



Retrospective assessment of acute poisoning incidents by nonpharmaceutical agents in Jordan: Data from Pharmacy One™ Poison Call Center, 2014 to 2018—Part I

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Abstract

The Pharmacy One™ Poisoning Call Center (P¹PCC), located in Amman, Jordan, was created to address deficiencies identified by the pharmacy service, including in the management of poisoning cases. The aims of this study were to analyze the patterns of poisoning cases reported to the P¹PCC and to describe the role of the P¹PCC pharmacist in ensuring preparedness and managing the response to poisoning cases. In addition, the information from these interventions was used to survey human poisoning in Jordan. This is a retrospective descriptive study of acute poisoning incidents in the Jordanian population, as recorded by the P¹PCC during the period 2014–2018. Inquiries received by the P¹PCC were recorded on a predesigned form. The year, patient demographics, toxic agent involved, and circumstances of the poisoning event were all fully documented utilizing Oracle and Excel spreadsheets. A total of 1992 poisoning incidents were reported to the P¹PCC, predominately (68.59%) via 911 phone calls. Reports were predominantly from males (1.67:1). Children were the second most common age group after adolescents (22.62% and 42.49%, respectively). The most frequent causative nonpharmaceutical agents were household products (17%) in preschool children and animal bites (20%) in adolescents. Most of the poisoning incidents (74.63%) occurred at home. Unintentional poisoning (54.12%), with mild medical outcomes (61.45%), accounted for most of the poisoning incidents caused by exposure to household products. These data may represent the most recent picture of poisoning incidents in Jordan. Emergency medical services were provided by experienced pharmacy practitioners at the P¹PCC, to respond to emergency needs in the community in a professional manner. Therefore, the need for unnecessary hospitalization and the cost of ambulance dispatch were minimized, which are highly valuable outcomes.

KEYWORDS

Jordan, pharmacist, Pharmacy One™, poison control center

Abbreviations: P¹PCC, Pharmacy One™ Poisoning Call Center; JNDPIC, Jordan National Drug and Poison Information Center; CCC, Command and Control Center; AAPCC, American Association of Poison Control Centers.

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1 | INTRODUCTION

According to recent reports by the World Health Organization, poisoning incident rates have increased dramatically over the last few years, with an estimated 45 000 deaths annually, mostly involving children and youth (<25 years).¹ Acute poisoning is considered a medical emergency case, representing a health problem that requires effective rapid medical intervention, which should be provided to encounter different types of poisoning.^{1,2} Such intervention can be successfully performed through on-call consultation, which provides information and advice to reduce the mortality and morbidity rates caused by various poisoning incidents. It can also minimize overall health care costs by preventing the use of unnecessary antidotes and other expensive treatments or interventions.³

There are many different types of poisons, including biological agents, such as plants and insect/animal stings or bites;⁴⁻⁶ pharmaceuticals/medications;^{7,8} chemicals, such as heavy metals like lead and mercury;⁹⁻¹¹ toxic gases, such as carbon monoxide and hydrogen sulfide;¹²⁻¹⁵ household cleaning/cosmetic products;¹⁶⁻¹⁸ and pesticides, including organophosphates and carbamates (insecticides), paraquat and diquat (herbicides), and quinone and captan (fungicides).¹⁹⁻²² Furthermore, acute poisoning may be intentional (suicide attempt) or unintentional (accidental), environmental, or occupational. Intentional poisoning is mostly encountered in adults, whereas accidental poisoning, mainly by household products, such as washing powder, commonly occurs in young children.^{23,24}

Since the first poison control and drug information centers were established in the 1950s in North America and Europe, with measures of surveillance of poisoning incidents established on a national level, through population database implementation.^{3,25,26} Similarly, the Jordan National Drug and Poison Information Center (JNDPIC) was established at the University of Jordan, Amman, Jordan in 2006, with the aim of providing a comprehensive collection of the most updated data and toxicology resources in the country.²⁷ This was followed by the establishment of the Pharmacy One™ Poisoning Call Center (P¹PCC) in Amman, Jordan in 2014. This is a privately funded center, recognized as the first and only pharmacist-operated poisoning center in the country. The mission of the center is to provide first-aid advice to the public regarding poison exposure and possible preventive measures. It also provides free-of-charge telephone consultations and information regarding different types of poisoning events to the public and healthcare providers.

