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A cross-sectional study examining the pattern of acute poisoning among patients admitted to a governmental hospitals in Sana'a City, Yemen

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ABSTRACT

Introduction: As in other countries, acute poisoning cases in Yemen are a public health problem that causes a high level of morbidity and mortality. Understanding the general aspects of this issue helps in reducing its severity.
Objectives: The general goals of this study are to identify patterns of acute poisoning in Yemen, with a focus on poison type and sociodemographic variables.
Methods: This is a cross-sectional study conducted on 177 cases of acute poisoning in the emergency units of three government hospitals in Sana'a, Yemen. Information was collected using a questionnaire that included all sociodemographic and medical data related to each case.
Results: Cases of acute poisoning were more common in males (56.5 %) than females(43.5 %), and concentrated in the age group of 21–30 years. Approximately 66,1 % of cases occurred in individuals residing in rural areas. The percentage of non-educated individuals (53.7 %) was higher than educated ones(46.3 %). The study indicated that poisoning incidents were either intentional or non-intentional. Regarding intentional poisoning, it was categorized into homicidal or suicidal acts. The most common toxic substances involved were pesticides(30.5 %), followed by household poisoning (22.0 %), food poisoning(20.9 %), and medications(16.9 %). The most prevalent symptoms accompanying poisoning were nausea and vomiting. With regard to loss of consciousness, the percentage of those who lost consciousness was (28.8 %), and most of the cases were those who were exposed to medicines.
Conclusions: Cases of acute poisoning are mostly caused by exposure to pesticides, followed by household poisoning incidents and food poisoning. Awareness about the risks of pesticides and how to handle them is crucial, especially since most poisoning cases occur in rural areas among non-educated individuals.

1. Introduction

Acute poisoning is the term for short-term (less than 24 h) exposure to poison by any means. It is a serious worldwide public health issue that frequently results in emergency hospital admission, which raises morbidity and mortality rates [1]. The number of instances is rising daily as a result of alterations in social behavior and lifestyle [2].

According to the World Health Organization, around seven million people experience acute poisoning each year; the majority of these instances are found in middle-income nations, and roughly 90 % of these deaths are the result of accidental poisoning [3,4]. Depending on cultural variety and economical variables, many countries employ different poisons. Acute poisoning can occur accidentally or on purpose; accidental poisoning is more common in children, whilst intentional poisoning is more common in adults [5]. In Low- and middle-income countries, problems with the health care delivery system and chemicals management mechanisms enhance the incidence of accidental and suicidal poisoning [6]. Acute poisoning and suicide attempts account for over a million deaths worldwide each year [7]. It was shown that people under 30 years old, particularly women, had the highest frequency of acute poisoning [8–10]. In the Arab region, particularly in the Arabian Peninsula, cases of acute poisoning are prevalent among members of society, including children, adults, men, and women, with varying rates. In Kuwait, a 2012 study revealed that the age group of 12–29 years

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Table 1
Demographic characteristics of subjects admitted with acute poisoning.

Variable	Number	%
Age (Year)		
<10	21	11.9
11–20	45	25.4
21–30	89	50.3
>30	22	12.4
Total	177	100.0
Gender		
Male	100	56.5
Female	77	43.5
Total	177	100.0
Resident		
Urban	60	33.9
Rural	117	66.1
Total	177	100.0
Education		
Educated	82	46.3
Non-educated	95	53.7
Total	177	100.0

accounted for approximately 54.3 % of acute poisoning cases, with intentional poisoning accounting for 57.8 % of these cases [11]. While another study in Bahrain on accidental poisoning cases among children found that 89.3 % of poisoning cases occurred in children under the age of 4years. Most of these cases were due to the ingestion of hydrocarbons, medications, and household cleaners [12]. In Qatar, a study conducted in 2010 found that the incidence rate of acute poisoning cases was 35.3 per 100,000 people, with the majority of these cases (65 %) occurring among men [13]. In the United Arab Emirates, according to a study conducted at two hospitals of northern emirates, the prevalence of acute poisoning cases among men (50.5 %) was slightly higher than among women (49.5 %). Most of the poisoning cases were accidental (56.7 %) and largely resulted from exposure to medications (62.9 %) [14]. Acute poisoning cases in children accounted for 55.8 % of all cases in Oman. Among these cases, 59.5 % resulted from stings from scorpions, snakes, and insects, with medication and pharmaceutical product poisoning coming in second [15]. According to a study done in Syria in 2022, notably in the cities of Aleppo and Damascus, the percentage of poisoning cases among women (52.6 %) was greater than the percentage among men (47.4 %). Scorpion stings were the cause of most of these cases [16].

