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From Drivers to Passengers: Concept of Passive Drink Driving and Need for Passenger-Centric Interventions to Reduce Drink-Driving in Bengaluru City, India Former Project Coordinator, Road Safety Risk Factor in Bengaluru Metropolitan Region, India

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Abstract

Introduction:

Analogous to second-hand smoking, passive drink driving refers to travelling with the driver under the influence of alcohol, beyond the legally prescribed BAC limits. Such passengers are exposed to impaired driving conditions and increased risk for road crashes.

Aim:

To estimate the prevalence of passive drink driving in Bengaluru city and to highlight the relevance of a passenger-centric approach as a strategy for reducing road traffic injuries and fatalities.

Methodology:

A cross-sectional drink-driving assessment was conducted in March 2023 across 48 police station jurisdictions in Bengaluru city. Random, two-phase alcohol breath testing was carried out among 10810 drivers and riders. Information on the number and characteristics of passengers travelling with screened drivers was collected through direct observation by trained field investigators. Passive drink driving was defined as passengers travelling with drivers detected with a BAC >30 mg/100 ml of blood. The percentage of passenger-carrying vehicles operated by drivers with BAC above 30 mg/100 ml, as well as the proportion of passengers travelling with a drink-drive violator, indicate presence of passive drink-driving is presented to measure passive drink driving. Data were analysed using SPSS version 25.

Results: There were 11468 passengers in 5624 vehicles**.** For every 1000 vehicles with passengers, 25 were driven by a drink-drive violator. Among 11468 passengers, around 1.7% (95% CI 1.52- 2.01) were travelling with a drink-drive violator.

Discussion: Passengers face crash risks similar to those of drink-driving offenders, yet passenger-centric interventions are largely ignored in the control of drink-driving in the Indian context.

Conclusion: Passenger-focused communication strategies should be deployed to discourage individuals from travelling with impaired drivers. Inclusion of passive drink driving as an indicator in routine road crash surveillance systems, along with further research on its health and legal implications, is recommended.

Introduction

Official reports indicate that around 170,000 people were killed due to road crashes in India in the year 2023, of which 33% were passengers. While official reports attribute 1-2.5% of these fatalities to driving under the influence(1), Hospitals-based studies from different parts of India suggest that 10-30 % of emergency room RTI registrations reported alcohol consumption at the time of injury (2). Studies from

USA reported 43-66% of passenger deaths due to travelling with a drink driver (3)(4) (5). Research data from India is limited on passenger fatalities attributed to drink-driving.

Passengers travelling in vehicles driven by individuals under the influence of alcohol are likely to face crash risks comparable to those of the driver. It is therefore reasonable to describe such passengers as being exposed to drink-driving ('passive drink driving') from a risk perspective, analogous to passive smoking. These passengers are exposed to impaired driving behaviours, including rash driving, disregard for safety and alcohol-related errors in judgment.(6)

A large sample drink-driving assessment study was conducted in Bengaluru, a metropolitan city in India, covering nearly 10810 assessments in March 2023 by the Department of Epidemiology, National Institute of Mental Health and Neurosciences (NIMHANS), and Johns Hopkins International Injury Research Unit (JH-IIRU), with support from Bengaluru Traffic Police (BTP) and the Bloomberg Initiative for Global Road Safety (BIGRS). This paper uses data from the assessment to estimate the prevalence of passive drink driving in Bengaluru city. The percentage of passenger-carrying vehicles operated by drivers with BAC above 30 mg/100 ml, as well as the proportion of passengers travelling with a drink-drive violator, indicate presence of passive drink-driving. The paper highlights the relevance of passenger-centric approaches to reduce road crashes and fatalities due to drink-driving.

Methodology

Bengaluru, the capital of Karnataka state, is the third most populous metropolitan agglomeration in India (7).Between March 4 and March 31, 2023, a cross-sectional drink-driving assessment was carried out in all 48 police station limits in the city. Detailed methodology and results are available in the report "Reducing drink-driving in Bengaluru city" (8). A brief methodology is described here for the readers.

Drink driving assessment was conducted on 52 roads sampled from all 48 police station limits in the city, between 10 p.m. and 12 a.m. Every day, drink-drive checks were conducted on two randomly chosen roads within the limits of two separate police stations in the city. Assessment comprised of alcohol breath testing (screening and confirmatory) by the police and collection of observational data regarding specific vehicles, road and rider characteristics, by trained field data collectors.

The traffic wardens (a formal volunteer force) and police personnel from the respective traffic police station were briefed about the study's purpose and methodology (stopping vehicles, setting up check-points, conducting alcohol breath testing) daily before data collection. Traffic wardens helped with traffic control and assisted in random stoppage of vehicles.Police conducted screening and confirmatory breathalyser tests, as well as random vehicle stops for testing. NIMHANS field data collectors collected data by observation.

