

Prescription Pattern and Appropriateness of Non- Steroidal Anti- Inflammatory Drug Therapy in Patients with Osteoarthritis: A Cross Sectional Study

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Abstract

Objectives: Current medical management of osteoarthritis (OA) is mostly palliative with non-steroidal anti-inflammatory drugs (NSAIDs) being the mainstay of therapy. NSAIDs are commonly used despite well-known side effect which may lead to various adverse drug reactions and drug toxicity. Therefore, the objectives of the study are to analyse the prescription pattern of NSAIDs in OA patients and to assess appropriateness of the use of NSAIDs in relation to gastrointestinal and cardiovascular risk.

Methods: A cross sectional study was carried out among patients attending orthopaedics out- patient department & provisionally diagnosed as OA. Patients who were prescribed any of the following drugs or their combinations were included in the study: NSAIDs, Glucocorticoids, Opioid analgesics and Symptomatic Slow Acting Drugs for OA (SYSADOA). To assess prescription pattern, 'WHO core prescribing indicators' were used. Analysis of appropriateness of NSAIDs use by the prescribers in relation to GI & CV risks, the recommendations of the 'First International Working Party Report on Management of Patients on NSAIDs' were adopted and categorised as appropriate or inappropriate or uncertain. Data were entered in statistical software 'EpiInfo'. Data were represented by suitable tables & figures and expressed in frequency and percentage.

Results: A total 600 OA patients were included in the study. Out of 600 prescriptions, NSAIDs were prescribed in 547 prescriptions. Total 402 prescriptions were analyzed for appropriateness of NSAIDs therapy. Out of total 402 prescriptions, 222 prescriptions were found appropriate, 127 inappropriate and 53 were found as uncertain.

Conclusions: The study showed that NSAIDs should be selected more judiciously for OA patients in relation to GI and CV risk in order to reduce untoward adverse effects of these agents.

Key-words: NSAIDs, Prescription pattern, Appropriateness.

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Introduction

Osteoarthritis (OA) is the most common type of joint disease and is a major cause of disability.¹ Non-steroidal anti-inflammatory drugs (NSAIDs) are the mainstay of therapy in OA patients. NSAIDs use may lead to various adverse drug reactions and drug toxicity which may increase the cost of the therapy². Therefore, it is important to promote rational use of these agents in OA patients. Prescribing pattern studies suggest modifications in the prescribing behavior of medical practitioners to make medical care rational and cost effective.³ Gastrointestinal and cardiovascular side effects of NSAIDs are the most common. It has prompted the necessity for assessments of both GI and CV risk in patients who need these medications⁴. Different scientific societies agree that the medical management of patients who require NSAIDs must be based upon the previous assessment of GI and CV risk factors in the individual patient.⁵

This study was planned to assess the prescription pattern and appropriateness of use of NSAIDs in patients with OA in relation to GI and CV risk factors at Tripura Medical College and Dr. B.R. Ambedkar Memorial Teaching Hospital (TMC).

Subjects and Methods

Study design: Cross sectional study.

Study setting: Orthopaedics outpatient department (OPD) and Department of Pharmacology, TMC

Study period: 15th October, 2018 to 15th September, 2020.

Study population: Patients attending Orthopaedics OPD & provisionally diagnosed as OA.

Inclusion criteria:

1. Patients aged 18 years & above, willing to give consent for the study.
2. Patients who were prescribed any of the following drugs or their combinations:

NSAIDs, Glucocorticoids, Opioid analgesics and Symptomatic Slow Acting Drugs for OA (SYSADOA).

Exclusion criteria:

1. Seriously ill patients.
2. Patients who had been advised indoor admission.
3. Patients with insufficient data in relation to GI & CV risk.
4. Patients who had received herbal or other alternative medicines.

Sample size: WHO document "How to investigate drug use in health facilities?"⁶ recommends to include at least 600 prescriptions in a cross-sectional survey. Considering this as a standard, 600 OPD patients who fulfilled selection criteria were included in the study.

