

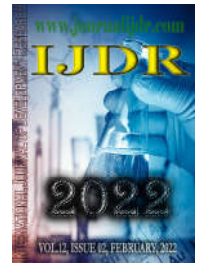


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RESEARCH ARTICLE

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INCIDENCE OF SELF-MEDICATION AND INDISCRIMINATE USE OF NON-STEROIDAL ANTI-INFLAMMATORY DRUGS AMONG YOUNG UNIVERSITY STUDENTS

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ABSTRACT

Objectives: Evaluate the prevalence of self-medication and possible adverse reactions caused by the use of non-steroidal anti-inflammatory drugs by students of the School of Health Sciences of the Amazonas State University, Brazil. **Methods:** This is a study with a quantitative approach, consisted of questions addressing gender, age, university course, adverse effects and questions about self-medication. **Results:** Of the 60 academics who answered the questionnaire, the majority are female (33/55%) were aged between 18 and 22 years (31/52%). The students were mostly from the dentistry course (26/43%). As for the practice of self-medication, 47 (78%) report practicing. The anti-inflammatory drug that was most associated with self-medication is ibuprofen, which was used by 23 students (38.6%). Regarding knowledge about the risks of self-medication, 37 (61.6%) report having knowledge, while 29 (48.3%) describe stomach pain as a consequential adverse reaction to the indiscriminate use of drugs, and 31 (51.6%) use these drugs under their own guidance. **Conclusions:** This study shows that the practice of self-medication was high among the undergraduates, which requires the subject to be tackled with the undergraduates and the risk factors and the need for greater guidance by the health professional on the use of these drugs should be explained.

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INTRODUCTION

Self-medication is a common form of self-attention to health and refers to the consumption of a product with the aim of treating or alleviating perceived symptoms or diseases, or even promoting health (Bortolonet *et al.*, 2008; Gonçalves *et al.*, 2009; Xavier *et al.*, 2021). It can be practiced in a variety of ways, such as acquiring the drug without a prescription, sharing medications with other family members or within a social circle, using leftover prescription drugs, reusing old prescriptions and not following the prescription, prolonging the dose period or stopping the dosage indicated in the prescription early (Carvalho *et al.*, 2014; Cohen, 2000). In Brazil, about 80 million people are adept at self-medication, which is a practice that is associated with an increase in the frequency of cases of intoxication, as well as aggravating and masking diseases. It is, therefore, considered a public health problem that deserves attention (Hainer *et al.*, 2000; Musial *et al.*, 2008; Souza *et al.*, 2017). Much of this practice involves prescription-free medicines mainly from classes of drugs that are aimed at the treatment of pain symptoms, which are common to numerous health problems. These are easily accessible and commonly compose the stock of medicines in various

house holds, which makes the class of analgesics and anti-inflammatories more frequent in the practice of self-medication (Fernandes & Cembranelli, 2015; Souza *et al.*, 2017). Non-steroidal anti-inflammatory compounds (NSAIDs) have been known to mankind for about 100 years, and they are among the most widely used pharmacological agents in clinical practice, with more than fifty different drugs on the market (Souza *et al.*, 2017). They feature a wide range of therapeutic properties, including analgesic, anti-inflammatory, and antipyretic, as well as a prophylactic for cardiovascular disease, which is closely related to the increase in the use of anti-inflammatory drugs without a doctor's prescription, not only for specific diseases, such as rheumatoid arthritis or osteoarthritis, but also for many other painful phenomena, including headaches, colds, and menstrual cramps. This is worrying, since self-medication may increase the risks of drug-drug interactions and adverse reactions (Kummer & Coelho, 2002; Sandoval *et al.*, 2017; Silva *et al.*, 2016). Currently, among the most common anti-inflammatory drugs are acetylsalicylic acid (ASA), diclofenac (sodium and potassium), ibuprofen, naproxen, nimesulide, indomethacin, ketoprofen, mefenamic acid, piroxicam and celecoxib (Kummer & Coelho, 2002).

