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A Case-control Study on the Risk of Upper Gastrointestinal Bleeding in Patients Taking Non-steroidal Anti-inflammataory Drugs (NSAIDs) in Mashhad, Iran

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Gastrointestinal bleeding is one of the most common causes of patient admissions at emergency wards. Despite considering nonsteroidal antiinflammatory drugs (NSAIDs), aspirin and *Helicobacter pylori* as the leading causes, mortality from gastrointestinal (GI) bleeding is still high. So pattern of NSAID consumption and related conditions may help in preventative behavior.

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Methods: This case-control study was conducted on 300 patients. Patients were divided into two groups: with and without GI bleeding. Patient's information was extracted using their hospital records and the data eventually was statistically analyzed.
Results: The results of this study showed no significant difference between the two groups in terms of age, gender, marital status, distribution of weight, and education level (P>0.05).The frequency of NSAIDs use was significantly higher in patients with gastrointestinal bleeding (P = 0.016) with the most NSAID use as aspirin(32.66%). The prevalence of smoking, using drugs and alcohol consumption was significantly higher in the study group (P <0.05).
Conclusion: A history of consuming NSAIDs increases the risk of GI bleeding. The frequency of cigarette, drug, and alcohol consumption in the case study group was significantly higher than that of the control group.

Keywords: Gastrointestinal bleeding; nonsteroidal anti-inflammatory drugs; aspirin.

1. INTRODUCTION

Gastrointestinal bleeding is the most common reason for acute hospitalization of patients in gastroenterology wards [1]. Different studies have evaluated the implemented cost of GI bleeding on both patients and the health care system, in addition to its impact on mortality and morbidity rates. These studies have concluded that GI bleeding, in fact, incurs higher patient and system costs and raises mortality and morbidity rates [2,3]. Several factors have been propounded as etiologic factors behind GI bleeding, among which H. pylori, non-steroid anti-inflammatory drugs (NSAIDs), and aspirin have been deemed as the most significant, especially in upper GI bleeding [4]. Different epidemiologic studies have suggested that a combination of several different NSAIDs, or a high dose of any one of these drugs, can increase the risk of GI bleeding up to seven and nine fold respectively [5]. These results emphasize not only the importance of NSAIDs but also their sensible usage. Recently, due to the increased prevalence of arthritic diseases and osteoarthritis, the use of NSAIDs has grown. The prescription of multiple NSAIDs to patients by different physicians in various fields has led to the increased simultaneous consumption of several NSAIDs. This raises the risk of GI bleeding and other NSAID side effects, especially among the older population.

In a study on Northeast of Iran, Zeinali et al. [6] showed that about 20% of all prescriptions included at least one NSAIDs. in comparison with 12.1% in USA. In consideration of the rising usage of NSAIDs, it is imperative to study the relationship between the use of NSAIDs and upper GI bleeding. Although this relationship is now mentioned in textbooks, there has not yet been any related study conducted in Mashhad, Iran to explore the high prevalence of NSAID consumption, this despite numerous warnings about the side effects following the unbridled use of these drugs. Furthermore, since accurate statistics about NSAID side effects are critical for future prophylaxis recommendations, it appears beneficial to conduct a study on the correlation between upper GI bleeding and NSAID consumption [6].

2. METHOD AND MATERIALS

The present case control study was conducted in several steps. These steps were performed simultaneously and they were designed as a checklist for utilization in the present study, by which samples were chosen, data extracted and collected, and statistical calculations made.

2.1 Checklist Design

The checklist was designed as two forms. The first form was intended for patients hospitalized at the emergency ward of Qaem Hospital, Mashhad, Iran due to upper GI bleeding and who had undergone diagnostic and therapeutic measures. This checklist included identification code, gender, age, weight, educational level, occupation, marital status, and residence. Also listed was any history of digestive diseases, GI bleeding, non-digestive diseases, smoking, alcohol consumption, drug abuse, and medications. In addition, the following information was provided: endoscopy results, primary hemoglobin, primary platelet, primary PT,

INR, and the possible need for a blood transfusion.

