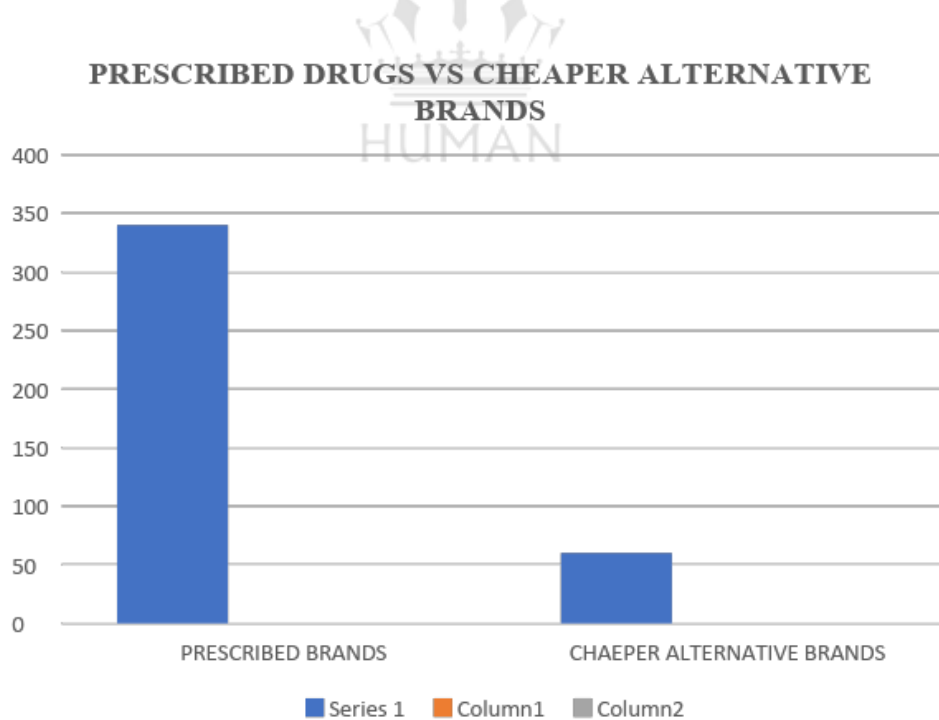
About 15% (60/400) of the people are bought cheaper alternative drugs with the same chemical composition rather than prescribed drugs. These alternatives were from WHO-GMP certified companies.

*Citation: RITHUVAREN M KRISHNAN et al. Ijppr.Human, 2021; Vol. 22 (4): 94-128.*

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Replacement of the prescribed costlier Brands with cheaper alternative brands was initiated by the People only. Pharmacies had no role in making such decisions.
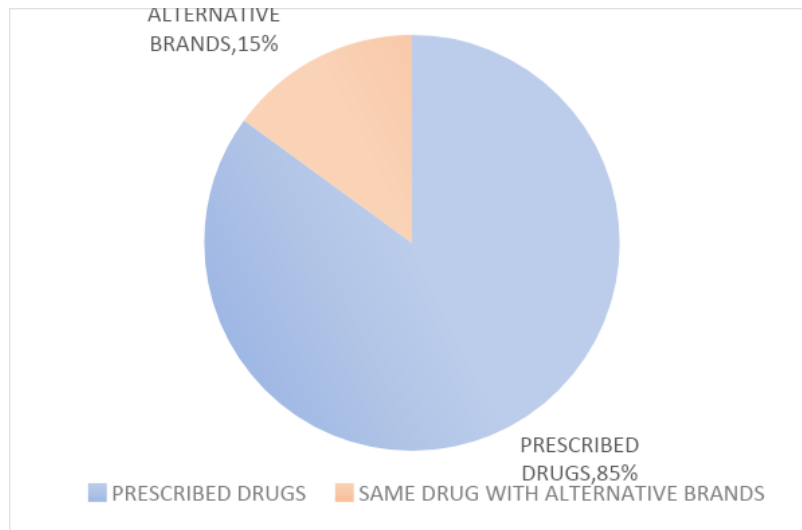
Out of the 400 prescriptions, 60 persons bought alternative brands which are Cheaper.

