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Substance Use and Drivers' Perception of Road Accidents: Evidence from District Dir Lower, Khyber Pakhtunkhwa, Pakistan

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Abstract: *This study investigates the relationship between Substance use and drivers' perception of road accidents in District Dir Lower, Khyber Pakhtunkhwa, Pakistan. A sample of 285 drivers was randomly selected from four major bus stands: General Bus Stand, Ahmad Brothers Coach Dir Flying Coach (ABC DFC), Malak Bus Stand, and New Dir Flying Coach Company (NDFC). Data were collected using a structured interview schedule. Descriptive statistics (frequencies and percentages) were applied for univariate analysis, while the chi-square test was employed for bivariate analysis to examine the association between the dependent variable (drivers' perception of road accidents) and the independent variable (Substance use). Association between substance use and drivers perception of road accidents show that drivers perception of road accidents had a highly significant association (P =0.000) with drivers occasionally drive after consuming alcohol or other substances, drivers sometimes use drugs or alcohol while driving (P =0.000), drivers feel confident in their abilities to drive safely under the influence of substances (P =0.037), drivers have seen others drive after drinking alcohol or using drugs frequently (P =0.000), driver's reaction time decreases after drinking alcohol or using drugs (P =0.000), and drivers have been in situations where they were tempted to drive after consuming substances (P =0.002). It is concluded from the study that use of drugs/alcohol or other substances are frequently used by drivers while driving. They are confident of their abilities to drive safely under the influence of drug or alcohol. The peer influence promotes drug use during driving that negatively impact driving performance, vehicle control and drivers' reaction time which increase the chances of road accidents. Therefor it is recommended to Increase checkpoints and monitoring to ensure compliance with using drugs and drive. In addition, providing traffic authorities with tools to conduct routine drug and alcohol testing among drivers to reduce impaired driving.*

Introduction

A traffic collision occurs when an automobile collides with a stationary object, such as a tree or a utility

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pole, another vehicle, a pedestrian, an animal, or a road barrier. This could result in bodily harm, death, car damage, or property loss. Car accidents cause deaths and injuries, as well as psychological stress and financial hardships. Road accidents are a significant cause of fatalities globally (Mohammed *et al.,* 2019). An accident is a tragedy that happens unexpectedly and for no apparent reason. The majority of such instances are not accidental at all. These are encounters which could and should have been avoided (Gulzar *et al.,* 2012).

It is commonly recognized that driving under the influence (DWI) increases the likelihood of traffic accidents. 79% are men, and the average age is 37.6 ± 13.4 years. 42% of drivers had blood alcohol levels over the legal limit, while 58% of drivers have blood alcohol levels detected. 18% of drivers test positive for recreational drugs, and 12% test positive for tetrahydrocannabinol. 21 percent of drivers had opiate levels. Overall, 39% of tests were positive for more than one substance, and 85% tested positive for at least one (Kureshi, Nelofar, *et al.,* 2024).

A variety of illicit and prescription medications can impair driving skills. Among non-alcohol substances, marijuana is the most frequently found substance in the general driver population as well as drivers involved in accidents. (Li, Mu-Chen, *et al.,* 2012). In many regions of Pakistan, marijuana is widely accessible and widely used (Kongpetch, 2004). Marijuana use has been shown to double the risk of being involved in a car accident (Li *et al.,* 2012) and to impair cognitive abilities and driving performance, including psychomotor skills, divided attention, and lane tracking (Gårdinger, Max Bremberg, *et al.,* 2024).

Drugged driving is a growing public safety hazard (Brady and Li, 2013). In Pakistan, alcohol consumption and drug use is prohibited by law. Nonetheless, the prevalence of alcohol consumption while driving prevails. The state of risky driving practices is conspicuous in Pakistan, among the commercial drivers (commercial drivers are greater in Pakistan than in drivers from other nations). This disparity could be attributed to gaps in the Pakistani highway police's implementation of drug and alcohol usage rules. A high prevalence of substance use is also reported in several Western research, but these results are probably overstated because the participants were drivers who were suspected of abusing drugs and subsequently examined for it by the traffic police (Drummer *et al.,* 2007).

