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Original Article

Investigating Public Awareness About the Effect of Over-the-Counter Drugs on the Heart in Benghazi City, Libya

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Abstract

Background: Over-the-counter (OTC) medications are widely used for self-treatment without medical supervision. While considered generally safe, some OTCs— such as nonsteroidal anti-inflammatory drugs (NSAIDs), decongestants, and certain pain relievers — have been associated with adverse cardiovascular effects, including hypertension, arrhythmias, and increased risk of heart attacks. Despite this, public awareness about these risks remains limited, especially in developing countries like Libya, where regulation and health education are often insufficient. Benghazi, as a major city, presents an important context for assessing such awareness. **Aim:** To assess the awareness of the public of Benghazi about the effect of OTCs on heart health. **Methods:** This descriptive cross-sectional study is composed of two main sections: Section A – Pharmacist Survey: A short Google Forms questionnaire consisting of four questions was distributed among pharmacists to identify the most commonly dispensed OTCs and understand local usage trends. The same data collection period and analysis methods were applied as in Section B.– Public Survey: A structured online questionnaire was shared via social media platforms to assess public knowledge, behaviors, and attitudes concerning the use of OTCs and their cardiovascular impact in Benghazi. Sample Size: 385 participants (determined using Cochran's formula). Exclusion Criteria: Medical doctors, medical students, and individuals with cardiac conditions. Data Analysis: Descriptive statistics and reliability testing using SPSS.**Results:** 328 participants completed the survey and were included in the present analysis. 53.9% of the participants were female, with the majority (34.2%) aged between 21 and 30 years old. Additionally, 85.6% attended university, 20.7% reported having chronic diseases. **Conclusion:** The findings of this study are consistent with both local and international research, highlighting the critical need to bridge the gap between awareness and behaviour. Comprehensive educational initiatives and regulatory improvements are essential to reduce cardiovascular and systemic risks associated with inappropriate OTC medication use

Keywords*:* over-the-counter drugs. nonsteroidal anti-inflammatory drugs (NSAIDs), Heart, Cardiovascular effect

Introduction

Over-the-counter drugs (OTCs) became an integral part of self-medication practices worldwide as a result of the widespread availability and overuse [1-3]. Generally, OTCs are medications consumed by the public without a prescription and are considered safe and effective when used as directed [4,5]. OTCs integration into modern healthcare is largely attributed to their perceived convenience, affordability, and general safety [1,2].

In practice, OTCs are frequently used to relieve common symptoms such as headaches, musculoskeletal pain, allergies, cough, and cold [5]. Thus, OTCs became frequently utilized unsupervised by the public due to their wide applications. According to global estimates, more than 2,000 active ingredients are used in over 300,000 OTC products currently available on the market worldwide [6]. Despite OTCs clinical and therapeutic effectiveness, there are still several side effects associated with their overuse and misuse, including allergic reactions and unsupervised use during pregnancy [4]. Drug-drug and drug-food interactions are considered limitations of OTCs, particularly in individuals with specific health conditions. Additionally, it is suggested that self-medicating without proper awareness or monitoring can pose significant health risks—especially with repeated or prolonged doses [3].

Recent studies around the globe reported a noticeable rise in OTCs consumption, raising concerns about potential misuse. For example, in Spain OTCs usage increased by 78.9%, while the purchase of prescription medications has declined [7]. Similarly, in Saudi Arabia's Asir region, 53.5% of residents reported using OTC analgesics, often with limited understanding of proper usage [8]. In Punjab, India, 69% of individuals rely on OTC medications as part of their regular health management[3].

The commonly used OTCs include analgesics such as paracetamol (Panadol) and ibuprofen (Nurofen), antihistamines like chlorpheniramine, and decongestants such as pseudoephedrine [7]. These drugs are often selected for their ability to relieve pain, fever, allergy

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symptoms, or nasal congestion—making them among the most frequently purchased OTC categories globally. Analgesics, in particular, remain the most widely used OTC, largely due to their effectiveness in managing musculoskeletal and headache-related discomfort [8,10].

Another category of OTCs is nonsteroidal anti-inflammatory drugs (NSAIDs), that includes ibuprofen, decongestants such as pseudoephedrine, and even certain antihistamines, have been linked to adverse cardiovascular effects [7,11]. NSAIDs are among the most frequently used classes of medications worldwide. More than 30 billion OTC-NSAID tablets are sold annually, reflecting their widespread availability and use[12. NSAID use is prevalent across all age groups, with the highest frequency reported among older adults; studies indicate that 30–40% of the elderly use NSAIDs regularly, and around 10–13% use them daily [11].