In general, the mechanism of action of NSAIDs is related to the inhibition of arachidonate cyclooxygenase, i.e., inhibition of the synthesis of prostaglandins, which are intermediate endogenous substances of the inflammatory process. This process occurs via the inactivation of isoenzymes called cyclooxygenases (COX), which catalyze the biosynthesis of prostaglandins and thromboxanes; COX has three isoforms: COX-1, COX-2 and COX-3 (Wannmacher & Bredemeier, 2004). COX-1 is present in most tissues including blood platelets, and is responsible for the physiological production of prostanoids. As such, it regulates normal cellular processes such as gastric cytoprotection, vascular homeostasis, platelet aggregation and renal function. COX-2 is present in the sites of inflammation and causes high production of prostanoids, as well as being expressed in tissues such as the brain, kidneys and bones. COX-3 has more restricted distribution than the previous two, though it is abundantly found in samples of brain and heart tissue (Howland & Mycek, 2007; Silva *et al.*, 2016). According to Rang *et al.* (2007), NSAIDs have three main actions: anti-inflammatory, due to the reduction of prostaglandins; analgesic, related to the decrease in prostaglandin production; and antipyretic effect, due to the decrease in mediating prostaglandin, which is responsible for raising the hypothalamic set point that exerts control over temperature during fever. The anti-inflammatory action of NSAIDs is clearly linked to COX-2 inhibition, which is usually indirectly associated with vasodilation, swelling and pain (Rang *et al.*, 2007).

Like other drugs, given their toxicity in various systems, NSAIDs have the potential to cause adverse reactions (Clayton & Stok, 2006; Luz *et al.*, 2006; Reis & Ojeda, 2002). Important adverse effects of NSAIDs occur in the gastrointestinal tract, where the most commonly seen are abdominal pain, heartburn and diarrhea. These side effects result from blocking COX-1 in the gastrointestinal mucosa and the consequent inhibition of the production of prostacyclin and prostaglandins (PGE2 and PGD2) in the stomach (Oliveira *et al.*, 2019; Sandoval *et al.*, 2017). In order to reduce the undesirable effects caused by non-selective NSAIDs, selective COX-2 inhibitors have been widely used; however, the cost of these drugs is higher, which requires a cost-benefit assessment for decision-making regarding their use (Wannmacher & Bredemeier, 2004). The consumption of anti-inflammatory drugs without a doctor's prescription is growing, not only for specific diseases such as rheumatoid arthritis or osteoarthritis, but also for many others, such as painful phenomena in general, including headaches, flu and menstrual cramps. This is worrying, as self-medication may increase the risks of drug interactions and adverse reactions (Clayton & Stok, 2006; Silva *et al.*, 2016). According to data obtained by the World Health Organization, adverse drug reaction refers to "any harmful, unintended and unwanted effect of a drug, which occurs at doses used in humans for prophylaxis, diagnosis or treatment" (WHO, 2002). The effects of drug interactions with non-steroidal anti-inflammatory drugs are broad and include decreased beta-blocker activity, increased toxic effect of lithium, methotrexate, valproic acid, sulfonamides and sulfonylureas, as well as increased activity of oral anticoagulants, thyroid hormones, digoxin, insulin and oral hypoglycemic agents (Silva *et al.*, 2016). In the United States, NSAIDs are present on more than 70 million prescriptions, and more than 30 billion over-the-counter pills are sold annually. In Brazil, different studies of drug use place NSAIDs among the most used by the population, but specific studies on the use of these drugs and their clinical implications are still lacking (Oliveira *et al.*, 2019).

MATERIALS AND METHODS

This is an observational, descriptive, cross-sectional and quantitative study (Gil, 2002), with convenience sampling, that emphasizes the description of the problem of self-medication, according to the perspective of this practice as a public health problem. Its aim is to characterize the profile of self-medication and identify the factors associated with it. A total of 60 randomly selected individuals of either gender, who were students of the courses offered by the School of Health Sciences of the Amazonas State University, and who were

willing to answer the questionnaire, were interviewed. As inclusion criteria, the interviewee was required to be 18 years of age or older, be a student of the dentistry, medicine or nursing course at the university, be studying between the 3rd and 10th period, agree to participate in the study and sign the informed consent form (ICF). The following exclusion criteria were employed: being under 18 years of age, not being enrolled in the 3rd to 10th period of the dentistry, medicine or nursing courses at the university. Any individual that filled in the questionnaire incorrectly or did not fill it in completely was excluded from the sample. The instrument used was a structured questionnaire, which was composed of questions that addressed sociodemographic aspects and the practice of self-medication (defined event-variable, such as "have used or purchased medicines without a prescription"). The questionnaire was answered by the students who were approached during the period that they were at the university. In the questions, we chose to evaluate forms of self-medication in the following manner: use or purchase of medicines without a prescription; ask the pharmacist/staff for advice on the purchase of medicine not solicited by the doctor; receive advice from other people including family or friends on the use of medicines; acquire medicine after seeing an advertisement. After data collection, the tabulation and analysis of the data were performed using the SPSS program (version 23.0) in order to analyze the results obtained. The Pearson's correlation coefficient was used to compare the percentages of the results obtained, and a descriptive analysis of qualitative variables, through absolute and relative frequency tables was performed using the Chi-square test and adopted a significance level of 5%. The entire research process is in accordance with the ethical principles set forth in Resolution No. 466/12, of the National Health Council, of the Brazilian Ministry of Health. The privacy and individuality of the subjects who participated in the study were preserved via the signing the informed consent form, which informed them about the purpose and procedures of the study, and which was made available to the respondents at the time of answering the form.

