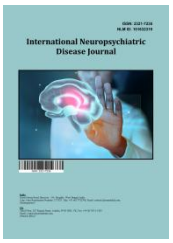

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A Systematic Review of Pattern and Prevalence of Cannabis Use among Transporters and Associated Road Traffic Accidents

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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Systematic Review Article

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ABSTRACT

Background: Cannabis (marijuana), while being prohibited in many countries, is the most commonly used illicit drug worldwide (WHO, 1997). "Cannabis-impaired driving" refers to the impairment brought on by 9-tetrahydrocannabinol's (THC) cognitive and psychomotor effects, which have a negative impact on a driver of a motor vehicle after THC ingestion. In contrast, a "cannabis-positive driver" is a person who operates a motor vehicle while exhibiting driving impairments due to any measurable THC concentration in blood, oral fluid, or urine. A driver is considered to be "driving under the influence of cannabis" (DUIC) if their cognitive or psychomotor abilities are significantly impaired and their blood, oral fluid, or urine contains a specific amount of THC.
Aim: This study aimed at conducting a systematic review of pattern and prevalence of cannabis use among transporters and the associated road traffic accidents.

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Design: A systematic review.
Data Sources: Systematic search for worldwide published literature from PubMed, PsycINFO, EMBASE, Google Scholar, Science Direct, Cochrane Library and Medline databases.
Study eligibility criteria: These studies provided techniques and/or measurements of the frequency and pattern of cannabis use among transporters and the related traffic incidents.
Data extraction: The first reviewer extracted the data, and the second reviewer verified it. Both reviewers individually critiqued each of the identified papers. Data was extracted from each eligible study (including author, title, year, and study setting) following the Preferred Reporting Items on Systematic Reviews and Meta-Analysis (PRISMA). These data abstraction forms were examined, and studies that satisfied the criteria were added to the meta-analysis.
Findings: Only 10 studies met all of the inclusion criteria out of the 2,251 papers that were recovered after looking at the titles and abstracts (where an abstract was not available, the article was still counted).
Conclusion: The study emphasizes the significance of education, law enforcement, and routine drug testing, reducing bribery among federal prosecutors, and influencing the accessibility of cannabis and other psychiatric substances as assessments for preventing substance cruising and restricting road traffic accidents. It also highlights areas where the study's findings and the scientific literature on risk factors for traffic accidents and preventative measures overlap. To increase acceptance and improve results, it is crucial to incorporate lay perspectives into road safety policies and initiatives.

Keywords: Cannabis use; transporters; road traffic; accidents.

1. INTRODUCTION

Cannabis (marijuana), while being prohibited in many countries, is the most commonly used illegal substance globally [1]. Cannabis use while driving has increased in recent years [2]. For instance, the research conducted by the DRUID, which examined 50,000 drivers from 13 different nations, found that 1.32 percent of them had used cannabis [3]. Weekend cannabis usage was detected at rates of 10–12% in traffic and 26-27% in crash participants, with 0.5-7.6% of those implicated suffering serious injuries [3]. "Cannabis-impaired driving" refers to the impairment brought on by 9-tetrahydrocannabinol's (THC) cognitive and psychomotor effects, which have a negative impact on a driver of a motor vehicle after THC ingestion.

In contrast, a "cannabis-positive driver" is a person who operates a motor vehicle while exhibiting driving impairments due to any measurable THC levels in their blood, oral fluid, or urine. A driver is considered to be "driving under the influence of cannabis" (DUIC) if they display a quantifiable decline in cognitive or psychomotor function and a specific level of THC in their blood, oral fluid, or urine [4]. Different perceptual and motor skills required for driving, such as stability, executive function, engine hyperactivity and behavioral inhibition, belief, psychomotor speed, selective memory, sensory perception, and verbal memory (reaction time and accuracy), are all adversely affected by THC both acutely and possibly chronically [3]. All of these deficits could be dose-dependent [5], have a detrimental impact on driving prowess and crash risk, and could get worse with continued cannabis use [4, 5]. Results on the connection between driving ability and the likelihood of a traffic accident while under the influence of cannabis, however, produced mixed results [6-8].

Mixed results could be explained by methodological heterogeneity. For a thorough assessment of the relationship between cannabis use, driving prowess, and the risk of a car accident, it is necessary to take into account a variety of study types, as summarized by [2], including sample surveys, laboratory tests, and observational data like specific instances and their variant, "culpability" research. Each research methodology has advantages and disadvantages. For instance, determining the percentage of cannabis users in study samples is difficult in epidemiological research. Studies that depend solely on self-reported data run the risk of underestimating the true prevalence of cannabis use. Only a small percentage of studies evaluate the level of cannabis in blood, other body tissues, or fluids at the moment of the accident. The frequency of cannabis use or the time since the last cannabis intake just before the crash, however, may not be obvious. The use of

additional drugs (such as alcohol) and the frequency and duration of cannabis usage are a few other factors that may increase the risk of an accident while under the influence of marijuana.