Even though NSAIDs are generally safe in the short-term, research indicates that a significant portion of OTC analgesic users exceed recommended dosages or have contraindications, putting them at high risk of complications in the gastrointestinal (GI), cardiovascular, and renal systems [13,14]. For instance, the misuse of ibuprofen and naproxen can initially cause mild cardiovascular effects—such as slight increases in blood pressure and fluid retention—which may become clinically relevant with regular or prolonged use, particularly in individuals with pre-existing cardiovascular conditions [15,17]. These effects are not limited to minor symptoms. Several studies have also associated NSAID use with more serious cardiovascular outcomes, including thrombotic events, stroke, and myocardial infarction (MI)[18,20].

In particular, certain NSAIDs, selective inhibitors such as diclofenac and Cyclooxygenase-2 (COX-2), have been linked to a higher risk of major cardiovascular events, while naproxen and low-dose ibuprofen are generally considered safer alternatives [19,21]. NSAID overdose is suggested to promote hospitalization due to heart failure by 19%, especially among the elderly and those with comorbidities. This adverse effect is thought to be due to sodium retention, reduced renal perfusion, and interference with antihypertensive medications [15,17]. Such mechanisms underscore the importance of cautious NSAID use, even at OTC doses, particularly in high-risk populations.

Notably, NSAIDs exert their effects by inhibiting cyclooxygenase (COX) enzymes, which are responsible for the synthesis of prostaglandins. There are two main types of COX: COX-1 and COX-2. Inhibition of COX-1, which plays a protective role in the gastrointestinal (GI) tract, is associated with adverse GI effects such as ulcers and bleeding. To minimize these complications, selective COX-2 inhibitors were developed to preserve COX-1 function while targeting COX-2, which is primarily involved in inflammation and pain. However, subsequent studies have shown that selective COX-2 inhibition may significantly increase the risk of cardiovascular thrombotic events [17,22,23].

This increased risk is believed to result from an imbalance between prostacyclin (PGI_2) and thromboxane A_2. NSAIDs, particularly COX-2 inhibitors, reduce the production of PGI_2—a vasodilator and inhibitor of platelet aggregation—without affecting thromboxane A_2, a pro-thrombotic agent. This shift may promote vasoconstriction, platelet aggregation, and a pro-thrombotic state [18,24]. Understanding this mechanism is essential when evaluating the cardiovascular safety of commonly used OTC NSAIDs, especially in at-risk populations. Therefore, individuals with pre-existing cardiovascular conditions or those taking medications like diuretics and anticoagulants may experience compounded risks when taking NSAIDs [18,20].

In light of the growing cardiovascular concerns linked to the unsupervised use of OTC medications, particularly NSAIDs, this study was conducted to evaluate public awareness in Benghazi regarding their potential impact on heart health. By focusing on the community's knowledge, attitudes, and practices, the research aims to identify existing misconceptions and areas of limited understanding

Material and Methods

This descriptive cross-sectional study utilized two separate structured questionnaires to collect data:

1.Section A Pharmacists' Questionnaire:

This section aimed to determine the most commonly used OTC medications from the perspective of practicing pharmacists. A total of 4 mixed -format questions were developed to collect relevant data. The questionnaire was distributed to a sample of community pharmacists in Benghazi using a convenience sampling method; all responses were collected anonymously, and participation was voluntary

2. Section B Public Awareness Questionnaire:

The study was conducted in Benghazi, Libya, and the largest city in Libyan East, from January 2023 to May 2023. In order to assess and evaluate the knowledge, behavior, and attitude towards the effect of OTC drugs on the heart among the general population of Benghazi, medical professionals, medical students, and individuals with known cardiac diseases were excluded.