PERCENTAGE OF ADDED MEDICATION FOR PAIN BY THE PATIENT APART FROM PRESCRIPTION

Study showed that a number of additions of medicines were done by the patients for management of pain along with the physicians prescriptions.
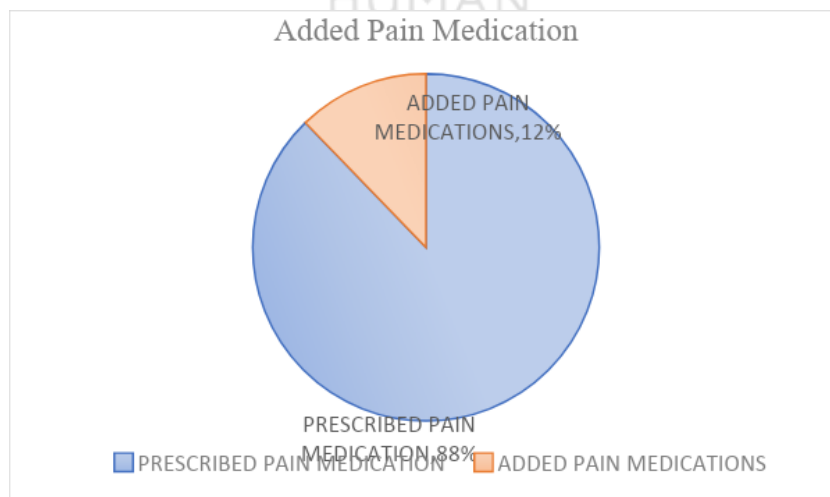
Here out of 400 prescriptions 49 persons added pain medications from their prescriptions. ie .12% percentage of people added prescribed pain medications. The added Medications mainly involved topical analgesics in the form of gels and sprays.

Citation: RITHUVAREN M KRISHNAN et al. Ijppr.Human, 2021; Vol. 22 (4): 94-128.

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PERCENTAGE OF PEOPLE WHO ASKED TO REPLACE THEIR OWN SELF MEDICATIONS TO TREAT PAIN
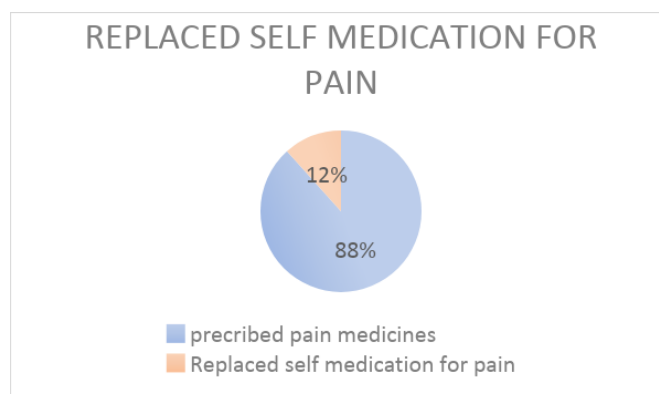
Here out of 400 prescriptions, 53 persons added their self pain medications from their prescriptions. ie.13.25%percentage of people replaced prescribed pain medications with their own self medications.

PHARMACO ECONOMICAL STUDIES

400 Prescriptions were evaluated and the total cost of the prescribed medications was calculated to be 136797 rupees. (Includes the cost of both analgesics and supporting medicines).

The average cost per prescription were found to be 342 rupees.

TOTAL COST OF ANALGESICS IN 400 PRESCRIPTIONS

From the analysis of 400 prescriptions, the total cost of the medications given to control the pain alone was found to be 47388 rupees.

AVERAGE PERCENTAGE OF COST FOR MEDICATIONS USED TO CONTROL PAIN FOR EACH PRESCRIPTION

From the evaluation of 400 prescriptions, The calculated average cost of pain medications per prescription was found to be 120.425rupess.

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Cost Categories	Cost in Rupees
Cost of Prescribed Pain Medications	48170
Cost of supporting Prescribed Medications	88627
Total Cost of Prescriptions	136797
Average Cost/prescription	342
Average Cost of pain medication/Prescription	120.45

Cost Categories	Cost in Rupees
Cost of Prescribed Pain Medications	48170
Cost of supporting Prescribed Medications	88627
Total Cost of Prescriptions	136797
Average Cost/prescription	342
Average Cost of pain medication/Prescription	120.45

The above table shows that the total cost of omitted prescribed medicines to control Pain was calculated to be 1795 rupees. i.e. only 3.72% of the total prescribed pain medications.

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COST OF TOTAL ADDED PAIN-MEDICINES APART FROM THE PRESCRIPTION

DRUG	NO. OF PRESCRIPTIONS IN WHICH THE DRUGS WERE ADDED	AVG. UNIT PRICE OF DRUG	TOTAL FREQUENCY	TOTAL COST
Diclofenac ointment	25	90	25	2250
Diclofenac Spray	13	140	13	1820
Diclofenac Roll-on	5	130	5	650
Acetaminophen	6	1.6	42	67
TOTAL	49	361.6	85	4787

Here 49 persons added extra medicines to treat pain apart from the prescribed medicines for pain. In this study, it is found out that a total amount of 4787 rupees was spent for the added medication which is 9.93 percentage of the total analgesic cost.

