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BY

JAMIU M. O. AND GIWA, A.

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UTILIZATION OF NON-STEROIDAL ANTI-INFLAMMATORY DRUGS AMONG PHYSICIANS IN A NIGERIAN TERTIARY HEALTH FACILITY

Jamiu M. O.^{1*} and Giwa, A.¹

ABSTRACT

Nonsteroidal anti-inflammatory drugs are medications used to relieve pain, fever and inflammation. Serious toxicity related to Gastro intestinal tract, kidney, dermatological and spontaneous abortion during early pregnancy are of serious concern in their use. The study was to evaluate the utilization of Nonsteroidal anti-inflammatory drugs among prescribers at General Outpatient Department of the University of Ilorin Teaching Hospital. Retrospective study of 1297 patient prescription sheets was carried out at General Outpatient Department of the University of Ilorin Teaching Hospital for a period of six months to evaluate prescribing pattern of Nonsteroidal anti-inflammatory drugs by Physicians. Data obtained were analyzed using Statistical Package for Social Science. Data were presented in the form of text, frequency tables, bar chart and pie chart. Inferential statistics was done using logistic regression and chi square. Out of 1497 prescription sheets studied, 1297 prescriptions contained Nonsteroidal anti-inflammatory drugs, giving prescribing rate of 86.6%. About 7.3% of prescriptions contained more than one Nonsteroidal anti-inflammatory drug. The percentage of generic prescribing was found to be 45%. About 17% of the prescribed Nonsteroidal anti-inflammatory drugs were of long time use with only 0.04% co- prescribed with gastro-protective agent, omeprazole or misoprostol. Diclofenac tablet was the most prescribed Nonsteroidal anti-inflammatory drug with 42.2% prescribing rate followed by aspirin (19.8%) and ibuprofen (17.7%). There was no significant difference in duration of prescribed NSAIDs and number of prescribed medicines per prescription in relation to patient's gender status. The prescribing rate of Nonsteroidal anti-inflammatory drugs was high with associated multiple NSAIDs use. Diclofenac tablet was the most widely prescribed. Co-prescribing of Non-Steroidal anti-inflammatory drugs with gastro-protective agents was found to be very low.

KEYWORDS

NSAIDs, prescribing pattern, diclofenac, utilization, Ilorin

INTRODUCTION

Nonsteroidal anti-inflammatory drugs (NSAIDs) are medications used to relieve pain, fever and inflammation and they include a large group of drugs that work by inhibiting the production of prostaglandins.

They represent diverse group of drugs with analgesic property and most frequently prescribed drug globally. The demonstrated efficacy in musculoskeletal disorders like osteoarthritis increased their choice in pain management. Serious toxicity relating to gastrointestinal tract and other side effects are limitations in the choice of this category of drugs.[1] Age is a significant risk factor for NSAID-induced gastrointestinal events; indeed, patients above 75 years of age carry

¹Department of clinical pharmacy and pharmacy practice, Faculty of Pharmaceutical Sciences, University of Ilorin, Ilorin, Nigeria.

²Research Unit, Peace Standard Pharmaceuticals, Ilorin, Nigeria.

*CORRESPONDING AUTHOR: jamolakunle@gmail.com

the highest risk and are similar in this respect to patients with a history of peptic ulcer.[2] Other side effects include acute kidney injury, hypersensitivity reactions and spontaneous abortion during early pregnancy are notably associated with chronic use of NSAIDs.[3]

People desire to take responsibility for their own health care management. Many do so via self-medication. Self-medication is defined as the use medications without consulting a professional health care practitioner. Self-medication involves acquiring medication without a prescription, resubmitting an old prescription to procure medication, sharing medications with others, or utilizing a medication that is already available in the residence. Several governmental organizations developed policies to encourage self-care for minor illnesses, reclassifying many drugs as nonprescription medications instead of prescription-only medications, allowing the drugs to be administered by patients without a prescription[4] and could also be described as medication that is taken on patient's own initiative or on advice of a pharmacist or lay person.[5]

