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Original Research

Patterns of drug overdose deaths in Kuwait from 2014 to 2018

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ABSTRACT

Background: Kuwait is an Arabian Gulf couFntry with a population of around 4.4 million as of 2020. In recent years, government based news agencies have commonly exposed drug smuggling plots that were foiled by local authorities. We attempted to study the patterns of drug overdose deaths in Kuwait, which we believe is a good method to address the effect of illicit drug use in the country.

Methodology: All cases that were signed out as drug overdose death were collected from the General department of criminal evidence. The relationship between demographic factors and drug types were analyzed using various statistical methodologies.

Results: 344 victims were identified from 2014 to 2018. The majority of whom were Kuwaiti nationals (67%) and the average age of death was 38. Hawalli governorate had the highest number of cases, while Jahra governorate had the least. Morphine appeared to be the most common drug found in the victims post mortem (79.9%) followed by benzodiazepines (43%). Our study has an extremely low female number of victims (2.6%). Some substances that are commonly abused globally eg heroin and cocaine were rarely recovered in our study. The number of cases have had an increase over the study period with the highest number of cases in 2018.

Conclusion: The current study is the first of its kind in Kuwait and one of the first in the middle east region. It is evident that illicit drug use and subsequent drug overdose deaths are on a rise in Kuwait and government agencies need to put a strategic plan to address and reduce this problem.

1. Introduction

Illicit drug use (IDU) and subsequent drug addiction has been a global public health problem with increasing incidence for the past 3 decades [1,2]. It is therefore not surprising that deaths due to overdose of illicit drugs are on a parallel increasing trend. Many publications from many parts of the world have addressed this problem. Extensive information can be gathered about patterns of IDU and related overdose deaths in the United states of America [3,4], Europe [5] and other countries around the globe [6,7]. Knowledge about corresponding patterns of overdose related deaths secondary to IDU are scarce in Arab countries [8] and non-existent in the State of Kuwait. While a few publications addressed patterns of IDU in Kuwait [9–11], no analysis of drug overdose deaths was made.

Kuwait is an Arabian Gulf country with a population of around 4.4 million [12]. It is divided into 6 governorates (Fig. 1). The expatriate workforce constitutes about 70% of the population. The Kuwaiti nationals make up a smaller percentage of the population. One who follows the local news in Kuwait over the past decade clearly notices a huge increase in the attempts to smuggle illicit drugs to the country via air, sea, land and by mail. It is thought that the number of times the local authorities were successful at intercepting the entry of these substances are less that the times the substance was successfully smuggled and distributed in the country. A corresponding increase in emergency room visits is also noted among drug abusers due to an unintentional overdose which can ultimately result in death in a large number of people.

All cases that are suspected to have died secondary to a drug overdose are considered medicolegal cases in the State of Kuwait and have to be referred to the General department of criminal evidence (GDCE). Within this department the forensic pathology unit handles the case and performs all necessary toxicologic and anatomical tests. The latter includes a full autopsy and gross and microscopic examination of organs.

The purpose of this study was to investigate patterns of drug overdose deaths in Kuwait from 2014 to 2018. We decided to choose the 5 year period 2014–2018 as the filing system in the GDCE was more organized following 2014 and information can be retrieved easily. We

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were specifically interested in studying the relationships between demographic factors such as gender, age, nationality and residential area and find out any correlation with type of drugs used and common combinations of drugs.

Our specific research questions were:

1. What was the most common combination of drugs found in overdose victims?
2. Is there a relationship between drug types in overdose victims?
3. What are the differences across years for drug type and combination of drugs?
4. Is there a significant difference between year and number of drugs found in overdose victims?
5. What are the differences across genders (female versus male) for drug type, combination of drugs, and number of drugs found in overdose victims?
6. Is there a significant association between drug type and residential area?
7. Is there a significant relationship between age and drug type?
8. Does age significantly predict the number of drugs found during overdose?

2. Methods

After obtaining ethical approval from Kuwait University, our research team collected files from the GDCE which is under the auspices of the ministry of interior. Demographic Information regarding age, gender, area of residence, nationality were noted. In addition all results of toxicologic screening, autopsy report and radiologic findings were collected. Any information from crime scene investigation and police report were also reviewed. Cases that fit the criteria of death due to illicit drug overdose were included in the study.