COMPARISON OF COST OF ALTERNATIVE BRANDS WITH PRESCRIBED BRANDS

From the study it is found out that about 60 persons from 400 prescriptions replaced their prescribed brands with Cheaper Alternative Brands.

Citation: RITHUVAREN M KRISHNAN et al. Ijppr.Human, 2021; Vol. 22 (4): 94-128.

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Generic Name	Prescribed Brands	Unit Price	Cheaper Alternative Brands	Unit Price
Etoricoxib	Etoshine 60(Sun Pharma)	14	Etosaid 60 (Macleods)	4
Piroxicam	Dolonex(Pfizer)	12	Dolocip(Cipla)	3
Celicoxib	Zycel(Zydus Cadila)	12.12	Celib(Torrent)	3.6
Diclofenac gel	Succor Gel(Succor health care)	144	Intagesic Gel(Intas)	90
Diclofenac+ Paracetamol+ Chlorozoxone	Mobizox (Sun)	19.7	DiclotoL-MR(Bluecross)	4.1
Deflazacort	Orthocort(macleods)	12	Mahacort (mankind)	7.9
Pregabalin	Pregaba(Torrent)	14	Nugaba(sun pharma)	9
Pregabalin+ Nortryptilline	Pregaba NT(Torrent)	18.5	Neurica NT (Micro labs)	15.5
Diclofenac +Metaxaxolone	Flexura D (Sun Pharma)	17.4	Flexalone D(Icon life)	10.8
Tramadol+ Paracetamol	Ultracet(jansenns)	13	Duracet(Rhine)	7
Gabapentin	Nervibrain	12	Gabacap(Zydus cadila)	3.7
Bromalein +Trypsin+ Rutoside	Enzomac(Macleods)	20.33	Isibro(Isis)	16
Etoricoxib+ Thiocholchiside	Etoshine MR(Sun Pharma)	23	Etoro TH	18

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List of prescribed medicines which were replaced with the alternative brands are as shown below.

While Comparing the Cost of the Drugs, it is clear that the Alternate Brands shows a huge difference in the cost with Prescribed Brands.
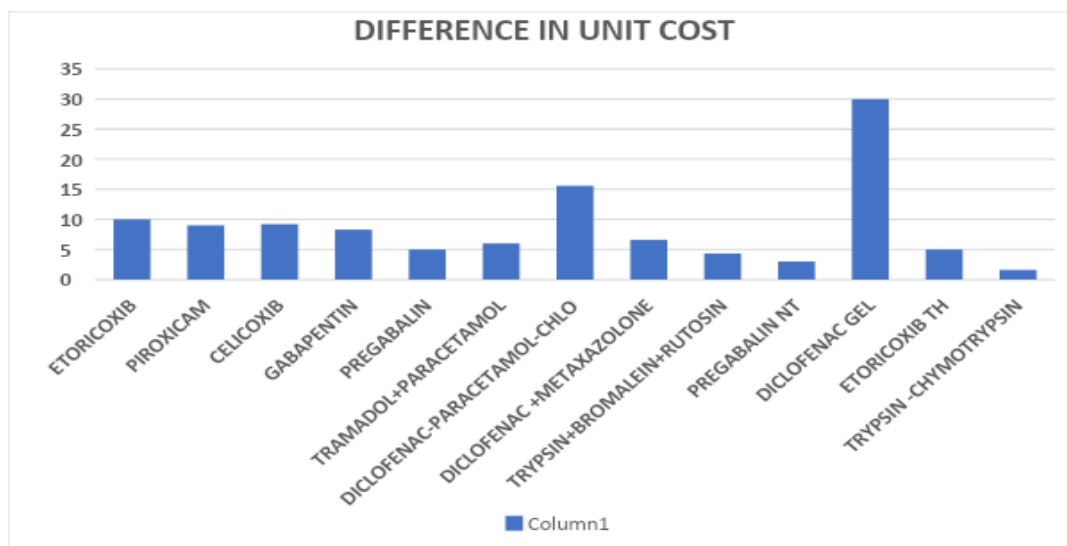
The table below shows the number of prescriptions from each category which were replaced by the alternative Brands

Drug	No. of prescriptions in which these drugs were replaced with alternative brands
Etoricoxib	7
Piroxicam	4
Trypsin-Chymotrypsin	7
Pregabalin	6
Tramadol+Paracetamol	3
Diclofenac+Paracetamol+ Chloraxazone	3
Gabapentin	7
Celecoxib	7
Diclo+Metaxazolone	8
Trypsin+Bromalein+ Rutoside	2
Etoricoxib +Thiocholchiside	5
Pregabalin +Nortyptilline	1
Total	60

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Comparison of Total Unit cost of these 60 Prescriptions are analyzed and are shown below.