In 2016, the P¹PCC developed partnerships with the Command and Control Center (CCC), as a joint operational center (911) in Jordan. Based on the agreement between the Pharmacy One™ group, the Civil Defense Directorate, and the Public Security Directorate, the P¹PCC will provide expert emergency advice and treatment protocols, 24 hours per day and 365 days per year, with the aim of making the center's services more accessible to the public.

In a previous study by Obeidat *et al.*,²⁷ the patterns of poisoning cases reported to JNDPIC were analyzed over a 3-year period (2006-2008). To the best of our knowledge, there is no updated data or published information available since then. Therefore, this

study aimed to evaluate and describe poisoning cases managed by the P¹PCC during a recent 4-year period (2014-2018). In addition, information extracted and analyzed from the databases was used to survey poisoning incidents in Jordan.

2 | MATERIALS AND METHODS

2.1 | Study design

This was a retrospective descriptive study of acute poisoning incidents in the Jordanian population, as recorded by the P¹PCC during the period 2014-2018. Inquiries received by the center were recorded on a predesigned form. The year, patient demographics, toxic agent involved, and circumstances of the poisoning event, were all fully documented utilizing Oracle and Excel spreadsheets.

2.2 | Study population

During the implementation period (2014-2018), the P¹PCC recorded 1992 on-call poisoning incidences, which were all managed over the phone with no clinical or physical interventions. All cases were managed according to the relevant scientific information resources and databases, such as DynaMed/EBSCOHealth@ELM.jo (electronic library of Medicine) and MicroMedex-PoisonDex, which were accessed by well-trained toxicology specialists. In addition, an in-house Oracle database that included most of the toxins or chemicals that commonly contribute to poisoning incidents in the country was used. The documentation system included Oracle and Excel spreadsheets.

Calls to the P¹PCC direct hotline number and CCC (911) call processing systems, in addition to private clinics and hospitals at the time of the present study, were the methods to report any poisoning cases approaching the center. Information on the circumstances of the poisoning incidents was collected using open questions, directed toward vital parameters that would determine the presence of any risk factor, which may require immediate clinical or physical intervention. In noncritical cases or cases that did not involve any risk factors, callers were usually asked to follow first aid recovery procedures at home.

Cases of exposure to toxic agents were categorized as: hydrocarbons, drugs (medications), pesticides, gases, heavy metals, household products, animal bites/stings (insects, spiders, scorpions, and snakes), plants, and food agents. Based on the American Association of Poison Control Centers (AAPCC) guidelines, the Poison-Severity Scale, and the signs and symptoms described by the patient (or the patient's family) at the onset of the call, the clinical outcomes of poisoning incidents were classified and defined into five grades (0-4, Table 1).^{27,28}

Based on the source of the incoming call, a decision was made as to whether follow-up was necessary. No follow-up was performed after a recommendation was provided, when the call was received via 911 or healthcare providers, such as emergency rooms and hospitals. However, personal or self-reported cases were considered for follow-up in a time span ranging from 4 to 24 hours.

TABLE 1 Poison-severity scale used by the P¹PCC for grading the severity of the reported cases

Severity grades	Symptoms and signs
None (0)	No symptoms or signs related to poisoning
Minor (1)	Mild, transient and spontaneously resolving symptoms
Moderate (2)	Pronounced or prolonged symptoms
Severe (3)	Severe or life-threatening symptoms
Fatal (4)	Death ^a

^aSevere cases resulting in death were graded separately in the score, to allow a more accurate presentation of data (death is not a grade of severity but an outcome).

The frequencies (%) of poisoned incidences, were calculated based on the total number of cases reported for each class of toxic agent, associated with the age and gender of the caller, site, manner and route of exposure, clinical outcome, and source of call. These data were used as an evaluation tool for the determination of causes and potential risk factors that are associated with each type of toxicity.

2.3 | Data analysis

Statistical analysis was performed using Statistical Package for Social Sciences (version 21; IBM). Descriptive analysis was performed to determine the frequencies (%) of the categorical variables.