Literature Review

Road safety has become a major worldwide issue, putting people's lives at risk. Each year, traffic accidents claim the lives of over 1.35 million individuals and cause injuries to more than 50 million others globally (WHO, 2018) Most of the burden of road traffic injuries falls on low and middle-income countries (Spiegel *et al.,* 2008). By 2030, road traffic injuries are expected to become the fifth leading cause of death (Shams *et al.,* 2021; Dindi *et al.,* 2019). This increase is projected to be most significant in low and middle-income nations (LMICs) (Razzak *et al.,* 2022)**.**

The current study on drug driving, its impact on driving ability, and the associated risk factors and perceptions indicates that drug driving is relatively common, with a 12-month prevalence of about 4% in the general population. Drugs are often found in individuals involved in traffic accidents, with studies in Australia showing that up to 25% of drivers involved in accidents test positive for drugs (Kelly *et al.,* 2004). Drug use significantly influences road accidents in Pakistan, raising both the risk and severity of crashes (Mir, Razzak and Ahmad, 2013). The impact of drug use on driving is a major concern, further exacerbating the already high rate of traffic accidents in the country. (Mohammed *et al.,* 2019).

Substances like alcohol and marijuana affect drivers' mental states, altering their perceptions and slowing their reactions, which increases the risk of road traffic collisions (RTCs) (Blandino *et al.,* 2022). Alcohol impairs brake reaction time, speed regulation, steering control, and lane discipline, while

marijuana affects tracking, attention, reaction time, short-term memory, hand-eye coordination, decision-making, and concentration (Tomczak, 2022).

Crash responsibility is directly connected with intoxicant use (Drummer *et al.,* 2004). Alcohol consumption may be responsible for up to 21% of road traffic accidents in different regions around the world (Chisholm and Naci,2008). Alcohol consumption in combination with marijuana increases the likelihood of an RTI (Mir *et al.,* 2012).

Pakistan, a low-income country, experiences the sixth highest annual death rate worldwide from road traffic injuries, with 40,000 fatalities each year. Commercial drivers contribute to 60% of this total (Mir *et al.,* 2013). Although Pakistan has laws against driving under the influence (DWI) (World Health Organization, 2009), and alcohol use is completely banned for all drivers, the effectiveness of these regulations in tackling the issue remains uncertain (Batool *et al.,* 2012). As an Islamic state, the sale and use of alcohol and marijuana are prohibited for the general population, and they are not regarded as possible contributors to traffic accidents (Mir *et al.,* 2012). However, with changing patterns of alcohol consumption, with the labor class having the largest frequency of alcohol use (Haider and Chaudhry, 2008), and with marijuana being a widespread illicit drug of abuse here (Khalily *et al.,* 2010). Commercial drivers in Pakistan may not be immune to this driving hazard. The extent of use alcohol and marijuana use is directly related to accidents by commercial drivers (OMOOHU, 2019) and motor vehicle accidents in Pakistan which continue to be one of the primary causes of injury death (Rockett *et al.,* 2012).

Driving under the influence of drugs is an increasing public health and traffic safety hazard (Walsh *et al.,* 2004). In 2007, the prevalence of drug-related driving in the United States was reported at 11-14% (Lacey *et al.,* 2011). According to a thorough analysis by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), between 0.3% and 1.3% of all drivers operate a motor vehicle while under the influence of alcohol and illicit drugs (Raes *et al.,* 2008) This is a worrying fact, because drivers who have used drugs are substantially more likely to be responsible for a fatal accident than nonusers, especially after taking multiple drugs (WHO,2017 and Penning *et al.,* 2010). A worldwide rise in the acceptance of experimental and recreational drug use, effective identification by emergency services, and the expansion of drug testing availability and utilization in hospital settings are all potential causes of the rise in RTI reports brought on by DRUID (Bhatia *et al.,* 2024; Schumann *et al.,* 2021)

