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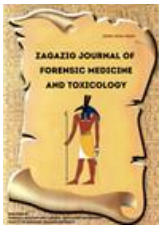

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Original article

Correlation between Drug Abuse in Drivers and Occurrence of Road Traffic Accidents

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Abstract

Background: Illicit drug use significantly impairs brain functions—including perception, attention, balance, and coordination—thereby increasing the risk of severe road traffic crashes and fatalities. This study aimed to assess the relationship between substance use and injury severity among drivers in Upper Egypt and to identify the most commonly abused drugs to help establish future preventive measures. **Subject and Methods:** This cross-sectional study included drivers involved in road traffic accidents who were admitted to the emergency units of university hospitals in Aswan and Sohag, Upper Egypt, between January 1st, 2020, and January 1st, 2021. Data were collected on demographics, vehicle type, collision type, and injury patterns. Urine samples from 372 drivers were analyzed for tramadol, cannabis, amphetamines, cocaine, morphine, barbiturates, benzodiazepines, and alcohol using multi-drug rapid dipstick tests. **Results:** All participants were male, with most aged between 26–35 and 36–45 years. A total of 71.8% tested positive for at least one drug, and 15.7% had evidence of dual-drug use. The most detected substances were cannabis (29.2%), tramadol (27.0%), and morphine (23.6%). Alcohol was not detected in any sample. **Conclusion:** This study highlights the widespread use of illicit and prescription drug substances among drivers, posing a significant risk to traffic safety. These findings highlight the urgent need for improved drug awareness programs, stricter traffic law enforcement, and expanded screening initiatives to reduce drug-related accidents.

I. Background

Every year, road traffic accidents (RTAs) claim the lives of almost 1.25 million people worldwide. Most victims are within the highly productive age group (15–29 years) (Bhatia and Gupta 2024) According to studies conducted by the WHO in low- and middle-income nations, a sizable portion of expert drivers take illicit drugs and stimulants to stay alert and minimize fatigue throughout their lengthy workdays (Yunusa et al., 2017). Exposure to illicit drugs can severely impair brain functions such as perception, attention, balance, and coordination, leading to catastrophic car crashes and fatal accidents (Berning et al., 2015) Drug-impaired drivers pose a significant risk to both them and others on the road. Aglan and Adawi, 2016). Additionally, the World Health Organization (WHO) said in 2016 that drug use and road safety are becoming global concerns. Most of the attention paid to drug-impaired driving has been directed toward impairment resulting from the use of illegal substances

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like cocaine and cannabis. However, drug impairment is not limited to illegal substances (Asbridge et al., 2016). Driving ability can also be impaired by various prescriptions and over-the-counter medications. For instance, opioid painkillers, stimulants, and sedative-hypnotics pose risks such as addiction, overdose, and impaired cognitive function. These risks include addiction, overdose, and death, all of which have a substantial burden on health care, social services and public safety systems (Riester et al., 2024).

Egypt is one of the top nations with a high number of road fatalities. A recent estimate reported that those RTAs caused 767 Disability-Adjusted Life Years (DALYs) to be lost per 100,000 people, ranking among the highest global mortality rates (Arafa et al., 2019). This study aimed to assess the frequency of road traffic injuries (RTIs) among a random sample of drivers admitted to the emergency trauma units of two university hospitals in Upper Egypt (Aswan and Sohag) to evaluate the potential role of substance abuse as a risk factor for RTIs, examine the relationship between substance use and injury severity, identify the most commonly abused substances, and monitor patient outcomes from hospital admission to discharge or death, including the effectiveness of treatment modalities and follow-up plans.

This study addresses a critical research gap by investigating substance use among drivers involved in RTAs in Upper Egypt, a region with limited data despite high fatality rates (Arafa et al., 2019). Unlike previous studies (Berning et al., 2015) that focus on illicit drugs in high-income countries, this research examines the impact of both illicit and prescription drugs on injury severity and patient outcomes. Tracking cases from admission to discharge or death provides hospital-based insights that can inform road safety policies and public health interventions to reduce drug-related accidents.