3 | RESULTS

3.1 | Type and prevalence of poisoning incidents

During the 4-year study period, a total of 1,992 poisoning incidents were reported to the P¹PCC, due to exposure to toxic agents. Figure 1 shows the frequency of poisoning incidents according to the type of toxic agent involved. The most common causative agents were drugs, which were responsible for 45% (n = 900) of all reported cases. The second most common causative agent class was nonpharmaceutical agents, which mainly consisted of animal bites (snake, scorpion, insects, and spiders), household products (bleaches, detergents, acids, and alkalis), hydrocarbons (including petroleum distillate, kerosene, benzene, and Vaseline), heavy metals (usually lead and mercury), pesticides (organophosphate and carbamate insecticides), and gases (carbon monoxide, especially due to incomplete combustion of fuels found in winter stoves). Poisoning due to plants and food were the least common categories of cases reported to the center and therefore, these two categories were not investigated in depth in this study.

Of all the reported poisoning incidents, ingestion was the main route of exposure to the toxic agent, comprising 44.23% (n = 483) of the cases. This was followed by the dermal route in cases of animal

bites (n = 453, 41.48%) inhalation (n = 127, 11.63%). The least frequent routes of exposure were ocular and parental routes, which accounted for a combined total of 29 cases (2.66%).

Figure 2 shows that the number of poisoning incidents varied from year to year, with the maximum number (n = 834, 76.37%) of cases reported in 2017. Almost all toxic agents showed the same trend of increasing in frequency from 2014 until the end of the study period.

As shown in Figures 1 and 2, poisoning incidents caused by drugs contributed to the majority of all cases reported to the center, with an annual increase over the study period. In "Part I" of this study, we present detailed data regarding poisoning incidents caused by exposure to nonpharmaceutical agents only. In "Part II," which will follow shortly, we will present data for poisoning incidents caused by drugs.

3.2 | Population characteristics and circumstances of poisoning incidents

The baseline demographics and circumstances of the poisoning incidents are shown in Tables 2-4, excluding cases of drug poisoning (as discussed above). Cases involving males were more frequent than those involving females (1.67:1). Children (<5 years; n = 247, 22.62%) were the second most common age group after adolescents (>20 years; n = 464, 42.49%; Table 2). Animal bites were the major cause of toxicity among adolescent and male patients, whereas household products were the main toxic agent in children and female patients.

Of the reported cases, most of the poisoning incidents (n = 815, 74.63%) involved exposure to various poisoning agents at home. Outside the home, poisoning was mainly caused by animal bites, whereas poisoning at work sites was infrequent. In addition, the majority of poisoning incidents (n = 749, 68.59%) were reported to the P¹PCC via the 911 switching system (Table 3).

Unintentional poisonings (n = 591, 54.12%) and mild medical outcomes (n = 671, 61.45%) accounted for most of the poisoning incidents caused by exposure to household products (Table 4). Unintentional exposure to pesticides contributed to the highest proportion of poisoning cases with severe medical outcomes, whereas attempted suicide mostly occurred by exposure to household products.

Cases that were self-managed at home, by receiving instructions from trained pharmacists at the P¹PCC and were not referred to hospitals, were reported as a percent reduction in ambulance dispatch. Table 5 shows that the percent reduction in ambulance dispatch increased during the period of 2016-2018 (no such data were available prior to 2016), based on the recommendations made by the P¹PCC, as reported by the 911 system. Considering that the cost per ambulance dispatch is estimated to be approximately \$ US 50-100, these findings show that, in addition to the convenience of a home-based first aid approach, this pharmacy-based service was able to help reduce the general cost of first aid services usually offered by the 911 system.

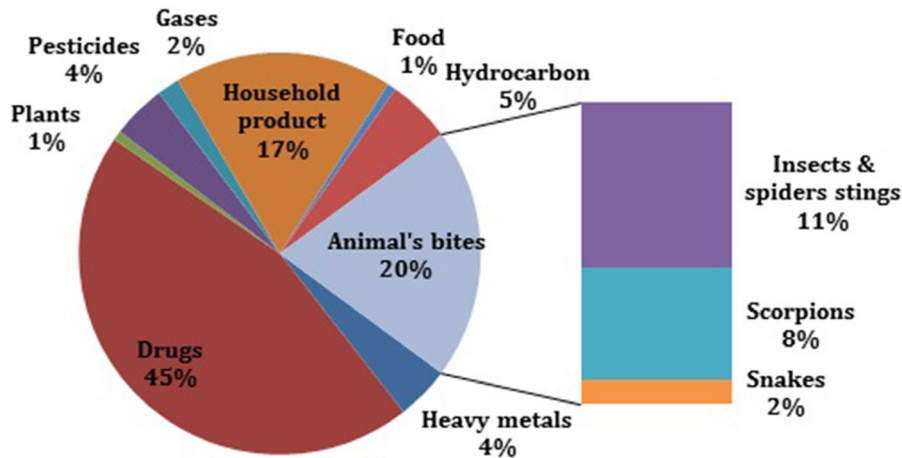


FIGURE 1 Frequency (%) of poisoning cases reported to the P¹PCC during the period 2014-2018, according to the type of toxic agent

