



# Amphetamine-type stimulant (ATS) use and association with concurrent use of benzodiazepines, barbiturates and THC in the West Bank among male Palestinians: a cross-sectional study

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## ABSTRACT

**Introduction** Amphetamine-type stimulants (ATSs) are becoming a growing concern in the West Bank. Despite the focus on marijuana, statistics show that ATS seizures and clandestine laboratories indicate increased use of this highly addictive chemical among Palestinians. Shifting from marijuana to ATS can have severe clinical and social consequences, yet insufficient studies have been conducted. Our study aimed to evaluate the prevalence of ATS use and its correlation with other drug use in male Palestinians living in the northern West Bank.

**Methods** A cross-sectional study was conducted among Palestinian men aged ≥18 years from the north of the West Bank in 2022–2023. A self-administered questionnaire and urine analysis test were used to determine drug use. ATS users in this study tested positive for at least one of the following: amphetamines, ecstasy or methamphetamines.

**Results** Out of 787 participants, 129 (16.4%) were drug users. The prevalence of drug use among drug users was as follows: benzodiazepines (55.8%), amphetamines (41.1%), tetrahydrocannabinol (THC) (38.8%), methamphetamines (38.0%), barbiturates (9.3%), phencyclidine (1.6%) and ATS (48.8%); 84.1% were amphetamine and 77.7% were methamphetamine users. Most ATS users (68.3%) were polydrug users; 57.1% were benzodiazepine, 30.2% were THC and 12.7% were barbiturate users. The adjusted binary logistic regression revealed that ATS users were more likely to be benzodiazepine (OR=11.059,  $p<0.001$ ), THC (OR=5.520,  $p<0.001$ ) and barbiturate users (OR=17.109,  $p=0.01$ ).

**Conclusion** The study found that ATS use is widespread among Palestinian men and is associated with other drug use, including benzodiazepines, barbiturates and THC. The study recommends implementing better strategies and policies for controlling and confiscating illicit substances to address the severe medical and sociological problems that can arise from drug dependence. Additionally, the study highlights the risks associated with transitioning from marijuana to ATS, which can have severe clinical and social consequences.

## INTRODUCTION

Amphetamine-type stimulants (ATSs) are a group of synthetic drugs that are chemical derivatives of the parent compound alpha-methylphenethylamine. They are potent stimulants that improve attention, lower sleeping hours, and can cause significant short-term and long-term effects. These new highly addictive chemicals tended to arise most frequently in groups who participated in risky behaviours.<sup>1</sup> Unfortunately, there are currently no approved pharmacotherapeutic options for treating stimulant use disorders, including amphetamines,<sup>2</sup> which can lead to severe clinical and social consequences. Several problems could result from ATS use. These include overdose-related early deaths,<sup>3</sup> chronic use-related decreased productivity, vehicle accidents, violence and crime.<sup>4</sup>

In many regions, the primary source of ATS is illicit manufacturing in clandestine laboratories.<sup>5</sup> In other regions, they can be obtained as prescription pharmaceutical stimulants via the grey or black markets and are used non-medically.<sup>5</sup> Violent conflicts in low and middle-income countries have been identified as a risk factor for producing and using illicit drugs.<sup>6–9</sup> The unique socioeconomic context in Palestine, characterised by political and economic tensions, has created conditions that facilitate the spread of illicit drug use.<sup>10</sup> Palestinian youth who experience marginalisation and alienation within their own culture are those primarily affected by these conditions.<sup>6 7 11</sup> The estimated number of drug users in the occupied Palestinian territories in 2017 was over 80 000, and 26 500 were high-risk drug users, consisting of 1.8% of the male population aged over 15 years.<sup>12</sup> Moreover, young adults in the West Bank were

### WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Since 2013, there has been a growing concern about amphetamine-type stimulant (ATS) seizures and clandestine laboratories in the West Bank, with a transition towards ATS use from marijuana. Home-made methamphetamine use is prevalent among illicit drug users, but limited data exist on substance use among young males in the region. Previous studies have been challenged by poor measurement and inconsistent reporting, and concern about the hidden nature of drug use in Palestine continues to be reported. Investigating the reasons behind substance use, individually and in combination with other drugs, is crucial.

### WHAT THIS STUDY ADDS

⇒ The study found high rates of drug use in general (16.4%) and ATS use (8.0%) among male Palestinians in the region who also engaged in polydrug use. The use of ATS was significantly higher in benzodiazepines (48.6%), tetrahydrocannabinol (38%) and barbiturate (66.7%) users than non-users. ATS was also more prevalent in alcohol and coffee users. Furthermore, undergraduate degree holders and those who went to school were more likely to use ATS than illiterate individuals, and ATS was more likely to be prevalent among refugees than village dwellers and young adults under 30 years old than late adults over 40 years old.

### HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The study found high rates of drug use in general and ATS use among male Palestinians who also engaged in polydrug use. The high rates of drug use and the polydrugs used underline the need for better approaches and policies to tackle the illicit drug trade in the area and the risks of transitioning from marijuana to ATS. Policymakers and healthcare professionals must collaborate to address the medical and social issues arising from drug dependence. We hope that our findings will aid future research and improve public health outcomes in the West Bank and beyond.

involved in drug production, use and distribution.<sup>9</sup> Until 2013, marijuana, medications including tramadol, antidepressants, diazepam, heroin and synthetic cannabis were among the most widely used substances in the West Bank.<sup>9</sup> Few people were found to use methamphetamine and cocaine.<sup>6</sup>

Monitoring substance use patterns and trends among young people in the West Bank on a regular, reliable and routine basis can help identify problems and develop evidence-based interventions to stop, contain, and address existing and potential future problems. While tetrahydrocannabinol (THC) has garnered most of the attention in the West Bank in recent years, statistics on ATS seizures and the finding of clandestine laboratories point to a rapidly expanding area of concern.<sup>9</sup> Moreover, 38% of the illicit drug users in the West Bank had taken methamphetamine, a new liquid psychoactive powerful sexual stimulant that enhances attention and lowers sleeping hours offered under a street name called GG and was considered as an alternative to sildenafil (Viagra); hence, it was not regarded as an illegal narcotic until 2016.<sup>9 11 13</sup> However, limited data exist on the extent of substance use among young males in the region, with

previous studies challenged by poor measurement and inconsistent reporting. Only a few studies have been conducted in the West Bank, Gaza Strip and East Jerusalem to estimate the prevalence, trends and patterns of ATS use.<sup>5 6 8 9 14</sup> Concern about the hidden nature of drug use in Palestine continues to be reported.<sup>15</sup> Furthermore, the results of these studies suggested that there is a transition use from marijuana toward ATS,<sup>15</sup> but little is known about the nature of this use. Investigating the reasons behind substance use, individually and in combination with other drugs, is crucial. To fill this gap, this study aimed to assess the prevalence of ATS use among male Palestinians in the north of the West Bank, examining its association with other drug use and other illicit substance use.

## METHODOLOGY

### Study design and population

The cross-sectional study conducted between 2022 and 2023 focused on collecting data on drug use among Palestinian men aged between 18 and 60 years in the northern region of the West Bank. The study aimed to cover all demographic categories of the population in the region, including those residing in urban, rural and refugee areas. To achieve this, the three largest governorates in the region, which have a mix of urban, rural and refugee populations, were selected for the study. Participants were required to complete a questionnaire and provide urine samples for testing. Addiction can make it hard for people to participate in substance use studies. Individuals who struggle with addiction often face social marginalisation, which can make it difficult for them to participate in substance misuse studies. To address this issue, participants for a study investigating risk factors associated with the use of psychostimulants were recruited through media and flyers without explicitly mentioning illicit drugs. This approach helped to protect the rights and interests of participants who may have feared legal consequences or social stigmatisation. All subjects were provided with the necessary information to make an informed and voluntary decision before taking part in the study. Moreover, to ensure privacy and confidentiality, informed consent was obtained without directly referencing drug abuse, addiction, misuse or illegal drugs. Participants were given the right to decline participation at any time without any negative consequences. All data collection, treatment and storage were carried out in a secure and confidential manner, and code numbers were used instead of names to further ensure confidentiality.<sup>16</sup>

### Sample size and sampling technique

The participants of the study were Palestinian men living in the northern region of the West Bank and were aged between 18 and 60 years. Those who could not give informed consent, participated in the pilot study or refused to provide urine samples were not included in the study. It was demonstrated that 28% of people

in the middle of the West Bank who misuse drugs were found to have methamphetamines in their system.<sup>17</sup> The minimum required sample size for the study was determined to be 310 individuals based on an estimated 28% proportion of substance use, with a 95% confidence level and 5% precision. An additional 20% were added to accommodate incomplete questionnaires, resulting in a final sample size of 372. Proportional stratified sampling was implemented. First, the stratification was based on the governorates. Then, each governorate's proportional sample size was calculated based on the location: city, village and refugee camps. Random sampling from each part was difficult, so a convenience sampling technique was used to select participants from each site.

### Study tool and operational definitions

A previously validated self-reported substance use questionnaire was used,<sup>13–18</sup> which included self-reported substance use such as alcohol, cigarettes, waterpipes, electronic cigarettes (vape), energy drinks (EDs), tea and coffee, and sociodemographic data including age, work status, marital status, location and educational level. A current substance user in this study is a participant who recognised himself as a user during the last month in the self-reported questionnaire. A drug user is a participant who tested positive for any of the 12 drugs tested using the multiline drug screen test in urine, known as the 12 Panel Drug Test DOA-1124-011T. These drugs include amphetamine, barbiturates, benzodiazepines, cocaine, ecstasy (MDMA), marijuana (THC), methadone, methamphetamine, oxycodone, opiates, phencyclidine (PCP) and propoxyphene. This test, which is compatible with healthcare professional use, can detect any or all of these drugs when they are above the test's detection limit specified in the manual for each drug. It is 99% accurate, and can detect each of the substances mentioned above with a total agreement level of no less than 97.4% with gas chromatography–mass spectrometry, the hallmark test for detecting substances within a given specimen, with some reaching an agreement level as high as 99%.<sup>19</sup> ATS users in this study are individuals who tested positive for at least one of the following: amphetamine, MDMA or methamphetamine. Polydrug user in this study is the participant who tested positive for more than one drug. In order to ensure high-quality results, the main study was preceded by a pilot study aimed at analysing its validity and demonstrating the response rate. Additionally, a negative control was tested as part of the study.