II. Subjects and Methods

This research was carried out in the emergency departments of two university hospitals in Upper Egypt (Aswan and Sohag). The study included 372 drivers involved in RTAs, the sample size was calculated using Epi Info™ statistical software, considering the estimated prevalence of substance use among drivers from previous studies, with a 95% confidence level and an acceptable margin of error. This ensured adequate statistical power to detect significant associations between drug use and injury severity. A random sampling method was applied to select participants, and only those meeting the inclusion criteria were enrolled in the study.

All participants provided their written informed consent, and the research was authorized by Aswan University's Ethics Committee research ethics council, "Asw. Uni/423/12/19".

II.1 Study design

This cross-sectional study was conducted over one year, from January 1st, 2020, to January 1st, 2021, among drivers involved in RTAs admitted to the emergency departments of two university hospitals in Upper Egypt (Aswan and Sohag). Participants were grouped into five age categories: 15–25, 26–35, 36–45, 46–55, and over 55 years. Additionally, drivers were categorized based on urine screening results for illicit and prescription drugs: those who tested positive were assigned to Group A, while those who tested negative were assigned to Group B. This classification was used to compare demographics, drug use patterns, and clinical outcomes.

II.2 Subjects

All demographic and accident-related information was collected through a structured questionnaire, which was completed by drivers and/or their relatives.

Inclusion Criteria

The study included drivers involved in RTAs, specifically focusing on rear-end collisions.

Exclusion Criteria

To ensure accuracy in substance detection, participants were excluded if they:

- Had received medications with false-positive urine drug test results
- Had chronic diseases or medical conditions that could impact psychomotor performance.

Sample Collection and Drug Screening

Urine samples (10–50 mL) were collected in sterile plastic containers, transported in ice-cooled boxes, and stored at -20°C until analysis.

Samples were tested for tramadol, cannabis, amphetamines, cocaine, morphine, barbiturates, and benzodiazepines using a multi-drug rapid dipstick test (Dia Sure) manufactured by Hangzhou Biotest Biotech Company (China, 2018). This test is a one-step

competitive immunoassay panel for the qualitative detection of drugs of abuse.

Alcohol screening was performed using an alcohol rapid dipstick test (Right Sign) manufactured by Azure Biotech Inc. (USA, 2020).

II.3 Data analysis

• Findings were entered, coded, and processed using IBM SPSS Statistics, release 20.

• Parametric quantitative variables were reported as means, standard deviations (SDs), and ranges.

• Non-parametric numerical quantitative variables were presented as medians with interquartile ranges.

• Categorical data were summarized as occurrence rates and percentage distributions.

• Group comparisons for categorical variables were conducted using the Chi-square test (χ^2), and Fisher's exact test was applied when any cell had an expected count of less than 5.

• A 95% confidence interval (CI) was used with a 5% margin of error. A p-value <0.05 was considered statistically significant, while p>0.05 indicated no statistically significant difference.

III. Results

Of the 372 road traffic accident victims included in this study, 100.0% were men, and the majority, 62.0%, were married. The age range of 26 to 35 years had the highest percentage of injuries, 38.7%. Regarding employment, driving was the primary occupation for 57.3% of the victims (figure 4). In terms of education, 41.9% had an intermediate level of education. As for smoking, 79.8% were smokers, with 43.4% smoking an average of 4–10 cigarettes per day. Additionally, 56.5% of the victims resided in urban areas (Table 1).

Regarding the timing of accidents, the highest percentage, 28.2%, occurred in the morning between 6:00 AM and 12:00 PM, followed by 27.4% in the early morning between 12:00 AM and 6:00 AM.