The target sample size was 385 and was calculated via Cochran's Formula. The study instrument was a self-administered Google form online questionnaire with 27 questions, 7 questions for knowledge, 3 questions for attitude, and 9 questions for behaviour. Ethical approval was obtained from the Research and Consultation Center at Libyan International University

3. Statistical and Data Analysis

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All data were presented as frequencies and percentages. Inferential statistical analysis was conducted using the chi-square test to assess the association between the dependent categorical variables and the independent variables of the study: knowledge, attitude, and behaviour related to the usage of OTC drugs and their potential effects on heart health. A *p*-value ≤ 0.05 was considered statistically significant

Results

A. Pharmacist survey

The data illustrate that most pharmacists in this study worked for more than 10 years¬ (42.4%), from 5 to 10 years (30.3%), and less than 5 years (27.3%) Fig 1. Additionally, Figure 2 shows that according to the participated pharmacist, the most common medications used in Benghazi are Analgesics (NSAIDs) (75.8%), Cold and Allergy medications (51.5) and Vitamins (54.5%), and the less commonly used are Topical treatments, Cough suppressor and Antacids 24%, 33.3%, 30% respectively Fig 2.

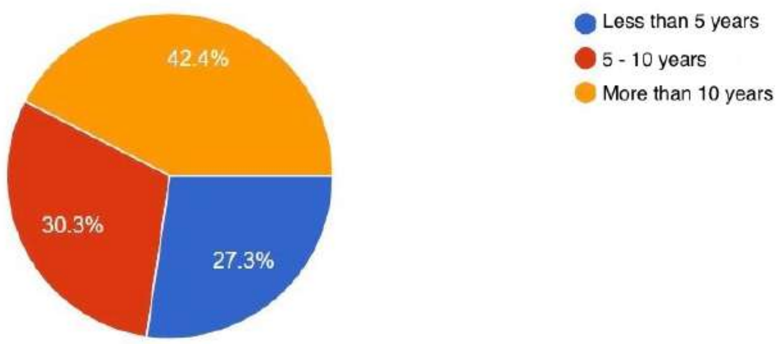

Figure 1: Participated pharmacist years of experience (n=33).

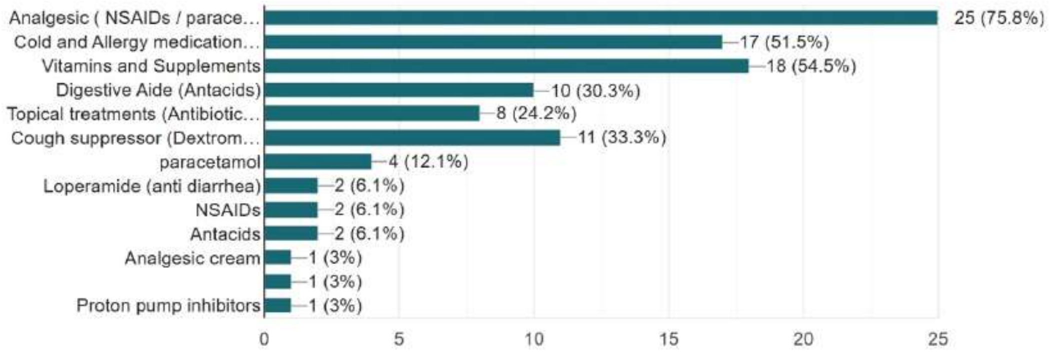

Figure 2: The most common OTCs in Benghazi in the participating pharmacist's opinion (n=33).

B. Public survey

1. Participation and demographic characteristics

Out of a total of 326 individuals approached, 317 participants (97.2%) agreed to take part in the study. Among the respondents, 86.4% were residents of Benghazi. The age distribution showed that the majority of participants (34.1%) were between 21 and 30 years old, followed by 22.4% under the age of 20. Female participants slightly outnumbered males, representing 53.9% of the total. In terms of educational level, a large proportion (85.5%) held a university degree, while only 13.6% had completed secondary education, and less than 1% had only preparatory education Fig 3 – Fig 6.

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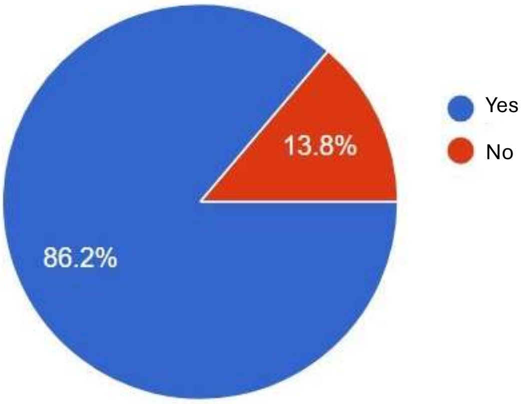

Figure 3: Participant's status of living in Benghazi (n=317). Data are expressed as percentage.