### Statistical analysis

The primary dependent outcome of interest was ATS use (yes or no). The primary independent variables were the other illicit drug use (yes or no). We used descriptive statistics to characterise the sample. Valid percentages were reported.  $\chi^2$  and Fisher's exact tests were used to estimate the statistically significant difference between categorical variables. The crude OR was calculated for the risk factors associated with ATS use. An

adjusted binary logistic regression model was used to assess the association between ATS use and other illicit drugs, including benzodiazepines, THC and barbiturates, by generating the ORs and 95% CIs. The model was adjusted to age (<30, 30–39 and >40 years as a reference group), job (worker or without work as a reference group), marital status (single or married and others as a reference group), location (city, village and refugee camp as a reference group), educational level (undergraduate or more, high school or less, and illiterate as a reference group), and current smoking of cigarettes, waterpipe and electronic cigarettes, and drinking EDs, tea, coffee and alcohol (yes or no as a reference group for each substance). In addition, the interaction between age and the area was tested. A *p* value of <0.05 was used as the significance level. The normality of the continuous variable distribution (age) was tested using the Shapiro-Wilk test. According to the findings and the frequency of drug use among Palestinians in a previous study,<sup>9</sup> the age group was divided into three categories: under 30, 30–39 and over 40 years. All analyses were performed using IBM SPSS Statistics for Mac, V.21.

## RESULTS

### Background information

Over 5 months, we invited 1509 individuals between 18 and 60 years to participate in our study. Of those invited, 629 individuals declined to participate, 87 refused to provide urine samples and 6 incomplete questionnaires were disqualified. This left us with a final group of 787 participants aged 18–58 years.

**Table 1** describes the general sociodemographic characteristics of the participants. Most participants (67.3%) were young (18–30 years), 28.1% lived in urban areas, 30.7% lived in rural areas and 41.2% lived in refugee camps. The majority (60.5%) were married, 79.9% had a job, 76.0% with a high school or less education degree; 16.5% were illiterate, and 7.5% were undergraduate or more. Most participants (59.5%) were current cigarette smokers, 31.9% were current waterpipe smokers and 8.3% were current vape smokers. Only 9.8% reported that they were current alcohol users. The prevalence of current coffee intake was 81.3%, current black tea intake was 81.6% and current ED intake was 56.4% (**table 1**).

### Frequency of ATS and other illicit substance use

**Table 2** describes the frequencies of ATS use and polydrug use. Out of 787 participants, 129 (16.4%) were drug users. Out of 129 drug users, 41.1% were amphetamine users, 38.0% were methamphetamine users, 9.3% were barbiturate users, 55.8% were benzodiazepine users, 38.8% were THC users, 1.6% were PCP users and 48.8% were ATS users. Among ATS users, 84.1% were amphetamine users, 77.7% were methamphetamine users, 12.7% were barbiturate users, 57.1% were benzodiazepine users and 30.2% THC users. Moreover, most of the ATS users (68.3%) were polydrug users (**table 2**).

**Table 1** Background information of the participants and self-reported substance use

Characteristics	Missing N	Category	n (%)
Age in years	3	<30	528 (67.3)
		30–39	142 (18.1)
		≥40	114 (14.5)
Education	4	Illiterate	130 (16.5)
		High school or less	598 (76.0)
		Undergraduate or more	76 (7.5)
Marital status	0	Single	311 (39.5)
		Married or others	476 (60.5)
Work status	3	With work	629 (79.9)
		Without work	158 (20.1)
Self-reported substance use	0	Current cigarette smoking	466 (59.5)
		Current waterpipe smoking	250 (31.9)
		Current electronic cigarette smoking	65 (8.3)
		Current energy drink consumption	442 (56.4)
		Current coffee consumption	637 (81.3)
		Current black tea consumption	640 (81.6)
		Current alcohol consumption	77 (9.8)
Location	0	Camp	324 (41.2)
		City	221 (28.1)
		Village	242 (30.7)

**The univariate analysis of ATS use based on sociodemographic factors and other substance use**

The percentage of ATS use was significantly higher in benzodiazepine users (48.6%) than the non-users (3.9%) (OR=23.209, p<0.001), in THC users (38%) than non-users (6%) (OR=9.653, p<0.001), in barbiturate users (66.7%) than non-users (7.1%) (OR=26.182, p<0.001), in alcohol users than non-alcohol users (OR=2.386, p=0.01), and coffee users (OR=3.581, p=0.01) than non-users. Moreover, ATS was significantly more prevalent in undergraduate degree holders (16.9%) (OR=2.508, p=0.016) and those who went to school (7.5%) (OR=3.112, p=0.024) than illiterate (6.2%). It is also less likely to be prevalent among village dwellers (OR=0.274, p=0.001) and young adults <30 years (OR=0.348, p<0.001) than late adults >40 years. No association was determined between ATS use and the other factors (p>0.05) (table 3).

