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# DRUG-INDUCED DRIVING IMPAIRMENT IN OLDER ADULTS

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**ABSTRACT**

At any age, several prescription drugs can impair a person's ability to drive. There are currently over 6000 FDA -approved medications in the market. There are number of drugs in market both as OTC as well as prescription which can influence the driving performance and is a growing public health concern. Benzodiazepines are linked to a 60 to 80% rise in the risk of car accidents when taken with alcohol. The increased risk of car accident is linked to people over the age of 65. The purpose of this study was conducted to know several classes of medication like stimulants, cannabis, antihistamines, alcohol, opiates and cannabis association with objective indicators of unsafe driving. Drugs and alcohol have been associated with a high crash risk in older people. Driving under influence of drug/alcohol caused 3.5% (5,405 deaths), 1.9% (2935 deaths) in India in 2022 and India is called as the "Road accident capital of world". There is a significant frequency of polypharmacy in this age group, and older adults are more likely to experience medication-related driving impairment and this can affect anyone regardless of age. Higher risk of MVC and lower ability to drive have been linked to a number of drugs and it is important for the Pharmacists to play a crucial role in assessing how drugs affect driving and other motor abilities and informing patients about the hazards.

**Keywords:** FDA, Aged, Driving, Medication, Impairment, Polypharmacy, Pharmacist.

## INTRODUCTION

Driving is one of the most difficult things humans engage in on a daily basis since it requires complicated information processing. In order to minimise or reduce the risk of accidents, driver health must be taken into account. Despite the fact that people over the age of 65 use these drugs and are more vulnerable to their side effects. The International Council on Alcohol, Drugs and Traffic Safety (ICADTS) categorization can be used to group drugs according to how they affect driving [1].

There are currently over 6000 FDA-approved medications on the market. Driving under the influence of drugs (DUID) is an increasing public health and traffic safety concern, while driving while intoxicated by alcohol is a topic of study that is well-established. Certain medicines, for instance, may not significantly affect the abilities (cognition, psychomotor

function, physical ability) required to operate a motor vehicle. Medications associated with car accidents may also be classified as potentially impairing driving performance. Not surprisingly, Medication that has been linked to impaired driving has been labelled as potentially driver impairing (PDI) medication [2].

The geriatric population has grown faster than any other category during the previous two decades, and analysts predict that by 2030, 20% of the population will be categorised as aged. The group in the United States with the fastest rising population is thought to number about 40 million people who are at least 65 years old. The likelihood of being involved in a fatal car collision increases by 1.29 and 3.74 times, respectively, between the ages of 65 and 69 and over the age of 85, compared to people in their 40s. Driving under influence of drug/alcohol caused 3.5% (5,405 deaths), 1.9% (2935 deaths) in 2022. India is called the road accident capital of world [3].

To treat multimorbidity, an increasing number of medications are being prescribed to the elderly. Medication risks disproportionately affect older people. Medication errors and side effects are both examples of medication-related adverse events. Burden is experienced by older people as a result of their ageing, multimorbidity, and polypharmacy. The use of multiple medications is often referred to as polypharmacy, but a standard definition is not used [4].

The link between benzodiazepines and the risk of car accidents has now been established, with consistent findings in several studies. Driving abilities may be hampered by any psychoactive chemical that affects the central nervous system. These substances may include alcohol, prescription medicines, or illicit substances. Pregabalin and gabapentin are two drugs that impair judgement and have a rising prevalence in car accidents. The euphoric and dissociative qualities of gabapentinoids may be used inappropriately. The French medication classification system defines a level 2 or level 3 risk of driving impairment as an increased risk of being at fault for a traffic accident for those who take prescription medications. 3.3% [2.7%-3.9%] of motor accidents were linked to levels 2 and 3 of drug use [5].

By 2050, the number of people aged 80 and up in OECD countries is expected to triple, and one-third of the population will be over 65. Out of fear of assaults on buses or trains, many senior citizens still prefer to drive their own car, particularly in congested urban areas with reliable public transportation. Mobility is essential for maintaining a high standard of living as we age. Good driving, on the other hand, is dependent on a number of factors, including one's own perception of oneself, excessive self-assurance, risk acceptance, the need for experience, and so on [6].

**DRIVING AFFECTED BY MEDICINES**

**BENZODIAZEPINES**

Independent of their half-lives, benzodiazepine anxiolytics that are taken during the daytime impair driving ability. At least for the first four weeks of treatment, patients with anxiety who are given anxiolytic drugs for daytime usage should be strongly counselled not to drive. The increased risk of a car accident linked to benzodiazepine use is supported by substantial epidemiological data. 4% of fatal accidents and 16% of drivers who are wounded and are hospitalised contain benzodiazepines. According to estimates, benzodiazepines are linked to a 60% to 80% rise in the probability of traffic accidents and a 40% increase in "accident responsibility," and they are also thought to enhance the risk of accidents when taken together with alcohol. With dose and the use of multiple benzodiazepines, the risk of a car accident also rises. Adverse effects of benzodiazepines Drowsiness, lightheadedness, and impairment of mental and motor functioning are the most typical symptoms [7].