Asides gastrointestinal toxicity, renal failure has been recently known to be a risk if the patient is also concomitantly taking an ACE inhibitor and a diuretic - the so-called "triple whammy" effect. Liver problems are also possible with the long term use of NSAIDs. Greater understanding of pain mechanisms and growing appreciation for pain control have, however, caused rheumatologists to consider new approaches in pain management with the use of Nonsteroidal Anti-Inflammatory Drugs (NSAIDs). Both selective and nonselective cyclooxygenase (COX) inhibitors have antipyretic, anti-inflammatory and analgesic effects and are widely used in treating many painful conditions, including rheumatic diseases. NSAIDs are effective and widely available in over-the-counter formulations and in

prescription products. Examples include ibuprofen, naproxen, diclofenac, and celecoxib. NSAIDs are frequently used without considering the relative contraindications since most NSAIDs are sold over the counter. Conventional NSAIDs are associated with gastrointestinal side effects. Estimates of the number of deaths from NSAID-related gastrointestinal bleeding vary widely and figures of approx. 3500 to 16,500 per year are quoted for the US in a recent FDA report. Both conventional NSAIDs and COX-2 inhibitors are associated with increased cardiovascular risk. NSAIDs may increase blood pressure, particularly in hypertensive patients. Of all NSAIDs, naproxen seems to pose the least cardiovascular risk, although naproxen is associated with the same risk for myocardial infarction as other NSAIDs. Contrary to some clinical assumptions, gastrointestinal risk is present at first dose with a non-selective NSAID, and co-therapy with a proton pump inhibitor (PPI) does not guarantee complete protection.[6]

Interactions of NSAIDs include interaction with low-dose aspirin. Many patients combine either NSAIDs or COX-2 inhibitors with "cardio protective" low-dose aspirin. Epidemiological studies suggest that this combination therapy increases significantly the likelihood of gastrointestinal adverse events over either class of NSAID alone. Prior occupancy of the active site of platelet COX-1 by the commonly consumed NSAID ibuprofen impedes access of aspirin to its target site and prevents irreversible inhibition of platelet inhibition.[7] Epidemiological studies have provided conflicting data as to whether this adversely impacts clinical outcomes, but they generally are constrained by the use of prescription databases to examine an interaction between two drug groups commonly obtained without prescription. Evidence in support of this interaction has been observed in comparing ibuprofen-treated patients with and without

aspirin in two coxib outcome studies, but the trials were not powered to address this question definitively. In theory, this interaction should not occur with selective COX-2 inhibitors, because mature human platelets lack COX-2.

Angiotensin-converting enzyme (ACE) inhibitors act, at least partly, by preventing the breakdown of kinins that stimulate prostaglandin production. Thus, it is logical that NSAIDs might attenuate the effectiveness of ACE inhibitors by blocking the production of vasodilator and natriuretic prostaglandins. Due to hyperkalemia, the combination of NSAIDs and ACE inhibitors also can produce marked bradycardia leading to syncope, especially in the elderly and in patients with hypertension, diabetes mellitus, or ischemic heart disease. NSAIDs may increase the frequency or severity of gastrointestinal ulceration when combined with corticosteroids and augment the risk of bleeding in patients receiving warfarin. Many NSAIDs are highly bound to plasma proteins and thus may displace other drugs from their binding sites. Such interactions can occur in patients given salicylates or other NSAIDs together with warfarin, sulfonylurea hypoglycemic agents, or methotrexate; the dosage of such agents may require adjustment to prevent toxicity. The problem with warfarin is accentuated, both because almost all NSAIDs suppress normal platelet function and because some NSAIDs also increase warfarin levels by interfering with its metabolism; thus, concurrent administration should be avoided.

Study of interactions between Nonsteroidal anti-inflammatory drugs (NSAIDs) and antihypertensive drugs revealed that NSAIDs can induce an increase in blood pressure (BP) and may potentially reduce the efficacy of several antihypertensive drugs. The proposed mechanism of action was inhibition of prostaglandin (PG) synthesis since NSAIDs have higher propensity to increase blood

pressure (BP) as the regulation of BP (and renal function) is more prostaglandin dependent and to interact with drugs such as diuretics, beta-blockers and ACE inhibitors that may act through the increase of prostaglandin formation. In contrast, NSAIDs do not interact with calcium antagonists and central acting drugs which actions are apparently unrelated with renal/extra-renal production of prostaglandin.