Urine screening results showed that 71.8% of drivers tested positive for illicit and prescription drugs, while 28.2% tested negative. Additionally, all drivers 100.0% tested negative for alcohol. In this study, positive cases were classified as Group A, while negative cases were classified as Group B (Figure 1). Among the positive cases, 84.3% were single-drug users, whereas 15.7% used a combination of drugs (Figure 2). Cannabis 29.2% and tramadol 27.0% were the most frequently detected substances, with 5.6% of victims using both simultaneously. In contrast, none of the victims tested positive for barbiturates 0.0% (Figure 3).

A statistically significant relationship was found between age group and type of drug use. Cannabis use varied significantly across age groups (χ^2 = 28.037, p =0.001), with the highest prevalence in the 26–35 age group (46.2%), followed by 36–45 (30.8%) and 15–25 (23.1%).Tramadol use also differed significantly by age (χ^2 = 27.000, p = 0.001), being most prevalent among individuals aged 26–35 (29.2%).Benzodiazepine use showed significant age association (χ^2 = 17.143, p = 0.016), most commonly seen in the 36–45 and 46–55 age groups (50.0% in each).Use of combined drugs such as benzodiazepines and tramadol (χ^2 = 30.735, p = 0.001) and dual drug use involving cannabis with tramadol or opiate with tramadol (χ^2 = 25.225, p = 0.001) also showed highly statistically significant associations with age (Table 2).

Based on test results, illicit and prescription drug use was significantly higher among drivers in urban areas, 61.5%, compared to those in rural areas, 38.5% (Table 3).

A highly statistically significant relationship was found between the type of drug used and the type of vehicle driven. Cannabis use differed significantly across vehicle types (χ^2 = 15.586, p = 0.011), with the highest prevalence among taxi/light van drivers (35.7%) and the lowest among bus drivers (10.0%).

Tramadol use was most common among motorcyclists (27.3%), also showing significant variation by vehicle type (χ^2 = 16.254, p < 0.05). Benzodiazepine use as a single substance was highest among tractor drivers (16.7%), with a significant association between use and vehicle type (χ^2 = 19.587, p < 0.05).

Combined use of cannabis and tramadol was significantly more frequent among truck drivers (10.0%), motorcyclists (4.5%), and private car drivers (4.3%) (χ^2 = 21.357, p < 0.05). Cannabis and opiate use was observed only among private car drivers (4.3%), with statistically significant variation by vehicle type (χ^2 = 16.374, p < 0.05). Opiate and tramadol dual use was notably higher among pedal cyclists (20.0%) than in other vehicle types (Table 4) and (Figures 5& 6). Regarding the relationship between drug use and clinical outcomes, although most cases in both Group A and Group B were discharged without complications, 65.2% and 77.1%, respectively, a higher incidence of disabilities, 13.5%, and deaths, 14.6%,

was observed in Group A compared to Group B 8.6% and 11.4%, respectively (Table 5).

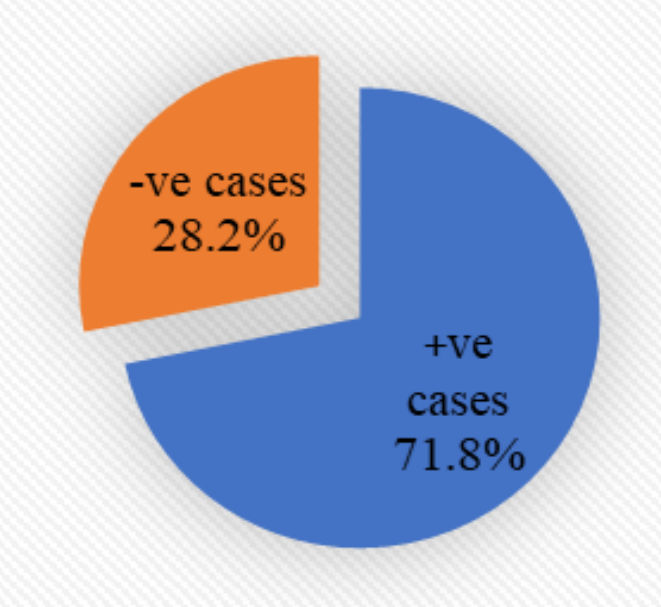

Figure (1): Pie chart showing the result of urine screening for illicit and prescription drugs.