Comparing Yemen to its neighbors and other nations in the area, no prior research has addressed acute poisoning cases in Yemen as a whole. We don't know the prevalence, the sorts of poisons involved, the causes, or the risk factors.

So this study aims to shed light on this matter by identifying the various forms of poisoning, the most prevalent poisons that cause it, risk factors, and socioeconomic factors that impact it. A study of this kind might open the door for more in-depth studies of this condition in the future, which would help identify the scope of the issue, its root causes, and potential solutions.

2. Methods

2.1. Study design and setting

Selection of the type and design of the study, a descriptive cross-sectional study, based on previous studies that investigated acute poisoning [8,17].

The study was conducted at Al-Thawra, Al-Jumhori, and 22 May hospitals in Sana'a city over the course of nine months, from July 2023 to March 2024. All poisoning cases admitted to the emergency department of the aforementioned hospitals made up the research population. In all, 177 individuals with acute poisoning in the emergency department were included in the study. Utilizing data collection forms, the information was gathered from patient case sheets. Age, gender, the agents involved in the exposure, the cause for the exposure, the presenting symptoms, and the mode of poisoning (Intentional or unintentional) were all routinely evaluated in these records. Additionally, the questionnaires were created using the prior publication, with some modification [18,19]. It is utilized to gather information on residents, education level, and demographics. The Medical College Ethics Committee of Al-Hikma University in Sana'a, Yemen, authorized the study protocol, and verbal consent was obtained from the subjects.

2.2. Inclusion and exclusion criteria

Regarding the criteria for selecting and excluding cases, all acute poisoning cases that arrived at the hospital's emergency unit were selected. Any case that was not diagnosed as acute poisoning or any case that did not complete the required information was excluded.

2.3. Data analysis

SPSS version 26 was used to tabulate and statistically analyze the data. Statistical descriptive approaches, such as frequency and percentage, were employed in the analysis. The statistical comparison of frequencies between the groups was performed using the chi-squared test. P values are two-sided and deemed statistically significant if they are less than 0.05.

3. Results

Over the course of nine months, from July 2023 to March 2024, a total of 177 acute poisoning patients were admitted to the emergency care units of Al-Thawra, Al-Jumhori, and 22 May hospitals in Sana'a city. Of them, 100 are male (56.5 %) and 77 are female (43.5 %). The age of the patients was split into four groups. The age group of 21–30 years old had the highest percentage of poisoning cases (50.3 %), followed by that of 11–30 years old (25.4 %), > 30 years (12.4 %), and <10 years (11.9 %) of all cases.117 subjects, or 66.1 %, live in rural areas, while 60 subjects, or 33.9 %, live in urban areas. In relation to matters of education, 95(53.7 %) of the subjects lacked education, compared to 82 (46.3 %) who were educated. Table (1)

The findings revealed two types of poisoning: non-intentional (accidental), intentional (suicide), and homicidal. Of the 132 cases of acute poisoning, 74.6 % were non-intentional (accidental). Of the second stage, 25.4 % were intentional, 20.9 % (37) committed suicide, and the remaining 4.5 % (8) committed homicide. According to gender, the percent of accidental poisoning in males 81 (81 %) is higher than that in females 51 (66.2 %); in contrast, the percent of suicidal poisoning in females 22 (28.6 %) is higher than that in males 15 (15 %), and homicidal poisoning in females 4 (5.2 %) is higher than males 4 (4 %). Table 2

In terms of the kind of poison to which the patient was exposed, household toxins like Clorox and Flash accounted for 22 % (39) of instances, with pesticides accounting for 30.5 %(54) of cases. But in the cases of 20.9 % (37) and 16.9 % (30), it was chemical agents and food poisoning, respectively. Additionally, 16.9 % (30) of instances are

Table 2
Manner of poisoning according to Gender.