"Again, a small percentage of studies [7] provide a combined evaluation of different legal and illegal substances or include controls for additional confounding variables". "Cannabis use frequency and timing before an event have various effects on driving abilities. While laboratory and experimental studies frequently have small sample sizes, they typically evaluate specific driving impairment under different but defined doses of smoked or oral cannabis products [8] in a controlled setting. Participants in these studies are usually aware of the potential effects of cannabis use and attempt to compensate by driving more slowly and safely" [8].

"A recent double-blind, randomized clinical study [9] on 26 healthy occasional cannabis users exposed them to vaporized THC-dominant, CBD-dominant, THC/CBD-equivalent, and placebo cannabis supplements in these laboratory studies. The Standard deviation of lateral position (SDLP), a lane-waving indicator, was the end point assessed during 100 km of on-road driving experiments at 40 and 240 min after cannabis use". There were no significant differences between CBD-dominant cannabis and placebo, but the SDLP following vaporized THC-dominant and THC/CBD-equivalent cannabis was considerably larger at 40-100 min but not 240-300 min. The doses that were examined here might be typical of everyday use.

Comparatively, epidemiological and survey samples generally do not undergo assessments of their cognitive deficits, which may cause variation in study outcomes. Unsurprisingly, some research that examined the relationship between cannabis usage and the risk of auto accidents found an elevated risk [10], while others came to ambiguous conclusions [11]. "The outcome criteria for various study types vary. Simple collisions [8] and crashes with injuries and fatalities [2] were both included in several meta-analytical studies, each of which had a different profile of risk factors".

"Additionally, five meta-analyses [2] that aggregated the effect size of DUIC made the case that cannabis increases the likelihood of car accidents. All studies utilized a random-effect model to determine the magnitude of the impact of cannabis usage on auto accidents. But every study also noted a sizable heterogeneity among the examined research". "The more recent meta-analysis revealed that publication bias, which favored studies indicating a positive link between DUIC and automobile crash risk, was to blame for the high heterogeneity discovered" [12].

1.1 Aim

This study aimed at conducting a systematic review of pattern and prevalence of cannabis use among transporters and the associated road traffic accidents.

2. METHODS

This analysis used a top-down search approach. According to the Preferred Reporting Items on Systematic Reviews and Meta-Analysis (PRISMA) [13-16], the researcher gave priority to studies with the strongest degree of evidence, i.e., pooled data from systematic reviews and meta-analyses. The researcher then considered studies with a lesser level of evidence if the initial search failed to address the study theme (e.g., cohort studies, case-control studies). We extensively searched PubMed, PsycINFO, Medline, Embase, and the Cochrane Library. We manually reviewed the references of the indicated reviews and meta-analyses to find new studies. Data extraction, data synthesis, eligibility assessment of full-text publications, and search result screening were all carried out separately by two reviewers; any discrepancies were settled by consensus or by referring them to a third expert.

2.1 Eligibility Criteria

Systematic reviews or meta-analyses and prospective related studies examining the effects of cannabis use on memory, IQ, driving performance, and traffic accidents satisfied the inclusion criteria. Up to 2021, all English-language studies had been taken into account.

Reviews without a recorded systematic literature search, non-systematic reviews, systematic reviews that did not concentrate on cannabis or cannabinoids, animal and molecular research, expert analysis, and viewpoint statements were all excluded.

2.2 Search Strategy and Methodological Assessment

The terms (MeSH-Terms) used for the worldwide search were "Marijuana OR Marihuana OR Marijuana" or "Cannabis OR cannabinoid* OR hemp OR hanf." Different databases received the built-in, pilot-tested, and accepted search strings. Using the SIGN-checklist, the systematic review of each study that was considered was evaluated, with results ranging from "excellent quality (++)," "acceptable quality (+)," "poor quality (-)," to "unacceptable-reject." Based on study type and quality, each study received a degree of evidence rating from "1" (the highest level of evidence) to "5". (Lowest level of evidence).