NSAIDs are among the most commonly prescribed categories of drugs worldwide in the treatment of pain and inflammation in many conditions as over the counter drugs. Each day it is estimated that 30 million people would wide get benefit from their anti-inflammatory and analgesic effects.[8] NSAIDs guidelines have been established to increase physician awareness of the complications associated with NSAID use; however, some physicians either do not recognize or do not adhere to such guidelines. A recent survey of physicians identified six major barriers that affected their use of established NSAID guidelines. The barriers mentioned were as follows: lack of familiarity with the guidelines, perceived limited validity of the guidelines, and limited applicability of the guidelines to specific patient populations, clinical inertia, anecdotal experiences, and clinical heuristics. The lack of familiarity was attributed to the overwhelming number of published medical guidelines and difficulties in keeping up to date with new recommendations. In support of this, a search of the literature identified more than 20 different guidelines that mention NSAIDs and the elderly in addition to other highly acclaimed medication risk factor guidelines or tools.[9]

Prescribers need to be aware of the possibility of overdosing on NSAIDs that might result from prescribing and/or taking OTC medications that contain the same active NSAID ingredient. A meta-analysis of data from case-control studies revealed that

the odds ratio (reference point is nonuse of NSAIDs) for experiencing a serious GI complication was 4.9 in patients taking a single NSAID, 10.7 in patients taking two, and 60.0 in patients taking three NSAIDs simultaneously.[10] Combination of certain medications or herbal additives with prescribed or OTC NSAIDs may intensify or mask the side effects associated with NSAIDs; for example, corticosteroids, ginkgo biloba, warfarin, and alcohol can increase the severity of gastrointestinal bleeding or peptic ulcers.[11,12-14]

METHODS

Study setting

University of Ilorin Teaching Hospital is a tertiary health facility located in Oke Oyi, Ilorin East Local Government Area. It serves as referral hospital for patients from kwara and other neighbouring states like Oyo, Kogi, Niger, Osun, Ekiti. It provides tertiary level of health care services even though quite a number of patients bypass the primary and secondary health facilities. The hospital has over 600 beds with over 100 specialists in various disciplines of medicine in addition to resident doctors- in-training and medical officers.[15] The General Outpatient department, otherwise known as family medicine, operates five days a week from hours of 8.00am and 4.00pm daily.

Study design

Ethical approval for the study was obtained from the Research Ethics Committee of the University of Ilorin Teaching Hospital, Ilorin, Nigeria. All prescriptions from November 2013 to April 2014 were obtained from the Outpatient Pharmacy Department prescription bank. Systematic random sampling was used as selection method with one out of every five prescriptions. A total of 7,485 prescription sheets were obtained. The prescriptions containing NSAIDs were separated from those without NSAIDs. A total of 1497 prescriptions were found to contain

NSAIDs. Out of these 1,297 met the inclusion criteria.

Data collection

Data collection form was used to collect information about the prescribing pattern of NSAIDs in the pharmacy unit of General Outpatient Department (GOPD). Information collected from treatment sheets included patient demographics, name of NSAIDs, dosage number of NSAIDs, strength and duration.

Data analysis

Data obtained from the prescription sheets through the data collection form were properly sorted out coded and entered into spreadsheet of computer software package, Statistical Package for Social Sciences (SPSS) version 16 and analyzed. The data from the questionnaires were sorted and properly checked to ensure that the questionnaires were properly filled. Data were coded and analyzed with the computer using the Statistical Package for Social Sciences (SPSS) software package version 16.

Analyzed data were presented in form of texts, frequency tables, percentages, bar and pie charts for descriptive statistic. Chi-square and odd ratio from logistic regression were used to test for significant associations between categorical variables. P-value less than 0.05 were considered statistically significant.

RESULTS

Out of 1497 prescription sheets 86.6%. The prescribing rate was hence found to be 86.6%. The prescribing characteristics are provided in Table 3.1. More females used NSAIDs compare to males and a high percentage (87.1%) of these prescribed medicines were in tablet dosage form. Only 0.1% was injectable and 92.7% of the prescriptions had only one NSAID prescribed while co-prescribing with either omeprazole or misoprostol was 0.04%. The percentage of

drugs prescribed from Essential Drug List (EDL) was also high (81%) but generic prescribing was low (45%). Most NSAIDs prescribed were for less than One week

duration and only 17% were for duration longer than three weeks (See Table 1).