Manner of poisoning	Gender		
	Male	Female	Total
Accidental	81 (81 %)	51(66.2 %)	132(74.6 %)
Suicidal	15 (15 %)	22(28.6 %)	37(20.9 %)
Homicidal	4 (4 %)	4(5.2 %)	8(4.5 %)
Total	100 (56.5 %)	77(43.5 %)	177(100 %)

Table 3
Type of poisons.

	No.	%
Pesticides	54	30.5
House hold	39	22.0
Food poisoning	37	20.9
Chemical agents	12	6.8
Medicines	30	16.9
Unknown	5	2.8
Total	177	100.0

related to medication toxicity. In the end, 2.8 % (5) of cases had unidentified causes. Table 3

Patients experience a variety of acute poisoning symptoms. Of them, 40.7 % (72) of cases have abdominal pain, 41.8 % (74) have nausea and vomiting, and 17.5 % (31) have other symptoms such as arrhythmia, asphyxia, and diaphoresis. Regarding abdominal pain, it was primarily concentrated in cases of food poisoning, followed by pesticide poisoning. Meanwhile, symptoms of nausea and vomiting were primarily associated with pesticide poisoning, followed by household poisoning. Table 4

Regarding loss of consciousness, the number of people who lost consciousness was 51 (28.8 %), while those who did not lose consciousness were 126 (71.2 %). The highest percentage of those who lost consciousness was among people exposed to medications, with 16 (31.4 %), followed by those exposed to household toxins, with 13 (25.5 %). Table 5

As previously stated, there were two categories of acute poisoning instances listed above: intentional and non-intentional. The findings indicate that there are statistically significant disparities between males and females when it comes to intentional or non-intentional poisoning (P=0.036,C.I= 1.093–4.322); the rate of intentional poisoning in females was 26(14.7 %), whereas it was 19 (10.7 %)in males.

The findings demonstrated that there is no statistical correlation between the manner of poisoning and either place of residence (P = 0.785, C.I =0.446–1.843) or educational level (P = 1.0, C.I = 0.498–1.935). Table 6.

On the other hand, regarding residency and its impact on the level of education, the results showed a statistical relationship between the place of residence and the educational level (P= 0.00,C.I =3.614–15.121), as 81 (69.2 %) of the uneducated live in rural areas and 14 (23.3 %) live in cities (Table 7). This relationship may explain the rise in poisoning cases in rural areas due to a lack of education.

4. Discussion

Poisoning is defined as exposure to any substance that causes harm or a disruption in the body's normal function [20]. Acute poisoning is a serious public health issue that is linked to a high mortality everywhere in the world [21]. The 9-month period studied reported 177 admissions due to acute poisoning. It was reported that the poisoning rates in male and female patients were 56.5 % and 43.5 %, respectively. and the 50.3 % of the patients were between 21 and 30 years of age. This result was similar with study conduct in UK that revealed the poisoning rates in male and female patients were 55.8 and 44.2 %, respectively, and the 63 % of the patients were under 40 years of age [22]. In contrast Poisoning was found to be predominant in females (56.4 %) compared with males (43.6 %) in a study conducted in India and was more frequently observed in age groups (21−30) [1]. However, in the Governmental Hospital in Palestine, the high frequency of poisoning among age categories <18 years (45.4 %) is close to our results, which showed the frequency of poisoning among age groups <20 years (37 %) [5].

High incidence of poisoning cases in the age group (21−30), is attributed to this stage is the stage of activity, work, and great contact with society and the environment.

On the other hand, studies in Saudi Arabia and Brazil showed that the most of the poisoning cases were among children under the age of five years, and this were not consistent with the findings of this.study, as the rate of poisoning in children under ten years old represented only 11.9 % of acute poisoning cases [23], this may be due to the fact that this study was conducted in public hospitals and not in children's hospitals or poison treatment centers. Therefore, studies should be done to confirm the incidence and prevalence of poisoning among children in Yemen.