The total Unit cost of the 60 Prescribed medicines is calculated to be =351.75 rupees.

This calculation is based on the above table, The cost of each prescribed brands are added to ger the total.

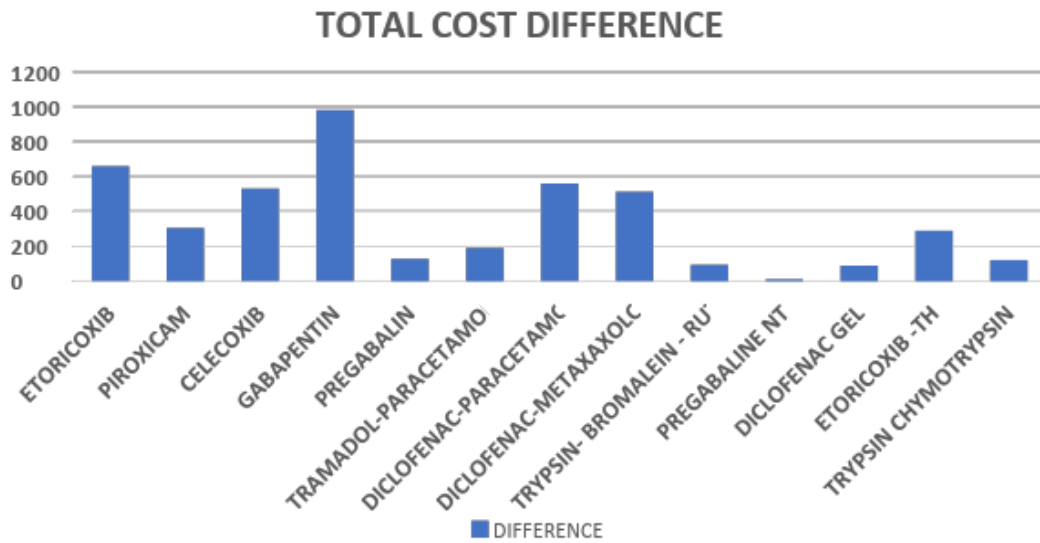Total cost of the 60 Cheaper Alternative brands are calculated to be =193 rupees.
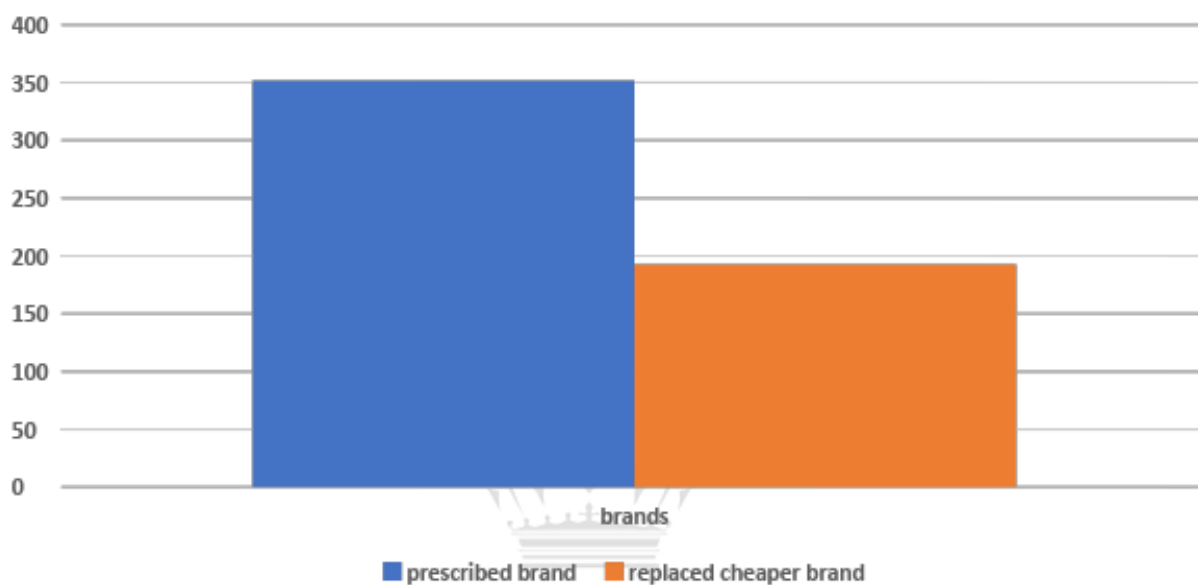
This show that there is a difference of 153 rupess while comparing the unit price of both Prescribed and Alternative brands.