3. Data analysis

Data analysis included descriptive statistics, correlations, chi-square analyses, and simple linear regression. Descriptive statistics were used to evaluate percentage differences between groups based on year of overdose, gender of victim, drug type, and combinations of drug types. For correlation analysis, the relationship of the various categories of drug types was correlated with Spearman Rho correlation analysis. In addition, age was correlated with each drug type using point-biserial correlations. A one-way analysis of variance (ANOVA) was utilized to evaluate the differences between the number of drugs found in overdose victims' system across years. For chi-square analyses, significant differences were evaluated by comparing categories of drug type and residence (location). Last, a simple linear regression was analyzed with age as the predictor variable and number of drugs found in overdose victim as the dependent variable.

4. Results

The sample included 344 drug overdose victims from 2014 to 2018. About 67% (231/344) are Kuwaiti nationals. The remaining victims were of various nationalities from the expatriate workforce. The average age of the drug overdose victims was 38.00 (SD = 11.28), ranging 15 to 71. Of this sample, 335 (97.4%) were male and 9 (2.6%) were female. The majority of overdoses were in Hawally (31.4%), followed by Ahmadi (17.2%), Farwaniyah (17.2%), Kuwait City (12.5%), Mubarak Al Kabeer (11.3%), and Jahra (10.5%). In addition, the majority of

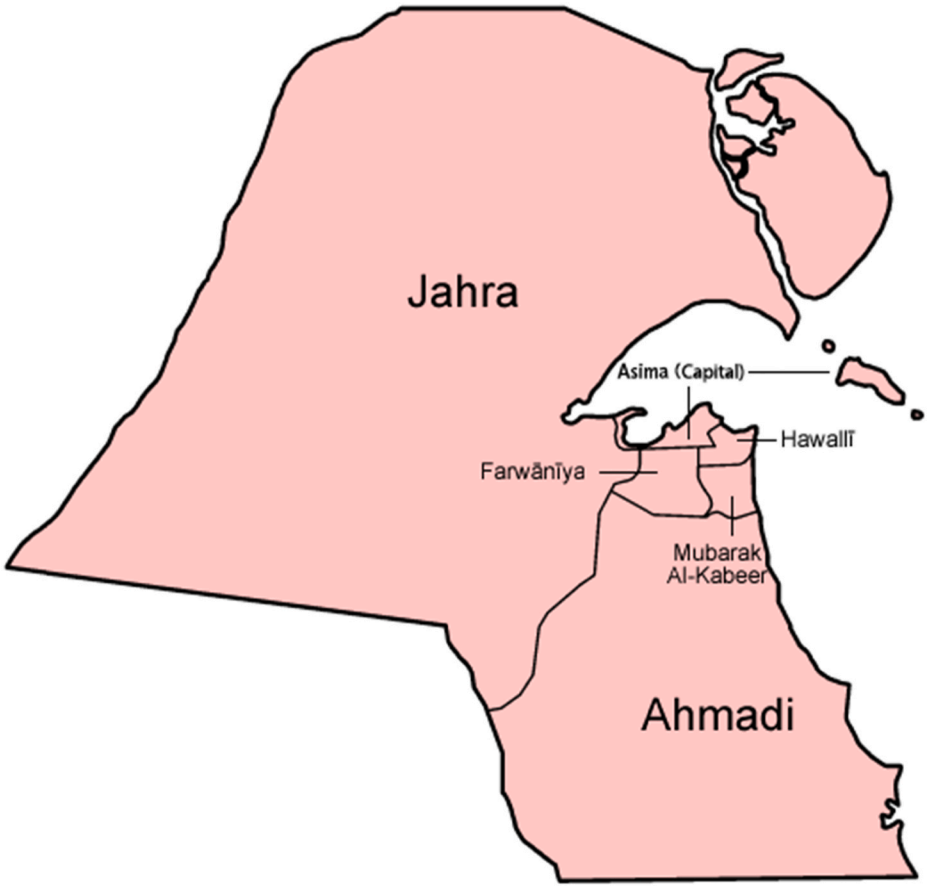

Fig. 1. Governorates of the State of Kuwait.
Asima (capitol) = Kuwait city.

overdoses occurred in 2018 (34.0%).