2.3 Data Synthesis

A method for qualitative data synthesis was used in this review. The substantial variability of the key outcome measures precluded the use of an aggregated data analysis. When interpreting the study's findings, the sample size, amount of evidence, bias risk, and degree of heterogeneity or homogeneity were all taken into account. The availability of numerical data or results, the highest SIGN-rating (Quality assessment tool for systematic reviews), the most recent date of publication, and a greater number of studies and observations were included as preference criteria [17] in the event that there were duplicate primary studies. For each result, assessments were performed independently. Both reviews were eligible for inclusion if they reported on distinct outcomes from two reviews with identical primary studies.

3. RESULTS

Only 10 studies met all the inclusion criteria out of the 2,251 papers that were recovered after looking at the titles and abstracts (where the abstract was missing, the article was still counted). The study selection process and the reasons for exclusion are shown in Fig. 1.

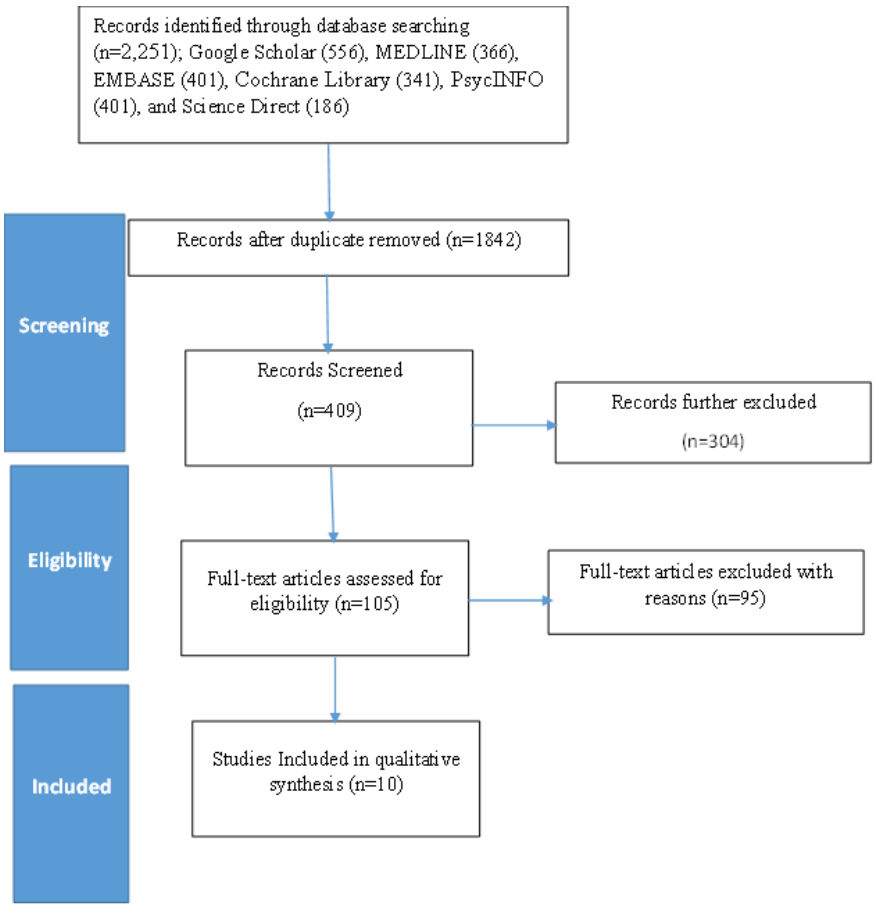

Fig. 1. PRISMA flow chart of the systematic review process

4. DISCUSSION

A study on marijuana use and auto accidents was completed by Ulrich et al. [18]. In this study, the general association between any crash and DUIC chronic cannabis usage was first analyzed, and then it was determined how this relationship changed when various co-factors were taken into account. “Five meta-analyses on various study types were included in the research on these subjects (case-control, culpability, and cohort studies). All five meta-analyses found that the use of cannabinoids is linked to an increased risk of automobile accidents. While, as expected, the number of studies covered grew over time. Nine studies totaling 51,783 participants were examined in the first meta-analysis [2], and nine studies totaling 92,200 participants were examined in the second meta-analysis from the same year” [19]. “Only two studies [19] were previously analyzed [2] in the first meta-analysis”.

“While 12 studies were added [7] re-analyzed information from the initial and second meta-analysis [2] and added a second study with 21 included studies, of which 14 were also evaluated in the previous study [7], the third meta-analysis [7] with 27 studies included eight studies each from the first [2] and second [19] meta-analysis. Of these, 12 were included in the most current analysis [12], of which 12 were examined in the previous greatest meta-study” [7]. As a result, the studies included in the available meta-analytical study on this subject overlap to some extent, although not entirely. The selection criteria differ between studies as well. Some of these investigations include case-control and culpability studies [2], as well as cohort [19] and laboratory research [7], before case-control, culpability, survey, and cohort studies [12] are completed.

