Prescribing pattern of analgesics in orthopedic in-patient department at tertiary care hospital in Guwahati, Assam, Northeast India

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Abstract:

Objectives: The aim of this study is to evaluate the prescribing pattern of analgesics and analyze the rational use of analgesic in orthopedic in-patient department of tertiary care teaching hospital, Guwahati, Assam.

Subjects and Methods: An observational and cross-sectional study was carried out for 1 month from April to May 2014. Collected data included age, sex, diagnosis and line of management during the study. The generic name and the average cost of treatment per patient were evaluated using Indian Drug Review, 2014. The prescribed drugs were assessed with respective National Model List of Essential Medicines (NLEM), 2011 and the rationality of prescriptions was determined using the World Health Organization indicators of drug utilization. The patients’ details were recorded in a predeigned data collection form and results were analyzed by descriptive statistics.

Results: Out of 200 patients, 123 were male and 77 were female. The average number of analgesic per prescription was 1.46. In this study, 55.5% of patients had received single analgesic. Diclofenac was the most commonly prescribed analgesic (43.49%). During hospitalization, majority of the patients have received parenteral preparation. Gastroprotective agents and antimicrobials were frequently prescribed along with analgesics. Out of 292 analgesics prescribed, 183 (62.67%) were from the NLEM, India. Furthermore, 176 (57.19%) analgesics were prescribed by generic name. The average cost of treatment per patient was 2151.72 INR. Utilization of analgesic in terms of defined daily dose/100 bed-days was 104.01.

Conclusion: The percentages of analgesics prescribing from NLEM and the use of analgesic by generic name were found satisfactory. Regular educational interventions to improve prescribing practices among physicians at different levels may further promote rational prescribing.

Key words: Analgesics, drug utilization, National Model List of Essential Medicines, orthopedics, prescription pattern
that help in evaluating drug prescribing trends, efficiency, and cost-effectiveness of hospital formularies.\textsuperscript{[11]} Defined daily dose (DDD) is an important tool to compare the drug utilization among different clinical setups within a country and between different countries. DDD/100 bed-days provide a rough estimate of drug consumption in hospital inpatients and it is a fixed unit of measurement independent of formulation and price.\textsuperscript{[12,13]} Therefore, this study was conducted to observe and analyze the prescribing pattern of analgesics at orthopedic in-patient department of tertiary care hospital of Guwahati, Assam. Moreover, this study was also performed to evaluate whether the prescribed analgesics were enlisted under National Model List of Essential Medicines (NLEM), India 2011 and prescribed by generic name.

**Subjects and Methods**

An observational and cross-sectional study design was adopted for this study. The data was collected from April to May, 2014 at Orthopedic in-patient department of a tertiary care teaching hospital, Guwahati, Assam. The Institutional Ethical Committee permission was taken to conduct this study (IEC approval no. MC/233/2013/105 dated February 26, 2014).

**Inclusion Criteria**

Patients who received analgesics in orthopedics ward during study period irrespective of age, sex, diagnosis, and treatment.

**Exclusion Criteria**

Prescriptions of patients attending orthopedic OPD and those who were admitted in other in-patient department. The patients who were absconded or discharged against medical advice were excluded from the study.

**Collection of Data**

A total 200 patients were enrolled during the study.

Demographic data comprised age, sex, and address were collected from bed-head ticket information file. The clinical data included diagnosis, name of analgesics, route of administration, duration of treatment with analgesics, any adverse event with analgesics (if any), co-prescribed drugs, and duration of hospital stay were recorded. These data were documented in a predesigned case record form. Analgesics prescribed by Physicians of orthopedic department of this hospital were considered in this study.

The generic names of the drugs were obtained from the Indian Drug Review, 2014.\textsuperscript{[14]} The study was also assessed to check whether the drugs prescribed were enlisted under NLEM, India 2011 or not. The cost of drugs per patient was calculated as per hospital formulary and Indian Drug Review, 2014. The cost of treatment consisted free drug supplies from this Government Tertiary Care Hospital as well as the drugs purchased by the patients from outside this hospital. The cost of laboratory investigations and ward charges were not included. The common analgesics were classified according to the anatomical therapeutic chemical (ATC) classification based on their chemical, pharmacological, and therapeutic properties. Drug utilization pattern was measured in DDD/100 bed-days. DDD/100 bed-days were calculated using the following equation.\textsuperscript{[15]}

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\text{DDD/100 bed-days} = \frac{\text{Total dose in mg during study period} \times 100}{\text{DDD of drug} \times \text{study duration (days)} \times \text{bed strength} \times \text{average bed occupancy rate}}
\]

During the time of discharge, analgesic prescriptions pattern, and other relevant data were collected again.

**Statistical Analysis**

Descriptive statistics were used to analyze the results. Nonnormal continuous data were presented by median (interquartile range difference (IQRD)). Percentage and averages of the variable were also calculated to compare the data with other findings.