The second form was designed for patients hospitalized at Khatam-al_Anbia Hospital, Mashhad, Iran of Ophthalmology with a chief complaint and reason for hospitalization that was unrelated to GI bleeding (control group). This checklist included the following: identification code, gender, age, weight, educational level, occupation, marital status, and residence. Also listed was any history of digestive diseases, GI bleeding, non-digestive diseases, smoking, alcohol consumption, drug abuse. All the patients were asked about NSAID use (continuously or based on need).

2.2 Selection of Cases and Control Samples

The method of sampling in the current study was simple nonrandomized. Two groups were studied. The first group (case group) consisted of patients hospitalized for GI bleeding according to clinical manifestation and/or diagnostic endoscopic examination at the emergency ward of Qaem Hospital. The second group (control group) was made up of patients hospitalized at Khatam-al_Anbia Hospital of Ophthalmology due to a chief complaint and reason for hospitalization unrelated to GI bleeding.

2.3 Data Extraction and Collection

In this step of the present study, required data were collected and registered onto the appropriate checklist. The study group data were collected from the patients' hospital files. The control group data were obtained by conducting direct interviews and also by accessing the patients' previous files. To accomplish this, at Khatam-al Anbia Hospital, the researcher first explained the study and its purpose to the patients and obtained their consent before reviewing files or interviewing.

2.4 Statistical Calculations

First, the data were entered into SPSS ver.16 software. The median and Interquartile range were utilized to describe the quantitative data indexes. Frequency and frequency percentage served as the indexes for explaining qualitative data. In order to compare qualitative variables in the case study and control groups, the Chi-squared test or where appropriate, exact Fisher's test were utilized. If the data had a normal distribution, the independent t-test compared the quantitative data from the two groups; otherwise, its nonparametric equivalent (Mann-Whitney-U test) performed this comparison. The confidence interval (CI) and the level of significance were deemed as 95% and 0.005 respectively.

3. RESULTS

The present work studied a total number of 300 patients aged above 35. Patients were divided into two groups: 1) those suffering from upper GI bleeding (case and 2) those without GI bleeding (control group). The mean age of the patients was 45.81±21.28 years (in the range of 40 to 87 years).

The patient demographics of the two groups are compared in Tables 1 and 2. Statistical tests showed no significant difference between the two groups in terms of age, gender, marital status, distribution of weight, and education level ($P>0.05$). In regard to residence, the results indicated a significant difference between that of the case study and the control group ($p=0.002$).

Fig. 1 compares the two groups' frequency of cigarette and alcohol consumption and drug abuse.

Table 3 provides the frequency of NSAID consumption in the two groups. As indicated, NSAID consumption in patients with GI bleeding was significantly higher compared to those not suffering from this condition ($p=0.022$). Furthermore, the comparison among

Table 1. Comparison of median and interquartile range of demographic variables

Variable Group	Case Groups (with GI bleeding) Median (IQR) (n=150)	Control Group (without GI bleeding) Median (IQR) (n=150)	P-value
§Age	(65-47) 59	(65-45) 54	0.116

	male	88 (58.6%)	84 (56%)	
Gender	*female*	62 (41.3%)	66 (44%)	0.726
	< 50	25 (16.6%)	31 (20.7%)	
Weight	50 -70	81 (54%)	74 (49.3%)	0.615
(kg)	>70	44 (29.4%)	45 (30%)	

§: Mann-Whitney-U test

Table 2. Comparison of qualitative demographic variable frequency

Variable Group		Case group frequency& percentage	Control group frequency & frequency percentage	*P-value
Marital Status	single	45 (28.7%)	40 (26.7%)	0.796
	married	105 (71.3%)	110 (73.3%)	
	illiterate	12 (8%)	12 (8%)	
	only reading & writing	36 (24%)	20 (13.3%)	
	up to elementary school	32 (21.3%)	36 (24%)	0.107
	high school diploma	53 (35.3%)	51 (34%)	
Educational Level	associate degree	13 (8.7%)	25 (16.7%)	
	Bachelor degree & higher	4 (2.7%)	6 (4%)	
	city	94 (62.7%)	124 (82.7%)	0.002
Residence	village	56 (37.3%)	26 (17.3%)	