RESULTS

This is a cross-sectional study that used observational research of 60 volunteer students who were enrolled in courses of the School of Health Sciences at the Amazonas State University. The attributes were classified according to the responses collected from the 60 interviewees. According to the interviewees' answers, it was possible to identify and classify the main points that should be improved in order to stimulate greater awareness of the rational use of NSAIDs. The following are the results found after data analysis (Table 1). After the application of the questionnaires, it was found that 55% of the respondents (33) were female; not differing much from the male gender, whose participation percentage was 45% (27). The higher percentage of women in the sample (55%) may be related to their greater presence in higher education courses, since they corresponding to 55% of graduates according to the Brazilian government's higher education census (Inep, 2015). In this research, which is composed of students of the nursing, medicine and dentistry courses, it was also found that the index of self-medication among dental students is high when compared to the other courses, and that the purchase of over-the-counter medicines is the most common practice among them. Regarding the age of the participants, it was found that among the age group from 18 to 22 years old, 43.3% practiced self-medication, in the age group from 23 to 25, the percentage was 26.6% and, in individuals over 26 years old, it was 8.3%. Table 1 shows that 47 (78%) of the students practice self-medication, as for the access to the medicines used, purchase according to the need/self-determination (51.6%) was the main response of the participants, followed by advice from family or friends (20%), and other reasons such as having stocks of medicines at home, or purchases after watching TV advertisements (6.6%). The interviewees were also questioned about which anti-inflammatory drugs were used. The most commonly used NSAIDs were ibuprofen (38.6%), nimesulide (25%), diclofenac potassium (6.6%), acetylsalicylic acid (5%) and diclofenac sodium (3.3%). Regarding the presentation of adverse effects, 61.6% of the students involved were aware of the

Table 1. Description of variables: gender, age and course (n%)

Variable	Gender		Age			Course		
	Female	Male	18 to 22	23 to 25	> 26	Nursing	Medicine	Dentistry
Practice of self-medication								
Yes	28 (46.6)	19 (31.6)	26 (43.3)	16 (26.6)	5 (8.3)	15 (25)	10 (16.6)	22 (36.6)
No	5 (8.3)	8 (13.3)	5 (8.3)	6 (10)	2 (3.3)	4 (6.6)	5 (8.3)	4 (6.6)
Awareness of adverse effects								
Yes	18 (30)	19 (31.6)	16 (26.6)	15 (25)	6 (10)	10 (16.6)	12 (20)	15 (25)
No	15 (25)	8 (13.3)	15 (25)	7 (11.6)	1 (1.6)	9 (15)	3 (5)	11 (18.3)
Access to medicines								
Self-determination	19 (31.6)	12 (20)	14 (23.3)	12 (20)	5 (8.3)	11 (18.3)	7 (11.6)	13 (21.6)
Advice	6 (10)	6 (10)	9 (15)	3 (5)	0 (0)	2 (3.3)	2 (3.3)	8 (13)
Other motives	3 (5)	1 (1.6)	3 (5)	1 (1.6)	0 (0)	2 (3.3)	1 (1.6)	1 (1.6)
No answer	5 (8.3)	8 (13.3)	5 (8.3)	6 (10)	2 (3.3)	4 (6.6)	5 (8.3)	4 (7)
Medicines								
Ibuprofen	13 (22)	10 (16.6)	14 (23.3)	7 (11.6)	2 (3.3)	8 (13.3)	7 (11.6)	8 (13.3)
Nimesulid	9 (15)	6 (10)	5 (8.3)	8 (13)	2 (3.3)	4 (6.6)	2 (3.3)	9 (15)
Diclofenac potassium	1 (1.6)	3 (5)	2 (3.3)	1 (1.6)	1 (1.6)	2 (3.3)	1 (1.6)	1 (1.6)
Acetylsalicylic acid	3 (5)	0 (0)	3 (5)	0 (0)	0 (0)	1 (1.6)	0 (0)	2 (3.3)
Diclofenac sodium	2 (3.3)	0 (0)	2 (3.3)	0 (0)	0 (0)	0 (0)	0 (0)	2 (3.3)
No answer	5 (8.3)	8 (13.3)	5 (8.3)	6 (10)	2 (3.3)	4 (6.6)	5 (8.3)	4 (6.6)
Adverse effects								
Stomache ache	15 (25)	14 (23.3)	16 (26.6)	10 (16.6)	3 (5)	8 (13.3)	8 (13.3)	13 (21.6)
Allergies	11 (18.3)	4 (6.6)	9 (15)	4 (6.6)	2 (3.3)	6 (10)	1 (1.6)	8 (13.3)
Nose bleeds	2 (3.3)	0 (0)	1 (1.6)	1 (1.6)	0 (0)	1 (1.6)	0 (0)	1 (1.6)
Nausea/vomiting	0 (0)	1 (1.6)	0 (0)	1 (1.6)	0 (0)	0 (0)	1 (1.6)	0 (0)
No answer	5 (8.3)	8 (13)	5 (8.3)	6 (10)	2 (3.3)	4 (6.6)	5 (8.3)	4 (6.6)