Table 1. Prescribing characteristics of NSAIDs

Characteristic	Options	Frequency (%)
Gender	Male	485(37.4)
	Female	812(62.6)
	Total	1297
NSAID dosage form	Tablet	1212(87.1)
	Capsule	178(12.8)
	Injectable	2(0.1)
	Total	1392
Availability on Essential Drug List	Tablet/capsule/injectable	1127(81.0)
Generic Prescribing	Tablet /capsule/injectable	630(45.0)
	Less than 7 days	789(56.8)
Prescribing duration	7-21 days	365(25.7)
	More than 21 days	247(17.5)
Prescribing with Gastroprotective drugs	Omeprazole/ misoprostol	50(0.04)
Multiple NSAIDs Prescribing	More than on NSAID	95(7.3)
	Analgesic/ anti-inflammatory	1117(80.2)
	Antiplatelet	275(19.8)

The frequency distribution of prescribed NSAIDs is provided in Table 2. Diclofenac tablet was the most commonly prescribed NSAID (42.2%) followed by aspirin (19.8%) and ibuprofen tablet (17.7%). The prescribed aspirin was indicated for cardioprotective condition. The least prescribed NSAID was tenoxicam (0.6%) (See Table 2).

Table 3 examined gender difference in duration of prescribed NSAIDs. The results showed that although there was proportionally higher number of female patients that was prescribed NSAIDs there was no statistically significant difference in this proportion.

Table 4 below assessed the relationship between the patient's gender and number of prescribed medication per prescription. Chi square analysis was used to determine the level of significance in the categorical variables.

DISCUSSION

This study revealed high prescribing rate of NSAIDs among the prescribers in UITH and more number of women were prescribed NSAIDs than men. Majority of the prescribed drugs were from essential drug list although not all the drugs were in generic as advocated by WHO.[16]

Table 2. Frequency distribution of prescribed NSAIDs.

Name of NSAID	Frequency (%)
Aspirin	279(19.8)
Aceclofenac	76(5.7)
Celecoxib	24(1.7)
Diclofenac	588(42.2)
Ketoprofen	241(17.3)
Ketorolac	26(1.9)
Meloxicam	66(4.7)
Tenoxicam	8(0.6)
Ibuprofen	274(17.7)

However, generic prescribing of NSAIDs was found to be low. Diclofenac tablet was found to be the most commonly prescribed NSAID. The prescribing durations for most drugs were for short duration with low multiple NSAIDs prescribing.

There is widespread assumption that women consult more frequently for all symptoms or conditions than men and men more reluctant to consult which may result in health care providers assuming that women have a lower level of symptom severity before deciding to consult.[17] Studies have also shown that some common pain conditions, including migraine and tension-type headache, facial pain, and abdominal pain, population-based studies indicate higher prevalence rates in adult women than in adult men.[18]

Table 3. Association between gender of the patient and duration of therapy and cost of NSAID.

		Prescribing Duration		Total
		Short (≤ 7 days)	Long (>7 days)	
Gender	Male	308(59.1%)	213(40.9%)	521
	Female	479(55.1%)	390(44.8%)	870
Total		788(56.6%)	603(43.3%)	1392

Prescribing from essential drug list and in generic are some of the World Health Organization specification for rational drug use. [19] It proposed 100% compliance to Essential medicine and generic prescribing. The results obtained indicated good compliance with prescribing from EDL but poor in generic prescribing this is at variance with the standard of good prescribing practice according to WHO. A study carried out at University of Jos Teaching Hospital showed that 70.2% of prescribed drugs were in generic. Drugs prescribed from the hospital formulary which is always in accordance with EDL were 88%.[20] A similar

study carried out in Hawassa, South Ethiopia obtained 98.7% and 96.6% in generic prescribing and Essential Drug List prescribing respectively.[21]

Prescribing duration of most of the NSAIDs (56%) were for short course therapy(less than seven days) while about 20% were more than three weeks, although majority of those on long term were cardioprotective dose of aspirin 75mg. Gastrointestinal side effects of NSAIDs increases with increased duration and high dose has been found to be responsible for gastrointestinal and renal toxicity of NSAIDs.[22,23] It has been also

Table 4. Relationship between Gender of the patients and number of prescribed medications per prescription.