One important contributing factor to the numerous avoidable causes of RTI-related morbidity and mortality is driving while under the influence of alcohol or other substances (Das *et al*., 2012, and WHO, 2017) Psychoactive substances change how the mind works, resulting in decreased attention, motor performance, perceptual-motor coordination, and delayed reaction time and information processing (Blomberg *et al.,* 2009; Papalimperi, *et al.,* 2019). These consequences could result in poorer vehicle control, which would lead to RTIs. Driving under the influence of drugs (DRUID) is linked to high-risk behaviors that put not only the driver's life but also the lives of other drivers, passengers, and pedestrians on the road at risk, such as speeding, breaking traffic laws, and increased lane-weaving (Drummer, 2008 and Penning *et al.,* 2010). Prescription drugs like benzodiazepines, antidepressants, and antipsychotics have also been linked to side effects that could make driving dangerous, such as sedation, reduced focus, and delayed reflexes (Chang *et al.,* 2013 and Olesen *et al.,* 2022).

Although 62% of the world's road traffic accident (RTA) burden is attributed to low-middle income nations (WHO, 2017), Southeast Asia (SEAR) has the highest rate of RTAs and associated injuries worldwide. According to estimates, driving under the influence of drugs and alcohol accounts for between 30% and 50% of all RTAs in SEAR. (Asia, 2012).

The previous several decades have also seen the creation and distribution of numerous compounds,

including designer pharmaceuticals and authorized prescription prescriptions, whose cognitive effects may vary in a number of ways from those of recognized psychoactive chemicals. It is impossible to overlook the potential for driving while under the influence of these more recent chemicals, thus methodical research and development of methods for detecting them in bodily fluids are required (Bhatia *et al.,* 2024).

The risk of getting involved in an RTA varies depending on the psychoactive drug used. The relative risk of RTI fatality is high when driving under the influence of amphetamines, cocaine, benzodiazepines, opiates, and cannabis. Moreover, relative risks for injury and property damage are even higher. These estimates may differ from region to region, especially for developing countries (Bhatia and Gupta 2024).

In Pakistan, little attention has been paid to drug and alcohol usage in relation to road safety. Reports and studies from government and non-government organizations, the media, and the general public can provide information on the most prevalent medicines used by drivers, who are primarily professionals (Kayani, King and Fleiter, 2013) Describe the prevalence of drug use among professional drivers. Interestingly, there hasn't been any research done on unlawful drunk and drug driving among regular drivers yet, Mir *et al.,* (2012) found that although 30% of drivers used marijuana while driving, nearly 10% of drivers in a sample of 857 commercial bus and truck drivers in Rawalpindi and Islamabad used alcohol and 4.6% reported using both drugs. A qualitative investigation in Islamabad, Rawalpindi, and Lahore (Kayani, King and Fleiter, 2013) discovered reports that bus, truck, and taxi drivers frequently utilize illegal narcotics for fun and to fight off exhaustion. Furthermore, it was discovered that although police are well aware of the pervasiveness of drug use among drivers, they lack the tools and legal authority necessary to do official drug and alcohol tests on drivers. According to a case study in Lahore (Batool, Carsten, and Jopson, 2011), drug and alcohol abuse are common among public transportation drivers and are thought to exacerbate abnormal behaviors (Kayani, Ahsan, *et al.,* 2019).

One of the few constitutions in the world that forbids its inhabitants from using harmful drugs and drinking alcohol is Pakistan's, which does so under Articles 37(g) and (h). There is an exemption for the use of alcoholic beverages for religious and medicinal purposes, as well as for non-Muslims. The Prohibition (Enforcement of Had) Order of 1979, which is a part of the Pakistani penal law, punishes people who are found guilty of using drugs or excessive amounts of alcohol. However, non-Muslims who possess a government-issued permit to consume alcohol under specific guidelines are exempted from this regulation. A unique law known as the "Control of Narcotic Substances Act, 1997" was passed by the legislature with the primary goal of punishing anyone who cultivate, possess, traffic, or sell drugs in any way. Any such act is punishable under this legislation by imprisonment for up to two years, death, or life in prison (Kayani, Ahsan, *et al.,* 2019).

