Prevalence, awareness, and patterns of non-steroidal anti-inflammatory/pain relief drug use among Undergraduates in Delta State, Nigeria: a cross-sectional study

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ABSTRACT

Background: This study aims to offer insights into the knowledge, awareness and prevalence that exists among undergraduates in Delta State regarding the appropriate use of NSAIDs and other pain relievers.

Methods: This study was a simple, randomly selected cross-sectional descriptive study that utilize a pre-tested questionnaire from a similar study for data collection. The questionnaire was well structured and pretested, comprising 19 open and closed-ended questions, including sub-questions that covered topics from social demographics to knowledge and prevalence. For associations with demographic variables, data analysis employed frequency and percentage counts, as well as chi-square inferential statistics. A p-value of 0.05 was considered statistically significant.

Results: The study found that 56.8% of participants were female, mostly aged 21-25. Painkiller use was prevalent at 83.3%, with common choices being Paracetamol, Ibuprofen, Aspirin, Diclofenac, and Indomethacin for various pains. Effectiveness influenced drug selection for 26.5% of respondents, while healthcare professionals prescribed 33% of the drugs used. For pain management, 45.9% sought hospital advice, and 27% visited chemists. Additionally, 54% of respondents knew the correct dosage, but only 48.3% adhered to it. Over 20.3% rated their awareness of adverse drug reactions (ADRs) as good. Common side effects included sweating, heartburn, chest pain, and stomach pain. The P-values for associations between sociodemographic variables and prevalence were 0.250 for gender and 0.0001 for both age and ethnicity respectively.

Conclusion: The study revealed that over half (54%) of respondents had good knowledge of NSAIDs and a high prevalence (83.3%) of NSAID use, with 30% of respondents stating their awareness of ADRs associated with undergraduate students in Delta State. The high prevalence of NSAIDs use underscores the need for continued public health education on the safe and effective use of these medications.

Introduction

Pain is an unavoidable element of the human condition, an intricate phenomenon that can subjectively appear in various shapes and degrees of severity'1. It is not only a bodily feeling, but a complex experience that can greatly affect a person's quality of life, emotional state, and general ability to operate2. Efficient pain management has emerged as a critical issue in public health, as unregulated pain can result in substantial physical, psychological, and social ramifications.

Non-Steroidal Anti-inflammatory Drugs (NSAIDs) and other analgesics are often prescribed for the

pharmacological management of various types of pain, including headaches, menstrual cramps, musculoskeletal injuries, and chronic illnesses"–3,4. These drugs are easily obtainable and within reach. Also, these medications have unique mechanisms of action that aid in reducing symptoms by reducing inflammation, inhibiting the generation of prostaglandins, or modulating pain pathways. Although NSAIDs and pain relievers provide significant advantages in the management of pain, their continuous inappropriate use or a lack of understanding can result in harmful effects, drug interactions, and the possibility of overuse or addiction5. Concerns have been raised about the potential dangers that relate to NSAIDs, which include renal impairment, cardiovascular events, and gastrointestinal issues6. In addition, the improper use of pain medications that are available without a prescription, such as paracetamol, can result in hepatotoxicity as well as other negative effects' ' 7.

Undergraduate students across various tertiary institutions in Nigeria make up a significant proportion of the population prone to experiencing pain and therefore become dependent on medications that are used in its treatment8. Among this population, there are a variety of factors that might contribute to the occurrence of pain, these include the demands of academic life, extracurricular activities, and lifestyle choices. To these effects, it is necessary to establish efficient strategies for pain management because its occurrence is associated with these factors. Students at the undergraduate level regularly experience a wide range of unpleasant ailments, such as headaches, menstrual cramps, musculoskeletal injuries, and stress-related pain9. As a result, they commonly take pain medication to alleviate their discomfort.