		Number of medications per prescription			Total
		1-3	4-5	>5	
Gender	Male	205(39.3%)	228(43.7%)	88(16.9%)	522
	Female	312(35.8%)	400(45.9%)	159(18.3%)	871
Total		517(37.1%)	628(45.2%)	247(17.7%)	1392

noted that low dose aspirin are not save in their ability to induce peptic ulcer diseases. [24]

Despite the fact that 21% of prescribed NSAIDs were for long time duration and about 7% of the prescriptions contained multiple NSAIDs, less than 1% of patients were co-prescribed gastroprotective agent(s) which was at variance with standard guideline for appropriateness of use of NSAIDs in preventive measures for gastrointestinal side effects (Dubois et al, 2004).

Diclofenac was found to be the most widely prescribed analgesic/ anti-inflammatory NSAID which was consistent with a study carried out in South Western Nigeria in Physiotherapy department of three tertiary heath facilities.[25] This is also similar to the result of Owusu-Ansah carried out in Ghana . [26] Studies also emphasized the critical role of pharmacists' role in ensuring rational use of drugs in reducing the irrational use of drugs by dissemination of drug information to guide patients, physicians, and policy makers.[27]

CONCLUSION

The prescribing rate of NSAIDs was high with associated multiple NSAIDs use. There was low incidence of co-prescribing with gastro-protective agents despite existence of long prescribing duration of non- selective cox inhibitors.

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COMPETING INTERESTS

The authors declare that they have no competing interests

REFERENCES

1. Gul, S., Ayub, M. Prevalence of prescribing pattern of more than one NSAID in Pakistan. Journal of Scientific and Innovative Researc, 2014; 3(2): 148-154.
2. Berardi, R.R., Welage, L.S. Petic Ulcer Diseases In: Pharmacotherapy: A Pathophysiologic Approach 6th ed. DiPiro, J. T., Talbert, R. L., Yee G.C., Matzke G.R., Wells, B.G., Posey, L.M (eds); McGraw-Hill, New York, 2005.
3. Louie, S.G., Park, B., Yoon, H. Biological response modifiers in the management of rheumatoid arthritis. Am. J. Health. Syst. Pharm., 2003, (60): 346-355.
4. Saeed, M.S., Alkhoshaiban, A.S., AlWoraf, Y.M.A., Long, C.M. Perception of selfmedication among university students in Saudi Arabia .Archives of Pharmacy Practice. 2014, 5(4): 149-152.
5. Sherazi BA, Mahmood KT, Amin F, Zaka M, Riaz M, Javed A. Prevalence and Measure of Self Medication. Journal of Pharmaceutical Sciences and Research, 2012; 4(3): 1774-1778.
6. Wells, B.G., DiPiro, J.T.,Schwinghammer, T.L., Hamilton, C.W. Pharmacotherapy Handbook, 6th Edition. McGraw-Hill, 2006, 550-557.