**Risk factors associated with methamphetamine use**

The adjusted binary logistic regression for the association between ATS and other substances revealed that ATS users were more likely to be benzodiazepine users (OR=11.059, p<0.001), THC users (OR=5.520, p<0.001) and barbiturate users (OR=17.109, p=0.0). No interaction between other drugs was found (p>0.05) (table 4).

**DISCUSSION**

This study explored the use of ATS among Palestinians in the north of the West Bank. The findings revealed that these drugs were widely used alone or in combination with other drugs. The results indicated that 8% of men in the north of the West Bank used ATS drugs, with the highest prevalence (14.8%) among young men (30–39 years). It was demonstrated that 28% of people in the middle of the West Bank who misuse drugs were found

**Table 2** The frequency of amphetamine-type stimulant (ATS) use and polydrug users

	In total N=787	Among drug users n=129	Among ATS user n=63
	n (%)	n (%)	n (%)
Drug users (at least one positive drug)	129 (16.4)	129 (100)	–
Amphetamines	53 (6.7)	53 (41.1)	53 (84.1)
Methamphetamines	49 (6.2)	49 (38.0)	49 (77.7)
Barbiturates	12 (1.5)	12 (9.3)	8 (12.7)
Benzodiazepines	72 (9.1)	72 (55.8)	36 (57.1)
Tetrahydrocannabinol	50 (6.4)	50 (38.8)	19 (30.2)
Phencyclidine	2 (0.25)	2 (1.6)	0 (0)
ATS in total	63 (8.0)	63 (48.8)	
<b>Polydrug use with ATS</b>			43 (68.3)
One drug with ATS			25 (39.7)
Two drugs with ATS			17 (27.0)
Three drugs with ATS			1 (1.6)

**Table 3** Univariate analysis of the factors associated with ATS use

		ATS positive	ATS negative	OR	95% CI	P value
		n (%)	n (%)			
Tested illicit drug						
Benzodiazepines	Yes	35 (48.6)	37 (51.4)	23.209	12.776 to 42.162	<0.001
	No	28 (3.9)	687 (96.1)			
THC	Yes	19 (38)	31 (62)	9.653	5.053 to 18.441	<0.001
	No	44 (6)	693 (94)			
Barbiturates	Yes	8 (66.7)	4 (33.3)	26.182	7.644 to 89.677	<0.001
	No	55 (7.1)	720 (92.9)			
Self-reported substances						
Cigarette smoking	Yes	41 (10.1)	425 (91.2)	1.360	0.787 to 2.349	0.269
	No	21 (6.6)	296 (93.4)			
Waterpipe smoking	Yes	22 (8.8)	228 (91.2)	1.192	0.692 to 2.052	0.527
	No	40 (7.5)	494 (92.5)			
Vape smoking	Yes	8 (12.3)	57 (87.7)	1.727	0.784 to 3.809	0.170
	No	54 (7.5)	665 (92.5)			
Energy drink intake	Yes	33 (7.5)	409 (92.5)	0.871	0.518 to 1.465	0.602
	No	29 (8.5)	313 (91.5)			
Coffee intake	Yes	58 (9.1)	579 (90.9)	3.581	1.279 to 10.027	0.010
	No	4 (2.7)	143 (97.3)			
Black tea intake	Yes	53 (8.3)	587 (91.7)	1.354	0.652 to 2.813	0.414
	No	9 (6.3)	135 (93.8)			
Alcohol use	Yes	12 (15.6)	65 (84.4)	2.386	1.210 to 4.702	0.010
	No	51 (7.2)	659 (92.8)			
Sociodemographic variables						
Marital status	Single	23 (7.4)	288 (92.6)	0.870	0.510 to 1.485	0.610
	Married	40 (8.4)	436 (91.6)			
Job	Yes	59 (9.4)	570 (90.6)	3.985	1.425 to 11.142	0.005
	No	4 (2.5)	154 (97.5)			
Education	Undergraduate or more	10 (16.9)	49 (83.1)	2.508	1.191 to 5.282	0.016
	High school or less	45 (7.5)	553 (92.5)	3.112	1.16 to 8.351	0.024
	Illiterate	8 (6.2)	122 (93.8)	1		
Age	<30	31 (5.9)	497 (94.1)	0.348	0.192 to 0.628	<0.001
	30–39	21 (14.8)	121 (85.2)	0.571	0.277 to 1.175	0.128
	>40	10 (8.8)	104 (91.2)	1		
Location	City	8 (3.6)	213 (96.4)	0.531	0.222 to 1.265	0.153
	Village	16 (6.6)	226 (93.4)	0.274	0.126 to 0.599	0.001
	Refugee camp	39 (12.0)	285 (88.0)	1		

THC, tetrahydrocannabinol.

to have methamphetamines in their system<sup>17</sup> compared with 6.2% in this study.

The production and distribution of illegal drugs were noticed remarkably in 2013 in the West Bank.<sup>9</sup> Few studies suggested that the pattern of drug use in the north of the

West Bank has changed since 2013.<sup>6 8–11</sup> The results of this study indicated that a prominent feature has been a shift from THC use to amphetamines and related substances in the north of the West Bank. Several factors could contribute to the shift from THC use to ATS use.