Drivers from every randomly stopped vehicle were asked to blow into a breathalyser for a three-second alcohol screening test. The assessment used the MSIPL breath alcohol analyser A8080TC, calibrated using the wet bath method, which is routinely used by traffic police for enforcement. Screened positives

(a red colour band indicating "positive" on the device screen) were subjected to a confirmatory breathalyser test by the Sub-inspector of Police, and the results of their BAC levels were recorded. "Drink-driving violators" were classified as those drivers having a blood alcohol content (BAC) of more than 30 mg per 100 ml of blood.

The team of NIMHANS Field Data Collectors (FDCs)(one observer and one recorder) observed the entire procedure and collected data digitally, using an observational checklist developed jointly by JH-IIRU and NIMHANS. Data on vehicle types, ownership, weekend or weekday use, driver age and sex, number of occupants, child occupants, use of seat belts, helmet use, and use of mobile phones while driving or riding were all collected by observation. Police were approached for details regarding outcomes of alcohol breath testing and BAC levels. The number of passengers travelling within the vehicle was also recorded. Faculty from NIMHANS and coordinators from Bengaluru Traffic Police monitored data collection twice a week to ensure data quality and reduce bias. A weekly quality, coding, and consistency check was performed on the data.

Statistical analyses were performed using SPSS version 25 (IBM Corp., Armonk, NY, USA). A co-traveller with a drink-drive violator is operationally a passive drink-driver. Two indicators were used to measure passive drink-driving exposure.

Proportion of vehicles with passenger exposure to drink-driving violators:

This was calculated as the *number of vehicles in which the driver had a blood alcohol concentration (BAC) >30 mg per 100 ml of blood divided by the total number of vehicles carrying at least one passenger, multiplied by 100*. Stratified prevalence estimates were generated by vehicle type, driver sex, and driver age, along with 95% confidence intervals. This indicator represents the percentage of passenger-carrying vehicles operated by drivers with BACs exceeding 30 mg/100 ml.

Proportion of passengers travelling with drink-driving violators:

This was calculated as the *number of passengers travelling in vehicles driven by drivers with BAC >30 mg per 100 ml of blood divided by the total number of passengers observed, multiplied by 100*.

Both are important concepts from a public health perspective as we need to reduce both the percentage of passenger-carrying vehicles operated by drivers exceeding the BAC threshold of 30 mg/100 ml as well as the percentage of passengers exposed to the risks associated with travelling with a drink-driver.

The institutional ethics committees of NIMHANS [No. NIMHANS/IEC (BS&NS DIV.)/2020-21] and Johns Hopkins International Injury Research Unit (IERB No.13638) granted ethics clearance. All necessary permissions were obtained from the Bengaluru traffic police.

Results

Of the 10,810 vehicles stopped for drink-driving checks, 5,624 (52.0%) had at least one passenger in addition to the driver. Among all stopped vehicles, 458 (4.2%) had a child occupant. Totally, there were 11468 passengers in 5624 vehicles and 602 child passengers in 458 vehicles.

Out of these 10,810 drivers stopped for drink-driving checking, 320 drivers had a BAC level of 30mg%.

Proportion of vehicles with passenger exposure to drink-driving violators

The proportion of vehicles with passenger exposure to drink-driving violators is 2.5% (95% CI 1.97-2.76). For every 1000 vehicles with passengers, 25 were driven by a drink-driving violator. (See table 1). This proportion was higher among younger drivers aged 18-24 years (5.7%) and among motorcyclists (4.6%).

Table 1: Proportion of vehicles with passenger exposure to drink-driving violators

Variables	Number of vehicles with passenger	Vehicles with passengers and driven by a drink-drive violator (BAC >30mg%)	Proportion of vehicles with passenger exposure to drink-driving violators
Vehicles with passengers	5624	132	2.5(1.97, 2.76)
By age of driver N=5624*			
18-24	88	5	5.7(2.10, 12.41)
25-59	5456	125	2.3 (1.91,2.71)
60 or older	77	2	2.60(0.43,8.31)
By sex of driver (N= 5624)			
Female	104	3	2.9 (0.73,0.76)
Male	5502	128	2.3(1.95,2.75)
Non-observable	18	1	5.5 (0.27,24.48)
By Type of vehicle (N=5624)**			
Sedan/Saloon	3098	61	1.9 (1.52,2.50)
Pick up/light truck	224	2	0.9 (0.14,2.91)
Truck/large truck	163	3	1.8 (0.47,4.92)
SUV	572	9	1.6(0.77,2.86)
Three-wheeler	232	2	0.8 (0.14,2.81)
Motor Cycle	1208	55	4.6 (3.48,5.84)
Drink-drive violator= Driver with BAC >30mg per 100 ml of blood as detected by breathalyser			
(Under 18 years n=3); (*Other vehicles n= 3)*			

Proportion of passengers travelling with drink-driving violators

Among 11468 passengers, around 1.7% (95% CI 1.52- 2.01) were travelling with a drink-drive violator. The proportion of child passengers travelling with drink driving violators is 2.1% (95% CI 1.26-3.65). This proportion was higher among passengers in powered two-wheelers (4.4%) (95% CI 3.47-5.74) and among those travelling in trucks (2.9%). See Table 2.