Medications such as piroxicam, ibuprofens, diclofenac which are typical examples of NSAIDS and other pain relievers, are extremely popular in Nigeria. However, there has been a lack of research done to evaluate the level of understanding, prevalence, and awareness of these medications among undergraduate students, notably in Delta State, which is home to several educational institutions of higher learning. Given this knowledge gap, it is imperative to conduct a comprehensive study to provide essential information that can guide targeted actions and policies. This study aims to offer insights on the knowledge, prevalence of use, and awareness of NSAIDs and other pain relievers among undergraduates in Delta State. The findings aim to provide valuable insights for the development of educational campaigns, institutional policies, and recommendations that promote the safe and responsible use of these medications among young individuals in higher educational institutions. It also aligns with broader initiatives to encourage responsible medication use and promote health literacy. This valuable resource will offer stakeholders, such as governmental health institutions and ministries, healthcare professionals, policymakers, and pharmaceutical companies, the opportunity to gain valuable insights. These insights will enable them to create targeted strategies and interventions that are specifically tailored to the unique needs of this population.

Methods

Study Design
A cross-sectional descriptive study was conducted in two randomly selected tertiary institutions in Delta State, Nigeria. These institutions were chosen from several available ones based on their specific locations.

Study Setting
The research was conducted among students of the two tertiary institutions Western Delta University, Oghara (Delta central) and College of Education, Agbor (Delta North) located in Delta state, Nigeria. Delta state is an oil producing state situated in the Niger Delta region, South-south geopolitical zone. Delta state is made up of three senatorial districts comprising of Delta North, Delta Central and Delta south. Western Delta University is in Ethiope West LGA, Oghara and has four faculties. The Faculty of Natural and Applied Sciences, Faculty of Social Sciences and Management, Faculty of Law and the Institute of Delta Studies. College of Education Agbor is situated in Ika South LGA and consists of five schools- School of Sciences, School of Education, School of Social Sciences, School of Languages and School of Technical Education: housing departments such as Agricultural Science, Biology and Chemistry, Biology and Geography Biology and Integrated science, etc.

Instrument for Data Collection
The study used a well-structured, pretested questionnaire with 19 open and closed-ended questions, including sub-questions, divided into seven sections (A-G) for proper data collection. The first section (A) was designed to collect demographic information about the respondents, section B focused on the knowledge of prevalence and pattern of self-medication, section C focused on reasons for choice and indications for using pain relievers, section D on the

knowledge of Non-steroidal Anti-inflammatory drugs(NSAIDs), section E on the health seeking behaviors and drug utilization patterns, section F on the awareness and response to Adverse Drug Reactions(ADRs) and section G on the source, procurement and cost of NSAIDs. The study questionnaire was adopted from a similar study done by Owonaro and Eniojukan[10]. The data collection was conducted after daily lectures; the students were first addressed as to the purpose of the study before they were administered with the questionnaire in the class. Efforts were made to ensure the confidentiality of respondents' information by not asking for their names assuring them that their responses could not be linked to them. Clear instructions were provided for filling the questionnaire, and measures were taken to prevent multiple entries from any student. The questionnaire was prepared in English language and there was little, or no barrier associated in interpretation of questions asked since the respondents were students.

Sample Size

Two faculties were selected from Western Delta University and two schools from College of Education based on population strength. The sample size was calculated using Fischer formula11. Consequently, a total sample size of 400 was used for the study.

N=Z²PQ/e²

Where:

Z= standard normal deviation (1.96)

P= population in the target population estimated to have a particular characteristic (in the case prevalence – 0.53 Trussel)

Q= 1.0 – p

e=level of precision or margin of error (0.05)

Data Analysis

Data collected were entered into Microsoft excel, rechecked for accuracy, and loaded into the Statistical Package for Social Sciences (IBM SPSS) version 23 USA spread sheet for descriptive statistics. Percentage frequencies were calculated and presented in tables. Chi square inferential statistics was used for determination of associations of demographic profiles with prevalence, pattern of use, health seeking behaviors and choice of NSAIDs and its usage in general. A p-value of 0.05 was considered statistically significant.

Ethical Consideration

The study was approved by each institution. A letter of introduction was presented to the Dean of Students Affairs of each institution used and permission granted. Participation was voluntary and the purpose, general content and nature of the study was explained to each respondent to obtain a verbal informed consent.

Result

Demographic Information

The demographic characteristics of the respondents showed higher proportion of female to male (56.8% and 43.3%) in which most of them were within the age of 21-25(34) % and most of the respondents that participated were Urhobos and Igbos. All the students' level were represented in the study but more of 200 and 400 levels participated in the survey with 26.5% and (25.8) % respectively as shown in the Table 1 below.