**Table 4** Adjusted binary logistic regression for factors associated with methamphetamine use

Methamphetamine use (yes)*	Yes*	OR	95% CI	P value
<b>Covariates</b>	<b>Covariate category</b>			
Benzodiazepine use	Yes*	11.059	5.559 to 21.920	<0.001
THC use	Yes*	5.520	2.422 to 12.548	<0.001
Barbiturate use	Yes*	17.109	3.33 to 87.86	0.01
Coffee intake	Yes*	1.973	0.614 to 6.343	0.254
Alcohol consumption	Yes*	1.211	0.505 to 2.902	0.668
Job	Yes*	1.909	0.581 to 6.277	0.287
Age in years	<30	0.580	0.271 to 1.244	0.162
	30–39	1.058	0.403 to 2.772	0.909
	>40 (reference)	1		
Location	City	0.491	0.168 to 1.435	0.194
	Village	0.416	0.143 to 1.207	0.106
	Refugee camp (reference)	1		
Education	University and more	1.920	0.685 to 5.383	0.215
	Elementary to high school	1.685	0.393 to 7.226	0.483
	Illiterate (reference)	1		

\*The reference category is 'no'.  
THC, tetrahydrocannabinol.

First, ATSs have been locally manufactured and seized in the West Bank in different forms, tablet form bearing the Captagon logo and ecstasy group substances.<sup>9</sup> Second, liquid homemade methamphetamine (GG) was manufactured in rural areas and spread quickly to refugee camps.<sup>9</sup> Due to the low cost and easy accessibility of the raw starting materials needed to manufacture meth-cooking and the ease of selling, the ATS has spread quickly among young adults in the West Bank.<sup>9</sup> Thus, the suggested transformation to ATS use in the West Bank could be partially attributed to the increase in the local synthetic processes of methamphetamines.

The use of methamphetamines is a serious issue due to their highly addictive nature and the intense release of dopamine that they cause in the central nervous system.<sup>14 20</sup> Unfortunately, these drugs are becoming more common worldwide, and individuals who use methamphetamines often also use other illicit substances.<sup>21</sup> The study revealed that ATS was often combined with other drugs, particularly benzodiazepines, barbiturates and THC. These findings align with international studies, indicating consistent patterns of substance use behaviours. Benzodiazepines are a class of drugs primarily used for treating anxiety, but they are also effective in treating several other conditions. A benzodiazepine can be dangerous if used in excess, and it can be lethal if combined with alcohol or other drugs.<sup>22 23</sup> Drug users rarely use benzodiazepines alone; instead, they frequently use them in conjunction with other substances to boost their effects.<sup>24</sup> Therefore, benzodiazepine misuse is a cause for concern. Previous research has established a link between ATS and benzodiazepine

use, as drug users tend to mix the two to achieve either stimulating or sedating effects.<sup>25–28</sup> Combining amphetamines and benzodiazepines resulted in more significant driving impairment than either drug alone.<sup>29</sup> People who combine benzodiazepines and amphetamines are at a higher risk of experiencing psychological issues such as depression, anxiety and social dysfunction.<sup>30</sup> Studies have shown that those who use benzodiazepines are more likely to use amphetamines through injection and reuse needles, which increases their chances of contracting bloodborne viruses like hepatitis B and HIV.<sup>30</sup> Additionally, combining benzodiazepines and amphetamines can result in higher levels of impairment while driving than using either substance alone.<sup>29</sup> It is also believed that combining ATS and benzodiazepines can lead to more severe myocardial injury and an increased risk of cardiac mortality.<sup>23</sup> These results suggest further investigation into these drugs' usage patterns and adverse effects among Palestinians.

Barbiturates are also a significant concern, as they cause suicide.<sup>21</sup> The United Nations Commission on Narcotic Drugs and the WHO Expert Committee recognise the health risks of these drugs and have called for stricter regulation of their manufacture, distribution and use.<sup>31</sup> Withdrawal from barbiturates can even be more severe than withdrawal from opiates,<sup>32</sup> underscoring the importance of addressing this issue as a public health concern. This study also found a correlation between ATS use and the use of barbiturates and THC. More recently, amphetamines have been used with one of the barbiturates, such as amobarbital or phenobarbital, to produce mood-elevating effects.<sup>25 26</sup> In the early 1990s,

methamphetamine availability at lower prices led to its growing popularity among local communities of cannabis users.<sup>35</sup> The well-documented role of ATS and cannabis in the pathogenesis of psychiatric disorders, ranging from anxiety spectrum to psychotic and cognitive disorders, raises serious concerns about the sequelae of their combined use.<sup>34 35</sup> It has been suggested that cannabis may prolong and intensify the sensation of euphoria associated with the consumption of ATS.<sup>36 37</sup> However, it has been demonstrated to have various impacts on anxiety. It may worsen some of the harmful subjective effects of ATS, including panic and paranoia.<sup>38</sup> This alarming scenario raises the urgency of a better understanding of the effect of combining THC with amphetamines on the Palestinian population. The implications of these findings warrant further exploration.