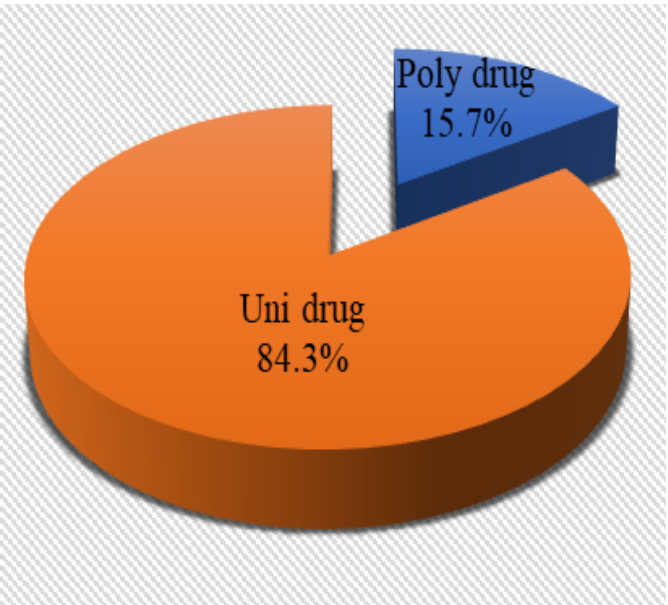

Figure (2): Pie chart showing the percentage of uni and polydrug users among the positive studied population.

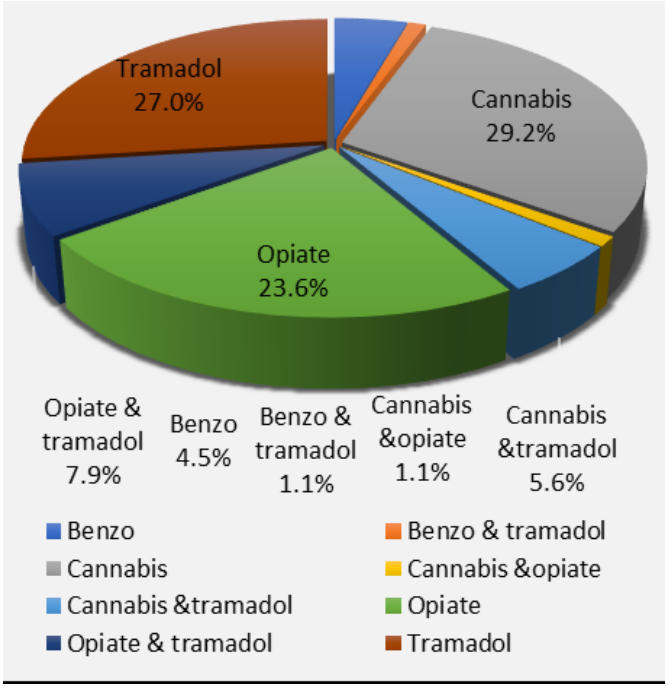

Figure (3): Pie chart showing the percentage distribution of drugs in the studied population.