Methodology

Selecting the universe is an important step in any research, as it includes all the elements from which the samples were drawn (Reiner, 1983). The universe of the study was District Dir Lower. Four bus stands (General Bus Stand, Ahmad Brothers Coach Dir Flying Coach (ABC DFC) Malak Bus Stand and New Dir flying coach company [NDFC]) constitute the study universe, specifically, drivers of these bus Stand were respondents of the study. For this purpose, a pilot survey was conducted in the four selected Bus Stands to estimate the number of drivers employed there. According to pilot survey a total of 1047 divers were employed in selected bus stands (table-1). The population of 1047 requires a sample size of 285 (Sekaran, 2003). The sample size for each stratum (Bus Stand) was allocated proportionally. The Substance use was used as independent variables, and drivers' perception of road accident was used as a dependent variable. Primary data were collected from the Drivers of public transport through

structured interview schedule, due to the persistent nature of illiteracy. The structured interview schedule was covering all the study variables as given in the conceptual framework. After collecting the data, the data was coded and entered into a software called SPSS (Statistical Package for Social Sciences) to draw the result. The result of Univariate was gained in the form of frequency and percentage whereas, for bi-variate analysis, the chi-square test was used to measure the association between dependent and independent variables.

Results and Discussion

Respondents Perception regarding substance use

Drugged driving is a growing public safety hazard. Substance use has impacts on drivers resulting in delayed reaction time, steering control and lane control. It also affects decision making and concentration which can Couse road accident. Perception of respondents regarding substance are given below in table 4.16

The results reveal that the majority 65% of the respondents occasionally drive after consuming alcohol or other substances. Similarly, 66% of the respondent's sometime used drugs or alcohol while driving, 77.5% of the respondents felt confident in their abilities to drove safely under the influence of substances. Mostly drivers drive under the influence of drugs or other substances and recklessly drinking alcohol or use other drugs while driving with confidence which is extremely risky behavior. That can cause fatalities or injuries due to road accident. Drug use significantly influences road accidents in Pakistan, raising both the risk and severity of crashes (Mir, Razzak and Ahmad, 2013). Similarly, Mir *et al.,* (2012) found that although 30% of drivers used marijuana while driving, nearly 10% of drivers in a sample of 857 commercial bus and truck drivers in Rawalpindi and Islamabad used alcohol and 4.6% reported using both drugs. According to a thorough analysis by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), between 0.3% and 1.3% of all drivers operate a motor vehicle while under the influence of alcohol and illicit drugs (Raes et al., 2008), In addition, according to estimates, driving under the influence of drugs and alcohol accounts for between 30% and 50% of all RTAs in SEAR. (Asia, 2012). This is a worrying fact, because drivers who have used drugs are substantially more likely to be responsible for a fatal accident than nonusers, especially after taking multiple drugs (WHO,2017 and Penning et al., 2010). One important contributing factor to the numerous avoidable causes of RTI-related morbidity and mortality is driving while under the influence of alcohol or other substances (Das., et al., 2012, and WHO, 2017). The study on drug driving, its impact on driving ability, and the associated risk factors and perceptions indicates that drug driving is relatively common, with a 12-month prevalence of about 4% in the general population. Drugs are often found in individuals involved in traffic accidents, with studies in Australia showing that up to 25% of drivers involved in accidents test positive for drugs (Kelly *et al.,* 2004).