Many studies have shown that most cases of poisoning were higher in rural areas than in urban areas. A retrospective study in the Forensic Medicine Laboratory Institute in Upper Egypt from 2005 to 2010 showed that acute poisoning is more common in urban areas than in rural areas (83.4 % and 16.6 %, respectively). This finding is consistent with our study finding that 66.1 % of cases of poisoning were in rural areas and 33.9 % of cases were in urban areas [24]. While other studies in Saudi Arabia showed that almost half of acute poisoning cases were in rural areas, and this was contrary to what we reached [25].

The high rate of acute poisoning cases in the rural area may be related to the educational situation, as the results showed that there are significant differences between the educated and the uneducated in the rural area and the urban area (χ^2 = **33.6,** (P= 0.00,C.I =3.614–15.121)), as the percentage of uneducated in the rural area was 69.2 % (81) compared to the urban area 23.3 % (14).

Generally, acute poisoning is divided into intentional and non-intentional poisoning, while intentional poisoning is subdivided into suicidal and homicidal [26].

This study showed that the cases of acute poisoning were distributed between intentional and unintentional and the percentage of intentional poisoning cases was the highest compared to cases of intentional poisoning (74.6 %-25.4 % respectively). On the other hand, the cases of intentional poisoning were distributed between homicidal and suicide cases; suicidal cases accounted for 20.9 % of total poisoning cases, while homicidal cases accounted for 4.5 %.

Our findings are consistent with a 1999–2001 study carried out in a Malaysian government hospitals, which found that the majority of

Table 4
Common Acute poisoning Symptoms According to Type of poisons.

Type of poison	Poisoning Symptoms			
	Abdominal pain	Nausea and Vomiting	Others	Total
Pesticides	24 (33.3 %)	23 (31.1 %)	7 (22.6 %)	54 (30.5 %)
House hold	12 (16.7 %)	21 (28.4 %)	6 (19.4 %)	39 (22 %)
Food poisoning	26 (36.1 %)	11 (14.9)	0	37 (20.9)
Chemical agents	2 (2.8 %)	4 (5.4 %)	6 (19.4 %)	12 6.8 %)
Medicines	6 (8.3 %)	13 (17.6 %)	11 (35.5 %)	30 (16.9)
Unknown	2 (2.8 %)	2 (2.7 %)	1 (3.2 %)	5 (2.8 %)
Total	**72 (40.7 %)**	**74 (41.8 %)**	**31 (17.5)**	**177 (100 %)**

Table 5
Consciousness according to Type of poisons.

Type of poisons	Consciousness		
	Conscious	Unconscious	Total
Pesticides	45 (35.7 %)	9 (17.6 %)	54 (30.5 %)
House hold	26 (20.6 %)	13 (25.5 %)	39 (22 %)
Food poisoning	35 (27.8 %)	2 (3.9 %)	37 (20.9 %)
Chemical agents	3 (2.4 %)	9 (17.6 %)	12 (6.8 %)
Medicines	14 (11.1)	16 (31.4 %)	30 (16.9 %)
Unknown	3 (2.4 %)	2 (3.9 %)	5 (2.8 %)
Total	126(71.2 %)	51(28.8 %)	177 (100 %)

Table 7
Correlation between education status and resident.

Resident	Education		Total	χ2	C.I	P value
	Educated	Non-Educated				
Urban	46 (76.7 %)	14 (23.3 %)	82 (46.3 %)	33.6	3.614–15.121	o.oo
Rural	36 (30.8 %)	81 (69.2 %)	95 (53.7)%			
Total	60 (100 %)	117 (100)	177 (100 %)			

poisoning admissions were caused by unintentional poisoning (47 %), with intentional poisoning (20.7 %) coming in second [20].