**OPIATES**

Due to ageing and conditions that cause pain, older persons have a higher risk of developing chronic pain. Pain can affect older individuals' quality of life by impairing daily tasks as well.

For those who experience chronic pain, driving may need to be modified or reduced. Sadly, taking painkillers may make it more dangerous to drive. Use of opioids, benzodiazepines, opioid antagonists, and other painkillers has been associated with an elevated crash risk, in particular. Because opiates are central nervous system depressants, some physicians held the belief that patients taking opiates should not drive. Some evidence cited that taking stable opiate doses may drive safely and work. Opiates also have effect on cognitive and psychomotor function [8].

**ANTIDEPRESSANTS**

Attention, memory, motor coordination, and open-road driving have all been proven to be impaired by antidepressants like amitriptyline, imipramine, and doxepin. The main driving parameter and psychomotor performance were not significantly impacted by venlafaxine (standard deviation of lateral position). On the other hand, Mianserin significantly and repeatedly reduced both psychomotor and simulated driving performance. Antidepressant medication users have a higher crash risk than elderly drivers. During the initial phase of dosage modification, patients should be closely monitored and cautioned not to drive if they exhibit any signs of hypotension or sleepiness. If a patient is symptom-free and on maintenance medication, they can typically operate any type of motor vehicle [9].

**CANNABIS**

The non-psychoactive cannabidiol was originally supposed to be the only component of medicinal cannabis. The majority of those who suffer from the ailments for which medical cannabis was first touted as being helpful probably don't drive. THC is known to impair driving abilities, and its presence at any level is linked to a higher risk of crashes. The so-called "zero tolerance" drug driving law frameworks, which have been enacted in many countries and criminalise the presence of a substance (nearly invariably illicit) in a driver's blood or oral fluid regardless of impairment, serve as a significant illustration of this. With impaired coordination, visual function, and attention, which can last for several hours after use, THC can have detrimental effects on driving. On-road and driving simulation studies, however, have also found evidence of modifications in driver behaviour that lessen the probability of crashes brought on by these impairing effects. In contrast, drivers who are impaired by alcohol tend to underestimate their level of impairment and exhibit riskier driving habits [10].

**STIMULANTS**

Impact of stimulants on driving performance by single-dose effects of MDMA and dexamphetamine on driving performance before and after a sleepless night, as well as the effects of MDMA and dexamphetamine with and without alcohol. According to several laboratory research, MDMA has no influence on skills linked to driving as well as both good and negative consequences. Dexamphetamine and MDMA have been shown to enhance performance in some driving-related domains, but this does not necessarily imply that they will never have negative effects in other driving-related domains. According to the sleep deprivation research, sleep loss led to a large increase in SDLP in the road tracking scenario, which resulted in serious deterioration in both actual and simulated driving performance. The use of MDMA can impair performance, according to tests conducted in driving simulators [11].

**ANTIHISTAMINES**

Driving performance is considerably reduced by first generation H1 antihistamines such diphenhydramine, triprolidine, hydroxyzine, Clemastine, or dexchlorpheniramine, terfenadine both after a single dose and after repeated administration. Driving performance may also be affected by some second generation H1 antihistamines, such as cetirizine, loratadine, ebastine, emedastine, acrivastine, mizolastine but how much is dependent on the dose taken. Novel H1 antihistamines including fexofenadine, desloratadine, and levocetirizine do not

impair one's ability to drive. Several second-generation H1 antagonists can be provided safely in combination with alcohol, sedatives, hypnotics, antidepressants, or other CNS-active medications, however there are critical safety restrictions while the patient is operating a motor vehicle. All antihistamines are capable of crossing the blood-brain barrier and may cause sedation [12].

**ALCOHOL**

Driving skills are compromised and accident risk is increased by alcohol usage. It has been discovered that the likelihood of an accident resulting in injury or death dramatically increases while driving under the influence of alcohol. It is estimated that drunk driving causes 10,000 fatalities annually in Europe. Around 31% of all road fatalities in the USA are caused by drunk driving accidents. According to data from China, alcohol use was a factor in around 34.1% of traffic accidents. At a blood alcohol concentration of 0.035%, driving performance was compromised. At a blood alcohol concentration of 0.06 percent, alcohol also reduces hand stability and operating precision. BACs between 0.05% and 0.10% have been reported by certain study to affect behaviours including steering and braking. The ability to regulate steering and braking while drinking has been demonstrated. The number of fatal road accidents globally is estimated to be 1.35 million per year, and data suggests that alcohol frequently plays a significant role. The substance that causes the majority of fatal car accidents and injuries is alcohol. Driving under the influence of drugs is on the rise, although alcohol is still the drug that causes the majority of traffic accidents [13].