Table 1: Socio-Demographic Data of Respondents N=400

Variable		Frequency	Percent
Gender	Female	227	56.8%
	Male	173	43.3%
Age	16-20	112	28%
	21-25	136	34%
	26-30	83	20.8%
	>30	69	17.25%
Ethnicity	Urhobo	123	30.8%
	Igbo	101	25.3%
	Yoruba	73	18.3%

	Hausa	8	2%
	Others	95	23.8%
Student's level	100	52	13%
	200	106	26.5%
	300	82	20.5%
	400	103	25.8
	500	57	14.3%

Knowledge of NSAIDs

Data showed that 54% and 40.8% of respondents reported that they had very good knowledge about the correct dose and frequency of administration respectively. Also, 32.8%, 16.3% and 13.3% have good knowledge of its use with food, on empty stomach and with alcohol as seen in table 2 below.

Table 2: Knowledge of NSAIDS among Undergraduate Students

Knowledge of NSAIDS	Frequency (%)		
In your use of NSAIDs what your knowledge of is:	Very good	average	No idea
Its correct dose:	216 (54)	113 (28.3)	71 (17.8)
How often to be used	163 (40.8)	189 (47.3)	76 (19)
How long to be used	63 (15.8)	201 (50.3)	136 (34)
Use with food: always	131 (32.8)	188(47)	81(20.3)
Use on empty stomach	65 (16.3)	74 (18.5)	271 (67.8)
Use with alcohol always	53 (13.3)	118 (29.8)	229 (57.3)
Use with other drugs	236(59)	101(25.8)	63 (15.8)

Awareness and Response to Adverse Drug Reactions (ADRs)

The study's results, summarized in Table 3, showed that 17.3% of respondents reported sweating. 19.5% experienced heartburn, and 24.5% had stomach pain. Awareness of adverse drug reactions (ADRs) of NSAIDs was rated excellent by 22.8% of respondents, very good by 30% and good by 20.3% for ADR intervention, 49% always visited a doctor, 37.85 visited a pharmacist, and 12.8% visited nurses. Additionally, 27.5% always visited a chemist, 24.3% consulted family, and 1.5% visited herbal clinics.

Table 3: Awareness and Response to ADRS Among Undergraduate Students in Delta State

Awareness and Response	Frequency (%)					
	Excellent	Very Good	Good	Fair	Poor	not at all
How will you rate your overall knowledge on the Adverse Drug Reactions of NSAIDs?	91(22.8)	120(30)	81(20.3)	59(14.8)	49(12.3)	0.0
Experience in use of NSAIDs						
Variables	**always**		**sometimes**	**never**		
Heartburn	3 (0.8)		135 (19.5)	262 (81)		

Stomach pain	33(8.3)	98 (24.5)	269 (67.3)
Chest pain	12(4)	27(6.8)	361 (90.3)
Blood in urine	0.0 (0)	0.0 (0)	400 (100)
Blood in stool	0.0 (0)	77 (19.3)	323 (80.8)
Body swelling	11 (3.8)	33 (8.3)	356 (89)
Sweating	69 (17.3)	124 (31)	207 (51.8)
Others	16 (4)	157 (39.3)	227 (56.8)

When you experience any of the above who do you meet for an intervention?

Doctor	196 (49)	171(42.8)	33 (8.3)
Pharmacist	151 (37.8)	213(53.3)	36 (9)
Nurse	51 (12.8)	92 (23)	259 (64.8)
Family	97 (24.3)	174 (43.5)	129(32.3)
Friends	33(8.3)	189(47.3)	178(44.5)
Chemists	110(27.5)	141(35.3)	149(37.3)
Herbal clinic	6(1.5)	62(15.5)	332(83)

Prevalence and Pattern of Self-medication with NSAIDS

Table 4 below revealed that 47 % preferred to use Paracetamol always; 181 (27) % and 93 (23.3) % of respondents respectively preferred to use Ibuprofen and Piroxicam. Other respondents also reported use of Aspirin, Diclofenac and Meloxicam sometimes. The usage rates of Celecoxib, Indomethacin, Meloxicam, Mefenamic acid, Naproxen and other NSAIDs were very low. Combination of NSAIDs is higher at a rate of 40% mostly with Paracetamol and Aspirin. Details are as shown in the table below:

Table 4: Prevalence and Pattern of Self Medication with NSAIDS among Respondents

Prevalence	Frequency (%)		
	Yes	No	No idea
Have you ever used pain killers?	333 (83.3)	67(16.8)	0.0
Do you take pain killer without a visit to a physician?	163(40.8)	237(59.2)	

Pattern
If the above is yes, which do you use?