The majority of overdose victims had morphine in their system (79.9%), followed by benzodiazepine (43.0%), amphetamine (23.3%), methamphetamine (23.3%), and cannabis (14.2%). Few overdose victims had spice (3.8%), tramadol (2.3%), fentanyl (0.6%), cocaine (0.6%), alcohol (0.3%), and heroin (0.3%). Fig. 2 summarizes the type of drug and Table 1 summarizes the characteristics of the sample.

4.1. What was the most common combination of drugs found in overdose victims?

Several overdose victims had multiple drugs in their system, the average number of drugs was 1.92 ($SD = 0.8$), ranging 1 to 5. The most common substance retrieved was morphine alone (27.6%), followed by the following combinations: morphine and benzodiazepines (20.6%), morphine and amphetamine (5.2%), morphine, benzodiazepines, and methamphetamine (5.2%), morphine, cannabis, and benzodiazepines (3.5%), amphetamine and methamphetamine (3.2%), and morphine and methamphetamine (3.2%). Table 2 summarizes the combination of drugs.

4.2. Is there a relationship between drug types in overdose victims?

Spearman Rho correlations were conducted to evaluate whether the use of one drug was correlated with the use of another drug found in a person's system. Table 3 summarizes the results. Findings revealed that morphine was significantly less likely to be found in combination with cannabis, amphetamine, methamphetamine, spice, cocaine, alcohol, and fentanyl ($ps < .05$). In contrast, morphine was significantly more likely to be found in combination with benzodiazepines ($p < .01$). Cannabis is also significantly more likely to be found with amphetamine and alcohol ($ps < .05$). Amphetamine is also significantly more likely to be found with methamphetamine ($p < .01$). Whereas methamphetamine is less likely to be found with spice ($p < .05$).

The higher the number of drugs in a persons' system, the more likely they were to have morphine, cannabis, amphetamine, methamphetamine, benzodiazepines, or tramadol as one of those drugs ($p < .01$).

4.3. What are the differences across years for drug type and combination of drugs?

4.3.1. Drug type by year

As can be seen in Table 4, overdose victims with morphine in their system decreased 28% from 2014 to 2018 (from 98.4% to 59.8%). Similarly, benzodiazepine overdoses decreased by 21.4%, cannabis 10.3%, and amphetamine decreased slightly by 1.5% from 2014 to 2018.

In contrast, methamphetamine overdoses increased by 34.0% from 2014 to 2018 (from 4.8% to 36.8%). Spice overdoses also increased by 10.3% from 2014 to 2018. Overdoses with cocaine, heroin, alcohol, and fentanyl remained very low from 2014 to 2017 (ranging 0%–1.7%).

Table 1
Characteristics of the study population.

		F	%
Year	2014	63	18.3
	2015	63	18.3
	2016	33	9.6
	2017	68	19.8
	2018	117	34
Gender	Female	9	2.6
	Male	335	97.4
Location	Hawally	108	31.4
	Ahmadi	59	17.2
	Farwaniyah	59	17.2
	Kuwait City	43	12.5
	Mubarak Al Kabeer	39	11.3
	Jahra	36	10.5
Drug Type	Morphine	275	79.9
	Benzodiazepines	148	43
	Amphetamine	80	23.3
	Methamphetamine	80	23.3
	Cannabis	49	14.2
	Spice	13	3.8
	Tramadol	8	2.3
	Fentanyl	2	0.6
	Cocaine	2	0.6
	Alcohol	1	0.3
	Heroin	1	0.3

4.3.2. Combination of drugs by year

When assessing the most common overdose combinations by year, morphine and benzodiazepine (36.5%) were the most common combination in 2014, followed by morphine alone (23.8%), and morphine and amphetamine (11.1%). For 2015, morphine alone (26.5%) was the most common drug found post mortem, followed by morphine and benzodiazepine (12.7%) and morphine and amphetamine (12.7%). For 2016, morphine alone (36.4%) was the most common substance, followed by