**Results**

Out of 200 patients, 123 and 77 were male and female, respectively. Totally 292 analgesics were prescribed to the patients. The average number of analgesic per prescription was 1.46. The median age of the patient was 32.50 (IQRD 28) year. A maximum number of analgesic prescriptions were found in the age group of 21–30 years [Table 1]. Self-fall fractures (72%) were the most common condition followed by road traffic accident (21%), infective arthritis (4%), and congenital condition (3%) [Table 1].

As per the World Health Organization (WHO) drug use indicators, out of total analgesics prescribed, 183 (62.67%) were from the NLEM, India 2011 and 167 (57.19%) analgesics were prescribed by generic name. The average number of drugs per prescription was 4.98 [Table 1].

The median number of drugs per prescription (IQRD) was 5 (2) [Table 1].

As per the core indicators of drug utilization, in this study 111 (55.50%) of patients have received single analgesic; however, 87 (43.5%) numbers of patients have received two analgesics at a time. More than three analgesics were prescribed in 2 (1%) patients. The median duration of analgesic therapy was 4 (IQRD 3) days and 40% of analgesic were given for 3–5 days of duration for the treatment. The median duration of hospital stay was 8 (IQRD 9) days. Maximum analgesics (55.82%) were given by parenteral route [Table 1]. The average cost of treatment per patient was 2151.72 INR [Table 1]. Hospital and patient shared 1647.91 INR (76.59%) and 503.81 INR (23.41%) of the total drugs cost, respectively.

In this study, out of 292 most of the analgesics were peripherally acting analgesics (NSAIDS) 157 (53.77%), combination analgesics (nonopioid and NSAIDS) were 132 (45.20%), and centrally acting synthetic opioid analgesic i.e., tramadol 3 (1.03%) [Table 2]. Diclofenac was the most commonly prescribed analgesic 127 (43.49%) followed by aceclofenac and paracetamol 123 (42.12%), ibuprofen 24 (8.22%), ibuprofen and paracetamol 9 (3.08%), tramadol 3 (1.03%), aceclofenac 3 (1.03%), ketorolac 2 (0.69%), and piroxicam 1 (0.34%) [Table 2].
We have observed 223 (22.36%) number of analgesics being coprescribed with gastroprotectives mainly PPIs (proton pump inhibitors) 164 (73.54%) and H₂ blockers 59 (26.46%) [Table 3]. Adverse drug reactions were not found during the study. Total utilization of analgesic during the study in terms of DDD/100 bed-days was 104.01. Utilization pattern of various analgesic and DDD/100 bed-days is shown in Table 2.

**Discussion**

Fractures are among the most common orthopedic problems, and about 6.8 million people seek medical care attention for fracture in India and most common indication for prescribing diclofenac was fracture,[15,16] This study reveals that most common indication for hospitalization was fracture and diclofenac was the most commonly prescribed drug. Prescribing drugs by generic name, promote the rational use of drugs with regard to safety, efficacy, and cost by permitting the identification of the products by its scientific names. Increasing generic prescribing would rationalize the use and reduce the cost of drugs.[17,18] In this study, 167 (57.19%) analgesics were prescribed with generic name. More than 60% of medications were prescribed by generic name from 26 countries.[19]

Globally, NSAIDs are most commonly prescribed drugs for the management of pain and inflammation and the same has been reflected in this study. Despite the wide clinical use of NSAIDs, their gastrointestinal toxicity is the major limitation in clinical use. Hence, they are coprescribed with gastroprotective agents.[20] We found 22.36% of analgesics being co-prescribed with gastroprotectives.

Essential medicines list has been shown to improve the quality and cost-effectiveness of health-care delivery when combined with proper procurement policies and good prescribing practices. Essential drugs list or formulary issued to measure the degree to which practices conform to a national drug policy, as indicated by prescribing from the national essential drugs list or formulary for the type of facility surveyed. In this study, 62.67% analgesics were prescribed from the NLEM, India 2011.[21] The findings from Sen and Bathini[22] prescribed analgesics from the NLEM were 81.94%, Salman et al.[23] were 62.20% from NLEM, India 2003 and out of the 37 study reports, in 8 studies, 60% of the drugs were prescribed from an essential medicines list.[19]

The average number of drugs per prescription is an important parameter while doing a prescription audit. Multiple drug prescribing results polypharmacy, this may cause to irrational prescribing and induce adverse effect. In this study, the average number of drug per prescription was 4.98. The similar findings were reported in several countries (Indonesia, Niger, Nigeria, India, Ghana, and Pakistan) in which three or more drug were prescribed per prescription.[19]

This study reveal that the average cost of treatment per patient was Rs. 2151.72 INR whereas 23.81% cost shared by the patients. These differences in mean cost of total drugs in this study in comparison with other studies[24,25] may be due to variation in type and severity of the admitted patient, indications for the admission, different prescribing pattern, or inflation in the price of medications.