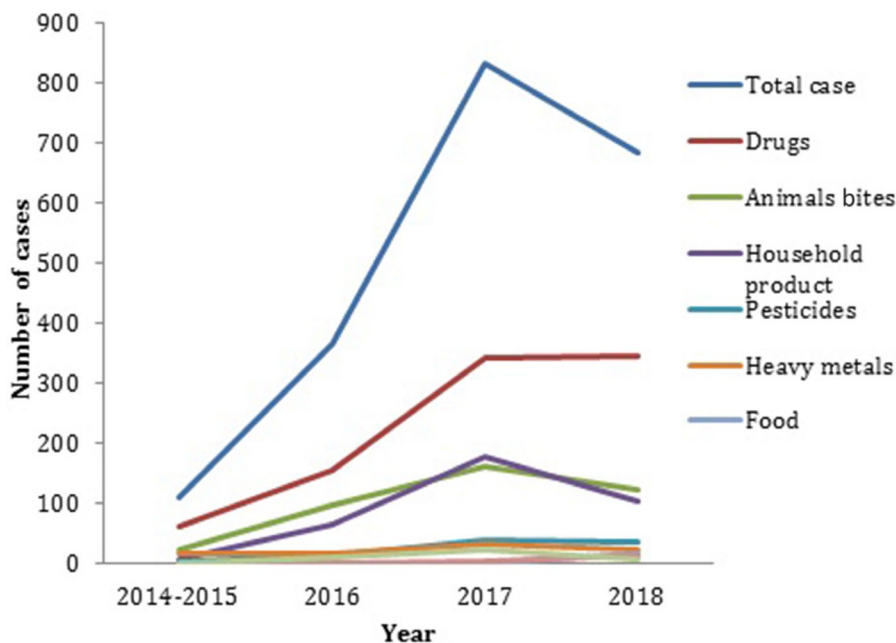


FIGURE 2 Annual number of poisoning incidents reported to the P¹PCC in the period 2014-2018, according to the type of toxic agent

4 | DISCUSSION

In this study, we contributed to the primary goals of the pharmacist-operated poisoning center at the P¹PCC, by supplying comprehensive medical information to the public, medical institutions, and professionals, who have an urgent need for data concerning the most common poisoning incidents in the country. In addition, the present study emphasizes the importance of the role of pharmacist in the management of poisoning cases within the existing healthcare system.^{29,30} In this regard, pharmacy education curricula need to be revised to produce well-trained pharmacists, able to meet future demands.

Overall, the numbers of calls received by the center have increased significantly over the 4 years of the study period, with a maximum number of calls received during 2017-2018. This was due to an increased public awareness of the services provided by the center. Previously, Obeidat *et al*²⁶ reported that more than 90% of calls

to the P¹PCC were from healthcare providers and only 3.6% were from the public. Since the center developed partnerships with the CCC in 2016, the majority of calls have been rerouted via 911 calls, which is a widely recognized system by both the public and healthcare professionals.

In this study, males showed the highest frequency of poisoning incidents, with a higher frequency of accidental exposure to toxic agents. Similar findings have been reported in Palestine, where 61.5% of cases involved accidental exposure in males, compared to 38.7% for accidental exposure in females.³⁰ Whereas, in Egypt, female cases (55.9%) and intentional poisoning (44.1%) were found to be predominant.³¹

This study also revealed high rates of unintentional ingestion of household products among children. Similar findings have been reported in Palestine,³⁰ Kuwait,³² and France.³³ The diversity of household products and the lack of awareness among housekeepers of the correct way to storing these products out of reach of children

TABLE 2 Distribution of cases with poisoning incidents from nonpharmaceutical agents reported to P¹PCC (2014-2018) according to gender and age groups