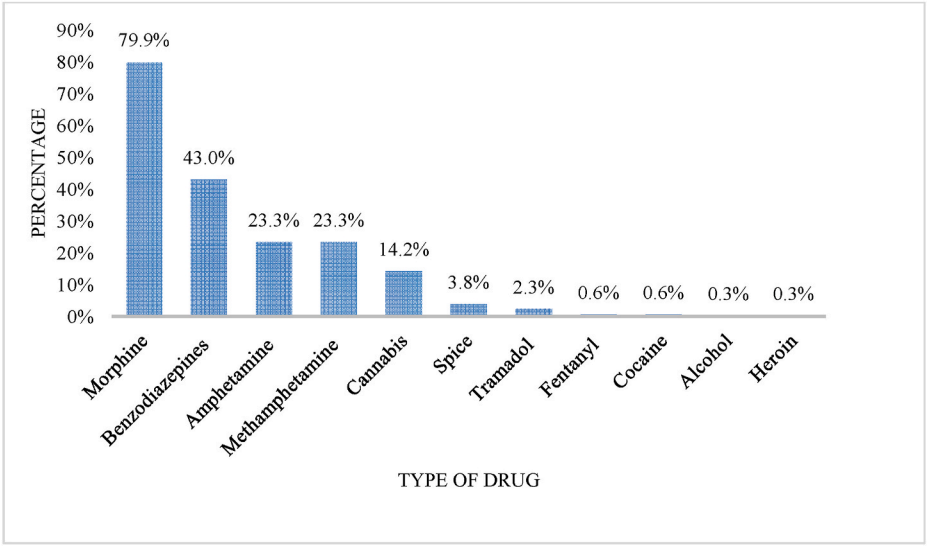

Fig. 2. Drugs identified by blood toxicological screening.

Table 2
Percentage of drug combinations in the study population.

Combination of Drugs	*F*	%
Morphine	95	27.6
Morphine/Benzodiazepines	71	20.6
Morphine/Amphetamine	18	5.2
Morphine/Benzodiazepines/Methamphetamine	18	5.2
Morphine/Cannabis/Benzodiazepines	12	3.5
Amphetamine/Methamphetamine	11	3.2
Morphine/Methamphetamine	11	3.2
Methamphetamine	9	2.6
Morphine/Benzodiazepines/Amphetamine/Methamphetamine	9	2.6
Morphine/Benzodiazepines/Amphetamine	8	2.3
Spice	8	2.3
Amphetamine	7	2
Morphine/Cannabis	7	2
Morphine/Cannabis/Amphetamine	5	1.5
Morphine/Cannabis/Benzodiazepines/Amphetamine	5	1.5
Benzodiazepines/Methamphetamine	4	1.2
Morphine/Amphetamine/Methamphetamine	4	1.2
Benzodiazepines	3	0.9
Benzodiazepines/Cannabis	3	0.9
Cannabis/Amphetamine	3	0.9
Morphine/Benzodiazepines/Tramadol	3	0.9
Benzodiazepines/Amphetamine	2	0.6
Benzodiazepines/Spice	2	0.6
Benzodiazepines/Tramadol	2	0.6
Cannabis/Amphetamine/Methamphetamine	2	0.6
Cannabis/Methamphetamine	2	0.6
Cocaine	2	0.6
Morphine/Cannabis/Amphetamine/Methamphetamine	2	0.6
Amphetamine/Spice	1	0.3
Benzodiazepines/Amphetamine/Methamphetamine	1	0.3
Benzodiazepines/Cannabis/Amphetamine	1	0.3
Benzodiazepines/Cannabis/Spice	1	0.3
Cannabis	1	0.3
Cannabis/Alcohol	1	0.3
Cannabis/Fentanyl	1	0.3
Methamphetamine/Fentanyl	1	0.3
Methamphetamine/Tramadol	1	0.3
Morphine/Benzodiazepines/Methamphetamine/Tramadol	1	0.3
Morphine/Cannabis/Benzodiazepines/Amphetamine/ Methamphetamine	1	0.3
Morphine/Cannabis/Benzodiazepines/Methamphetamine	1	0.3
Morphine/Cannabis/Methamphetamine	1	0.3
Morphine/Heroin/Methamphetamine	1	0.3
Morphine/Spice	1	0.3
Morphine/Tramadol	1	0.3

morphine and benzodiazepine (21.2%) and morphine, methamphetamine, and benzodiazepine (12.1%). For 2017, morphine and benzodiazepine (26.5%) was the most common combination, followed by morphine alone (23.5%). For 2018, morphine alone (24.8%) was the most common drug, followed by morphine and benzodiazepine (12.8%) and methamphetamine and amphetamine (8.5%).