Sampling technique: Convenience sampling.

Study tools & techniques:

Study was conducted after obtaining informed written consent from each patient in their own language. Patients who fulfilled selection criteria were interviewed individually & relevant data were recorded in a case record form.

Prescription pattern:

'WHO core prescribing indicators'⁶ were used with some modifications⁷ based on the objectives of the study as below:

1. Average number of drugs per encounter.
2. Percentage of encounters with NSAIDs prescribed.
3. Percentage of encounters with an injection of NSAIDs prescribed.
4. Percentage of encounters with non-selective NSAIDs (nsNSAIDs) prescribed.
5. Percentage of encounters with COX 2 selective NSAIDs prescribed.
6. Percentage of NSAIDs prescribed by generic names.
7. Percentage of NSAIDs prescribed from National List of Essential Medicine, India (NLEM-2015).
8. Percentage of Fixed Dose Combination (FDC) of NSAIDs prescribed.
9. Percentage of encounters with NSAIDs and gastro protective (GP) agent co-prescribed.

Appropriateness of NSAIDs use:

NSAIDs use by the prescribers in relation to GI & CV risks was assessed individually. GI and CV risks were assessed by interviewing individual patient and recording different risk factors in the case record form.

GI risk assessment:

GI risk was categorised either into "High GI risk" or with "No prior upper GI event". Presence of any of the GI risk factors mentioned below was considered as "High GI risk" & prescriptions not having any of these risk factors were considered as "No prior upper GI event" group:

- a. Age \geq 70 years.^{8,9}
- b. Prior Upper GI event (upper GI bleeding, perforation, obstruction, symptomatic ulcer).^{10,11}
- c. Concomitant use of aspirin, corticosteroids, anticoagulants or other antiplatelet drugs.^{12,13,14,15}

CV risk assessment:

CV risk was categorised into "High CV risk" or "Average CV risk". Presence of any of the risk factors mentioned below was considered as "High CV risk"¹⁶

- a. Presence of established CV disease (e.g., prior myocardial infarction, prior stroke and angina).
- b. An estimated 10-year CV risk of greater than 20% in patients without established CV disease. The 10 years CV risk was calculated by Framingham coronary heart disease risk score.¹⁷

"Average CV risk" was defined as 10-year CV risk < 20%.

After assessing GI and CV risks, each patient was categorised into any of the following four subgroups:

1. High GI risk and high CV risk
2. High GI risk and average CV risk
3. No prior upper GI event and high CV risk and
4. No prior upper GI event and average CV risk

To analyse appropriateness of NSAIDs use by the prescribers in relation to GI & CV risks, the recommendations of the 'First International Working Party Report on Management of Patients on NSAIDs'¹⁸ were adopted. Appropriateness of NSAIDs use in relation to GI and CV risk of each prescription was analysed on the basis of the recommendations and categorised as appropriate or inappropriate or uncertain as below:

Table 1: Treatment guidelines of NSAIDs therapy for patients with high GI risk & high CV risk (10-year risk > 20 %):

	No Aspirin or Anticoagulant	Low dose Aspirin Alone	Anticoagulant (e.g Warfarin) Alone	Low Dose Aspirin + other Antiplatelet (e.g Clopidogrel) or Anticoagulant
No Corticosteroids				
Naproxen	Inappropriate	Inappropriate	Inappropriate	Inappropriate
Non-Naproxen	Inappropriate	Inappropriate	Inappropriate	Inappropriate
Naproxen + PPI/ misoprostol	Appropriate	Appropriate	Appropriate	Appropriate
Non-Naproxen + PPI /misoprostol	Uncertain	Uncertain	Uncertain	Uncertain
Coxib	Inappropriate if < 70, uncertain if > 70	Inappropriate	Uncertain	Inappropriate
Coxib + PPI/ misoprostol	Uncertain	Uncertain	Uncertain	Uncertain

Continue.....