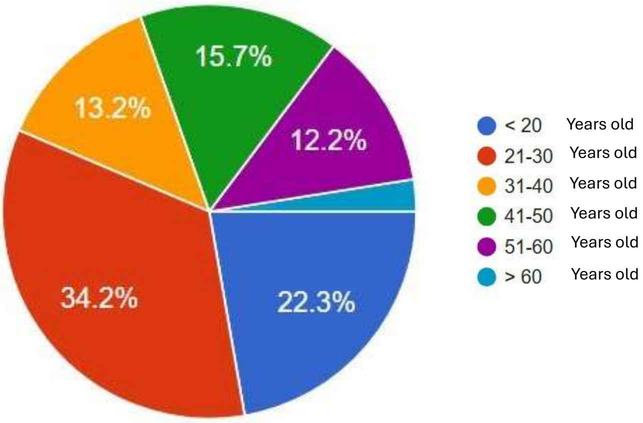

Figure 4: Participant's gender (n=317). Data are expressed as percentage.

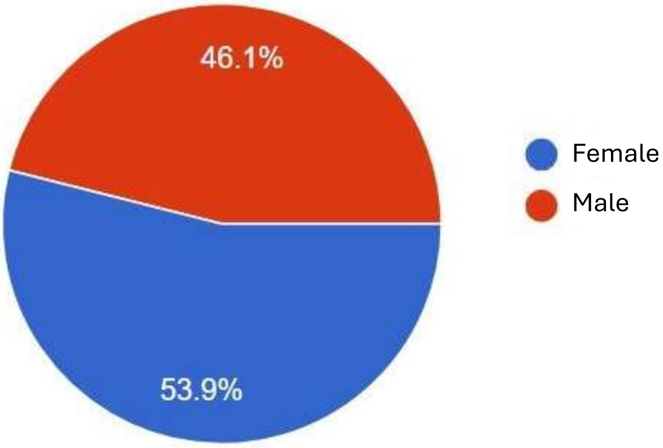

Figure 5: Participant's gender (n=326). Data are expressed as percentage

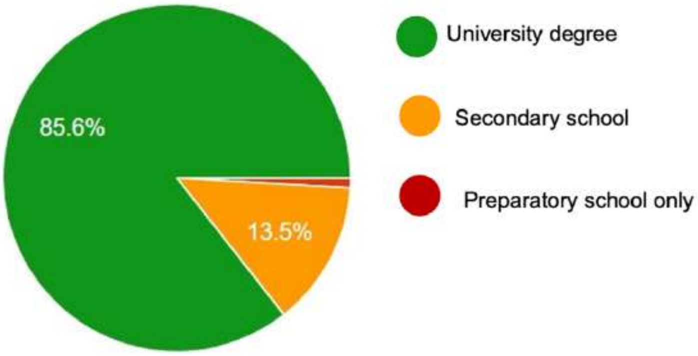

Figure 6: Education level (n=317). Data are expressed as a percentage

2. **Medical Field Background**
When asked about their academic or professional background, 17.7% of participants indicated that they either study or work in a medical-related field. In contrast, the majority (82.3%) reported no affiliation with the medical sector. This suggests that the data primarily reflects perceptions and behaviours of the general public rather than medically trained individuals Figure 7

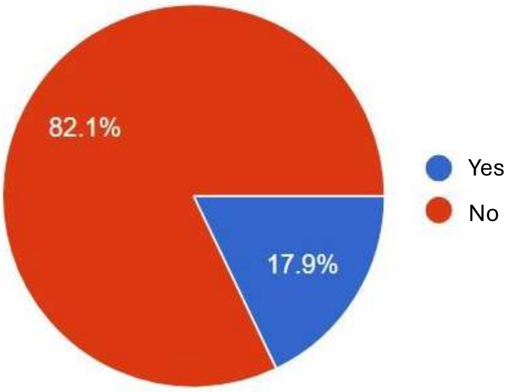

Figure 7: Medical Field Background (n=326). Data are expressed as percentage

3. **Medical history**
In relation to chronic health conditions, the majority of participants (79.2%) reported not suffering from any long-term illnesses. However, 9.8% stated that they had chronic conditions specifically related to cardiovascular disease or hypertension, while 11.0% reported other types of chronic illnesses Figure 8.