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COMPARISON OF THE TOTAL COST OF EACH MEDICINES IN 60 PRESCRIPTIONS AMONG PRESCRIBED BRANDS AND CHEAPER BRANDS

GENERIC NAME	COST OF PRESCRIBED BRANDS	COST OF ALTERNATE BRANDS	COST DIFFERENCE
Etoricoxib	924	264	660
Piroxicam	408	102	306
Celicoxib	756	223	533
Gabapentin	1248	266	982
Pregabalin	364	235	129
Tramadol+ Paracetamol	416	224	192
Diclofenac+ Paracetamo+ chloraxazone	709	147	561
Diclofenac+ Metaxazone	1357	842	514
Trypsin-Bromalein-Rutoside	447	352	95
Pregabalin+ Nortryptillin	74	62	12
Diclofenac gel	360	270	90
Etoricoxib + thiocholchicoside	1334	1044	290
Trypsin-Chymotrypsin	1185	1064	121

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COMPARISON OF THE DIFFERENCE OF THE TOTAL COST OF TWO BRANDS AS PER PRESCRIPTION


TOTAL COST DIFFERENCE

PART 2: A QUESTIONNAIRE FOR OBTAINING GENERAL PUBLIC BASED KNOWLEDE ON THE SELF MEDICATION AND THEIR EXPENSES

PATIENTS SUFFERING FROM PAIN RELATED PROBLEMS
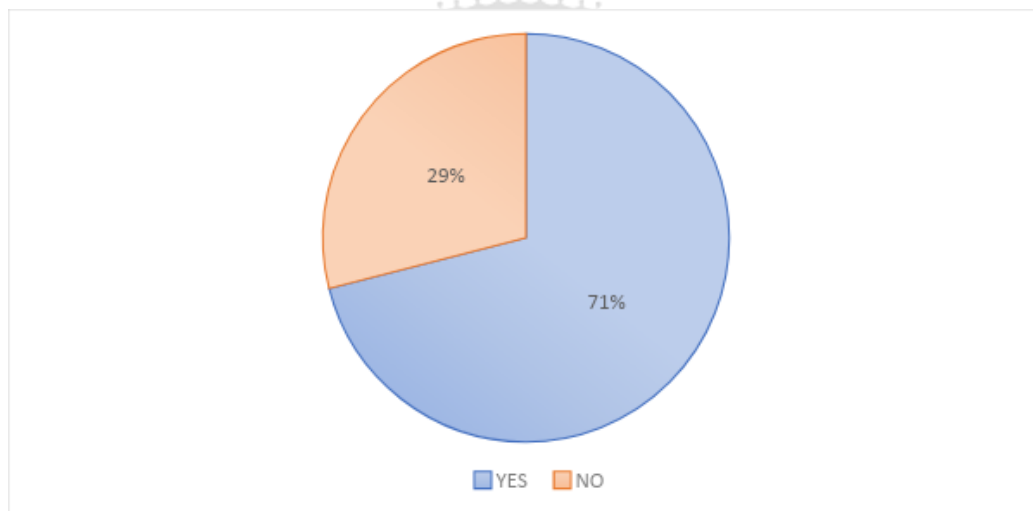
Among the collected 200 forms, about 142 people suffers from pain related problems.ie 71% are affected by pain related problems.

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PATIENTS TAKING PAIN MEDICATIONS FOR REGULAR BASIS
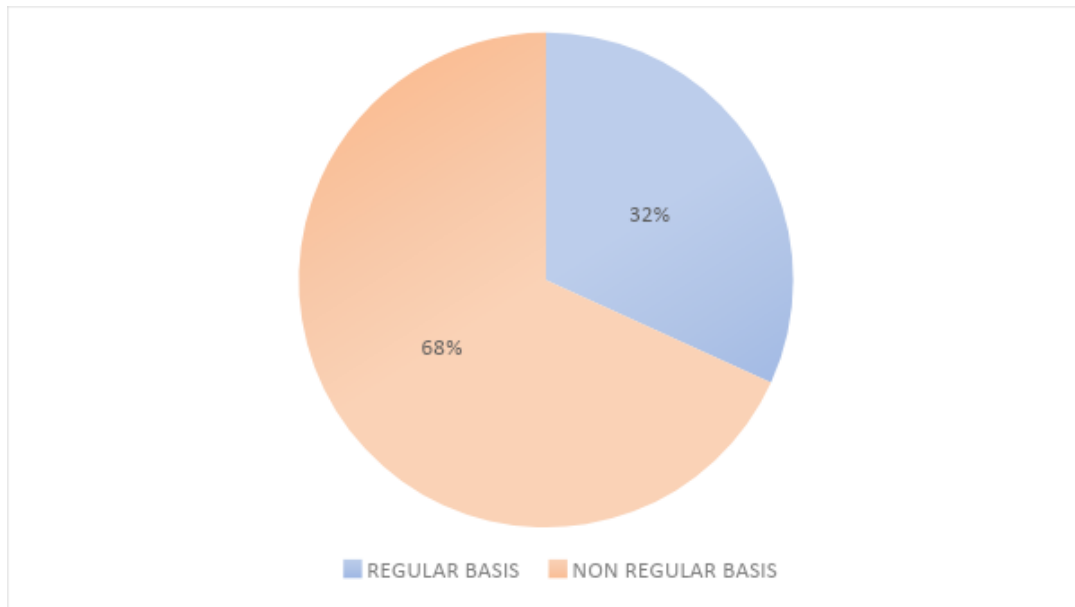
From the study, it is clear that majority of the studied population (68%) are not taking pain killers on regular basis.