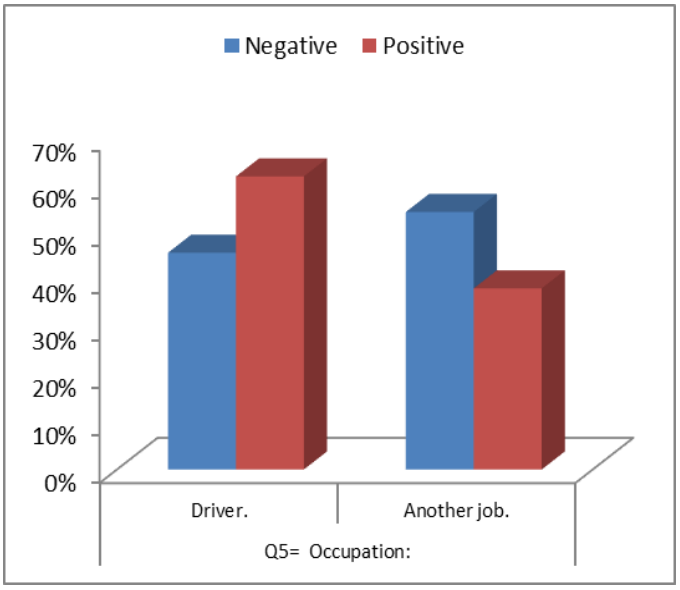

Figure (4): Bar graph shows occupational distribution of drivers of road traffic accidents in relation to drug use

Table (1): Socio-demographic characteristics of the study participants

Characteristics	Total (N=372)	%
Age groups (years):		
▪ 15–25	48	12.9%
▪ 26–35	144	38.7%
▪ 36–45	123	33.1%
▪ 46–55	48	12.9%
▪ > 55	9	2.4%
Gender (sex):		
▪ Male	372	100.0%
▪ Female	0	0.0%
Marital status:		
▪ Single	75	20.2%
▪ Married	231	62.0%
▪ Divorced	36	9.7%
▪ Widow	30	8.1%
Educational level:		
▪ Read and write	63	16.9%
▪ Primary	18	4.9%
▪ Intermediate	156	41.9%
▪ Secondary and high	135	36.3%
Occupation:		
▪ Driver	213	57.3%
▪ Another job	159	42.7%
Residence:		
▪ Urban	210	56.5%
▪ Rural	162	43.5%
Smoking:		
▪ Yes	297	79.8%
▪ No	75	20.2%

No: number %: Percentage

Figure (5): Positive test for tetrahydrocannabinol and morphine

Figure (6): Positive test for tramadol

Table 2: Distribution of Drug Types Among Various Age Groups in road traffic accidents Drivers Hospitalized at Upper Egypt University Hospitals (Jan 1, 2020 – Jan 1, 2021)

Type of drugs	Age groups (years)									
	15-25 yrs		26-35 yrs		36-45 yrs		46-55 yrs		> 55 yrs	
	No	%	No	%	No	%	No	%	No	%
BZs	0	0.0%	0	0.0%	6	50.0%	6	50.0%	0	0.0%
BZs and tramadol	0	0/0%	3	100.0%	0	0.0%	0	0.0%	0	0.0%
Cannabis	18	23.1%	36	46.2%	24	30.8%	0	0.0%	0	0.0%
Opiate	0	0.0%	30	47.6%	24	38.1%	9	14.3%	0	0.0%
Tramadol	9	12.5%	21	29.2%	18	25.0%	15	20.8%	9	12.5%
Cannabis and tramadol	0	0.0%	3	20.0%	9	60.0%	3	20.0%	0	0.0%
Opiate and tramadol	0	0.0%	6	28.6%	12	57.1%	3	14.3%	0	0.0%
Opiate and cannabis	0	0.0%	3	100.0%	0	0.0%	0	0.0%	0	0.0%
Chi-square test X^2	28.037		27.000		17.143		30.735		25.225	
P value	0.001**		0.001**		0.016*		0.001**		0.001**	

*$p < 0.05$; **$p < 0.01$ (statistically significant); Statistical test used: Chi-square test (X^2); BZs = Benzodiazepines
No: number; %: Percentage

Table 3: Residence of road traffic accidents drivers admitted to university hospitals in Upper Egypt between January 1st, 2020, and January 1st, 2021, regarding the kind of drugs used.