7. Catella-Lawson, F., Reilly, M.P., Kapoor, S.C. Cyclooxygenase inhibitors and the antiplatelet effects of aspirin. *N. Engl. J. Med.*, 2001, 345:1809-1817.
8. Chowdhury, S.S., Hasan, M., Rahman, K.J., Waheed, T.B. Study on the use pattern of NSAIDs in some General and specialized hospitals of Bangladesh. *International research journal of Pharmacy*, 2012, 3(2): 152-155.
9. Taylor, R., Lemtouni, S., Weiss, K., Pergolizzi, J.V. Pain Management in the Elderly: An FDA Safe Use Initiative Expert Panel's View on Preventable Harm Associated with NSAID. *Therapy Current Gerontology and Geriatrics Research*, 2012, 196159:1-9 .doi:10.1155/2012/196159.
10. Lewis, S.C., Langman, M.J.S., Laporte, J.N.S., Matthews M.D., Wiholm, B.E. Dose-response relationships between individual nonaspirin nonsteroidal anti-inflammatory drugs (NSAIDs) and serious upper gastrointestinal bleeding: a meta-analysis based on individual patient data, *British Journal of Clinical Pharmacology*, 2002, 54(3): 320-326.
11. Tulner, L.R, Frankfort, S.V., Gijsen, G.J.P.T., Van Campen, P.C.M., CKoks, C.H.W Beijnen, J.H. Drug-drug interactions in a geriatric outpatient cohort: prevalence and relevance. *Drugs and Aging*, 2002, 25(4): 343-355.
12. Abebe, W. Herbal medication: potential for adverse interactions with analgesic drugs. *Journal of Clinical Pharmacy and Therapeutics*, 2008, 27(6): 391-401.
13. Cheetham, T.C., Levy, G., Niu, F., Bixle, F.R. Gastrointestinal safety of nonsteroidal antiinflammatory drugs and selective cyclooxygenase-2 inhibitors in patients on warfarin. *Annals of Pharmacotherapy*, 2009, 43(11): 1765-1773.
14. Kaufman, D.W., Kelly, J.P., Wiholm, B.E. The risk of acute major upper gastrointestinal bleeding among users of aspirin and ibuprofen at various levels of alcohol consumption. *American Journal of Gastroenterology*, 1999, 94 (11):3189-3196.
15. Akande, T.M., Ologe, M., Medubi, G.F. Antibiotic prescription pattern and cost at University of Ilorin Teaching Hospital, Ilorin, Nigeria. *International Journal of Tropical medicine*, 2009, 4(2): 50-54.
16. WHO (2017). Introduction to drug utilization research. Available at prescribing available at <http://apps.who.int/medicinedocs/en/d/Js4876e/4.6.html> last assessed on 3rd March 2017.
17. Hunt, K., Adamson, J., Hewitt, C., Nazare, I. Do women consult more than men? A review of gender and consultation for back pain and headache. *J Health Serv Res Policy*, 2011, 16(2): 108-117.
18. LeResche, L. Gender considerations in the epidemiology of chronic pain. In: Crombie, I.K., Croft, P.R., Linton, S.J., eds. *Epidemiology of Pain*. Seattle, IASP Press, 1999, 43-52.
19. World Health Organization. The role of Pharmacists in the health care system: Essential medicines and Health Products information Portals, Geneva, 2015.
20. Ndukwe, H.C., Ogaji, J.I., Comfort, N. Drug use Pattern with Standard Indicators in Jos University Teaching Hospital Nigeria. *Wapjp*, 2013, 24(1): 88-93.
21. Desalegn, A.A. Assessment of drug use pattern using WHO prescribing indicators at Hawassa University teaching and referral hospital, south Ethiopia: a cross-sectional study. *Postgrad Med J*. 2001, 77:82-88 doi:10.1136/pmj.77.904.82.
22. Crowe, S.E. Feldman, M., Grover, S. Patient information: Peptic ulcer disease (Beyond the Basics). Available online at <http://www.uptodate.com/contents/association-between-helicobacter-pylori-infection-and-duodenal-ulcer> last assessed on 15th November 2014.
23. Russell, R.I. Non-steroidal anti-inflammatory drugs and gastrointestinal damage—problems and solutions. *Postgrad Med J*. 2001, 77(904): 82-88.
24. Johnell, K., Fastbom, J. Concomitant use of gastroprotective drugs among elderly NSAID/ COX-2 selective inhibitor users: a nationwide register-based study. *Clin Drug Investig*. 2008; 28(11):687-95.
25. Teslim, O.A, Vyvienne, M., Olatokunbo, O.M., Oluwafisayo, A.J., Mlenzana, N.B., Shamila, M., Nesto, M., Grace, M. Side effects of non-steroidal anti-inflammatory drugs: The experience of patients with musculoskeletal disorders. *American Journal of Health Research*, 2014, 2(4): 106-112.
26. Owusu-Ansah, S.A. Analgesics use at polyclinic outpatient Department of Komfo Anokye teaching Hospital, A project thesis submitted in partial fulfillment of M.Sc, Pharmaceutical Sciences. Kwame Nkrumah University of Science and Technology, Faculty of Pharmaceutical Sciences. Kumasi, 2009.
27. Soleymani, F., Ahmadizar, A., Abdollahi, M.A. Survey on the factors influencing the pattern of medicine's use: Concerns on irrational use of drugs. *J Res Pharm Pract*. 2013, 2(2), 59-63.