4.4. Is there a significant difference between year and number of drugs found in overdose victim?

A one-way analysis of variance revealed that the number of drugs found in the individuals' systems following an overdose did not differ significantly across years ($F = 0.992$, $p = .412$). Table 5 shows a summary of means for number of drugs by year.

4.5. What are the differences across genders (female versus male) for drug type and combination of drugs?

Although the number of females in the study was extremely small, nonetheless, we attempted to find any differences from the male population in terms of the following patterns:

Drug Type by Gender.: females (77.8%) and males (80.0%) were similar in their overdose with morphine in their system. Females (22.2%) and males (23.3%) also showed similar proportions of overdose with amphetamine.

For methamphetamine, females (55.6%) had a higher proportion of methamphetamine in their systems, in comparison to males (22.4%). Females (66.%) also showed higher use of benzodiazepine and cannabis (22.2%), in comparison to males (42.4% and 14.0%, respectively).

In contrast, females showed no use of tramadol, cocaine, spice, heroin, alcohol, or fentanyl whereas a few males (about 8 or less) were found with these drugs in their system after an overdose. Table 6 summarizes drug overdose type by gender.

Combination of drugs: The most common combination of drugs in system after an overdose for females was morphine alone (22.2%) or morphine, benzodiazepine, amphetamine, and methamphetamine (22.2%). In contrast, the most common combination of drugs in system after an overdose for males was morphine alone (28%), followed by morphine and benzodiazepine (20.9%).

Number of drugs: The average number of drugs found in females' systems after an overdose was 2.44 ($SD = 1.33$; ranging 1 to 4), whereas males had an average of 1.90 (SD = 0.85; ranging 1 to 5) drugs in their system.

4.6. Is there a significant association between drug type and residential area?

A chi-square test of independence was performed to examine the association between reason for drug type and location. The only significant differences that emerged was use of morphine and methamphetamine across locations. All other drug types were nonsignificant (*ps* $> .05$).

The association between morphine use and location was significant, $\chi^2(5) = 16.464$, $p = .006$. Follow-up analyses revealed Jahra had significantly lower proportion of morphine overdoses in comparison to the other locations ($p < .001$). The other locations did not differ

Table 3
Spearman Rho Correlations for Drug Type combinations.

		1	2	3	4	5	6	7	8	9	10	11
1	**Morphine**	–										
2	**Cannabis**	-.107*										
3	**Amphetamine**	-.205**	.150**									
4	**Methamphetamine**	-.257**	−0.047	.186**								
5	**Spice**	-.358**	−0.037	−0.073	-.109*							
6	**Benzodiazepines**	.157**	0.049	−0.103	0.008	−0.08						
7	**Tramadol**	−0.067	−0.063	−0.085	0.006	−0.031	0.1					
8	**Cocaine**	-.153**	−0.031	−0.042	−0.042	−0.015	−0.066	−0.012				
9	**Heroin**	0.027	−0.022	−0.03	0.098	−0.011	−0.047	−0.008	−0.004			
10	**Alcohol**	-.108*	.132*	−0.03	−0.03	−0.011	−0.047	−0.008	−0.004	−0.003		
11	**Fentanyl**	-.153**	0.078	−0.042	0.048	−0.015	−0.066	−0.012	−0.006	−0.004	−0.004	
12	**# Drugs**	.143**	.404**	.405**	.399**	-.107*	.630**	.132*	−0.09	0.072	0.014	0.02

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 4
Drug use by year.