possible adverse effects triggered by NSAIDs, while the smaller portion were unaware of the main adverse effects. It was also observed that 100% of the students involved reported the appearance of these effects when using the drugs, and the main adverse effect observed was abdominal pain in 48.3% of cases, followed by allergies (24.9%), nose bleeds (3,3%) and nausea/ vomiting (1,6%).

DISCUSSION

According to the World Health Organization, the incorrect use of drugs occurs in all countries and frequently causes harm to people (WHO, 2010). Among the consequences of this misuse are adverse drug reactions, medication errors, and the waste of resources, since 10%-40% of national health budgets are spent on drugs and an estimated cost of 3.4 million dollars is spent each year due to adverse reactions, often generated by their improper use (Silva *et al.*, 2013). In this study, a higher prevalence of self-medication was observed in females, which is in agreement with the results found by Antonov and Isacson (1996) and Silva *et al.* (2019), and this is possibly due to the tendency of women to direct more attention to health care than men, which may favor the practice of self-medication. In addition, this predominance in females may also be related to greater medicalization among women at all stages of life, due to numerous frequent health problems such as menstrual cramps and migraines. There is also a large number of educational and advertising campaigns aimed at women, in addition to the traditional social roles assigned to this sex, among them that of taking care of the family's health. Furthermore, in most studies on drug use, women commonly predominate because they tend to show greater concern for their health and, historically, are also known to seek health services more often than men (Antonov & Isacson, 1996; Silva *et al.*, 2019). Regarding age, the most predominant age group was between 18 and 22 years old, a result also found in similar studies (Lima *et al.*, 2021; Lima *et al.*, 2017; Silva *et al.*, 2013). The data can be justified by the fact that young people are often impetuous and choose not to wait for medical appointments, and use technology to research what they think they should use, as well as the fact that they are undergraduates in the fields of medicine (Aquino *et al.* 2010; Jesus *et al.*, 2013; Junior *et al.*, 2021; Souza *et al.*, 2020). When asked about the use of anti-inflammatory drugs, most of the graduates (78%) reported practicing self-medication, while only 22% of them do not use medications without advice from a health professional.

They also reveal that the purchase of over-the-counter medicines is the most common practice among them, since most of them do not consider it necessary to seek medical advice before buying medicines. Similar findings were found in the study conducted at the Polytechnic Institute of Bragança, with 219 students of the School of Health, in which 98% of the academics reported resorting to self-medication (Souza & Sena, 2017). These answers are not surprising since practicality, easy of purchase, limited access to health services and non-mandatory prescriptions are known factors that influence self-medication (Ferreira & Carvalho, 2021; Galato *et al.*, 2012; Souza *et al.*, 2017). Regarding the students surveyed, it was also found that the index of self-medication among dental students is high when compared to the other courses. Our findings are in accordance with those presented by Nunes *et al.* (2021), who describes self-medication as a frequent practice among university students of health courses, as well as in university students of other courses. Silva *et al.* (2014) and Damasceno *et al.* (2007) also found similar results among graduates of health courses. Self-medication is mainly motivated by patients' dissatisfaction with the questionable quality of care in health services, and the relationship between health professionals and patients that further deteriorates every day. Other motivations observed are the use of medication that in the recent past had been previously used by the individual, and the advice and indications given by friends and family (Aquino *et al.*, 2010; Silva *et al.*, 2013). When referring to the drugs used in the practice of self-medication, the most commonly used NSAIDs were ibuprofen (38,6%), nimesulide (25%), diclofenac potassium (6,6%), acetylsalicylic acid (5%) and diclofenac sodium (3,3%).