Taking Corticosteroids				
Naproxen	Inappropriate	Inappropriate	Inappropriate	Inappropriate
Non-Naproxen	Inappropriate	Inappropriate	Inappropriate	Inappropriate
Naproxen + PPI / misoprostol	Appropriate	Appropriate	Appropriate	Appropriate if < 70, uncertain if > 70
Non-Naproxen + PPI / misoprostol	Uncertain	Uncertain	Uncertain	Uncertain
Coxib	Uncertain	Inappropriate	Uncertain	Uncertain if < 70, inappropriate if > 70
Coxib + PPI/ misoprostol	Inappropriate if <70, uncertain if > 70	Uncertain	Uncertain	Uncertain

Table 2: Treatment guidelines of NSAIDs therapy for patients with high GI risk & average CV risk (10-year risk <20%):

	No Aspirin or Anticoagulant	Low Dose Aspirin Alone	Anticoagulant (e.g Warfarin) Alone	Low dose Aspirin + Antiplatelet (e.g Clopidogrel) or Anticoagulant
No Corticosteroids				
Naproxen	Inappropriate	Not applicable	Inappropriate	Not applicable
Non naproxen	Inappropriate		Inappropriate	
Naproxen + PPI/ misoprostol	Appropriate		Appropriate	
Non naproxen +PPI/ misoprostol	Appropriate		Appropriate	
Coxib	Uncertain		Uncertain	
Coxib+ PPI / misoprostol	Appropriate		Appropriate	
Taking Corticosteroids				
Naproxen	Inappropriate	Not applicable	Inappropriate	Not applicable
Non naproxen	Inappropriate		Inappropriate	
Naproxen + PPI/ misoprostol	Appropriate		Appropriate	
Non naproxen +PPI/ misoprostol	Appropriate if <70, uncertain if > 70		Appropriate if < 70, uncertain if > 70	
Coxib	Uncertain		Uncertain	
Coxib+ PPI / misoprostol	Appropriate		Appropriate	

Table 3: Treatment guidelines of NSAIDs therapy for patients with no prior upper GI event and high CV risk (10-year risk >20%):

	No Aspirin or Anticoagulant	Low Dose Aspirin Alone	Anticoagulant (e.g Warfarin) Alone	Low Dose Aspirin+ Antiplatelet (e.g Clopidogrel) or Anticoagulant
No Corticosteroids				
Naproxen	Appropriate if < 70, uncertain if ≥ 70	Uncertain	Inappropriate	Inappropriate
Non naproxen	Uncertain if < 70, inappropriate if ≥ 70	Inappropriate	Inappropriate	Inappropriate
Naproxen + PPI/ misoprostol	Inappropriate if < 70, appropriate if ≥ 70	Appropriate	Appropriate	Appropriate
Non-Naproxen +PPI/ misoprostol	Inappropriate	Uncertain	Uncertain	Uncertain
Coxib	Inappropriate	Inappropriate	Inappropriate if < 70, uncertain if ≥ 70	Inappropriate
Coxib + PPI/ misoprostol	Inappropriate	Inappropriate if < 70, uncertain if ≥ 70	Inappropriate if < 70, uncertain if ≥ 70	Uncertain
Taking Corticosteroids				
Naproxen	Uncertain if < 70, inappropriate if ≥ 70	Inappropriate	Inappropriate	Inappropriate
Non naproxen	Inappropriate	Inappropriate	Inappropriate	Inappropriate
Naproxen + PPI/ misoprostol	Uncertain if < 70, appropriate if ≥ 70	Appropriate	Appropriate	Appropriate
Non-Naproxen +PPI/ misoprostol	Uncertain	Uncertain	Uncertain	Uncertain
Coxib	Inappropriate	Inappropriate	Inappropriate	Inappropriate
Coxib + PPI/ misoprostol	Inappropriate	Uncertain	Inappropriate if < 70, uncertain if ≥ 70	Uncertain