Year	Used	Morphine		Amphetamine		Methamphetamine		Spice		Benzodiazepines		Tramadol		Cocaine		Heroin		Alcohol		Fentanyl		Cannabis	
		f	%	*F*	%	*F*	%	*F*	%	*F*	%	*F*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
2014	No	1	1.6	47	74.6	60	95.2	63	100	28	44.4	63	100	63	100	63	100	63	100	63	100	50	79.4
	Yes	62	98.4	16	25.4	3	4.8	0	0	35	55.6	0	0	0	0	0	0	0	0	0	0	13	20.6
2015	No	2	3.2	47	74.6	53	84.1	63	100	42	66.7	62	98.4	63	100	63	100	63	100	63	100	54	85.7
	Yes	61	96.8	16	25.4	10	15.9	0	0	21	33.3	1	1.6	0	0	0	0	0	0	0	0	9	14.3
2016	No	4	12.1	29	87.9	23	69.7	33	100	14	42.4	31	93.9	33	100	33	100	33	100	33	100	54	85.7
	Yes	29	87.9	4	12.1	10	30.3	0	0	19	57.6	2	6.1	0	0	0	0	0	0	0	0	9	14.3
2017	No	15	22.1	52	76.5	54	79.4	67	98.5	35	51.5	65	95.6	67	98.5	68	100	68	100	68	100	56	82.4
	Yes	53	77.9	16	23.5	14	20.6	1	1.5	33	48.5	3	4.4	1	1.5	0	0	0	0	0	0	12	17.6
2018	No	47	40.2	89	76.1	74	63.2	105	89.7	77	65.8	115	98.3	116	99.1	116	99.1	116	99.1	115	98.3	105	89.7
	Yes	70	59.8	28	23.9	43	36.8	12	10.3	40	34.2	2	1.7	1	0.9	1	0.9	1	0.9	2	1.7	12	10.3

Table 5
Summary of means for number of drugs by year.

Year	N	Minimum	Maximum	Mean	Std. Deviation
2014	63	1	4	2.0476	0.81178
2015	63	1	4	1.873	0.81304
2016	33	1	4	2.0303	1.07485
2017	68	1	4	1.9559	0.87133
2018	117	1	5	1.812	0.87031

significantly in their morphine use. Table 7 presents the results of the chi-square test and descriptive statistics (see Table 8).

The association between methamphetamine use and location was also significant, $\chi^2(5) = 14.431$, $p = .013$. Follow-up analyses revealed Jahra had a significantly higher proportion of methamphetamine use in comparison to the other locations ($p < .001$). All other locations methamphetamine use did not differ significantly. Table 7 presents the results of the chi-square test and descriptive statistics.

4.7. Is there a significant relationship between age and drug type?

A point-biserial correlation was conducted to evaluate whether age was correlated with drug type. Results revealed that older individuals were less likely to have cannabis in their system during an overdose ($\rho = -.158$, $p < .01$). In addition, older individuals were more likely to have cocaine in their system during an overdose ($\rho = 0.126$, $p < .05$). All other drug types were not significantly correlated with age (*ps* $> .05$).

4.8. Does age significantly predict the number of drugs found during overdose?

A simple linear regression was conducted with number of drugs in system at time of overdose as the dependent variable and age as the predictor variable. Results revealed that age did not significantly predict the number of drugs in a persons' system at the time of overdose ($F = 0.471$, $p = .493$).

5. Discussion

The majority of the victims were Kuwaiti nationals. This is an expected finding as the expatriate workforce arrive in the country with the intention of working and improving their standard of living. The state of Kuwait is an oil-rich country with a high GDP per capita as per world bank data [13]. The surplus amount of money per capita would allow people to afford illicit drugs for recreational use and engage in the act of IDU and subsequently overdose death. Due to the very low population of Kuwaitis (about 1.3 million) [12], the social setup is in a such a way that people and families know each other either by name or personally or via blood relations. Families have a large pride in their reputation and name within the Kuwaiti community. Due to the aforementioned reasons it was impossible for our research group to obtain information regarding name, marital status, employment, children, history of addiction and access to hospital files. The latter would help us understand the medical/psychiatric background of the fatalities and increase our knowledge about patterns of prescribed/IDU use in the country. The year 2018 shows almost double the number of deaths compared to individual previous years which undermines the magnitude of the problem. It also signals an increasing trend of drug abuse. The average age of death due to drug overdose was 38. A finding that isn't surprising given the traditional young age of illicit drug users in Kuwait and all around the world [14–16].

The gender difference is quite striking in our population as apposed the literature. The vast majority of victims were male and only a small minority were female. In studies from countries around the world like the United States of America, Australia, the United Kingdom, Europe and China [17–21], while males still make the larger proportion of IDU,

Table 6
Drug use by gender.