**Table 1: Driving affected by some medicinal classes**[14]

| **MEDICATION CLASS** | **EXAMPLES** | **CAUSES** |
|---|---|---|
| Antidepressants | Amitriptyline, clomipramine, doxepin, trimipramine | Drowsiness, hypotension, dizziness. |
| Antihistamines | Alimemazine, doxylamine, promethazine | Primary sedation that can cause impairment |
| Benzodiazepines | Clonazepam, diazepam, lorazepam, alprazolam | Sedation, drowsiness, learning impairment |
| Opiates | Oxycodone, hydrocodone, codeine, morphine | Sedation, reduced alertness, reduced body stability |
| Z-class hypnotics | Zopiclone, eszopiclone, zaleplon and zolpidem | Sedation, increased tracking errors, reduced alertness |
| Sympatholytics | Clonidine, methyldopa, guanabenz | Insomnia, confusion, nervousness, drowsiness, muscle weakness, dizziness |
| Diuretics | Furosemide, spironolactone, indapamide | Dizziness, weakness, fainting, blurred vision, tiredness |
| ACE Inhibitors | Captopril, enalapril, lisinopril | Dizziness, excessive tiredness, lightheadedness |
| Calcium channel blockers | Amlodipine, nifedipine, verapamil | Dizziness, excessive tiredness, weakness, drowsiness |
| Vasodilators | Alprostadil, hydralazine, nitroglycerin, | Fatigue, sleepiness, and impaired vision |

| | | |
|---|---|---|
| Antiarrythmatics | Dronedarone, ibutilide, amiodarone, bretylium | Dizziness, fatigue, lowered alertness, blurred vision |
| Digitalis glycosides | Digoxin | Blurred vision, dizziness, lightheadedness, drowsiness |
| Cannabis medicinal | Tetrahydrocannabinol, cannabidiol, | Driving and operating machinery should be avoided by patients. |
| Herbal products | Passiflora, skullcap, valerian | May cause sedation |
| Opthalmic anti-infectives | Timolol, moxifloxacin, gentamycin, neomycin | May cause vision impairment |
| Antispasmodics | Tizanidine, cannabinoids, clonidine, gabapentin, | It includes moderate risk |
| NSAID'S and Cox 2 inhibitors | Ibuprofen, etoricoxib, diclofenac, Rofecoxib, naproxen | Some could make feel drowsy or lightheaded. |

**COGNITIVE FUNCTIONS AFFECTING DRIVING**

The capacity of older persons to operate a motor vehicle can be significantly impacted by cognitive impairment, in its various degrees. Health care experts will play a bigger role in driving decisions made by people with cognitive impairment as the population ages and the number of older drivers on the road increases. While healthy adults get older, many cognitive abilities that are important for driving also clearly deteriorate; some abilities, like visual search, are already noticeably diminished in middle-aged people. Older drivers' driving risk is significantly influenced by their visual attention, which encompasses switching, distribution, search, and selection. Several factors, including heredity, a child's early surroundings, their schooling, and their career, have an impact on cognitive performance. The fifth decade of life is when cognitive performance begins to diminish, and age-related decline follows from this point on [15].

**MOBILITY**

The impairment of the driver, the adaptive devices used, the use of vehicles, safety, and accident involvement of people with disabilities driving modified vehicles. Motor skills are required to safely enter the vehicle and buckle the seatbelt before engaging in the act of driving. Motor skills required for driving and twisting the body to see oncoming traffic include muscle strength, endurance, flexibility, and proprioception. An individual's capacity to drive comfortably and safely might be affected by aging-related changes and musculoskeletal illnesses (such as arthritis). Senior drivers are more susceptible to collisions in situations that demand quick thinking, good visual perception, and attention due to functional impairments. Due to this, senior drivers are now more likely to be involved in collisions at junctions, particularly when left turns are involved. The abilities needed for independent driving can be impacted by a stroke. Yet, the majority of stroke survivors are able to resume independent driving. Adaptive equipment is available to help with physical issues, such as a left gas pedal and a spinner knob (a component attached to the steering wheel that enables controlled steering with one hand) (for those unable to use the right foot). Training is necessary to operate this kind of equipment safely and adjust to new driving techniques. The distance travelled by the car may be more which illustrates how people dependent on the car for their mobility [16].