Moreover, majority (70.5%) of the respondents have seen others drive after drinking alcohol or using drugs frequently. Similarly, 71.6% of the respondents agreed with a statement that driver's reaction time decreases after drinking alcohol or using drugs. Similarly, 73% of the respondents tend to drive even when they were feeling the effects of alcohol or drugs and 76.8% respondents have been in situations where they were tempted to drive after consuming substances. Mostly drivers have seen other drive after drinking alcohol or using other substances. Drivers were tempted to drive after consuming substances which extremely effect driving performance and decrease reaction time. That results traffic collision or boost the likelihood of road accident. Drug and alcohol abuse are common among public transportation drivers and are thought to exacerbate abnormal behaviors (Kayani, Ahsan, *et al.,* 2019). Furthermore, Substances like alcohol and marijuana affect drivers' mental states, altering

their perceptions and slowing their reactions, which increases the risk of road traffic collisions (RTCs) (Blandino *et al.,* 2022). Alcohol impairs brake reaction time, speed regulation, steering control, and lane discipline, while marijuana affects tracking, attention, reaction time, short-term memory, hand-eye coordination, decision-making, and concentration (Tomczak, 2022). Moreover, bus, truck, and taxi drivers frequently utilize illegal narcotics for fun and to fight off exhaustion. Furthermore, it was discovered that although police are well aware of the pervasiveness of drug use among drivers, they lack the tools and legal authority necessary to do official drug and alcohol tests on drivers. According to a case study in Lahore (Batool, Carsten, and Jopson, 2011).

Thus, Overconfidently Driving under the influence of alcohol or drugs is a risky and irresponsible conduct that dramatically increases the likelihood of traffic accidents, injuries, and fatalities. These substances have a negative impact on driving performance and reaction time. Being aware of the dangers, many drivers continue to engage in this risky behaviour, frequently have seemed by others.

Table 1: Respondents Perception Regarding substance use

Statement	Agree	Uncertain	Disagree
Drivers occasionally drive after consuming alcohol or other substances.	186(65%)	22(7.7%)	77(27.0%)
Drivers sometimes use drugs or alcohol while driving.	188(66.0%)	31(10.9)	66(23.2%)
Drivers feel confident in their abilities to drive safely under the influence of substances.	221(77.5%)	16(5.6%)	48(16.8%)
I have seen others drive after drinking alcohol or using drugs frequently.	201(70.5%)	24(8.4%)	60(21.1%)
Driver's reaction time decreases after drinking alcohol or using drugs.	204(71.6%)	39(13.7%)	42(14.7%)
Drivers tend to drive even when they are feeling the effects of alcohol or drugs.	208(73.0%)	33(11.6%)	44(15.4%)
Drivers have been in situations where they were tempted to drive after consuming substances.	219(76.8%)	23(8.1%)	43(15.1%)

Source: Field survey 2025

Association between substances use and Drivers perception of road accidents

Table 1 depicts the relationship between substance or drug use and driver's views of the likelihood of car accidents. Understanding this association is critical, as substance use has long been established as a primary contributor to impaired judgment, delayed reaction times, and unsafe driving behaviors.

The results show a highly significant association (P =0.000) between drivers perception of road accident and drivers occasionally drive after consuming alcohol or other substances. Similarly, a high significant association (P = 0.000) was found between Drivers perception of road accident and drivers sometimes use drugs or alcohol while driving. Additionally, significant association (P =0.037) was found between Drivers perception of road accident and drivers feel confident in their abilities to drive safely under the influence of substances. Driving under the influence of substance use is associated with high risk of accident and fatalities. Drivers over confident of their driving abilities don't hesitate to drive under the influence of drugs/substance or consume alcohol or other substance while drive which is highly linked with road accident that not only put their own life in danger but also that of the passenger, pedestrian and other drivers as well. Various studies show similar findings where driving under the influence of

drugs is a growing public health and traffic safety concern (Walsh *et al.,* 2004). Driving after drug consumption affects driving ability and increases the associated risk factors. It is a matter of concern that drug driving is very prevalent in the general population and driver's community. Drugs use is frequently found in individuals engaged in traffic accidents. Studies in Australia reveal that up to 25% of drivers involved in accidents test positive for drugs (Kelly *et al.,* 2004). Drug use significantly influences road accidents in Pakistan, raising both the risk and severity of crashes (Mir, Razzak and Ahmad, 2013). The impact of drug use on driving is a major concern for the road traffic authorities, further exacerbating the already high rate of traffic accidents in the country (Mohammed *et al.,* 2019).