The risk associated with alcohol and amphetamine use increases when these addictive substances are used simultaneously. Unfortunately, when misused, amphetamines can reduce the tired and groggy feelings that come with alcohol intoxication. This extended time increases the risk of alcohol poisoning from overconsumption, leading to organ damage and death. On the other hand, alcohol can enhance the pleasurable effects of amphetamines.<sup>39</sup> It is crucial to be mindful of these dangers and to practise safe and responsible substance use. In addition, experimental evidence suggests caffeine enhances the toxic effects of amphetamine-related drugs, increasing seizures, hyperthermia and tachycardia.<sup>40–42</sup> The relevance of these interactions is uncertain, but caution is warranted given the popularity of these drug combinations and their potential for toxicity. According to the univariate analysis, ATS use was associated with alcohol and coffee intake. Studies have shown that individuals who have experienced traumatic events are more likely to develop substance use disorders.<sup>43</sup> This is especially true for those with poor mental health who use stimulants to cope with their trauma.<sup>44</sup> Unfortunately, those who experience trauma at a younger age are less likely to develop healthy coping mechanisms and are more likely to become socially isolated, leading to an increased risk of drug use.<sup>44–46</sup> According to the univariate analysis results, ATS use was also more common among the young, the educated, the refugees and the workers. This could be attributed to their political situation, stress and financial constraints.<sup>6 13 16</sup> Refugee camps were identified as one of the areas where novel psychostimulant products, including amphetamines, have appeared.<sup>9 11</sup> In Palestine, there is a stigma around seeking help for mental health issues, which may contribute to the high prevalence of drug use among young people.<sup>16</sup> Unfortunately, over half of Palestinian youth show signs of depression, and there are few accessible counselling services and a stigma around seeking therapy.<sup>47</sup> Moreover, cultural stigma and high costs may prevent many individuals from taking prescribed antidepressants, and they may become more vulnerable to drug use. It is crucial to provide accessible counselling services and to promote a stigma-free

environment to support those struggling with addiction, especially vulnerable groups like refugees. One of the most effective measures to curb the use of ATS in Palestine is to increase public awareness about the dangers of drug misuse and addiction. This can be achieved through public education campaigns, community outreach and media campaigns that emphasise the negative consequences of drug use and highlight the benefits of a healthy and drug-free lifestyle. In addition, law enforcement agencies can play a critical role in curbing ATS use by cracking down on illegal drug trafficking and distribution networks, and by imposing strict penalties on those caught manufacturing, selling or using drugs. This can serve as a deterrent to others and help reduce the overall demand for ATS in the community. Another approach is to increase access to drug treatment and rehabilitation services for those struggling with ATS addiction. This can include establishing community-based treatment centres, providing access to medications that can help manage withdrawal symptoms, and offering counselling and support services to help individuals overcome addiction and maintain long-term recovery. It is worth noting that Palestine lacked a fully integrated system of drug dependence treatment and care until 2014. However, the implementation of the project 'Supporting the establishment-based drug dependence treatment and rehabilitation system' marked a significant step towards addressing this issue. The project, which aimed to support the establishment-based drug dependence treatment and rehabilitation system for the Palestine National Rehabilitation Centre, resulted in the creation of the first science, gender and human rights-based drug treatment and rehabilitation centre in Palestine. Moreover, it is now fully integrated into the Palestinian health system, providing a solid foundation for the government to tackle the increasing drug use and related risks in the state.<sup>12</sup> Finally, it is important to address the underlying social and economic factors that contribute to drug use, such as poverty, unemployment and lack of educational opportunities. By addressing these root causes, it is possible to create a more stable and prosperous society.

This study has several limitations. Drug use results could be underestimated in this study for several reasons. MDMA result is positive when MDMA concentration exceeds 500 ng/mL in the urine,<sup>48</sup> and the half-life of MDMA is 7–8 hours.<sup>49</sup> This relatively short half-life adds up to the underestimation of the prevalence of users of MDMA. The test does not detect some substances used in the West Bank, like tricyclic antidepressants, tramadol, ketamine, synthetic THC and other substances, which adds to underestimating the results.<sup>48</sup> In addition, the test used to examine urine has a limited time frame to detect substances. The test we used has a variable ability to detect the presence of a drug in the urine depending on the specific drug itself. Some can be detected only within 1 or 2 days after drug use, like cocaine, while others can be detected up to several days later, like PCP.<sup>48</sup> A negative result may not necessarily indicate drug-free urine.

Negative test results can be obtained when the drug is present but below the cut-off level of the test. The test does not distinguish between drugs of misuse and certain medications.<sup>48</sup> Unfortunately, there are no available confirmation tests for drugs in body fluids in Palestine. Moreover, the high rejection rate could add to the underestimated results. As our study only included men from the north of the West Bank, it is important to exercise caution when applying our findings to men from other governorates or to women. Therefore, generalising our results to other populations should be done with careful consideration. Despite these limitations, this study is the first to identify the associated risk factors with ATS use among Palestinians.