Table 4: Treatment guidelines of NSAIDs therapy for patients with no prior GI event and average CV risk (10-year risk <20%):

	No Aspirin or Anticoagulant	Low Dose Aspirin Alone	Anticoagulant (e.g Warfarin) Alone	Low dose Aspirin+Antiplatelet (e.g Clopidogrel) or Anticoagulant
No Corticosteroids				
Naproxen	Appropriate if < 70, uncertain if ≥ 70	Not applicable	Inappropriate	Not applicable
Non naproxen	Appropriate if < 70, uncertain if ≥ 70		Inappropriate	
Naproxen + PPI/ misoprostol	Inappropriate if < 70, appropriate if ≥ 70		Appropriate	
Non naproxen +PPI/ misoprostol	Inappropriate if < 70, appropriate if ≥ 70		Appropriate	
Coxib	Uncertain		Uncertain	
Coxib + PPI/ misoprostol	Inappropriate if < 70, uncertain if ≥ 70		Uncertain	
Taking Corticosteroids				
Naproxen	Uncertain if < 70, inappropriate if ≥ 70	Not applicable	Inappropriate	Not applicable
Non naproxen NSAID	Uncertain if < 70, inappropriate if ≥ 70		Inappropriate	
Naproxen+PPI/ misoprostol	Appropriate		Appropriate	
Non naproxen +PPI/ misoprostol	Appropriate		Appropriate if < 70, uncertain if ≥70	
Coxib	Uncertain		Uncertain	
Coxib + PPI/ misoprostol	Uncertain		Uncertain	

Ethical approval: Ethical approval was taken from the Institutional Ethics Committee as per memorandum No.F.3 (PO-75)/Inst. Ethical Com./SFTMC/2010-11/14288-98, Dated 13/10/2018.

Confidentiality: Was strictly maintained for each individual patient.

Statistical analysis: Data were entered in statistical software 'EpiInfo'. Data were represented by suitable tables & figures and expressed in frequency and percentage.

Results

Distribution of study population: A total 600 OA patients were included in the study. Gender, age and category (in relation to GI and CV risk) wise distributions is shown in table 5.

Table 5: Distribution of study population according to gender, age and in relation to GI & CV risk [n = 600]:

Gender	Category	Frequency (%)
	Female	334 (55.67)
	Male	266 (44.33)
Age (in years)	18- 30	0
	31- 49	201 (33.5)
	50-69	323 (53.83)
	>69	76 (12.67)
Category of patients in relation to GI & CV risk	High GI risk & high CV risk	34 (5.67)
	High GI & average CV risk	202 (33.67)
	No prior upper GI & high CV risk	116 (19.33)
	No prior upper GI & average CV risk	248 (41.33)

Prescription pattern of NSAIDs in OA patients:

Prescription pattern of NSAIDs in OA patients is shown in table 6. A total of 600 prescriptions were analyzed for prescription pattern of NSAIDs by using WHO core prescribing indicators.

Table 6: Prescription pattern of NSAIDs [n=600]:

SI	Core prescribing indicators	Data value
1	Average number of drugs per encounter	3.85
2	Percentage of encounters with NSAIDs prescribed	91.17%
3	Percentage of encounters with an injection of NSAID prescribed	2.33%
4	Percentage of encounters with nonselective NSAID prescribed	95.61%
5	Percentage of encounters with COX 2 selective NSAID prescribed	4.39%
6	Percentage of NSAIDs prescribed by generic names	15.72%
7	Percentage of encounter with NSAIDs prescribed from NLEM-2015	34.37%
8	Percentage of encounter with fixed -dose combination (FDC) of NSAIDs prescribed	17.55%
9	Percentage of encounters with NSAIDs and gastro protective (GP) agent co-prescribed	56.16%

Appropriateness of NSAIDs use in OA patients based on GI and CV risks: In this study, total 600 prescriptions were found with OA. Among these, NSAIDs were prescribed in 402 prescriptions as monotherapy. So, a total of 402 prescriptions were analyzed for appropriateness of NSAIDs therapy and summarized in table 7 and table 8.