**: Chi-Square test*

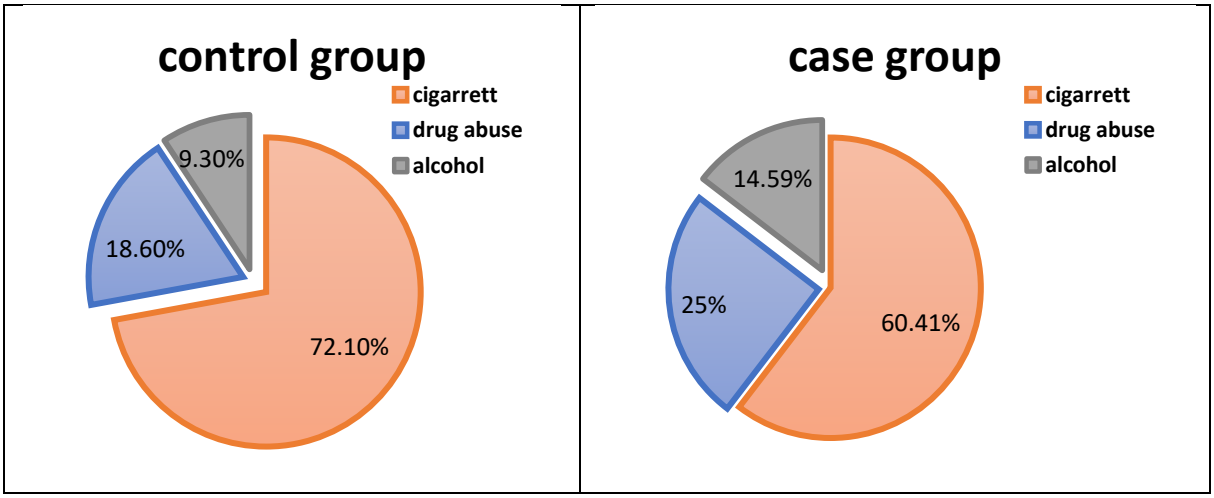

Fig. 1. Comparison of the Consumption of Cigarettes, Drugs, and Alcohol

the types of NSAID consumed by patients of the two groups showed a significant difference in regard to type ($p<0.001$). The most commonly used NSAID in the case study group was aspirin 80 mg per day, either as an ongoing consumption or at least for a past period of time. In fact, except for six patients, all subjects in the control group using NSAIDs were taking aspirin. After aspirin, the most common NSAID in the study group was ibuprofen. However, in the control group, there was greater consumption of ibuprofen followed by aspirin and diclofenac, respectively. In both study groups, other NSAIDs, such as indomethacin and naproxen, were less commonly used.

The frequency of other medications taken by patients is presented in Fig. 2. A significant difference inthetype of drugs taken is evident between the two groups ($p=0.035$). In the case study group, the most common were corticosteroids (15.3%), warfarin (14%), and plavix (13.3%). However, in the control group, the most prevalent drugs were specific serotonin

receptor inhibitors (SSRIs) (10.6%), plavix (4%), and corticosteroids (4%). In both groups, the consumption of heparin was less than any other of the drugs.

Fig. 3 provides patient endoscopy results. As seen, out of 150 patients with GI bleeding, 97 had undergone an endoscopy while the other 53 patients had not because of various reasons, such as patient unwillingness or medical conditions. The most common pathologic finding following endoscopy was ulcers (38.1%), while a mass was the least commonly observed pathology (4.2%). In 20.6 % of the patients, the endoscopy results were normal.

The logistic regression test was employed to assess the extent of the studied variables' prediction effect on GI bleeding. As seen, in a comparison between the study and the control groups, cigarette use, alcohol consumption, and, finally, a history of NSAID consumption can lead to an increased risk of upper GI bleeding incidence with an OR of 1.81, 4.241, and 1.838, respectively.

From these variables, drug abuse, gender, and age did not have any effect on raising or lowering the risk of upper GI bleeding incidence. Table 4 lists the results for each studied variable.