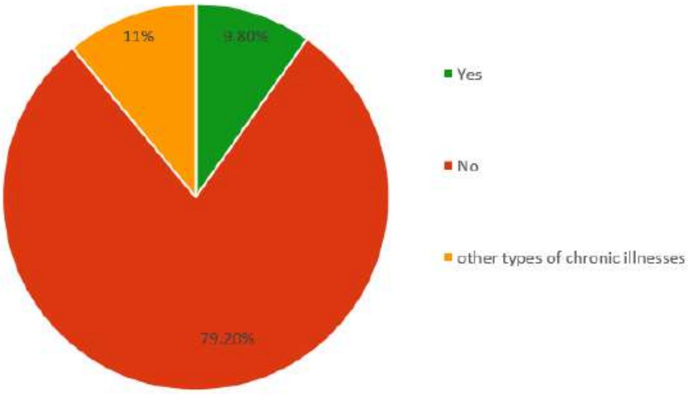

Figure 8: chronic illnesses (n=326). Data are expressed as percentage

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4. OTC Usage Patterns

The majority of participants (91.5%) indicated that they have used OTC medications. The most frequently used OTC medications according to participants were pain relievers such as paracetamol and ibuprofen Table 1 and Fig 9. Participants reported being influenced primarily by online recommendations, advertisements, and advice from family or friends when choosing OTC medications Fig. 10. Participants primarily chose OTC drugs due to their easy accessibility and the speed at which they relieve symptoms Fig 11. Most participants reported turning to OTC medications when experiencing mild symptoms or when lacking time to visit a doctor Table 2. A majority of participants (87.4%) stated that they keep OTC medications at home to treat common conditions Table 3. Additionally, over 60% of participants admitted to recommending OTC drugs to others without medical consultation Table 4.

Table 1: Participants' Previous usage of OTC Medications was the most (n=317). Data are expressed as percentages and frequency

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	No	27	8.5	8.5
	Yes	290	91.5	91.5
	Total	317	100	100

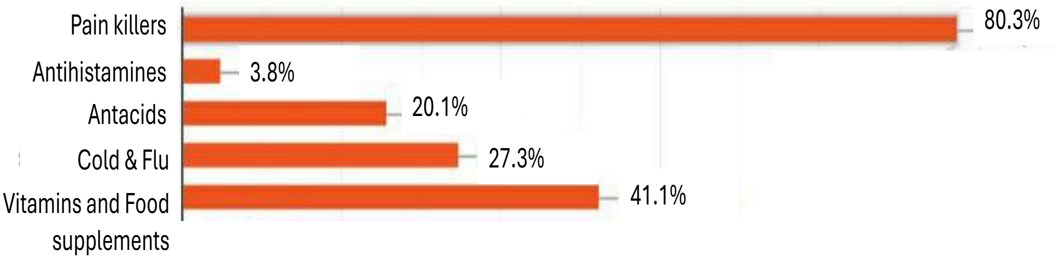

Figure 9: Most Common Types of OTC Medications Used by Participants (n=317). Data are expressed as percentage

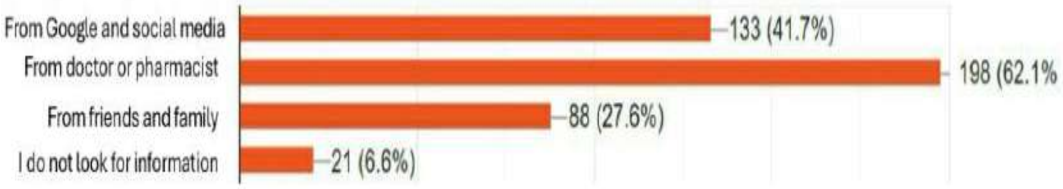

Figure 10: Sources of Information About OTC Medications (n=317). Data are expressed as percentage.