	Frequency Percent (%)
Paracetamol	188
	47
Aspirin	88
	22
Celecoxib	62
	15.5
Diclofenac sodium	141
	35.3
Diclofenac potassium	108
	27

Diclofenac with misoprostol	61	
	15.3	
Ibuprofen	181	
	45.3	
Indomethacin	26	
	6.3	
Meloxicam	9	
	2.3	
Mefenamic acid	37	
	9.3	
Piroxicam	93	
	23.3	
Others (Naproxen, tramadol, methylsalicylate)	29	
	7.3	

Which of these pain relievers have you ever combined?

	Frequency	Percent (%)
Paracetamol and Aspirin	160	
	40	
Paracetamol and Celecoxib	55	
	13.8	
Paracetamol and Diclofenac	131	
	32.3	
Paracetamol and Ibuprofen	94	
	23.5	
Paracetamol and Meloxicam	17	
	4.3	
Paracetamol and Naproxen	44	
	11	
Paracetamol and Piroxicam	71	
	17.8	
Paracetamol and Tramadol	37	
	9.3	
Paracetamol, Ibuprofen and Tramadol	12	
	3	
Aspirin and Diclofenac	73	
	18.3	
Diclofenac and Ibuprofen	22	
	5.5	
Diclofenac and Piroxicam	19	
	4.3	
Ibuprofen and Tramadol	11	
	2.3	
Pentazocine and Prednisolone	17	
	4.3	

Association between Socio-Demographic Variables with prevalence of NSAID USE

Table 5 below summarizes the association between various demographic variables of respondents with prevalence of NSAID and pain relief use with age, ethnicity, and school suggesting a significant association.

Table 5: Association between Socio-Demographic Variables with prevalence of NSAID USE

	Prevalence Yes No	Chi square	P value*
Gender			
Female	106		
Male	121	1.323	0.250
	57		
	116		
Age			
16-20	46		
21-25	66		
26-30	55		
>30	81	22.027	0.0001
	34		
	49		
	28		
	41		
Ethnicity			
Urhobo	50		
Igbo	73		
Yoruba	41	26.75	0.0001
Hausa+ others	60		
	30		
	43		
	42		
	61		
Levels			
100	21		
200	31		
300	43	23.387	0.0001
400	63		
500	33		
	49		
	42		
	61		
	23		
	34		
Schools			
WDU	107		
COE	93	189.545	0.0001
	56		
	144		

P- value significant* when < 0.05

Keys: WDU: Western Delta State University, Oghara, COE: College of Education, Agbor.

Association Between Socio-Demographic Variables with Pattern of NSAID USE

Data presented in Table 6 indicates that students' age and choice of school (public or private) had significant associations with the pattern of NSAID use among undergraduate students in Delta state. It also showed that gender, ethnicity and students' level of study were not significantly associated.

Table 6: Association Between Socio-Demographic Variables with Pattern of NSAID USE

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	Chi-sq	p-val
Gender														
Female	85	20	43	9	33	17	61	37	32	91	8	6		
													1.323	0.250
Male	103	17	50	20	55	45	80	71	29	90	18	3		
Age														
16-20	53	10	26	8	25	17	40	30	17	51	7	3		
21-25	64	13	32	10	30	21	48	37	21	62	9	4		
26-30	39	8	19	6	18	13	29	22	13	38	5	0	251.74	0.00*
>30	32	6	16	5	15	11	24	19	11	31	4	2		
Ethnicity														
Urhobo	70	15	29	11	25	17	40	40	17	57	10	3		
Igbo	33	8	21	7	28	17	31	36	15	45	7	3		
Yoruba	26	5	23	8	16	12	37	44	19	49	6	0		
Others	52	9	20	3	19	16	33	21	10	30	3	3	45.592	0.071
Level														
100	70	25	17	40	40	17	57	10	3	15	29	11		
200	36	28	17	31	36	15	45	7	3	8	21	7		
300	26	16	12	37	44	19	49	6	0	5	23	8	45.592	0.071
400+500	56	19	16	33	21	10	30	3	3	9	20	3		
School														
WDU	74	17	35	15	39	30	82	75	29	100	12	3		
COE	114	20	58	14	49	32	59	33	32	81	14	6	39.057	0.000*