Gender	Used	Morphine		Amphetamine		Methamphetamine		Spice		Benzodiazepines		Tramadol		Cocaine		Heroin		Alcohol		Fentanyl		Cannabis	
		f	%	F	%	*f*	%	*f*	%	F	%	*f*	%	F	%	*f*	%	*f*	%	*f*	%	*f*	%
Female	No	2	22.2	7	77.8	4	44.4	9	100	3	33.3	9	100	9	100	9	100	9	100	9	100	7	77.8
	Yes	7	77.8	2	22.2	5	55.6	0	0	6	66.7	0	0	0	0	0	0	0	0	0	0	2	22.2
Male	No	67	20	257	76.7	260	77.6	322	96.1	193	57.6	327	97.6	333	99.4	334	99.7	334	99.7	333	99.4	288	86
	Yes	268	80	78	23.3	75	22.4	13	3.9	142	42.4	8	2.4	2	0.6	1	0.3	1	0.3	2	0.6	47	14

Note: f = frequency; % = percentage.

Table 7
Results of chi-square test and descriptive statistics for drug use and location: Morphine.

Location	Use	
	No	Yes
Ahmadi	14 (23.7%)	45 (76.3%)
Farwaniyah	5 (8.5%)	54 (91.5%)
Hawally	20 (18.5%)	88 (81.5%)
Jahra	15 (41.7%)	21 (58.3%)
Kuwait City	7 (16.3%)	36 (83.7%)
Mubarak Al Kabeer	8 (20.5%)	31 (79.5%)

Note. $\chi^2 = 16.464$, df = 5; Numbers in parentheses indicate column percentages.

Table 8
Results of chi-square test and descriptive statistics for drug use and location: Methamphetamine.

Location	Use	
	No	Yes
Ahmadi	48 (81.4%)	11 (18.6%)
Farwaniyah	39 (66.1%)	20 (33.9%)
Hawally	88 (81.5%)	20 (18.5%)
Jahra	21 (58.3%)	15 (41.7%)
Kuwait City	36 (83.7%)	7 (16.3%)
Mubarak Al Kabeer	32 (82.1%)	7 (17.9%)

Note. $\chi^2 = 14.431$, df = 5; Numbers in parentheses indicate column percentages.

females still comprise a significantly higher number than our study. We think that if we were to perform the same study in Persian Gulf countries or the majority of Arab countries we will probably obtain similar results. In a recent study performed in the Islamic Republic of Iran in 2020, the authors were able to collect 465 cases of IDU that suffered from episodes of non-fatal drug overdoses. No female was present in their study [22]. The reason can be attributed to the fact that the aforementioned countries are Islamic/conservative countries and females in their teenage years and even as young adults live with their parents. They are under the supervision and support of their parents until they get married and leave the household. However, males do have a more flexible teenage and adult life, which includes freedom of travelling alone and unsupervised social interaction. This has led many youth to engage in acts such as IDU. Accidental deaths, namely secondary to road traffic accidents, have also increased in Kuwait [23] and we do believe that the high degree of independence and freedom at this young age are contributing factors.

In terms of residential area, the highest percentage of deaths was in Hawally governorate. It is most probably a reflection of the infrastructure of this place. It consists exclusively of rental apartments and buildings. It is where many people rent out apartments for "leisure and recreation." We would expect it to be a "hotspot" for drug use and ultimate overdose. The other governorates are primarily residential areas and consists of family houses so it probably will be less of an attractive area for IDU for privacy reasons. Notably Jahra governorate has the least percentage of cases possibly due the underprivilege status of most families living in this governorate. Therefore, purchase of illicit drugs might be costly to most of its inhabitants. We believe that this pattern is worthy of noting and expanding on. In one of the few publications from Kuwait that studied patterns of drug abuse among university student [9], they concluded that IDU was more common in students from a high socioeconomic background. We therefore think that most victims in the study are nationals that are "better off" from an income perspective. These people can afford personal rentals for their leisure or have houses in residential areas. This comprises the bulk of our study population, while people in Jahra are historically underprivileged. After reviewing worldwide literature there does not seem to be a clear consensus when relating socioeconomic status/income to substance abuse. However, many articles favor an increased use as income increases [24–26].

Which is in keeping with our findings.