All meta-analyses found significant heterogeneity among the included studies [2]. In the previous study [12], statistics indicating heterogeneity for several outcome criteria were also provided. The discrepancy in Odd Ratio (OR) estimates between meta-analyses for the overall statistics may be explained by all of these factors. Additionally, case-control studies arrive at greater OR estimates than culpability studies, and fatal collisions, with the exception of [2], obtain lower OR estimates than other types of crashes. Studies based on self-report have greater ORs than those based on blood or urine data, which brings us to our final point. Drivers engaged in collisions are categorized into those who caused the collision and those who were not at fault in culpability studies [2]. These studies are based on the assumption that if cannabis use increases the likelihood of a collision, it should be more likely to be found in drivers who are found to be at fault in an accident. However, in case-control studies when DUIC subjects are compared to non-DUIC control, OR might be higher. DUIC may also impair driving abilities and raise crash risks, but the risk of fatal collisions is lower than that of other forms of collisions (collision only, injury). As a result, the risk of car accidents increasing is still greater for fatalities even while it is considerably attenuated for collisions and injuries.

Self-reports of cannabis consumption may be prone to recollection bias and may be less accurate than blood or urine testing at detecting real cannabis use. Typically, it is believed that self-reported levels of cannabis use are understated. As noted in other research [19], the validity and reliability of various methods of determining cannabis usage, such as self-report, urine testing, and blood tests, may vary. According to the authors of one meta-analysis [13], laboratory examinations of blood samples from all research participants yield the most accurate data on accidental overdoses while operating. Saliva is the second-best indicator. Because inactive cannabis metabolites can be found in urine samples years after the drug has gone inactive, urine is a less reliable indicator than blood. While acute deterioration in driving ability from cannabis use lasts between 3 and 12 hours [19], the majority of these assessments only look at recent cannabis usage. Due to the fact that cannabis is an illegal substance in the majority of nations, drivers in the comparison groups may be less likely than those who were involved in accidents to submit to testing, which could cause the impact of marijuana usage on crash risk to be overestimated.

These meta-analyses have a number of drawbacks. In the fourth meta-analysis [13], only five studies that evaluated collision risk for drivers with blood THC levels of more than 2 ng/ml were discovered in the fourth meta-analysis. In addition, all case-control studies had high refusal rates (>15%), which would have led to selection bias if drivers who declined participation had differing drug usage rates than those who did. Many case-control studies compared cannabis exposure in cases and controls using various techniques (for example, blood THC in cases and saliva THC in controls).

Non-comparable regulations were used to estimate THC use in the general driving population (29), and only a small portion of included studies evaluated THC in blood samples or a mixture of blood samples and urine, saliva, or self-reports [20]. The applicability of the findings is restricted by each of these.

Additionally, numerous body fluids with different properties when it comes to determining THC levels include whole blood, plasma, urine, and saliva. According to experimental research, THC concentrations (logarithms) in oral fluid and plasma did not significantly correlate. However, after repeated oral THC doses, time has a different effect on plasma and oral fluid THC concentrations [21]. Since THC's clearance is non-linear, reverse regression of concentrations to an earlier period is not possible, and cannabinoids in urine have a longer window of observation than those in blood and oral fluids. Because cannabinoids are firmly linked to proteins in plasma (>90%) and there is little partitioning into erythrocytes, blood cannabinoid concentrations must be about quadrupled compared to plasma concentrations [22]. Additionally, for THC and 11-OH-THC at the majority of time points, regular smokers' blood and plasma concentrations of cannabinoids were considerably higher than those of occasional smokers [23]. THC levels higher than 2 g/L were found in oral secretions for 26 hours in occasional smokers and higher levels for more than 72 hours in regular smokers. Therefore, comparable to blood and urine, low THC concentrations can be seen for several days in the oral secretions of habitual smokers [24].

The review's authors conclude by noting that in addition to the body fluid characteristics and smoking status of the subjects, cannabinoid stability in these measurements also depends on the collection technique, the buffer structure of commercial detection methods, the analytes, storage units, storage temperature, and storage time. Five case-control studies with "high quality" SIGN ratings addressed the analyses on the correlation between THC content and crash risk.