Type of toxin	Gender		Frequency [n, (%)] ^a						
	Female	Male	Total	Age groups (year)					
				0-5	6-10	11-15	16-20	21-50	>50
Heavy metals	30 (34.88)	56 (65.12)	86	16 (18.60)	15 (17.44)	0 (0.00)	2 (2.33)	51 (59.30)	2 (2.33)
Plants	7 (46.67)	8 (53.33)	15	1 (6.67)	2 (13.33)	1 (6.67)	1 (6.67)	6 (40.00)	4 (26.67)
Pesticides	34 (39.08)	53 (60.92)	87	29 (33.33)	9 (10.34)	2 (2.30)	5 (5.75)	34 (39.08)	8 (9.20)
Gases	12 (33.33)	24 (66.67)	36	2 (5.56)	0 (0.00)	1 (2.78)	2 (5.56)	29 (80.56)	2 (5.56)
Household products	164 (46.99)	185 (53.01)	349	114 (32.66)	39 (11.17)	30 (8.60)	30 (8.60)	30 (8.60)	30 (8.60)
Food	6 (42.86)	8 (57.14)	14	2 (14.29)	1 (7.14)	1 (7.14)	2 (14.29)	8 (57.14)	0 (0.00)
Hydrocarbon	25 (24.51)	77 (75.49)	102	53 (51.96)	19 (18.63)	3 (2.94)	0 (0.00)	19 (18.63)	8 (7.84)
Animal's bite	131 (32.51)	272 (67.49)	403	30 (7.44)	60 (14.89)	49 (12.16)	31 (7.69)	206 (51.12)	27 (6.70)
Total	409	683	1092	247	145	87	73	383	81

^aPercentage by row.

TABLE 3 Distribution of cases with poisoning incidents from nonpharmaceutical agents reported to P¹PCC (2014-2018) according to the site of exposure to toxic agent and source of call

Type of toxin	Frequency [n, (%)] ^a					
	Site of exposure			Source of call		
	Work	Out door	Home	Public	911	Professional
Heavy metals	4 (4.65)	0 (0.00)	82 (95.35)	22 (25.58)	32 (37.21)	32 (37.21)
Plants	0 (0.00)	0 (0.00)	15 (100.00)	5 (33.33)	4 (26.67)	6 (40.00)
Pesticides	1 (1.15)	7 (8.05)	79 (90.80)	13 (14.94)	59 (67.82)	15 (17.24)
Gases	4 (11.11)	3 (8.33)	27 (75.00)	3 (8.33)	28 (77.78)	5 (13.89)
Household products	10 (2.87)	4 (1.15)	331 (94.84)	49 (14.04)	260 (74.50)	40 (11.46)
Food	0 (0.00)	0 (0.00)	14 (100.00)	5 (35.71)	4 (28.57)	5 (35.71)
Hydrocarbon	2 (1.96)	0 (0.00)	100 (98.04)	3 (2.94)	86 (84.31)	13 (12.75)
Animals bite	5 (1.24)	223 (55.33)	167 (41.44)	82 (20.35)	276 (68.49)	45 (11.17)
Total	26	237	815	182	749	161

^aPercentage by row.

may explain this phenomenon. According to the AAPCC, it is important to ask about the chemical composition of such products in order to manage intoxication.³⁴ Therefore, increasing public awareness about the urgent need to report these cases to local poisoning centers, in order to be treated under professional medical supervision, rather than trying to treat these cases at home, would have a large influence on the final medical outcomes, especially among children and patients with other risk factors.

Among adolescents, the most common causative agents were environmental, mainly consisting of scorpion stings. Scorpions have previously been identified as a public health problem in Jordan, with incidents mostly reported in rural and agricultural communities in the southern areas. The highest rates of scorpion sting cases are typically reported in July (22.5%) and August (23.0%).³⁵ This is probably due to the nature of the climate in Jordan, which is characterized by high temperatures for most days of the year, resulting in larger insect populations.

Pesticide poisoning is considered a major cause of mortality and morbidity in developing countries^{18,21} and it is responsible for most suicidal deaths, since pesticides are accessible and widely used.³⁶ However, in this study, exposure to pesticides was minor and it mainly occurred by accidental exposure at home.

Such data may pave the way for regional poison control centers to collaborate in order to raise awareness of the dangers of poisoning among the public and healthcare professionals.