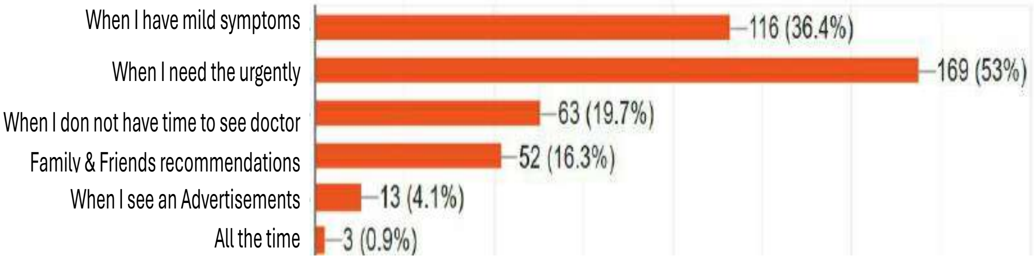

Figure 11: Main Reasons for Preferring OTC Medications Over Prescription Drugs (n=317). Data are expressed as a percentage.

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Table 2: Situations in Which Participants Use OTC medications (n=317). Data are expressed as percentage and frequency

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	No	66	20.8	20.8
	Maybe	121	38.2	38.2
	Yes	130	41.0	41.0
	Total	317	100	100

Table 3: Participants who Keep OTC Medications at Home for Common Illnesses (n=317). Data are expressed as percentage and frequency.

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	No	40	12.6	12.6
	Yes	277	87.4	87.4
	Total	317	100.0	100.0

Table 4: Participants Who Recommended OTC Medications Without Medical Advice (n=317). Data are expressed as percentage and frequency.

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	No	118	37.2	37.2
	yes	199	62.8	62.8
	Total	317	100.0	100.0

5. Awareness of OTC Risks

Only 41.0% of participants were aware that some OTC drugs may cause serious side effects (Table 5). Less than one-third of respondents (27.8%) were aware that certain OTC medications may increase the risk of heart disease (Table 6). More than half of the participants (57.1%) expressed concern about the long-term safety of OTC drug use Table 7. The majority of respondents (78.2%) believed that people overuse OTC drugs without fully understanding the risks (Table 8), while 45.7% believed that OTC drugs are safe for the heart when used properly Table 9.

Table 10 shows that 63.1% of participants felt that there is a lack of public awareness regarding the connection between OTC drugs and heart health. Over half of the respondents (56.8%) rejected the assumption that non-prescription drugs are completely safe Table 11. 65 % of respondents disagreed with the misconception that increasing the dose makes the drug more effective Table 12. Finally, Table 13 indicates that only 34.1% of participants consistently read the drug leaflet before using OTC medications.

Table 5: Participants' awareness of serious side effects of OTC Drugs (n=317). Data are expressed as percentage and frequency.

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	No	177	55.8	55.8
	Maybe	52	16.4	16.4
	Yes	88	27.8	27.8
	Total	317	100	100

Table 6: Participants' awareness of cardiovascular risks Associated with OTC use (n=317). Data are expressed as percentage and frequency.

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		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	No, I think it is safe	49	15.5	15.5
	I don't know	87	27.4	27.4
	Yes ,it is dangerous	181	57.1	57.1
	Total	317	100	100

Table 7: Participants' concern about long-term use of OTCC medications (n=317). Data are expressed as percentage and frequency.

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	No	156	49.2	49.2
	Maybe	63	19.9	19.9
	Yes	98	30.9	30.9
	Total	317	100	100

Table 8: Participants' awareness about the risk of OTC Medications overuse (n=317). Data are expressed as percentage and frequency.

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	No	17	5.4	5.4
	Maybe	52	16.4	16.4
	Yes	248	78.2	78.2
	Total	317	100	100

Table 9: Participants' knowledge about the Cardiovascular Safety of OTC Drugs When Used as Directed (n=317). Data are expressed as percentage and frequency.

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	No	52	16.4	16.4
	Maybe	120	37.9	37.9
	Yes	145	45.7	45.7
	Total	317	100	100

Table 10: Participants' knowledge about Cardiovascular Effects of OTC Drugs (n=317). Data are expressed as percentage and frequency.

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	No	200	63.1	63.1
	Yes	117	36.9	36.9
	Total	317	100	100

Table 11: Participants' opinion on how harmless the drugs are taken Without Prescription (n=317). Data are expressed as percentage and frequency.

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	No	180	56.8	56.8
	Yes	137	43.2	43.2
	Total	317	100	100

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Table 12: Participants' opinion about concept of positive correlation between OCTs dose and drug Effectiveness (n=317). Data are expressed as percentage and frequency.

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	Agree	206	65	65
	Disagree	111	35	35
	Total	317	100	100

Table 13: Frequency of reading the drug leaflet by participants prior to using OTC medications (n=317). Data are expressed as percentage and frequency.