These NSAIDs are among the most indiscriminately used drugs today, which can be justified by the plurality of effects, such as analgesic, anti-inflammatory and antithrombotic effects, and because they are effective in the treatment of mild to moderate pain and other symptoms that are characteristic of the inflammatory process, such as swelling, fever, and redness (Bennett & Holloway, 2017; Carneiro *et al.*, 2019; Oliveira *et al.*, 2019). The price of these NSAIDs can also be a determining factor in their choice since, in Brazil, they range from \$1.00 to \$4.00 per pack (values according to the maximum consumer price) (Noronha *et al.*, 2021). In the search for alternative drugs to acetylsalicylic acid, ibuprofen was cited for having greater anti-inflammatory activity, less gastric irritation, or longer action, with a lower daily dose. Nimesulide was one of the first NSAIDs on the market to selectively inhibit cyclooxygenase-2 (COX-2) (Silva *et*

al., 2019). The analgesic properties of anti-inflammatory drugs is often so effective that they end up being used in situations that could be solved with common non-opioid analgesics or with non-pharmacological treatment such as rest, physiotherapy and others (Rang *et al.*, 2016). This higher consumption of NSAIDs agrees with studies conducted in other regions of the country by Silva *et al.* (2013) and Aquino *et al.* (2010), which correlate this fact with the massive investment of the pharmaceutical industry since it allocates 70% of its advertising to this drug group, without often highlighting their contraindications and/or side effects. Silva *et al.* (2013) also links the routine use of non-steroidal analgesics to the current conception that such products are harmless to health. Many ignore the fact that these drugs, which are used to try to relieve signs and symptoms without the supervision of a doctor, can end up being used inappropriately and generate other signs and symptoms, possibly even more serious than the initial ones. Regarding access to the medicines used, purchase according to the need/self-determination (51,6%) was the main response of the participants, followed by advice from family or friends (20%), and other reasons such as having stocks of medicines at home, or purchases after watching TV advertisements (6,6%). In a comparison with our findings, Aquino *et al.* (2010) also observed a higher prevalence of self-determination for self-medication, followed by recommendations by family members. The study found that most university students used the medication based on self-determination, which can be justified because the interviewees are students of health courses and have more confidence and trust in their choices than those of third parties, since they believe that they have sufficient knowledge about how a drug is used, as well as what it is recommended for, what the correct dosage is and what the adverse effects are. The students were also asked about the science of adverse effects related to the practice and the drugs used. Regarding the presentation of adverse effects, 61,6% of the students involved were aware of the possible adverse effects triggered by NSAIDs, while the smaller portion were unaware of the main adverse effects. When asked if they have ever had any side effects after self-medicating, 100% of the students involved reported the appearance of these effects when using the drugs, and the main adverse effect observed was abdominal pain in 48,3% of cases, followed by allergies 25%. The origin of the adverse effects observed in the indiscriminate use of this class of drug is mainly based on the inhibition of prostaglandin production that occurs mainly in the gastrointestinal tract, with the most commonly observed being abdominal pain, heartburn and diarrhea. These side effects result from the blockade of COX-1 in the gastrointestinal mucosa and the consequent inhibition of the production of prostacyclins and prostaglandins (PGE2 and PGD2) in the stomach. Many patients do not tolerate treatment with NSAIDs due to such effects. Long-term treatment can cause erosion and gastric and duodenal ulcers (Batlouni, 2010; Silva *et al.*, 2019).

CONCLUSIONS

According to the results of this study, it can be concluded that the rate of self-medication with non-steroidal anti-inflammatory drugs is high due to their anti-inflammatory, analgesic and antipyretic properties, as well as the ease of access to these drugs and their low price. In addition, some interviewees said they self-medicated because they already had the medicine at home and others self-medicated because they had been advised by friends or family. The most consumed NSAIDs were ibuprofen and nimesulide. The profile found coincides with other studies in the literature, and is probably due to the fact that women, in general, tend to take more care of their health and the health of their families and, therefore, are more exposed to the use of medicines. Older people tend to use NSAIDs more often due to the emergence of chronic inflammatory diseases common with age. Non-steroidal anti-inflammatory drugs are one of the classes most used by the population and are potential aggravators or causes of gastric and intestinal problems, such as ulcers. All respondents claimed to have experienced adverse reactions with the use of NSAIDs, with stomach pain being the main reaction. Through the data obtained, it is possible to clearly observe the lack of information that the undergraduates of the health courses have regarding the drugs and their risks, which

indicates the need for awareness regarding the importance of drugs being used with caution, since improper use can aggravate or cause other pathologies.

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