**PERCENTAGE OF DOCTORS PRESCRIPTION AND SELF MEDICATION**
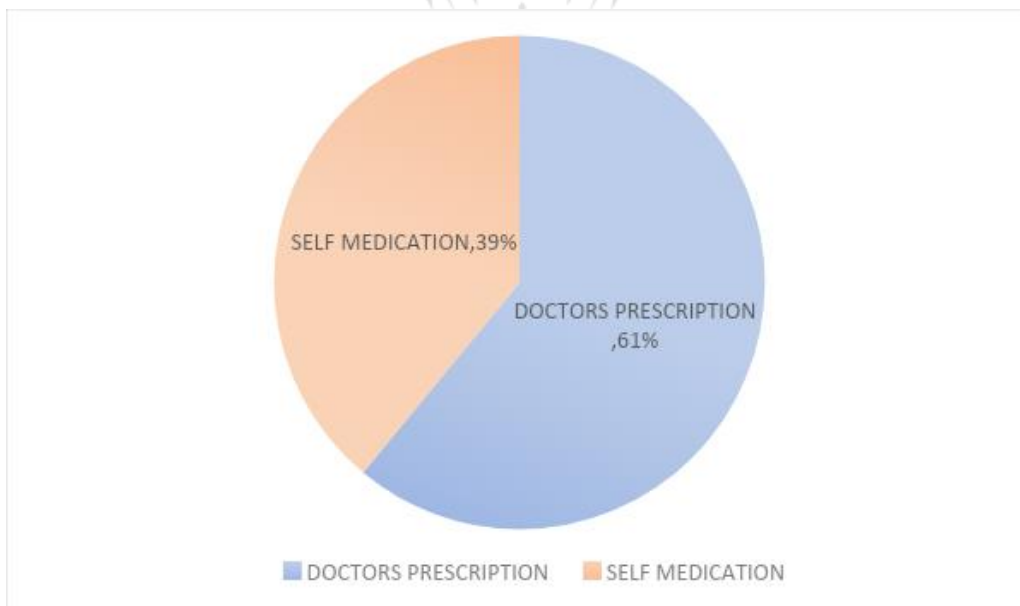
By analysing 200 people, about 78 people take their own self-medication apart from doctors consultation for their pain related problems.

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MOST PREFERRED TREATMENT
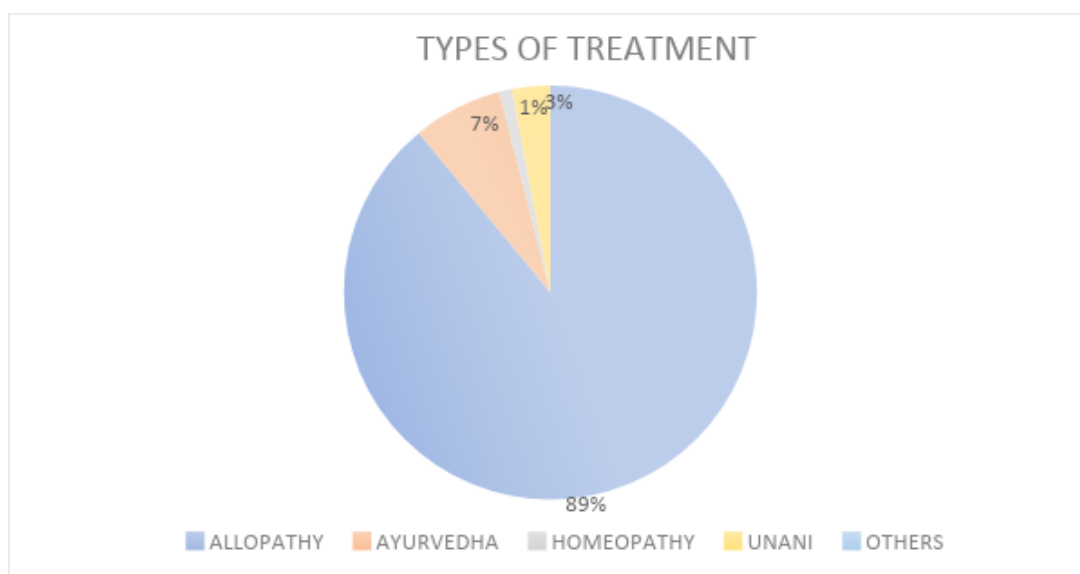
From this study it is understood that 178(89%)people out of 200 prefer allopathy as the most convenient treatment followed by Ayurvedha(7%) and Unani.