Opioids are the most commonly found substances in post mortem toxicology screening in our study population. Opioid abuse and opioid overdose related death are a worldwide problem. In a recent review by Lyden et al., it was considered an epidemic in the United States of America [27]. These authors mentioned that the problem starts with prescription opioids and eventually leads to addiction to heroin and illicitly manufactured fentanyl and subsequent death due to the latter 2 drugs. Data from the Centre for disease control has also shown that from 2011 to 2019 the majority of drug overdose deaths were synthetic opioids [28,29]. In their data oxycodone, methadone and heroin were the amongst the most common opioids. In our data these 3 drugs are extremely uncommon, however, morphine was the most common substance retrieved from our victims. Other synthetic opioids such as tramadol and fentanyl were only found in 5 victims in our study and heroin was found in only one person. Although trends of fentanyl abuse are increasing worldwide [30,31], this does not seem to be the case in Kuwait. It appears that the trend of opioid use in Kuwait is almost exclusive to morphine.

The second most common substance is benzodiazepines. Benzodiazepines are known prescription sedatives. Unlike morphine, Benzodiazepines are almost always combined with another substance in our study victims. The combination of morphine and Benzodiazepines is known to increase the risk of death due to overdose [32,33]. An increased worldwide trend of benzodiazepine abuse has been noted by several authors from almost all continents in the globe and was combined in a recent systematic review by Votaw et al. [34]. Alprozam appears to be the favored global drug, however, diazepam was almost exclusively the benzodiazepine found in our population. Another difference is that we had a higher percentage of victims compared to other studies worldwide. In 2 studies done on thousands of individuals in the United States of America and Sweden. The percentage of deaths of people with benzodiazepines in their blood stream was 16.1% and 19% respectively [5,35]. Our population had a percentage of 43%. This might signify an easier access to these substances in Kuwait.

Amphetamines and methamphetamines, known prescription stimulants, were the third most common substance found in our victims. Almost invariably found together and in combination with other substances, constitute 23.3% of fatalities. Fatalities secondary to the sole use of these 2 stimulants were very low in our study. Similarly, other colleagues who have studied methamphetamine abuse found it to be a commonly abused substance worldwide [36,37], however deaths directly attributed to its use were very low.

Another finding worthy of noting is that the alcohol and cocaine, 2 substances that are commonly abused worldwide, were only found in 1 and 2 victims respectively. In a systemic literature review done by Martins et al. in 2015 [38], Cocaine was found to be a commonly abused drug worldwide, most commonly in association with opioids. It is not clear why cocaine is not used as commonly in Kuwait.

Cannabis, a psychoactive drug from the cannabis plant, is commonly used worldwide for medical and recreational use [39,40]. While the government of Kuwait has not approved it for medical use, it is being used in Kuwait on a recreational basis and about 13.3% of our population tested positive for the active metabolite in post mortem toxicology screening. The percentage is almost double that number when spice, a synthetic cannabinoid, is factored in. Cannabis and cannabinoids are not known to cause acute toxicity leading to death in humans, it is therefore quite surprising that one of our victims tested positive for cannabis only and eight for spice only.

Some of the study population had as many as 5 drugs in their system. This probably reflects the adventurous nature of illicit drug users and the continuous quest to find the desired “state of mind” from particular drugs. It may also lead us back to the point that the surplus amount of money many people have can drive them to buy whatever is “new” or different in this area. Polydrug intake is a recognized, increasing problem among illicit drug users worldwide. Several authors have found this to be the case [32,41].

We have attempted to compare IDU patterns in association with gender. Although the number of female victims was extremely small, however, type and proportion of drugs found in their system was statistically similar in the most part with male victims. However, on average females had less numbers of drugs than males, which may also represent the less adventurous nature of females. Other studies have found a large numbers of women engaged in polydrug intake [42–44].

Jahra governorate, the most underprivileged of all governorates, had statistically significant low number of morphine overdoses and high number of amphetamine overdoses. This might be explained by the higher cost of morphine and cheaper cost of amphetamines.

6. Conclusion

After analyzing our data and reviewing international studies we think that the following can be concluded from the first study of its kind done in Kuwait to study the drug overdose victims:

First, drug abuse appears to be a public health problem that is increasing in severity. Secondly more efforts need to be done by government agencies, namely the health and law sectors, to find out how people are getting access to these substances. More resources need to be put in this field of research and more transparency needs to be practiced with the researchers to study the social/psychological factors underlying these victims. Maybe then certain practices/laws can be put in place to reverse these factors.

Ethical approval

Kuwait university approved the research project via grant no MG01/17.

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Declaration of competing interest

The authors declare that this is a novel work that hasn’t been published before or considered for publication elsewhere.

The authors all declare no conflict of interest.

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