Table 7: Appropriateness of NSAIDs use in the four subgroups:

Appropriateness of NSAIDs prescribed in "High GI and high CV risk" patients [n=32]:								
	NSAIDs	Aceclofenac	Diclofenac	Etodolac	Etoricoxib	Naproxen	Paracetamol	Total
	No. of Prescriptions	06	02	--	--	14	10	32
Number (%) of prescriptions analyzed as	Appropriate	--	--	--	--	12 (37.5)	--	12 (37.5)
	Inappropriate	04 (12.5)	--	--	--	02 (6.25)	06 (18.75)	12 (37.5)
	Uncertain	02 (6.25)	02 (6.25)	--	--	--	04 (12.5)	08 (25)
Appropriateness of NSAIDs prescribed in patients with "High GI and average CV risk" [n=152]								
	NSAIDs	Aceclofenac	Diclofenac	Etodolac	Etoricoxib	Naproxen	Paracetamol	Total
	No. of Prescriptions	47	33	19	17	07	29	152
Number (%) of prescriptions analyzed as	Appropriate	39 (25.66)	31 (20.39)	14 (9.21)	13 (8.55)	07 (4.61)	25 (16.45)	129 (84.87)
	Inappropriate	08 (5.26)	02 (1.32)	05 (3.29)	--	--	04 (2.63)	19 (12.5)
	Uncertain	--	--	--	04 (2.63)	--	--	04 (2.63)
Appropriateness of NSAIDs prescribed in patients with "No prior upper GI event and high CV risk" [n=81]								
	NSAIDs	Aceclofenac	Diclofenac	Etodolac	Etoricoxib	Naproxen	Paracetamol	Total
	No. of Prescriptions	23	23	5	3	11	16	81
Number (%) of prescriptions analyzed as	Appropriate	--	--	--	--	07 (8.64)	--	07 (8.64)
	Inappropriate	19 (23.46)	17 (20.99)	04 (4.94)	03 (3.7)	02 (2.47)	09 (11.11)	54 (66.67)
	Uncertain	04 (4.94)	06 (7.41)	01 (1.23)	--	02 (2.47)	07 (8.64)	20 (24.69)
Appropriateness of NSAIDs prescribed in "No prior upper GI event and average CV risk" group of patients [n=137]								
	NSAIDs	Aceclofenac	Diclofenac	Etodolac	Etoricoxib	Naproxen	Paracetamol	Total
	No. of Prescriptions	34	37	19	13	13	21	137
Number (%) of prescriptions analyzed as	Appropriate	19 (13.87)	25 (18.25)	09 (6.57)	--	07 (5.1)	14 (10.22)	74 (54.01)
	Inappropriate	11 (8.03)	8 (5.84)	07 (5.11)	07 (5.11)	04 (2.92)	05 (3.65)	42 (30.66)
	Uncertain	04 (2.92)	04 (2.92)	03 (2.19)	06 (4.38)	02 (1.46)	02 (1.46)	21 (15.33)

Table 8: Overall assessment of appropriateness of NSAIDs use in OA patients in relation to GI & CV risks [n=402]:

Groups	Number of prescriptions	Number (%) of prescriptions analyzed as		
		Appropriate	Inappropriate	Uncertain
1. High GI and high CV risk	32	12 (37.5)	12 (37.5)	08 (25)
2. High GI and average CV risk	152	129 (84.87)	19 (12.5)	04 (2.63)
3. No prior upper GI event and high CV risk	81	07 (8.64)	54 (66.67)	20 (24.69)
4. No prior upper GI event and average CV risk	137	74 (54.01)	42 (30.66)	21(15.33)
Total	402	222 (55.23)	127 (31.59)	53 (13.18)