Statistics on this association were not included in any of the meta-analyses. However, given that different legal cut-off values for THC blood levels exist among European countries for DUIC, the connection is significant. While other nations have cut-off principles of 1 ng/ml (Germany, Belgium, Ireland, Luxemburg, Netherlands in the appearance of other materials), 2 ng/ml (Czech Republic, United Kingdom), and 3 ng/ml (Netherlands) [EMCDDA Cannabis and Driving [7]], Norway's punishment rises in accordance with the THC composition detected (1.3, 3, and 9 ng/ml). It is important to consider which legal cut-off concentrations research uses when reporting evidence that is backed by empirical data.

The greatest OR value across research, from an Australian study [25], was OR 6.6, which is greater than ORs from subsequent studies [26], unadjusted OR (uaOR) 4.7, [27] (uaOR) 3.95, and [28] (uaOR) 2.29 for the same subgroup of people with THC of 5 ng/ml. However, in the [25] sample, the median THC content was 12 ng/ml and the THC content was 5 ng/ml in 84% of the THC-only cases. This rate is higher than the samples from France and Canada [26], 2.66% [27], 4.2% [28], and 0.9%. As a result, given the high percentage of those with THC levels of over 5 ng/ml, it was anticipated that THC would have an impact on accident risk in the Australian sample. Furthermore, alcohol was found in 43% of THC-positive cases, and in the Australian study [25] by Drummer et al. (2004), the effect of THC was also assessed in THC + alcohol cases, and a significant interaction was discovered. In French and Canadian samples, this effect was not repeatable.

As in the subsequent investigations [28], no significant interaction between blood levels of THC and alcohol was seen in the initial French study [26]. As a result, while each substance has unique effects, the majority of studies found a significant link between cannabis and alcohol use and being at fault in fatal crashes or injuries [7]. According to the Australian Study's findings, alcohol and cannabis both exhibit a biological gradient, with larger doses of both having a higher OR of responsibility in fatal accidents. After accounting for alcohol intoxication, the ORs in the second French study [26] show an inverse U-curve pattern with a maximum at THC concentrations between 2 and 5 ng/ml. This strong dose-effect was also observed in the first French [26] and Canadian [28] studies.

The authors of all the research agree that there is a clear dosage effect and that DUIC may play a causative role in fatal crashes. The most recent study by [26], particularly in individuals with greater blood concentrations of THC, supported the notion that increased odds of guilt are positively associated with THC. Due to the fact that THC blood levels were recorded in all five samples, culpability studies may be well adapted

to assess the risk of fatal and non-fatal accidents. When THC plasma concentrations in fatal [26] and non-fatal [28] are compared, the odds proportions for all THC blood levels are comparable (fatal crashes: 2.7 ng/ml [25], 1.78 ng/ml [25], 1.65 ng/ml [26] vs. non-fatal crashes: 1.13 ng/ml [28], 1.9 ng/ml), though the levels in fatal crashes tend to be higher. The results for the five culpability studies included in this analysis were supported by a prior meta-analysis and systematic review, which eliminated low-quality studies and revealed cannabis-associated risk for fatal collisions (OR = 2.1) and non-fatal crashes (OR = 1.74) [7].

Case-control and culpability studies, however, have drawbacks. As various authors have noted [28], estimating the level of inebriation for cannabis is more difficult than estimating the level of inebriation for alcohol, as various authors have noted [29]. The maximum effects of cannabis take longer to manifest after smoking and vaping than they do when THC blood levels are at their highest, peaking after about 30 minutes, depending on the study's design and timing of testing. THC levels fall, but the effects on cognition and psychomotor performance remain [30]. Whole blood THC levels while smoking a "joint" frequently peak at >100 ng/ml during smoking and then decline so quickly that they are typically 2 ng/ml 4 hours after a single acute exposure [30]. Psychoactive effects often reach their peak at 20 to 30 minutes and end by 4 hours. Consuming cannabis prolongs the occurrence and severity of these symptoms. 11-nor-9-carboxy-THC (THC-COOH), the primary THC metabolite, is not psychoactive and stays in the blood and urine for a considerable amount of time after impairment has subsided. THC-COOH thus gives proof of prior cannabis exposure but does not always signify intoxication or current use [31].

THC is primarily responsible for cannabis's effects that affect one's ability to drive. It is difficult to drive when metabolites like THC-COOH are persistent and measurable for a long time after use, but they don't have any known psychoactive effects that make it difficult to drive. It is necessary to compare the outcomes of culpability and case-control studies with those of experimental and laboratory investigations. The fact that laboratory and simulator research is carried out in an artificial setting is undoubtedly a drawback.