**AGE RELATED PRESCRIBING CONSIDERATIONS**

A person's susceptibility to certain drug classes, such as opioids, anticholinergics, and benzodiazepines, might rise as they age due to pharmacodynamic changes caused by age. However older persons are discovered to have frequently been implicitly rejected due to polypharmacy or coexisting illnesses, which goes beyond age. Older persons are more susceptible to drug-drug interactions since they frequently take many medications. Polypharmacy risk is increased by a lack of thorough monitoring, particularly following the prescription of new medications. Older persons frequently use over-the-counter (OTC) and complementary and alternative (CAM) medications, which puts them at higher risk of potential medication-related harm due to drug interactions. Hence, prescribers should be aware of older adults' non-prescription medication use [17].

**VISUAL IMPAIRMENT**

Visual impairment caused by some diseases like cataracts may impair vision. One in three adults in the 80+ age group have vision that is below the minimum standard needed for safe driving. According to predictions, there will be at least twice as many old people by 2051, which will lead to an increase in the number of persons who have vision impairment. This might have a big impact on traffic safety. It has been established that senior drivers' performance, safety, mobility, comfort, and driving habits are negatively impacted by cataract-induced vision loss. Age-related macular degeneration, glaucoma, cataracts, and diabetic retinopathy are the most frequent causes of visual loss in elderly people. Cataract is the leading cause of visual impairment in elders about 48% compared to other eye disorders. Age-related accident rates and decreased contrast sensitivity were both substantially correlated with visual acuity and visual fields. Older drivers were more likely to cause crashes when at fault due to severe contrast sensitivity impairment brought on by cataract [18].

**RANDOM ROADSIDE DRUG AND ALCOHOL TESTING**

Drug and alcohol testing can be conducted in a variety of contexts, including: pre-employment; for reasonable cause post-incident; as part of follow-up monitoring after treatment for a substance use disorder; prior to a return-to-work; or, finally, as random testing. Both alcohol and other drug use contribute to the risk of an accident, and the risk of being fatally injured is increased when drivers, whether or not they have consumed alcohol, test positive for another drug. In India there is a section named Section 185 in the motor vehicles act, 1988 considers drunk driving a criminal offence. The punishment for a drunk and drive can cause imprisonment for 6 months and a fine of 2000 rupees [19].

The likelihood of drivers being tested positive for alcohol or other drugs at a police roadblock declines during the course of the control period, most likely as a result of drivers warning other motorists before passing through the checkpoint. The Alere DDS®2 Test Kit, a portable drug screening instrument that can test a sizable variety of illicit and prescribed medications, was used for the drug test. The cut-off concentrations for THC are 25 ng/ml, for methamphetamine and amphetamine 50 ng/ml, for cocaine 30 ng/mg, for opiates 40 ng/ml, and for benzodiazepines 20 ng/ml [20].

**GENERAL POINTS TO ASSIST PEOPLE FOR SAFE DRIVING**

*Always read the cautions on the medication's container and any literature the pharmacist provides before using any medication.

*Adjust the doses and timing of medication to manage and minimize side effects while driving.

*Taking the medication which has fewer side effects.

*Avoid driving when alcohol is consumed.

*While taking medications that could impair your ability to drive, consider taking the bus or calling a cab.

*If you are feeling unwell, shaky, or dizzy, do not drive.

*Before consuming alcohol while taking medication, consult your physician and pharmacist.
*Verify your stability before taking any new medications.
*Don't use mobile or any other electronic device while driving.

## CONCLUSION

A higher risk of MVC and lower ability to drive have been linked to a number of drugs. It is complicated to determine whether taking a particular drug increases your risk of a motor vehicle collision or impairs your ability to drive. Driving remains an essential part of independence, mobility, wellbeing, and maintaining social connectedness. Older adults should drive their own car for as long as they can since they need personal mobility. Although steering is a task that may be learned more than once, interacting with traffic circumstances and other traffic participants is a complex task that calls for a variety of sensory, motor, and cognitive abilities. Several classes of medications were associated with objective indicators of unsafe driving. High-level competence is needed to drive. Medical illnesses and the medications taken for therapy may have a negative impact on this. Both alcohol and illegal narcotics make it impossible to drive safely. The most important takeaway is to ask your doctor and pharmacist if a medication will affect your ability to drive. If so, look into alternate medications or think about other transportation options. These drivers had higher levels of impairment, more frequent histories of depressive disorders, and more frequent polypharmacy than those who were not using any PDI medications. Particularly in rural areas, general or local governments may play a significant role in offering alternatives to driving. Because of the high prevalence of polypharmacy in this age group, older people are at a higher risk for medication-related driving impairment; however, medicines can affect anyone, regardless of age.

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All the authors have contributed equally.

## CONFLICT OF INTERESTS

The authors declare that there are no conflicts of interest in this article.

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