| Variables | Number of patient (%) | n=200 |
|-----------|-----------------------|-------|
| Age (years) | | |
| 0-10 | 36 (18) |
| 11-20 | 15 (7.5) |
| 21-30 | 46 (23) |
| 31-40 | 37 (18.5) |
| 41-50 | 36 (18) |
| 51-60 | 14 (7) |
| ≥ 60 | 16 (8) |
| Gender | | |
| Male | 123 (61.5) |
| Female | 77 (38.5) |
| Indications | | |
| Fracture (self-fall fracture) | 144 (72) |
| Road traffic accident | 42 (21) |
| Infective arthritis | 8 (4) |
| Congenital | 6 (3) |
| Category | | |
| Number of analgesic prescribed | | |
| One drug | 111 (55.50) |
| Two drugs | 87 (43.50) |
| Three drugs | 1 (0.50) |
| Four drugs | 1 (0.50) |
| Indicators assessed | Data value |
| Average number of analgesic per prescription | 1.46 |
| Median number of drugs per prescription (IQRD) | 5 (2) |
| Average number of drugs per prescription | 4.98 |
| Percentage of patients on analgesics from National Model List of Essential Medicines (%) | 62.67 |
| Percentage of analgesics prescribed by generic name (%) | 57.19 |
| Utilization pattern of analgesic in terms of DDD/100-bed days | 104.01 |
| Average cost of treatment per patient (INR) | 2151.72 |
| Most common analgesic prescribed (%) | Diclofenac, 127 (43.49) |
| Most common route of administration (%) | Parenteral, 163 (55.82) |

This study revealed that most of the analgesics were prescribed for appropriate indication. The duration of prescribing of analgesics is found to be satisfactory in this study. Although the average cost of treatment per patient was high, patient shared only 23.81% of total treatment. Cопrescribed drugs, i.e. proton pump inhibitors were commonly used for maximum. Analyzing the results of these indicators information is obtained about the “quality of prescribing the drug” to quantity in different circumstances of use (time, duration, age of the patient, route of administration, etc.). The calculation of DDD/100 bed-days for drug utilization is used as a tool to measurement the pattern of consumption of analgesics. In this study, the total drug utilization of analgesics at in-patients department during the study in terms of DDD/100 bed-days was 104.01.
The WHO has recommended the ATC classification/DDD system as a tool for presenting drug utilization research to improve the quality of drug use.

However, the recommended dose and the trends in drug utilization with indicator for measuring drug consumption are shown in Table 2.

**Conclusion**

The percentage of analgesics prescribed from essential medicines list and the use of the generic name were found to be satisfactory, but the average number of drug per prescription was high. This study highlights the need to minimize the average number of drugs per prescription. NSAIDs were commonly coprescribed with gastroprotective agents. Regular educational interventions at different levels may further promote rational prescribing.

**Financial Support and Sponsorship**

Nil.

**Conflicts of Interest**

There are no conflicts of interest.

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Table 2: Utilization pattern of analgesics in orthopedic in patients and defined daily dose/100 bed-days at a tertiary care hospital

| Classification of analgesic                                      | Number of analgesics (%) | ATC code | DDD (mg) | DDD/100 bed-days=104.01 |
|------------------------------------------------------------------|--------------------------|----------|----------|-------------------------|
| Peripherally acting analgesics (NSAIDs)                          | 157 (53.77)              | MO1AB16  | 200      | 1.65                    |
| Aceclofenac                                                      | 3 (0.03)                 | MO1AB5   | 100      | 30.71                   |
| Diclofenac                                                       | 127 (43.49)              |          |          |                         |
| Ibuprofen                                                       | 24 (08.22)               | MO1AE01  | 1200     | 18.77                   |
| Ketorolac                                                        | 2 (0.69)                 | MO1AB15  | 30       | 0.14                    |
| Piroxicam                                                        | 1 (0.34)                 | MO1AC01  | 20       | 0.07                    |
| Combination analgesics (nonopioid and NSAIDs)                   | 132 (45.20)              |          |          |                         |
| Aceclofenac and paracetamol                                     | 123 (42.12)              | MO1AX    | 200      | 51.58                   |
| Ibuprofen and paracetamol                                       | 9 (03.08)                | NO2BEO1  | 400      | 0.69                    |
| Centrally acting synthetic opioid analgesic                     | 3 (01.03)                | NO2AX02  | 500      |                         |
| Tramadol                                                         | 3 (01.03)                |          |          |                         |
| NSAIDS=Nonsteroidal anti-inflammatory drug, ATC=Anatomical therapeutic chemical, DDD=Defined daily dose. The DDD/100 bed-days of analgesics were calculated using following formula: DDD/100 bed-days=drug consumption in the study period (mg) × 100/assigned DDD (mg) × period of study × bed strength × average bed occupancy rate. Where, period of study=30 days; Bed strength=116 and average bed occupancy rate=0.4

Table 3: Coprescribed drugs with analgesics for patient during hospitalization at a tertiary care hospital

| Category of drugs                          | n (%) | n=997 |
|--------------------------------------------|-------|-------|
| Analgesics                                 | 292   | 29.29 |
| Gastroprotectives                          | 223   | 22.36 |
| Proton pump inhibitors (pentoprazole)      | 164   | 16.49 |
| H2 blockers (ranitidine)                   | 59    | 5.93  |
| Antimicrobials                             | 234   | 23.47 |
| Enzymes                                    | 120   | 12.04 |
| Miscellaneous drugs                        | 128   | 12.84 |

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