## CONCLUSION

The study found that Palestinians have a significantly higher frequency of ATS use. This was linked to other drugs, which is consistent with international studies and can have negative implications for individual health outcomes. Using ATS alongside THC, alcohol, benzodiazepines and barbiturates presents a new challenge for the health system. Those with higher levels of education were more likely to use ATS. However, further research is needed to understand ATS use in Palestine and the surrounding region fully. Investigating the reasons behind substance use, individually and in combination with other drugs, is crucial. The findings also highlighted a shift in drug use patterns in the north of the West Bank, with a move towards amphetamines and related substances. Dependence on these drugs can lead to severe medical and social problems. Improving strategies and policies for controlling and confiscating drugs of misuse and illicit substances is essential. Prevention efforts, education on substance misuse, and confidential support and treatment are necessary to create a supportive environment that encourages seeking assistance. Further research is suggested to explore the factors behind the transition from THC to ATS. Additionally, studies focusing on the usage of ATS among female individuals are also recommended.

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## REFERENCES

- Rodríguez-Bolaños R, Baruch-Dominguez R, Arillo-Santillán E, *et al*. Latent class analysis of Polysubstance use and sexual risk behaviors among men who have sex with men attending sexual health clinics in Mexico city. *Int J Environ Res Public Health* 2022;19:8847.
- Daldegan-Bueno D, Maia LO, Glass M, *et al*. Co-exposure of Cannabinoids with amphetamines and biological, behavioural and health outcomes: a Scoping review of animal and human studies. *Psychopharmacology (Berl)* 2022;239:1211–30.
- Han B, Compton WM, Jones CM, *et al*. Methamphetamine use, methamphetamine use disorder, and associated overdose deaths among US adults. *JAMA Psychiatry* 2021;78:1329–42.
- Hayley AC, Downey LA, Shiferaw B, *et al*. Amphetamine-type stimulant use and the risk of injury or death as a result of a road-traffic accident: A systematic review of observational studies. *Eur Neuropsychopharmacol* 2016;26:901–22.
- United Nations office on drugs and crime, U., understanding clandestine synthetic drugs. 2001.
- Massad SG, Shaheen M, Karam R, *et al*. Substance use among Palestinian youth in the West Bank, Palestine: a qualitative investigation. *BMC Public Health* 2016;16:800.
- Buwadi L. Structural violence and illicit drug use among youth living under occupation in Palestine. In: *Undergraduate Awards, 2021*. 2021.
- Damiri BR, Salahat IA, Aghbar MH. Pattern of substance use among schoolchildren in Palestine: a cross-sectional study. *Egypt J Forensic Sci* 2018;8:59.
- Damiri B, Sayeh W, Odeh M, *et al*. Drug use and possession, emerging of new psychoactive substances in the West Bank, Palestine. *Egypt J Forensic Sci* 2018;8:1–8.
- Palestinian National Institute of public health, M.O.H., illicit drug use in Palestine: A qualitative investigation formative phase study report. 2017.
- Damiri BR. The use of psychoactive substances in a conflict area in the West Bank: drug use risk factors and practices in Palestinian refugee camps. *Int J Ment Health Addiction* 2020;18:1507–20.
- VanM. Independent evaluation of Psey13. supporting the establishment of evidence-based drug dependence treatment and rehabilitation system for the Palestine national rehabilitation centre. 2019.
- Damiri B, Sandouka HN, Janini EH, *et al*. Prevalence and associated factors of psychoactive substance use among university students in the West Bank, Palestine. *Drugs: Education, Prevention and Policy* 2020;27:173–82.
- Sambo DO, Lebowitz JJ, Khoshbouei H. The Sigma-1 receptor as a regulator of dopamine neurotransmission: A potential therapeutic target for methamphetamine addiction. *Pharmacol Ther* 2018;186:152–67.
- Damiri B, Al Ali R, Al-Zagha R, *et al*. n.d. Determination of the cause and the manner of death in post-Mortem cases in the West bank in the years 2011–2021. *Palestinian Medical and Pharmaceutical Journal*;7.