P- value significant* when < 0.05

KEYS: 1= Paracetamol 2= Mefenamic acid 3= Piroxicam 4= Others (tramadol, Naproxen, etc.) 5= Aspirin   6= Celecoxib 7= Diclofenac sodium 8= Diclofenac potassium   9= Diclofenac and misoprostol 10= Ibuprofen 11= Indomethacin 12= Meloxicam 13= WDU- Western Delta State, Oghara 14= COE- College of education, Agbor.

Discussion
This study assessed the knowledge, awareness, and prevalence of NSAID/pain relievers use among undergraduates in Delta State's.

Knowledge about NSAIDs
According to the findings, a significant proportion of respondents had good knowledge of the correct dose of their pain relievers and the frequency of administration. Also, almost half of respondents claimed to have very good knowledge regarding the duration of NSAID use. The respondents' use of food during drug consumption was moderate, and 32% of them reported having very good knowledge. The institution's location in an urban area with the availability of pharmacies may explain the reason for these findings. A small portion of respondents admitted to taking NSAIDS on an empty stomach and with alcohol, which was similar to a study by Adedeji et *al.12*. With the high prevalence of the use of NSAIDs and the attendant grave consequences of their abuse and misuse, there is still a prime need to increase the level of knowledge of this population on the proper use of NSAIDs through public enlightenment campaigns, seminars, and workshops.

Awareness and Response to ADRs
The ADRs reported by the respondents after taking

NSAIDS include sweating, heartburn, chest pain, and stomach pain. They occur either always or sometimes after taking the NSAIDs. These are non-specific NSAID symptoms that may be part of the morbidity. A moderate population of respondents rated their awareness of NSAID ADRs as good. According to a study, patient ignorance of ADRs for NSAIDs and other medications is dangerous to any nation because it causes more harm than good to people's health[13]. Furthermore, about half of the respondents always reported these ADRs to a doctor, and a little above half reports to pharmacist and very low respondents report to herbal clinics. The reporting of ADRs and proper documentation is a valuable opportunity for enhancing pharmacovigilance efforts. Proper recording and analysis of these incidences of ADR can contribute significantly to the ongoing monitoring and evaluation of drug safety profile. These findings also emphasize the need for health professionals to be familiar with ADRs associated with NSAIDs and how to manage them if they become very severe[14].

Prevalence and Pattern of Self-medication with Pain Killers

This study reported high prevalence of use of NSAIDs among undergraduate students in Delta State. The pattern of use however further revealed that Paracetamol had the highest prevalence rate which can be attributed to its availability both in patent medicine store and registered pharmacies. This report is similar to studies of Sinha *et al*[15] and Azodo and Umoh[16], that reported high prevalence rate of Ibuprofen, Aspirin and Diclofenac use but not as frequent as Paracetamol. The frequent use of Paracetamol may be associated with the fact that it is affordable, can be procured without prescription and its ease of accessibility to everybody[16]. However, Celecoxib, Indomethacin, Naproxen and Mefenamic acid were not frequently used. This may be associated with their cost and the prescribers' reluctance in prescribing them due to their peculiar side effects. Other studies have shown NSAIDs as the most widely prescribed drugs in the world[17]. Although other NSAIDs are reported to be more potent and more effective than Paracetamol, the latter has a better safety profile[18]. This fact may favour the more frequent use of Paracetamol in addition to its considerably lower unit cost. Differences in the levels of potency and effectiveness among the NSAIDs have been reported[19]. NSAIDs are seen as part of household drugs and they can be procured from common outlets such as supermarkets, open markets, street hawkers and many other unauthorized places that will not provide the needed counseling and education for proper medication. Consequently, irresponsible self-medication practices should be expected. The attendant untoward effects like gastrointestinal ulceration, cardiovascular disorders and kidney impairment are a great concern[17,20]. The need for more education and enlightenment on responsible medication use and the adverse consequences of irrational use of pain killers among the students in these institutions should be given priority attention.