Thus, experimental findings indicate that after ingesting marijuana, drivers attempt to compensate by driving more slowly, but their control deteriorates as task complexity rises [7]. These actions restrict the applicability of experimental study findings to real-world traffic conditions [7]. However, just like with other mental performances, cannabis use (THC-dominant and THC-CBD-equivalent) enhances lane weaving 40 to 100 minutes after vaporization [19] and continuously impairs cognitive function, including important aspects like executive function, divided attention activities, and lane-position variability, all of which may increase the chance of a car accident. However, even when time of usage and duration of consumption are taken into account, there is generally no discernible association between THC blood or serum levels and driving abilities or disaster risk from experimental tests.

Unsurprisingly, despite the dosage effect, where higher THC blood concentrations result in higher OR estimations for crashes, there is no universal agreement on probable THC legal cut-off values. A link, however, does not always offer a hint of a cut-off value that is supported by science. According to experts, many drivers with blood THC levels above 3 ng/ml (42) or above 3-5 ng/ml (43) have considerable impairment and shouldn't be allowed to operate a vehicle. According to these statistics, several countries have established THC per se limits of 2 or 5 ng/mL, while many European nations have a limit of 1 ng/mL. These jurisdictions include numerous US states and Canada.

According to supporters of these lower THC values, a driver who was inebriated and had high THC concentrations at the time of driving could show amounts below 5 ng/ml many hours later if blood samples are delayed. They claim this fact supports lower per se limits for THC. These concentrations, particularly the 1 or 2 ng/ml values, have drawn criticism because it's possible that they don't signify impairment, particularly in heavy users who build up a resistance to certain of THC's impairment-causing properties [7]. After a week or longer of abstinence, some daily users may have blood THC levels > 1 ng/ml due to the buildup of cannabinoids in fat [7].

Therefore, it may not be suitable to completely analyze driving ability impairments using the different THC concentrations used to establish a cannabis-related driving violation in EU countries and several US states, varying between 1 and up to 7 ng/ml. Within hours following an accident,

measurements of THC and its non-psychoactive metabolite THC-COOH have various limitations and may not accurately reflect a reduction in driving ability. However, not all studies found statistically significant associations. Even greater THC concentrations of >5 ng/ml in subsequent studies resulted in higher chances of injuries and fatal concentrations. Instead, the evaluation of driving fitness may be more accurate (more valid for "actual" impairment) when both biological and psychomotor features are considered, and this is likely true in real-world traffic management scenarios.

Results of experimental and laboratory studies investigating the impact of cannabinoids on one's ability to operate a motor vehicle should take into account designs that incorporate measures of psychomotor and cognitive functions, such as reaction times, decision-making after lengthy and repetitive drives, and split attention duties. Research suggests that cannabis may have the greatest negative impact on certain cognitive abilities [7]. Last but not least, it is crucial to understand that cannabidiol is a crucial component of cannabis-based products (CBD). As for driving skills, it is a sedative chemical, so it could contribute to reducing them and raise the likelihood of accidents. However, no study examined the impact of CBD by itself on the likelihood of a car accident. Further research is undoubtedly required to determine the connection between CBD usage, driving abilities, and crash risks given the rising sales and use of CBD.

Research consistently shows that acute cannabis use significantly raises the probability of auto accidents and reduces certain driving abilities. According to CERQual, trust in the findings of multiple study types (case-control, culpability, and cohorts) is assessed as "moderate." When several confounders are taken into account in multivariate analyses, the odds ratios (ORs) for car collisions among cannabis users are slightly but considerably raised in meta-analyses. Additionally, greater OR estimates were found for non-fatal collisions, case control vs. responsibility, and self-report vs. blood tests. According to high quality responsibility studies (SIGN), there is a dosage impact of greater THC blood levels with enhanced danger for traffic deaths and those with wounds. This physiological gradient does not, however, offer a distinct legal cutoff value. As a result, the range of these cutoff values remains between 1 and 5 ng/ml. While measuring THC and its metabolite THC-COOH in blood and other tissues hours after a collision has a number of challenges (different body fluids have different time periods for THC levels), these values might not even represent genuine driving ability impairment. Therefore, ratings of psychomotor and cognitive abilities should be added to biological measurements in order to determine driving fitness.

Another study that Mark et al. [32] did was on acute cannabis consumption and the likelihood of auto accidents. A near doubling of the risk of a driver being involved in a motor vehicle collision that causes serious injury or death was discovered. This was after a thorough review of the literature in this meta-analysis of studies that investigated acute cannabis usage and motor vehicle traffic incidents with adequate management groups. High quality research, case-control studies, and studies of fatal crashes showed the greatest evidence of the elevated risk. Uncertainty surrounds how acute cannabis use affects the likelihood of minor collisions. The findings of this study are consistent with experimental research (laboratory, simulator, and forensic), which indicates that cannabis reduces the ability to perform the cognitive and motor activities required for safe driving, which raises the chance of an accident [33]. The findings are consistent with crash data that shows an increase in the use of drugs other than alcohol by drivers who sustain injuries or death [34], particularly cannabis and substances that depress the central nervous system.