- 16 Damiri B, Daraghma M. The epidemiology of substance use in the West Bank: who is at risk *J Ethn Subst Abuse* 2023;1–14.
- 17 UNODC, U.N.O.o.D.a.C., Estimating the Extent of Illicit Drug Use in Palestine. United Nations Office on drugs and crime UNODC. 2017.
- 18 Damiri BR, Sandouka HN, Janini EH, *et al.* Substance use by university students in the West Bank: a cross-sectional study. *The Lancet* 2018;391:S9.
- 19 WAIVED C. Identify® Diagnostics Drug Test Cups Test Instruction/ Questions & Answers, Available: <https://identifydiagnostics.com/content/identify-diagnostics-drug-test-cups-CLIA-INSERT-1-2019.pdf>
- 20 Abbruscato TJ, Trippier PC. DARK classics in chemical Neuroscience: methamphetamine. *ACS Chem Neurosci* 2018;9:2373–8.
- 21 Wilens TE, Gignac M, Swezey A, *et al.* Characteristics of adolescents and young adults with ADHD who divert or misuse their prescribed medications. *Journal of the American Academy of Child & Adolescent Psychiatry* 2006;45:408–14.
- 22 Pardo B. Insights into mixing fentanyl and benzodiazepines from Canadian drug seizures. *JAMA Psychiatry* 2022;79:81–3.
- 23 Starcevic B, Sicaja M. Dual intoxication with diazepam and amphetamine: this drug interaction probably potentiates myocardial ischemia. *Med Hypotheses* 2007;69:377–80.
- 24 Abuse S, Administration MHS. The TEDS report: substance abuse treatment admissions for abuse of benzodiazepines. Substance Abuse and Mental Health Services Administration Rockville, MD, 2011.
- 25 Maust DT, Lin LA, Blow FC. Benzodiazepine use and misuse among adults in the United States. *Psychiatr Serv* 2019;70:97–106.
- 26 Bogstrand ST, Middelkoop G, Christophersen AS. Trends in amphetamine and benzodiazepine use among drivers arrested for drug impaired driving in Norway 2000–2009. *Nor J Epidemiol* 2011;21.
- 27 Wood S, Sage JR, Shuman T, *et al.* Psychostimulants and cognition: a continuum of behavioral and cognitive activation. *Pharmacol Rev* 2014;66:193–221.
- 28 Stewart SA. The effects of benzodiazepines on cognition. *J Clin Psychiatry* 2005;66 Suppl 2:9–13.
- 29 Hoiseth G, Andås H, Bachs L, *et al.* Impairment due to amphetamines and benzodiazepines, alone and in combination. *Drug Alcohol Depend* 2014;145:174–9.
- 30 Darke S, Ross J, Cohen J. The use of benzodiazepines among regular amphetamine users. *Addiction* 1994;89:1683–90.
- 31 WHO. *WHO Expert Committee on Drug Dependence: thirty-seventh report*. 2016: World Health Organization,
- 32 Olmedo R, Hoffman RS. Withdrawal syndromes. *Emerg Med Clin North Am* 2000;18:273–88.
- 33 Kalechstein AD, Newton TF, Longshore D, *et al.* Psychiatric Comorbidity of methamphetamine dependence in a forensic sample. *J Neuropsychiatry Clin Neurosci* 2000;12:480–4.
- 34 Hall W, Solowij N. Adverse effects of Cannabis. *The Lancet* 1998;352:1611–6.
- 35 Salo R, Nordahl TE, Natsuaki Y, *et al.* Attentional control and brain metabolite levels in methamphetamine abusers. *Biol Psychiatry* 2007;61:1272–80.
- 36 Forney R, Martz R, Lemberger L, *et al.* The combined effect of Marijuana and Dextroamphetamine. *Ann N Y Acad Sci* 1976;281:162–70.
- 37 Mohamed WMY, Ben Hamida S, Cassel J-C, *et al.* MDMA: interactions with other psychoactive drugs. *Pharmacol Biochem Behav* 2011;99:759–74.
- 38 Tambaro S, Bortolato M. Cannabinoid-related agents in the treatment of anxiety disorders: Current knowledge and future perspectives
- 39 Hernandez-Lopez Cet *al.* MDMA and alcohol interactions in humans: psychomotor performance, subjective effects and pharmacokinetics. *J Pharmacol Exp Ther* 2002;300:236–44.
- 40 McNamara R, Kerans A, O’Neill B, *et al.* “Caffeine promotes hyperthermia and serotonergic loss following Co-administration of the substituted amphetamines, MDMA (“ecstasy”) and MDA (“love”). *Neuropharmacology* 2006;50:69–80.
- 41 McNamara R, Maginn M, Harkin A. “Caffeine induces a profound and persistent tachycardia in response to MDMA (“ecstasy”) administration”. *Eur J Pharmacol* 2007;555:194–8.
- 42 Vanattou-Saïfoudine N, McNamara R, Harkin A. Caffeine provokes adverse interactions with 3, 4-Methylenedioxyamphetamine (MDMA, “Ecstasy”) and related Psychostimulants: mechanisms and mediators. *Br J Pharmacol* 2012;167:946–59.
- 43 Khoury L, Tang YL, Bradley B, *et al.* Substance use, childhood traumatic experience, and Posttraumatic stress disorder in an urban civilian population. *Depress Anxiety* 2010;27:1077–86.
- 44 Spencer LP, Addison M, Alderson H, *et al.* “the drugs did for me what I couldn’t do for myself”: A qualitative exploration of the relationship between mental health and amphetamine-type stimulant (ATS) use”. *Subst Abuse* 2021;15:11782218211060852.
- 45 Capella M del M, Adan A. The age of onset of substance use is related to the coping strategies to deal with treatment in men with substance use disorder. *PeerJ* 2017;5:e3660.
- 46 Ullman SE, Relyea M, Peter-Hagene L, *et al.* Trauma histories, substance use coping, PTSD, and problem substance use among sexual assault victims. *Addict Behav* 2013;38:2219–23.
- 47 Wagner G, Glick P, Khammash U, *et al.* Exposure to violence and its relationship to mental health among young people in Palestine. *East Mediterr Health J* 2020;26:189–97.
- 48 W.H.P.M. One step drug of abuse test, in package insert for multi drug screen test. 2021.
- 49 Kolbrich EA, Goodwin RS, Gorelick DA, *et al.* Plasma pharmacokinetics of 3,4-methylenedioxyamphetamine after controlled oral administration to young adults. *Ther Drug Monit* 2008;30:320–32.