Table 3. Comparison of the frequency of NSAID consumption and its subtypes

		Control	Case	p-value
NSAID Consumption	yes	35 (23.4%)	55 (36%)	
	no	115 (76.6%)	95 (64%)	0.022**
Type of NSAID	Aspirin	13 (8.7%)	49 (32.66%)	
	Ibuprofen	14 (9.3%)	5 (3.34%)	
	Diclofenac	7 (4.7%)	0 (0%)	*<0.001
	Indomethacin	0 (0%)	1 (0.7%)	
	Naproxen	1 (0.7%)	0 (0%)	
	others	0(0%)	0(0%)	

**: Chi-Square test*
***: Fisher's exact statistical test*

Table 4. Evaluating the Predictive Effect of Variables under Study on the Establishment of GI Bleeding

Variable	CI 95% for OR (lower-upper)	Odds Ratio(OR)	P-value**
Age	0.942-1.004	0.965	0.175
Gender (risk of males compared to females)	0.634-1.664	1.029	0.92
Cigarette	1.071-3.151	1.838	0.024
Drug abuse	0.941-5.459	2.72	0.06
Alcohol Use	1.415-13.29	4.241	0.02
NSAID Use	1.076-3.067	1.812	0.021

*Logistic regression test**with the table margin and make it*

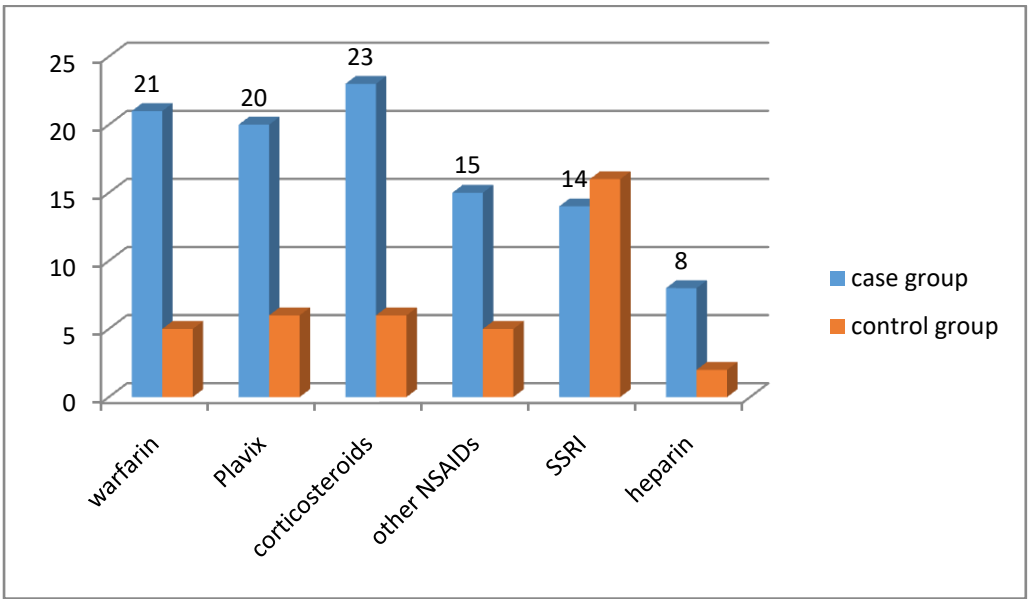

Fig. 2. Comparison of the frequency of other drugs consumption

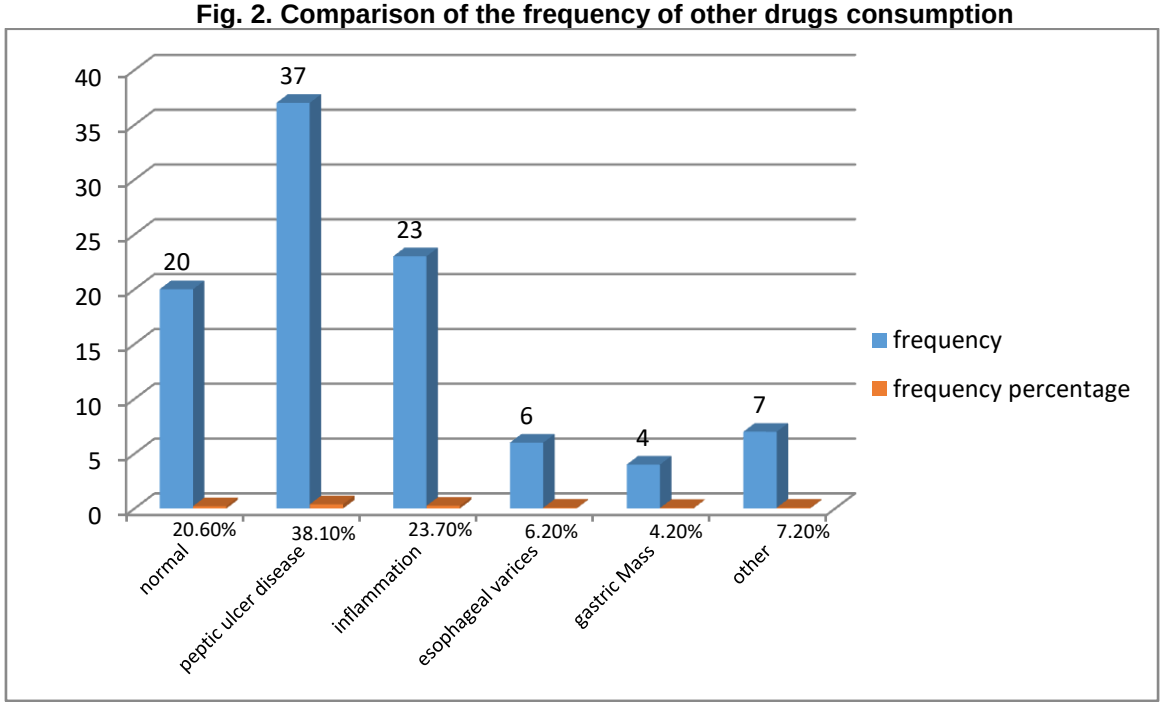

Fig. 3. Frequency of endoscopic findings in patients with Upper GI bleeding

4. DISCUSSION

In the present study, statistical tests revealed that there was no significant difference between the two groups in regard to gender frequency, age, marital status, weight group frequency, and educational level. The study revealed that patients in the case group lived more frequently in urban areas, a finding that had barely been investigated previously. For instance, the Button et al. study conducted in2010 showed that a higher number of patients with upper GI bleeding lived in urban areas [7]. Likewise, in the 2012 study by Whiskey et al., the prevalence of variceal and non-variceal upper GI bleeding was reported to be greater among the urban population [8]. Yet, these two above-mentioned studies did not further explore the possible

reasons behind their findings. In any case, it seems that the stronger presence of risk factors for upper GI bleeding in urban areas has led to a greater number of patients in these areas.

The present research suggests that the prevalence of cigarette smoking, alcohol consumption, and drug abuse was significantly higher in the study group when compared to the control group. These findings have also been reported in other similar studies. For example, the Crooks et al. 2013 study found thatcigarette use (whether active or passive) and alcohol consumption increased the risk of upper GI bleeding. The study also reported that the risk of bleeding incidence grew following a rise in alcohol consumption [9]. Another US study in 2016 revealed that drinking more than 30 gr of alcohol per day or more than 5 times per week was deemed to be an independent risk factor increasing the incidence of GI bleeding [10]. The study also suggested that cigarette use is not related to GI bleeding. Alcohol related mucosal damage can be caused by a rise in the production of oxygen-free radical species a fall in the level of prostaglandins, and also the release of mucosal leukotrienes [11,12].

As for cigarette smoking and upper GI bleeding, different results have been reported by various studies. This factor requires larger population size for evaluation. Similar to the current work, some researchers have propounded cigarettes as a risk factor for GI bleeding, while some others have not [10, 13, 14].