Furthermore, a highly significant association (P =0.000) was found between Drivers perception of road accident and drivers have seen others drive after drinking alcohol or using drugs frequently. Likewise, a highly significant association (P =0.000) was found between Drivers perception of road accident and driver's reaction time decreases after drinking alcohol or using drugs. Moreover, significand association (P =0.002) was found between Drivers perception of road accident and drivers have been in situations where they were tempted to drive after consuming substances. Transports drivers are frequently drinking alcohol or other drugs and they have to drive after that, where they don't have the backup or spare driver to drive the vehicle in emergency situation. Drug use is strongly prohibited by law in Pakistan. It is especially banned for drivers because frequently drinking alcohol or using other drugs while driving delay driver's reaction time, decrease attention and affect driving skills (control over the vehicle) which can Couse road accident or increase the chance of accidents. Drug and alcohol abuse are common among public transportation drivers and are thought to exacerbate abnormal behaviors (Batool *et al.,* 2011 & Kayani *et al.,* 2019). Likewise, a qualitative investigation in Islamabad, Rawalpindi, and Lahore (Kayani, King and Fleiter, 2013) discovered reports that bus, truck, and taxi drivers frequently utilize illegal narcotics for fun and to fight off exhaustion. Moreover, Prescription drugs like benzodiazepines, antidepressants, and antipsychotics have also been linked to side effects that could make driving dangerous, such as sedation, reduced focus, and delayed reflexes (Chang *et al.,* 2013 and Olesen *et al.,* 2022).

As against above results, non-significant association (P =0.29) was found between Drivers perception of road accident and drivers tend to drive even when they are feeling the effects of alcohol or drugs. It is obvious from the above results that drivers, occasionally or regularly, use narcotics, drugs and alcohol. Drug addiction is mostly transmitted due to peer interaction of fellow drivers. Drivers that use drugs or those who have seen others using drugs while driving reported high chances of road accidents in them. Drugs are mostly used for joy or killing the fatigue, however, it decreases attention, motor performance and delays driver reaction time which enhances road accidents and extent in the fatalities and injuries.

Table2: Association between substances use and Drivers perception of road accidents

Statements	Drivers Perception of road accident					Chi-Square p=Value
	Level	High risk road accident	Moderate road accident	Low risk road accident	Total	
Drivers occasionally drive after consuming alcohol or other substances.	Agree	109(58.6%)	63(33.9%)	14(7.5%)	186(100%)	$\chi2$= 69.807 P =0.000
	Uncertain	10(45.5%)	9(40.9%)	3(13.6%)	22(100%)	
	Disagree	12(15.6%)	28(36.4%)	37(48.1%)	77(100%)	
	Total	131(46%)	100(35.1%)	54(18.9%)	285(100%)	
Drivers sometimes use drugs or alcohol while	Agree	103(54.8%)	60(31.9%)	25(13.3%)	188(100%)	$\chi2$= 28.811
	Uncertain	12(38.7%)	15(48.4%)	4(12.9%)	31(100%)	