Discussion

The demographic profile showed that OA was more common in females (55.67%) which is in accordance with the study done by Ullal DS et al.¹⁹ OA affected population in this study was more common in the age group of 50 to 69 (53.83%) which is similar to the finding of Gupta R et al.²⁰. Out of 600 patients, maximum number of patients (41.33%) were found with no prior upper GI & average CV risk, whereas lowest number of patients (5.67%) was found with high GI & high CV risk. The prescribing practices of NSAIDs in this study indicated some deviation from the WHO standard. The average number of drugs per prescription in our study was 3.85 which was not in accordance with standard value 1.6 - 1.8.²¹ Percentage of encounters with NSAIDs prescribed in OA patients was 91.17%. NSAIDs were prescribed predominantly in 84% patients in another study by Jadhav MP et al.²² Non- Selective NSAIDs were the most commonly prescribed (95.61%) with the highest frequency for paracetamol (20.11%) in our study which was comparable to the finding of Vaishnavi P R R et al.⁷ To analyze appropriateness of NSAIDs use by the prescribers in relation to GI & CV risks, the recommendations of the 'First International Working Party Report on Management of Patients on NSAIDs'¹⁸ were adopted. Out of 402 prescriptions, overall, 55.23% prescriptions were found appropriate, 31.59% inappropriate and 13.18% were found uncertain. Maximum number of appropriate prescriptions (84.87%) was found in "High GI and average CV risk" group and the minimum number of appropriate prescriptions (8.64%) was found in patients with "No prior upper GI event and high CV risk".

Conclusion

NSAIDs should be selected more judiciously for OA patients in relation to GI and CV risk in order to reduce untoward adverse effects of these agents. The results of this study will be useful to plan further research and to improve prescribing practices. These findings may help to create strategies or guidelines to provide the appropriate therapy of NSAIDs in OA patient.

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References

1. Azad CS, Singh AK, Pandey P, Singh M, Chaudhary P, Tia N. Osteoarthritis in India: An Epidemiological Aspect. *Int J of Recent Scientific Res* 2017; 8(10): 20918-22.
2. Garg Y, Singh J, Sohal HS, Gore R, and Kumar A. Comparison of clinical effectiveness and safety of newer nonsteroidal anti-inflammatory drugs in patients of osteoarthritis of knee joints: A randomised, prospective, open label parallel group study. *Indian J Pharmacol* 2017; 49(5):383-9.
3. Paul AD, Chauhan CK. Study of usage pattern of nonsteroidal anti-inflammatory drugs (NSAIDs) among different practise categories in Indian clinical setting. *Eur J Clin Pharmacol* 2005; 60:889-92.
4. WHO: The Rational Use of Drugs. Report of a Conference of Experts, Nairobi, 25 -29 November 1985. Geneva: World Health Organization; 1987.
5. Lanan A, Garcia-Tell G, Armada B, and Alvaro AO: Prescription patterns and appropriateness of NSAID therapy to gastrointestinal risk and cardiovascular