In the present study's comparison of NSAID consumption between the study and control group, there was a significant difference in the type of NSAID used. Except for six patients, all of the study patients had used NSAIDs, of which aspirin was the most commonly consumed followed by ibuprofen. Patients in the control group, however, had comparatively higher ibuprofen consumption, with aspirin being the second most common drug consumed. Aspirin was used at a dose of 80 mg per day in both groups and unfortunately the dose of NSAIDs were not available which was one limitation of the present study. After aspirin, the control group used diclofenac at a higher rate than that of the case study patients. Both groups had a lower consumption of other types of NSAIDs, such as indomethacin and naproxen. In conclusion, the present study generally associates aspirin consumption with greater GI bleeding. This finding has also been noted in several previous studies. For example, review article by Castellsague et al. at [2012] concluded that ibuprofen, the most commonly used drug in the control group, is the safest NSAID from the aspect of upper GI bleeding [15]. Also, in their 2012 study, De Abajo et al. investigated the relation of NSAIDs and other drugs consumption with upper GI bleeding. It was revealed that aspirin poses a higher risk of upper GI disease than the consumption of other drugs [16].These results are in accordance with the present work's findings.

Another result of the present study addresses the frequency of other drugs consumption by the patients of the two groups. In both the study and the control group, a large spectrum of drugs were taken by patients, out of which the current work attempted to discern which are closer related to upper GI bleeding. The findings show a significant difference in the amount of drugs consumed by the two groups. Among the study subjects, the most common were corticosteroids (15.3%), warfarin (14%), and clopidogrel (13.3%). However, the most prevalent medications for control group subjects were SSRIs (10.6%), clopidogrel (4%), and corticosteroids (4%). In general, the drug consumption in the study group was significantly higher. In both groups, heparin was the least used. Previous studies have also investigated the relation between the use of various drugs and upper GI bleeding. For instance, the 2014 review by Narum et al. finally concluded that corticosteroids use is associated with an increased risk of upper GI bleeding and gastric ulcers [17]. As mentioned in the present study, using these drugs in the study group was more than in the control group. Regarding warfarin and clopidogrel and their relation to upper GI bleeding, previously conducted studies concur with the current paper's findings. In 2013, De Abajo et al. concluded that clopidogrel consumption can heighten the risk of upper GI bleeding in comparison to healthy individuals [16]. The subjects in the present paper's study group also took more multiple NSAIDs than did the control group. Previous studies have stressed that the consumption of multiple NSAIDs increases the risk of upper GI bleeding.

After exploring the risk factor of upper GI bleeding in their 2010 research, Scarpiganto and Hunt concluded that taking multiple NSAIDs or anticoagulant drugs, such as warfarin and corticosteroids, all can increase the risk of gastric bleedings, a finding with which the present paper is in accordance [18].

The current paper's other results deal with patient endoscopies. Ninety seven patients with GI bleeding underwent endoscopy while the other 53 patients did not for reasons such as medical issues or unwillingness to consent to the procedure. The most common pathologic finding was ulcers. In the 2011Hearnshaw et al. study of 6,750 patients with upper GI bleeding, the most commonly observed pathology was ulcers [19], findings similar to those of the current research.

5. CONCLUSION

The results of the present study indicate that greater consumption of NSAIDs in patients with upper GI bleeding is significantly higher in comparison with patients not suffering from this condition. Aspirin and Ibuprofen were the most two common drugs used. Moreover, a history of consuming NSAIDs increases a patient's risk of acquiring GI bleeding. Concurrent consumption of corticosteroids, Warfarin and clopidogrel increased the risk of GI bleeding in case group. Likewise, the frequency of cigarette, drug, and alcohol consumption in the case study group was significantly higher than that of the control group, thus signifying that variables, such as alcohol and cigarettes, increase the risk of GI bleeding in patients.

We suggest to consider the factors that increase the risk of upper GI bleeding in patients with NSAID use and prescribe prophylaxis to high risk patients.

CONSENT

As per international standard or university standard, patient's consent has been collected and preserved by the authors.

ETHICAL APPROVAL

This research was approved at ethical committee of Mashhad University of Medical Sciences with ethical code: 922817.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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