According to surveys of young drivers [35], driving while under the influence of cannabis is more common than driving while intoxicated in some areas [27]. The observed relationship between cannabis consumption and collision risk is less strong than that for alcohol, which is still the chemical that is most frequently found in crashes [36]. For instance, a blood alcohol level of 0.8 g/100 mL (17.36 mmol/l), which is the legal limit for impairment in many jurisdictions, is linked to an elevated relative risk of a crash of 2.69, with drivers 35 years old and younger being at a significantly higher risk [36]. The meta-studies analysis revealed significant heterogeneity in the effects of cannabis consumption [15]. The characteristics of the non-culpable group used as a control group in culpability studies may have contributed to differences in risk estimations between case-control and culpability studies.

Because they have been in a car accident but have been ruled not at fault for it, the individuals in this group are by definition not real controls. Due to this upward bias in the baseline crash risk of non-culpable drivers and their smaller effect sizes compared to collision-free control, tetrahydrocannabinol's impact on crash risk in culpability studies may be lessened. The more conservative impact obtained from the investigations of medium quality and culpability may be explained by variations in the types of controls used in different study designs.

The variation in tetrahydrocannabinol levels may be the cause of the increased effect of cannabis on the danger of motor vehicle accidents for studies of fatally wounded drivers, according to the study. Studies of drivers who sustained fatal injuries revealed higher levels of tetrahydrocannabinol in their plasma than those seen in research of non-fatal injuries (either due to thicker cannabis consumption or attributed to the shorter time frame between usage and quantification) [36]. We did not investigate dose impacts on the danger and intensity of collisions. Tetrahydrocannabinol is tested in severely wounded motorists at a time comparable to death, as compared to non-fatal crashes, where the compound is detected many hours after the disaster. Additionally, drivers involved in non-fatal collisions are more likely to reject drug testing, which worsens measurement bias.

Simulator studies have also discovered a significant dose-response impact, in which higher tetrahydrocannabinol concentrations were linked to an increased accident risk. Only three of the examined trials contained estimations of odds ratios at varying tetrahydrocannabinol concentrations; in all three cases, rising quantities of the drug increased the probability of crash [37]. The researcher is unable to differentiate between tetrahydrocannabinol levels in occasional and habitual cannabis users because only one of the examined studies evaluated cannabis use by drivers.

The conclusion of a study on cannabis, alcohol, and fatal traffic accidents was an empirical opinion of [38]. This study sought to determine the frequency of these impacts among drivers, the relevant assessment stage associated with them, and the relative risks of being responsible for a fatal accident while driving under the influence of alcohol or cannabis. The estimation of the same items for three more classes of illegal drugs (amphetamines, cocaine, and opiates) was a secondary objective, and the results were contrasted with those of a study of a similar nature conducted in France between 2001 and 2003. In order to create a database of 4,059 drivers, police processes for fatal crashes in Metropolitan France in 2011 were examined. 300 variables were then recorded. Tests for positive and prospective verification through blood testing provide data on alcohol and four categories of illicit substances.

The study evaluated drivers involved in a crash for whom they were not accountable and who could be matched with other drivers generally with drivers who were actually responsible for the event, that is, had directly contributed to its occurrence. 2.1% of drivers are thought to be under the influence of alcohol, while 3.4% are thought to be under the influence of cannabis. Alcohol-impaired drivers are 17.8 times (12.1–26.1) more likely to cause a fatal accident, and it is predicted that 27.7% of fatal accidents would be avoided if all drivers never went over the legal alcohol limit. The probability of being involved in a fatal accident increases by 1.65 (1.16 x 2.34), and it is predicted that 4.2% of fatal accidents might be avoided if no one ever operated a vehicle while under the influence of cannabis. Despite having a low prevalence, an elevated risk associated with opiate use has also been found to be significant, necessitating caution in how this data is interpreted. Other narcotic subgroups are considerably less common, and it is impossible to determine whether there are any additional dangers.