Few respondents in this study took combination pills, and those who did stated that a health professional had prescribed them. This aligns with previous studies that document a low prevalence of combination NSAID use and the rare instances of health professionals prescribing these drugs[21]. When it comes to the combinations of pain relievers, the most common ones were Paracetamol/Aspirin, Paracetamol/Diclofenac, and Paracetamol/Ibuprofen, accounting for 40%, 32.3%, and 23.5%, respectively. Using more than one NSAID has the advantage of having a synergistic effect on acute and chronic pains[22]. However, some combinations have other complications, such as aspirin and ibuprofen; ibuprofen has been reported decreases the antiplatelet effects of low-dose aspirin by blocking the active site has been reported to prevent platelet inhibition with aspirin[19]. Beside the synergic effects, the combination of two or more NSAIDs results in a broader adverse reaction spectrum. Therefore, we should encourage prescribers to adhere to standard treatment guidelines, as combinations of two or more NSAIDs often lack therapeutic benefits[23]. A strategic campaign on the rational use of NSAIDs should eliminate the unnecessary and dangerous use of multi-drug therapies. The additional risks of clinically significant adverse drug interactions (drug-drug, drug-food, and drug-disease) further emphasizes the need for educating the students on rational drug therapy with NSAIDs.

Further comparison of factors that influence the prevalence and use pattern of NSAIDs showed a significant level of students' age, ethnicity, level of study, and choice of school (public or private) influencing the use patterns and prevalence. These observations are not in agreement with the study of Das *et al*., who reported the non-significance of age, gender, and level of education on the extent and factors associated with non-prescription medicine use in eastern India[24]. One could compare the significance of these demographic variables in the prevalence of NSAID use to variations in geographic location and cultural backgrounds. The non-significance of gender on the prevalence and use of NSAIDs is not in agreement with the study by Dominick *et*.

al., who reported significant gender differences and found that females demonstrated higher consumption of analgesics than males[25]. Afolabi's[26] report, which noted a significant association between education and the factors influencing the pattern of self-medication among the adult Nigerian population, aligns with the significance of the study level these students have attained. Previous reports have reported a high prevalence of self-medication and drug use among young university students in Nigeria[27]. Their study further reported a significant association of living in a tertiary school environment with drug abuse and self-medication of varying drugs of which NSAIDS have a significant prevalence.

Conclusion and Recommendation

The study revealed that over half (54%) of respondents had good knowledge of NSAIDs and a high prevalence (83.3%) of NSAID use, with 30% of respondents stating their awareness of ADRs associated with undergraduate students in Delta State. Nevertheless, there remains a need to improve understanding on the duration of use and the necessity of avoiding NSAIDs on empty stomach or with alcohol beverages. The high prevalence of NSAIDs use underscores the need for continued public health education on the safe and effective use of these medications. ADRs such as heartburn, chest and stomach pains were reported, yet awareness of these ADRs was only moderate among respondents. Enhanced pharmacovigilance through proper reporting and documentation of ADRs is essential. Health professionals must be equipped to manage NSAIDs-related drug reactions and provide required information accordingly. Also, the high prevalence of NSAIDs self-medications, especially with paracetamol, readily suggests an urgent need for stringent regulation and enlightenment among the populace. Two demographic factors age and type of school, influences NSAID use patterns.

The place for public health education regarding the right use of drugs cannot be overemphasized, hence it is suggested by the authors that a widespread public education and awareness campaign on the adverse effects on the misuse and abuse of NSAIDs. These campaigns could include seminars, workshops, and informational materials targeting undergraduate students in various higher institutions. It is also suggested that the pharmacovigilance reported system should be enhanced alongside stricter regulation on the use of some pain relivers. By implementing their recommendation, it is possible to mitigate the misuse of NSAIDs and other pain relievers with the aim of enhancing the overall health of young people in Nigeria.

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