Type of drugs	Residence			
	Urban		Rural	
	No	%	No	%
Cannabis	48	61.5%	30	38.5%
Opiate	36	57.1%	27	42.9%
Tramadol	30	41.7%	42	58.3%
BZs	12	100.0%	0	0.0%
Opiate and tramadol	12	57.1%	9	42.9%
Cannabis and tramadol	9	60.0%	6	40.0%
BZs and tramadol	3	100.0%	0	0.0%
Opiate and cannabis	3	100.0%		0.0%

No: number %: Percentage BZs: benzodiazepines

Table 4: Distribution of the type of drug used by drivers of road traffic accidents hospitalized at Upper Egypt University Hospitals between January 1st, 2020, and January 1st, 2021, according to vehicle type.

	Type of drug															
Type of vehicle	BZs		BZs and tramadol		Cannabis		Opiate		Tramadol		Cannabis and Tramadol		Opiate and tramadol		Cannabis and opiate	
Heavy vehicles:	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Trucks	3	3.3	0	0.0	21	23.3	21	23.3	12	13.3	9	10.0	6	6.7	0	0.0
Buses	3	10.0	0	0.0	3	10.0	12	40.0	6	20.0	0	0.0	3	10.0	0	0.0
Tractors	3	16.7	0	0.0	3	16.7	6	33.3	3	16.7	0	0.0	0	0.0	0	0.0
Light vehicles:																
Taxi/light vans	3	3.6	0	0.0	30	35.7	9	10.7	15	17.9	0	0.0	3	3.6	0	0.0
Private car	0	0.0	3	4.3	9	13.0	6	8.7	15	21.7	3	4.3	3	4.3	3	4.3
Motorcycle	0	0.0	0	0.0	9	13.6	3	4.5	18	27.3	3	4.5	3	4.5	0	0.0
Pedal cycle	0	0.0	0	0.0	3	20.0	6	40.0	3	20.0	0	0.0	3	20.0	0	0.0
Total:	12	4.5	3	1.1	78	29.2	63	23.6	72	27	15	5.6	21	7.9	3	1.1
Chi square X2 test	15.586		16.254		19.587		21.357		16.374		14.08		5.464		16.254	
P value	0.016*		0.012*		0.003*		0.001*		0.011*		0.028*		0.485		0.012*	

*Statistically significant difference (*p* value < 0.05); ** highly statistically significant difference (*p* value < 0.001).
Statistical test used: Chi-square test (X^2); No: number; %: Percentage; BZs: benzodiazepines

Table 5: The association between drug use and clinical outcomes for road traffic accidents drivers admitted to university hospitals in Upper Egypt between January 1st, 2020, and January 1st, 2021.

		Drivers					
		Group A		Group B		Chi-square test	
		No	%	No	%	x^2	*p* value
Clinical outcome	Death	39	14.6%	12	11.4%	0.634	0.422
	Discharge disable	36	13.5%	9	8.6%	1.710	0.190
	Discharge free	174	65.2%	81	77.1%	5.012	0.025*
	Referred	18	6.7%	3	2.9%	2.135	0.143

*Statistically significant difference *(p value < 0.05)*; Statistical test used: Chi-square test (X^2); No: number; %: Percentage
Group A: illicit and prescription drugs positive; Group B: illicit and prescription drugs negative

IV. Discussion

According to the findings, the age group most frequently involved in RTAs was 26–35 years, 38.7%, followed by 33.1% of those aged 36 to 45. Those over 55 had the lowest rate of impact (2.4%). These results align with a study conducted in Norway by Jørgenrud et al. (2018), which demonstrated a significant negative correlation between older age and RTA involvement, with the greatest risk of fatal collisions being young males between the ages of 16 and 25. Furthermore, a significant increase in drug abuse was observed among drivers aged 26–45 years. This finding is consistent with Abdel Kareem and Ali (2018), who reported that drug abuse was most prevalent among individuals aged 18–30 years, a concerning trend given that this age group represents the most productive and active segment of society.