PERIODICAL USE OF PAINKILLERS
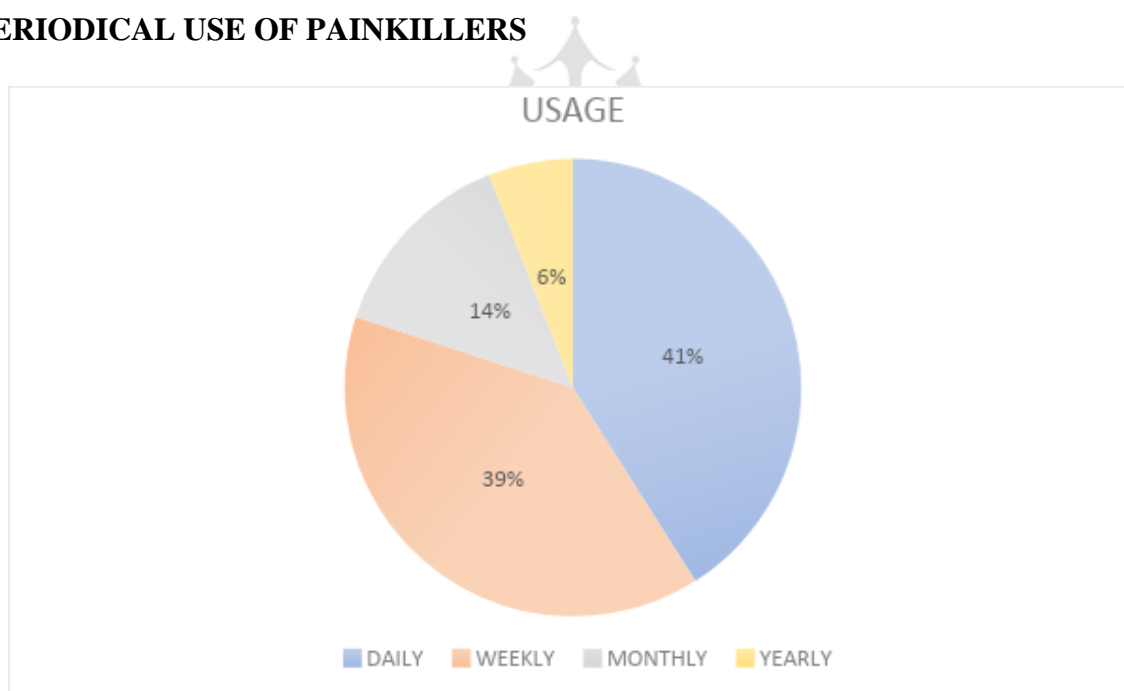
In the study about 41% of people of the 200 population uses painkillers in their daily life. (82\200) people use painkillers daily, 39% weekly, 14% uses monthly and the remaining 6 % of the studied population uses pain medications yearly.

Citation: RITHUVAREN M KRISHNAN et al. Ijppr.Human, 2021; Vol. 22 (4): 94-128.

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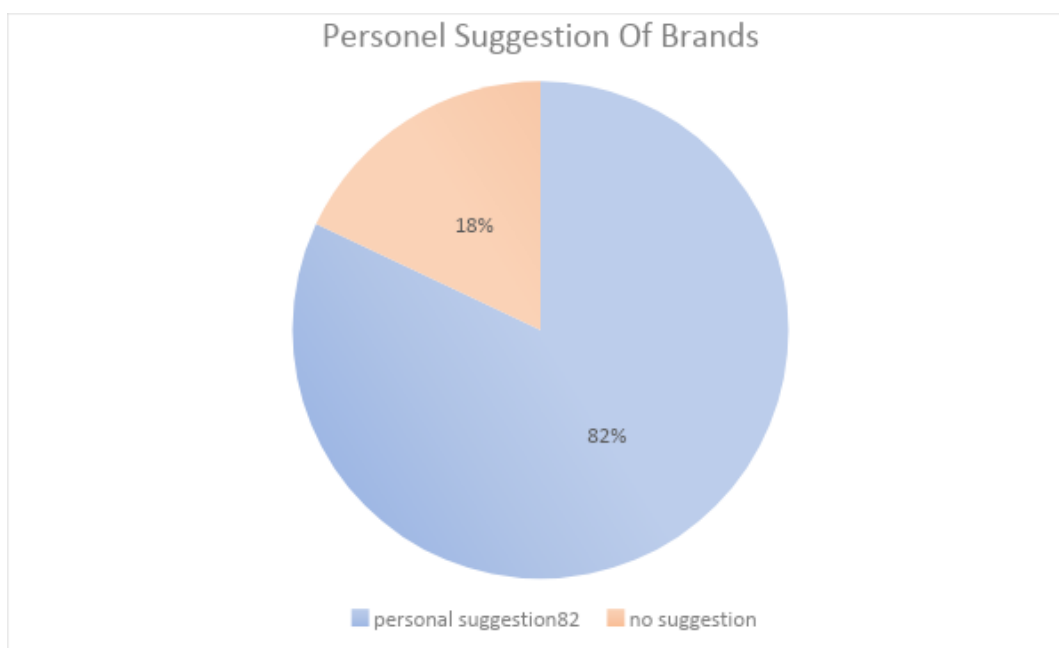**TIME TAKEN FOR DOCTORS**