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	Never	68	21.5	21.5
	Sometimes	141	44.5	44.5
	Always	108	34.1	34.1
	Total	317	100	100

6. Cardiovascular Symptoms after OTC Use

Table 14 demonstrates that 52.7% of participants reported that they had changed their usage behaviour after learning about the potential cardiovascular effects of OTC medications. In addition, 32.2% of participants reported experiencing cardiovascular symptoms such as palpitations, high blood pressure, or shortness of breath after using OTC medications (Table 15).

Table 14: Participants' behavior change after awareness of cardiovascular risks associated with OTC Drugs (n=317). Data are expressed as percentage and frequency.

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	No	150	47.3	47.3
	Yes	167	52.7	52.7
	Total	317	100	100

Table 15: Participants experienced cardiovascular complications Following OTC Drug intake (n=317). Data are expressed as percentage and frequency.

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	No	160	50.5	50.5
	Maybe	55	17.4	17.4
	Yes	102	32.2	32.2
	Total	317	100	100

7. Public Opinion and Regulation Support

Table 16 demonstrates that the majority of participants (73.5%) supported new stricter regulations on potentially harmful or addictive OTC medications.

Table 16: Participants' opinion on supporting new stricter regulations on harmful OTC Medications

		Frequency (n)	Percent (%)	Valid Percent (%)
Valid	Agree	31	9.8	9.8
	Neutral	53	16.7	16.7
	Disagree	233	73.5	73.5
	Total	317	100	100

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Discussion

This study aimed to assess the level of awareness, attitudes, and behaviors related to the use of OTCs and their potential cardiovascular risks among the population of Benghazi. The findings revealed that, while there is a general understanding that OTCs may have health-related consequences, a substantial gap remains between awareness and actual practice.

A considerable portion of participants demonstrated misconceptions regarding the safety of OTC medications, particularly the belief that their availability without a prescription implies minimal risk. Similar misconceptions have been reported in previous studies, such as Goyal et al. (2018), who found that rural populations often rely on informal sources and have a limited understanding of OTC analgesic risks[3]. Rema Shampe et al. (2024) in Zawia city further supported this, showing that even among university students, reliance on non-professional information results in inadequate awareness [25].

Moreover, Westerlund et al. (2017) reported that consumers frequently lack sufficient knowledge about OTC drug safety and tend to depend on unreliable information sources, underscoring a widespread issue of insufficient awareness [2].

The present study also revealed a high prevalence of unsafe behaviors, including recommending OTC medications to others without professional consultation and neglecting to read medication leaflets or adhere to dosage instructions. These findings are consistent with Aloudah et al. (2021), who identified common unsafe self-medication practices linked to inadequate public education and weak regulatory oversight [7].

Although some participants reported becoming more cautious after learning about cardiovascular risks, the persistence of risky behaviors highlights the limitations of passive awareness. This observation aligns with broader evidence that knowledge alone does not necessarily translate into safe medication use, especially without structured health education programs. Additionally, the common habit of storing and reusing OTC drugs at home without supervision contributes to ongoing misuse and increases the risk of adverse effects. These patterns emphasize the urgent need for targeted public health interventions, including pharmacist-led counseling, public awareness campaigns, and strengthened regulatory measures.

Conclusion

The findings of this study are consistent with both local and international research highlight the critical need to bridge the gap between awareness and behavior. Comprehensive educational initiatives and regulatory improvements are essential to reduce cardiovascular and systemic risks associated with inappropriate OTC medication use.

The present study highlights the need for creating focused awareness programs is essential, emphasizing the need to screen when exposed to risk factors, increasing awareness regarding the OTC, and correcting the myths regarding social stigma. The finding also highlights the need for improved OTC drug education programs. Further assessment of KAB in different geographical areas in Libya is needed to monitor and improve local efforts to achieve the WHO goals.

Limitations

The study was conducted through an online survey, and not all Benghazi residents have internet access. Therefore, the opportunity for each individual to be included in the study is not equal. Hence, the research results are not representative of the entire population. During the stage of collecting data from public places, through a self-administered paper questionnaire, the females were more responsive and cooperative, so the percentage of females in the study was more than the percentage of males. Hence, our research results are not representative of the entire population.

Conflicts of interest: The authors declare that they have no Conflicts of interest related to this study

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