Meanwhile, our results are not in agreement with previous study carried out in turkey at 2000 which showed (36.5 %) of acute poisoning cases involved accidental poisoning (non-intentional) while (63.5 %) involved intentional poisoning [27]. The same study showed that suicide attempts in women were more common (71.3 %), and this corresponds to the result of our study, as the percent of suicide cases in females were higher than in males 22 (28.6 %),15 (15 %) respectively Table 2. Furthermore, according to the Office of National Statistics, males die from drug and poison exposure more frequently than females do. The majority of female deaths are intentional or suicidal [28].

The most common causes of poisoning in this study are pesticides (30.5 %), followed by household poisoning (22 %), food poisoning (20.9 %), and medicines (16.9 %). Indeed, the incidence of pesticide poisoning is high in rural areas [29] because these areas are considered agricultural areas, and the pesticides are widely available in them, and they are easy to obtain. In this study, the majority of poisoning cases were in rural areas 117(66.1)%, and most of the rural areas in Yemen, if not all, are agricultural areas. There is also no awareness about the dangers of pesticides and how to deal with them with caution. Conversely, studies in Brazil and Saudi Arabia have shown that the main cause of poisoning cases is medicine [23,30].

The symptoms that patients with acute poisoning present with are varied and can include severe neurological symptoms, cardiac symptoms, and gastrointestinal symptoms (nausea, vomiting, and diarrhea) [31].

Our study showed that the most common symptoms were nausea and vomiting (41.8 %) followed by abdominal pain (40.7 %), nausea and vomiting was observed in 23 (31.1 %) cases with pesticide poisonings, and in 21 (28.4 %) cases involving house hold poisonings. Abdominal pain was observed in 26 (36.1 %) cases with food poisoning poisonings, and in 24 (33.3 %) cases involving pesticides poisonings Table 3. Our result is similar to Agarwal's and Rivera's studies, which showed the most common poisoning symptoms were vomiting [32,33]. This result is logic, as the symptoms according to the types of poisons for which the exposure rate was high are gastrointestinal symptoms (nausea, vomiting, and abdominal pain).

On the other hand, loss of consciousness is much more frequent in drug poisonings than other poisonings [27]; this is consistent with the results of this study, whereas 51 (28.8 %) of patients were unconscious and 16 (31.4 %) lost their consciousness due to exposure to medicines.

Finally, like other studies, there were some limitations, such as missing information due to negligence in documentation, as well as individuals feeling embarrassed to disclose certain information due to the privacy of Yemeni society, which in turn led to the loss of many cases and their exclusion.

5. Conclusion

In conclusion, despite the relatively short study period, the findings of this study are very important because this is the first study conducted in Yemen on this topic, and the results can be summarized as follows: Acute poisoning cases in Yemen are distributed between males and females, with a slight increase among males. The highest incidence of poisoning occurred in the age group of 21–30 years. Most cases are reported in rural areas and among uneducated individuals. Methods of poisoning include two types: unintentional and intentional (suicidal and homicidal), with the highest percentage being unintentional cases. The most frequently encountered toxic substances were pesticides, followed by household poisons and food poisoning.

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Declaration of Competing Interest

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Table 6
Manner of poisoning.

Gender	Non-intentional	Intentional	Total	χ^2	C.I.	P value
Female	51 (28.8 %)	26 (14.7 %)	77	5.002	1.093–4.322	0.036
Male	81 (45.8 %)	19 (10.7 %)	100			
Total	132 (74.6 %)	45(25.4 %)	177			
Resident						
Urban	44	16	60	0.073	0.446–1.843	0.85
Rural	88	29	117			
Total	132	45	177			
Education						
Educated	61	21	82	0.003	0.498–1.935	1.0
Non-educated	71	24	95			
Total	132	45	177			

influence the submitted work.

Data availability

No data was used for the research described in the article.

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Recommendation

According to the results of study, we recommend conducting more comprehensive and wider studies on acute poisoning cases in Yemeni society, targeting a larger segment of the population. Additionally, there should be efforts to raise awareness among individuals, especially in rural areas, about the dangers of pesticides and how to handle them safely to reduce poisoning cases. Furthermore, there should be initiatives to establish several poison control centers in the capitals of cities and rural areas

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