CONSULTATION AFTER SELF MEDICATION
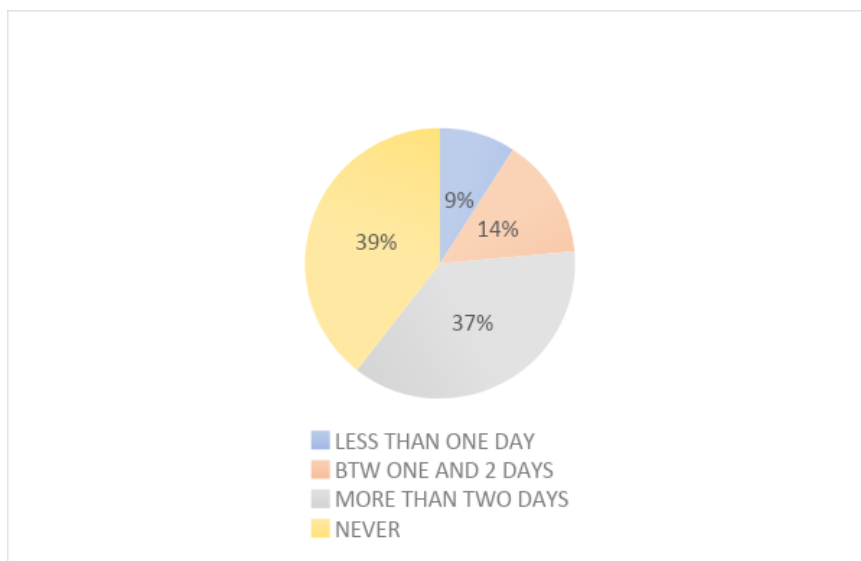
In this study, 39 % of the studied population refuses physicians consultation after their own self-medication which are about 78 out of 200 people. Only remaining 182 people undergoes consultation for further opinion.

AVERAGE EXPENSE OF A PERSON BUYING A MEDICATION TO CONTROL PAIN

From the analysis of 200 people, the average expense of buying pain medication per person with and without physicians consultation is 184 rupees.

Consultation	Average Cost (in Rupees)
Physician's Consultation	246
Self Medication	120
Average cost of both	184

Rupees 246 are spent by each person for Doctor's consultation and Rupees 120 are spend by each person from their own self medication.

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Personel Suggestion Of Brands

18%

82%

■ personal suggestion82 ■ no suggestion

82% of the people from this study gets local/personnel suggestions of Particular brands for their Self Medication.

CONCLUSION:

Drug prescribing pattern and pharmacoeconomic analysis of drugs form an important part of drug utilization studies. These studies provide feedback to physicians and promote the appropriate use of drugs. Rational and cost-effective medical care are the most important factors in determining healthcare delivery. In the study among 400 prescriptions, only 203 people (50-75%) only brought the full course of prescribed medication. NSAIDS and their combinations were the most prescribed medications that is 73% of the total prescribed medicines. 1446 were the total number of prescribed medications, out of which 622 drugs were used to control pain. 1.55 drugs/prescription of medicines were used to control pain 42% of the people refused to by the entire course of prescribed medicines. In the study about 15% of the people preferred cheaper alternative medicine than prescribed drugs. 13.25% of people replaced the prescribed medicine with their self-medication. 120.45 rupees was calculated as the average cost of pain medication/ prescription.

A Significant difference was found between the total cost of prescribed brands and alternative brands. In the study it was found out that the cost of pain medicines during the self-medication is much lesser than the prescribed drugs.

Citation: RITHUVAREN M KRISHNAN et al. Ijppr.Human, 2021; Vol. 22 (4): 94-128.

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