Additionally, [39] did a study in Zaria, Nigeria, on the prevalence of psychoactive substance use among commercial motorcycle riders and its effects on their health and society. Commercial motorcycle riders (Okada riders) have recently emerged to fill the vast public transportation shortfall in the majority of the nation's cities. However, this is not without the risks they provide to other road users, their passengers, and themselves. Some of these Okada riders are allegedly operating while under the influence of narcotics and other substances. However, there isn't much research that has been conducted in the community and looks into the issue in this region of Nigeria. A study was conducted (Okada) in order to ascertain the prevalence, health effects, and social effects of psychoactive substance use among commercial motorcycle riders (Okada). In Zaria, Kaduna state, Nigeria, a multi-stage sampling technique was utilized to sample commercial motorcycle riders who were

members of the commercial motorcycle union. Documentation on socio-demographic variables, variables impacting psychoactive drug use, effects on health status, motorcycling experience, and job performance were gathered using standardized, closed-ended, and structured interview surveys. A total of 200 commercial motorcyclists were questioned; the bulk of them (55.5%) were between the ages of 21 and 25; their average age was 25.4 3.9 years. The majority of motorcycle riders (69%) worked more than 10 hours each day, were all male, had no formal education, and were of Hausa ancestry.

Among motorcyclists, a significant incidence of 59.5% of traffic accidents that were linked to the use of psychoactive drugs was discovered. Cannabis (Indian hemp) accounted for 25.8% of all detected psychoactive substances/drugs, followed by solution (24.5%), caffeine (15.8%) (Kola), and coffee (4.8%). The factors that have been found to influence the use of psychoactive substances include staying awake, squelching feelings of fatigue, and peer pressure. Fractures of the upper and lower limbs (10.5%) and bruising and lacerations (62.5%) were the most frequent types of injuries. Commercial motorcycle riders are frequently involved in traffic accidents in this region of the country. Public awareness programs on road safety instruction and the health effects of psychoactive substance usage among commercial motorcycle riders are required. In order to combat the issue of substance misuse in our society and lower the amount of crashes on Nigerian roads, it is also advised that law enforcement authorities (NAFDAC, NDLEA, and FRSC) collaborate.

Last but not least, [40] conducted a 7-year survey for his study on the frequency of fatal road traffic accident injuries linked to alcohol use and psychoactive substance use. The explanatory study's objective was to outline the effects of alcohol and/or psychoactive drugs on catastrophic road traffic accidents (RTAs) from 2011 to 2017. The Institute of Laboratory Medicine and Toxicology at the University of Athens' toxicological findings were used for this. Over the course of a seven-year period (2011–2017), 1,841 (32.2%) of the autopsies performed by the Institute of Laboratory Medicine and Toxicology of the National and Kapodistrian University of Athens involved fatal RTAs. Alcohol and other psychoactive drugs were screened for in blood and urine samples. The outcomes were divided into categories based on sex, age, victim status (driver, motorcyclist, walker, or passenger), and the time of the collision (day, month, and year). A total of 40.7% of RTA-related fatalities were linked to alcohol use, and 20.3% of these were auto drivers. 87.3% of these victims were men. Younger age groups experienced more RTA-related fatalities with a blood alcohol content (BAC) >110 mg/dl than older age groups did. 348 victims (18.9%) had psychoactive substances present, with cocaine accounting for 11.1% of them, benzodiazepines for 25.9%, opiates for 16.4%, and cannabis for 46.6%. 4.5% of those who had been injured in RTAs had combined the use of alcohol and other psychotropic substances. Overall, the results of this study indicate that psychotropic drugs and alcohol are likely risk factors for fatal RTA accidents.

5. CONCLUSION AND RECOMMENDATION

For most of their everyday activities, Nigerians depend on commercial transportation. Human factors have an impact on the safety of commercial transportation, especially when it comes to driving while intoxicated due to alcohol or other psychoactive substance use. Road traffic accidents are more likely to occur when a person is driving while under the influence of cannabis, alcohol or other substances (DUI). However, the majority of legislation and actions addressing traffic offenses like DUI are based on expert opinions. The opinions of the transport employees themselves are not given much weight. Lay perspectives could improve the efficacy of policies and initiatives.

According to the opinions presented in this study, using psychoactive drugs such as cannabis while operating a commercial tricycle is associated with workplace risks such as stress, tiredness, and fatigue and can impair eyesight, judgment, and coordination while driving. These make traffic accidents more likely to occur. The opinions also stress the need for education, law enforcement, and frequent drug testing, as well as the need to stop corruption among law enforcement personnel and regulate the supply of psychoactive chemicals as ways to reduce drugged driving and traffic accidents. These opinions are supported by scientific data on the causes, consequences, and preventative strategies of road accidents. To increase acceptance and enhance results, it is crucial to incorporate lay perspectives into road safety policies and initiatives.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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