All RTA cases in this study were male 100%. A prior study by Mohamed et al. (2015) in Port Said, Egypt, attributed this to cultural norms restricting female mobility, family customs, lower female

literacy rates, and differences in driving behaviors between genders. Most RTA cases were married 62%, followed by single drivers 20.2%. These findings align with Issa (2016); they discovered that in Tabuk, Saudi Arabia, those with higher levels of education had a higher rate of RTAs. However, our results contrast with those of Johnell et al. (2014) in Sweden, who reported that married individuals had lower odds of RTA involvement This discrepancy may be attributed to family responsibilities and stress-related factors.

The highest prevalence of RTAs was observed among drivers with an intermediate educational level of 41.9%.

The current study found that 79.8% of RTA cases were smokers, with the highest involvement 43.4%) among those smoking 4–10 cigarettes per day. These findings align with Kogani et al. (2020) who reported that smoking and texting while driving were among the leading risk factors for motorcycle accidents.

In this study, 71.8% of RTA cases tested positive for drug use, with 48.3% using a single drug and 15.7% using multiple drugs. Among single-drug users, cannabis was the most prevalent, followed by tramadol and opiates. Among poly-drug users, opiate and tramadol co-use was the most common 7.9%, followed by cannabis and tramadol 5.6%. Notably, none of the cases tested positive for alcohol. These results are in line with Mageid (2017), who reported that cannabis is the most abused drug in Egypt due to its affordability and the widespread misconception that it enhances sexual performance and happiness.

In contrast, Mohamed et al. (2015) in Port Said, Egypt, found alcohol positivity in 18.3% of cases, cannabis in 27.5%, tramadol in 47.5%, amphetamines in 8%, and cocaine in 1.25%. Similarly, Hammam et al. (2018) reported that cannabis accounted for 80% of positive drug tests in over 50% of RTA cases in Sharqia, Egypt.

Conversely, Valen et al. (2019) in Norway found that alcohol was the most prevalent substance among impaired drivers in fatal crashes, followed by benzodiazepines, amphetamines, and cannabis. Unlike the Norwegian study, our study detected no alcohol use but identified a high prevalence of tramadol and opiates. This difference likely reflects variations in drug availability, cultural attitudes, and law enforcement practices.

A statistically significant association was observed between the type of drug used and the type of vehicle involved in crashes. Benzodiazepine use was more common among tractor drivers 16.7%, cannabis use among taxi drivers 35.7%, opiate use among bus and bicycle drivers 40%, and tramadol use among motorcycle drivers 27.3%. These findings are consistent with research by Kabbash et al. (2022). Aglan and Adawi (2016) also investigated drug use among taxi drivers in Cairo and reported that cannabis was the most used drug at 90.6%, followed by tramadol at 59.4%. Similarly, Abdel Kareem and Ali (2018) in Minia, Egypt, found that drug abuse was

most prevalent among taxi and microbus drivers, followed by private car and truck drivers. These findings suggest that certain driver categories may be more prone to drug use due to factors such as work-related stress, long driving hours, and easy access to drugs.

V. Conclusions

The widespread use of illicit and prescription drug substances among drivers poses a significant risk to traffic safety.

Limitations

Using urine dipstick tests may have led to false-positive or false-negative results, as they are less precise than confirmatory methods like GC-MS. Additionally, reliance on self-reported data from drivers and relatives introduces the risk of recall bias and underreporting.

Abbreviations List

RTA: Road Traffic Accident
RTIs: road traffic injuries
BNZ: Benzodiazepines
DALY: Disability-Adjusted Life Years
WHO: World Health Organization

Declarations

Funding

This research received no specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical approval

Ethical approval was granted by the Institutional Review Board (IRB) of the Faculty of Medicine, Aswan University (IRB No. 423/12/19).

Data availability statement

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of interest

The author declares that she has no competing interests.

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