driving.	Disagree	16(24.2%)	25(37.9%)	25(37.9%)	66(100%)	P = 0.000
	Total	131(46%)	100(35.1%)	54(18.9%)	285(100%)	
Drivers feel confident in their abilities to drive safely under the influence of substances.	Agree	112 (50.7%)	73(33%)	36(16.3%)	221(100%)	χ2= 10.195 P =0.037
	Uncertain	4(25%)	8(50%)	4(25%)	16(100%)	
	Disagree	15(31.3%)	19(39.6%)	14(29.2%)	48(100%)	
	Total	131(46%)	100(35.1%)	54(18.9%)	285(100%)	
I have seen others drive after drinking alcohol or using drugs frequently.	Agree	108(53.7%)	69(34.3%)	24(11.9%)	201(100%)	χ2=27.734 P =0.000
	Uncertain	7 (29.2%)	10(41.7%)	7(29.2%)	24(100%)	
	Disagree	16(26.7%)	21(35%)	23(38.3%)	60(100%)	
	Total	131(46%)	100(35.1%)	54(18.9%)	285(100%)	
Driver's reaction time decreases after drinking alcohol or using drugs.	Agree	95(46.6%)	79(38.7%)	30(14.7%)	204(100%)	χ2= 20.065 P =0.000
	Uncertain	19(48.7%)	14(35.9%)	6(15.4%)	39(100%)	
	Disagree	17(40.5%)	7(16.7%)	18(42.9%)	42(100%)	
	Total	131(46%)	100(35.1%)	54(18.9%)	285(100%)	
Drivers tend to drive even when they are feeling the effects of alcohol or drugs.	Agree	99 (47.6%)	74(35.6%)	35(16.8%)	208(%)	χ2= 10.753 P =0.29
	Uncertain	13(39.4%)	16(48.5%)	4(12.1%)	33(100%)	
	Disagree	19(43.2%)	10(22.7%)	15(34.1%)	44(100%)	
	Total	131(46%)	100(35.1%)	54(18.9%)	285(100%)	
Drivers have been in situations where they were tempted to drive after consuming substances.	Agree	113(51.6%)	73(33.3%)	33(15.1%)	219(100%)	χ2= 16.930 P =0.002
	Uncertain	4 (17.4%)	12(52.2%)	7(30.4%)	23(100%)	
	Disagree	14 (32.6%)	15(34.9%)	14(32.6%)	43(100%)	
	Total	131(46%)	100(35.1%)	54(18.9%)	285(100%)	

Integration of Information Technology and Intelligent Transportation Systems Perspective

From an Information Technology (IT) and Intelligent Transportation Systems (ITS) perspective, the findings of this study highlight the critical need for technology-driven interventions to mitigate substance-impaired driving and reduce road traffic accidents. Modern ITS applications such as real-time traffic monitoring, smart surveillance systems, and sensor-based driver monitoring can significantly enhance the detection and prevention of risky driving behaviors associated with drug and alcohol use. Advanced in-vehicle technologies, including driver behavior monitoring systems, reaction-time analysis, and fatigue and impairment detection sensors, can assist in identifying abnormal driving patterns and issuing timely alerts to drivers and traffic authorities. Furthermore, data-driven traffic management systems can integrate information collected from roadside sensors, CCTV cameras, and mobile enforcement units to support evidence-based decision-making. Such systems can help traffic authorities dynamically identify high-risk locations, peak times for substance-impaired driving, and recurrent behavioral patterns among drivers. The integration of centralized databases and intelligent analytics can also improve coordination between traffic police, health departments, and transport authorities, enabling targeted interventions and policy enforcement (Wahid et al., 2022).

Conclusions and Recommendations

It is concluded from the study that use of drugs/alcohol or other substances are frequently used by drivers while driving. They are confident of their abilities to drive safely under the influence of drug or alcohol. The peer influence promotes drug use during driving that negatively impact driving performance, vehicle control and drivers' reaction time which increase the chances of road accidents. Therefor it is recommended to Increase checkpoints and monitoring to ensure compliance with using

drugs and drive. In addition, providing traffic authorities with tools to conduct routine drug and alcohol testing among drivers to reduce impaired driving. In the broader ITS framework, adaptive and scenario-aware systems similar to dynamic routing protocols used in vehicular ad hoc networks (VANETs) can be conceptualized for road safety management. These systems can adapt enforcement intensity, surveillance mechanisms, and warning strategies based on real-time traffic conditions, driver behavior, and environmental factors. By leveraging IT-based solutions, road safety initiatives can move beyond traditional static enforcement methods toward intelligent, responsive, and preventive traffic management models. Such an approach aligns with the future vision of smart transportation systems, ensuring improved quality of service, enhanced safety, and reduced road traffic accidents in developing regions like Pakistan.

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