- history in patients with diagnoses of osteoarthritis. *BMC Medicine* 2011; 9(38):1-7.
6. WHO: How to Investigate Drug use in Health Facilities: Selected Drug Use Indicators. WHO/DAP/93.1. Geneva: WHO; 1993.
 7. Vaishnavi P.R.R, Gaikwad N, Dhaneria SP: Assessment of nonsteroidal anti-inflammatory drug use pattern using WHO indicators: A cross sectional study in a tertiary care teaching hospital of Chhattisgarh. *Indian J Pharmacol* 2017; 49(6): 445-50.
 8. Tannenbaum H, Peloso PM, Russell AS, Marlow B. An evidence-based approach to prescribing NSAIDs in the treatment of Osteoarthritis and rheumatoid arthritis: the Second Canadian Consensus Conference. *Can J Clin Pharmacol* 2000; (supplA):4A-16A.
 9. Hallas J, Lauritsen J, Villadsen HD. Nonsteroidal anti-inflammatory drugs and upper gastrointestinal bleeding, identifying high risk groups by excess risk estimates. *Scand J Gastroenterol* 1995; 30:438-44.
 10. Hippisley -Cox J, Coupland C, Logan R. Risk of adverse gastrointestinal outcomes in patients taking cyclo oxygenase 2 inhibitors or conventional non-steroidal anti-inflammatory drugs: Population based nested case control analysis. *BMJ* 2005; 331(7528):1310-16.
 11. Garcia Rodriguez LA, Jick H. Risk of upper gastrointestinal bleeding and perforation associated with individual non-steroidal anti-inflammatory drugs. *Lancet* 1994; 343:769-72.
 12. Laine L, Bombardier C, Hawkey CJ. Stratifying the risk of NSAID related upper gastrointestinal clinical events: Results of a double-blind outcomes study in patients with rheumatoid arthritis. *Gastroenterology* 2002; 123(4):1006-12.
 13. Gabriel SE, Jaakkimainen L, Bombardier C. Risks for serious gastrointestinal complications related to the use of non-steroidal anti-inflammatory drugs: A meta-analysis. *Ann Intern Med* 1991; 115:787-96.
 14. Piper JM, Ray WA, Daugherty JR. Corticosteroid use and peptic ulcer disease: Role of non-steroidal anti-inflammatory drugs. *Ann Intern Med* 1991; 114:735-40.
 15. Patrono C, Garcia Rodriguez LA, Landolfi R, Baigent C. Low dose aspirin for the prevention of atherothrombosis. *N Engl J Med* 2005; 353:2373-83.
 16. National Cholesterol Education Program: Third report of the expert panel on detection, evaluation and treatment of high blood cholesterol in adults (adult treatment panel III). Risk assessment tool for estimating 10-year risk of developing hard CHD (myocardial infarction and coronary death). Available at <http://hin.nhlbi.nih.gov/atp/iii/calculator.asp?usertype=prof>. Accessed December 8, 2018.
 17. Framingham Coronary Heart Disease Risk Score to estimate risk of heart attack in 10 years. Available at: <http://www.mdcalc.com/framingham-coronary-heart-disease-risk-score>.
 18. Chan FKL, Abraham NS, Scheiman JM, Laine L: Management of patients on nonsteroidal anti-inflammatory drugs: a clinical practice recommendation from the First International Working Party on Gastrointestinal and Cardiovascular Effects of Nonsteroidal Anti-inflammatory Drugs and Antiplatelet Agents. *Am J Gastroenterol* 2008; 103: 2908-18.
 19. Ullal D S , Narendranath S, Kamath K R, Pai S M , Kamath U S , Savur AD. Prescribing Pattern for Osteoarthritis in a Tertiary Care Hospital. *J Clinical and Diagnostic Research* 2010; 4(3):2421-6.
 20. Gupta R, Malhotra A, Malhotra P. Study of prescription pattern of drugs used in the treatment of osteoarthritis in a tertiary care teaching hospital: An observational study. *IJRMS* 2018; 6(3):985-9.
 21. Isah AO, Ross - Degnan D, Quick J, Laing R, Mabadeje AF. The Development of Standard Values for the WHO Drug use Prescribing Indicators. ICUM/EDM/WHO. Available from: http://www.archives.who.int/prduc2004/rducd/ICIUM_Posters/1a2_txt.htm. [last accessed on 2020 March 20].
 22. Jadhav M P, Dominic J C, Mukte A P. A prospective observational study to assess quality of life and prescription pattern in osteoarthritis patients at a tertiary care health center in Mumbai. *Indian J Med Sci* 2011; 65:58-63.