4.1 | Significant statements

The data extracted in this study can be used to increase public awareness regarding chemical intoxication. In addition, the present study emphasized the importance of the role of pharmacists in the management of poisoning cases, as it positively impacts public health services and reduces healthcare costs, by minimizing

TABLE 4 Distribution of cases with poisoning incidents from nonpharmaceutical agents reported to P¹PCC (2014-2018) according to the manner of exposure to toxic agents and toxicity severity score outcomes

Type of toxin	Frequency [n, (%) ^a]										Toxicity severity score grades		
	Manner of exposure										Mild	Moderate	Severe
	Suicidal	Unintentional	Occupational	Consultation	Intentional	Bite/sting	Mild	Moderate	Severe				
Heavy metals	1 (1.16)	78 (90.70)	1 (1.16)	1 (1.16)	1 (1.16)	0 (0.00)	16 (18.60)	10 (11.63)	0 (0.00)				
Plants	1 (6.67)	7 (46.67)	0 (0.00)	2 (13.3)	4 (26.67)	0 (0.00)	5 (33.33)	1 (6.67)	1 (6.67)	1 (6.67)			
Pesticides	16 (18.39)	69 (79.31)	1 (1.15)	1 (1.15)	0 (0.00)	0 (0.00)	29 (33.33)	22 (25.29)	13 (14.94)				
Gases	0 (0.00)	34 (94.44)	0 (0.00)	1 (2.78)	0 (0.00)	0 (0.00)	26 (72.22)	7 (19.44)	1 (2.78)				
Household products	37 (10.60)	298 (85.39)	8 (2.29)	4 (1.15)	1 (0.29)	0 (0.00)	213 (61.03)	67 (19.20)	3 (0.86)				
Food	0 (0.00)	11 (78.57)	0 (0.00)	1 (7.14)	2 (14.29)	0 (0.00)	6 (42.86)	6 (42.86)	1 (7.14)				
Hydrocarbon	4 (3.92)	94 (92.16)	2 (1.96)	0 (0.00)	1 (0.98)	0 (0.00)	62 (60.78)	21 (20.59)	4 (3.92)				
Animal's bite	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.25)	0 (0.00)	284 (70.47)	314 (77.92)	50 (12.41)	2 (0.50)				
Total	59	591	12	11	9	284	671	184	25				

^aPercentage by row.

TABLE 5 (%) Reduction in the ambulance dispatch, based on the recommendation made by P¹PCC during the period of 2016-2018, as reported by 911

Year	Reduction of ambulance dispatch (%)
2016	13.4
2017	17.1
2018	28.5

the need for unnecessary hospitalization and ambulance dispatch. Therefore, the economic value offered by the P¹PCC appears to be high.

4.2 | Limitations

The potential under-reporting or misdiagnosis of poisoning incidents limits the generalization of these findings. Therefore, more detailed studies are needed to obtain an accurate determination of the frequency of acute poisoning among Jordanians.

5 | CONCLUSION

This study analyzed the patterns of poisoning cases reported to the P¹PCC in the period 2014-2018. Part I of the study focused on acute poisoning cases caused by nonpharmaceutical agents, while Part II will focus on poisoning with pharmaceutical agents. Approximately 2000 poisoning incidents were reported to the center during the 5-year study period. Most of the reported cases were diverted to the P¹PCC via 911 calls. Males and children were most frequently exposed to poisoning agents, especially to household products and animal bites. Most of the reported cases of poisoning occurred at home, due to accidental exposure.

Therefore, as an integral part of the healthcare system, the partnership established between the P¹PCC and the CCC (911) has created new opportunities for pharmacists to participate in new roles within this system, in order to provide valuable services to their community, in addition to their classical role.

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DISCLOSURE

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Dima Balas contributed to project coordination, data analysis, writing the introduction, and final proofreading before submission. Reem

Issa contributed to writing the methodology and the study design, preparing the tables and figures, corresponding author. Alaa Yehya contributed to writing the discussion and the first draft of the manuscript. Aida Fawadleh contributed to collecting data and data analysis.

ETHICAL STATEMENT

The authors declare that at the time of this study was performed, it was in accordance with the research policy of Pharmacy one and Yarmouk university.

DATA REPOSITORY LINK

The authors declare that at the time of this study was published, data repository link was not available for the authors at Pharmacy one or Yarmouk university.

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