Table 2: Proportion of passengers travelling with drink-driving violators

Variables	Number of passengers	Number of Passengers travelling with a drink-drive violator	Proportion of passengers travelling with drink-driving violators (95% CI)
Number of Passengers	11468	201	1.7 (1.52,2.01)
Number of Child Passengers	602	13	2.1(1.26,3.65)
By Type of vehicle			
Sedan/Saloon	6179	112	1.8(1.50,2.18)
Pick up/light truck	330	3	0.9(0.30,2.63)
Truck/large truck	236	7	2.9(1.43,5.97)
SUV	1237	17	1.3(0.85,2.19)
Three-wheeler	393	4	1.1(0.39,2.58)
Motor Cycle	1296	58	4.4(3.47,5.74)
Proportion of passengers travelling with a drink-drive violator = Number of passengers travelling with a drink-drive violator/ total number of passengers *Note: age and sex are not computed as the age and sex data of passengers were not collected*			

Discussion

The study was one of the largest roadside assessments conducted in Bengaluru city and is an example of inter-sectoral collaboration between police, health professionals, community leaders, and academia for road safety research. Details of methodology, results and limitations of the assessment is published elsewhere (9).

We observed that, per 1,000 passenger-carrying vehicles, 25 were operated by drivers who violated drink-driving regulations. Further, 1.7% of passengers were travelling in vehicles driven by individuals with a blood alcohol concentration (BAC) exceeding 30 mg per 100 mL of blood. These findings highlight the issue of passive exposure to drink-driving and the probable risk faced by passengers. It also highlights the need for passenger-centric interventions to complement existing driver-focused strategies aimed at reducing alcohol-impaired driving.

Existing literature has used the term “passive drink-driving” to describe situations in which drivers operate vehicles with low blood alcohol concentration (BAC) levels. However, this conceptualisation may be inadequate, as it does not highlight the risk borne by passengers due to alcohol impaired driving by the driver. However, it closely relates to the concept of passive smoking. The World Health Organisation defines second-hand smoke as a mixture of smoke emitted from the burning end of a cigarette and the

smoke exhaled by a smoker. The involuntary inhalation of this smoke is termed second-hand or passive smoking(10). Exposure to second-hand smoke is associated with significant adverse health outcomes, including lung cancer, coronary heart disease, and cardiac mortality. Epidemiological evidence suggests that second-hand smoke exposure increases the risk of coronary heart disease by 25–30% and lung cancer by 20–30%.(10) Drawing analogy from passive smoking, it is appropriate to define passive drink-driving as “passengers travelling with a drink-drive violator” as they are exposed to errors of judgement, impaired driving-related risks and risk for crashes, as that of the alcohol-impaired driver or drink-drive violator.

Under the Motor Vehicle Act 1988 (Section 185), driving under the influence is defined as having a Blood Alcohol Concentration (BAC) above 30 mg per 100 ml of blood, as measured by a breathalyser. The Motor Vehicles (Amendment) Act of 2019 increased penalties for drink- driving, raising fines from ₹1,000 to ₹10,000 for the first offence and from ₹2,000 to ₹15,000 for subsequent offences(11) Bengaluru traffic police reported 5343, 4144, and 26371 drink driving cases in 2020, 2021, and 2022, respectively—197 incidents per 100,000 people in 2022 (12). Despite these legal provisions and enforcement efforts, existing laws and penalties remain predominantly driver-centric. Passengers travelling with drink-drivers, although exposed to similar crash risks, are largely overlooked in legislation, enforcement strategies, and public awareness campaigns addressing drink-driving. Through this study, we wish to emphasise the concept of “passive drink-driving” as a passenger-centric indicator to better capture the broader risk associated with alcohol-impaired driving.

In our study, the prevalence of passive exposure to drink-driving was 2.5%. This estimate is comparable to findings from a National Roadside Survey conducted in the United States, which reported that 2.2% of alcohol-impaired drivers had passengers travelling with them(13). In contrast, studies from Chile and Washington, DC, reported substantially higher proportions of passengers travelling with alcohol-impaired drivers, at 50.2% and 29.7%, respectively(14). Similarly, a longitudinal study based on 2019 survey data from the United States, using latent class analysis, found that 29.7% of respondents reported being passengers in vehicles driven by alcohol-influenced drivers(15). Additionally, a study conducted in Massachusetts in 2002 reported that 37% of passenger fatalities were attributable to alcohol-related crashes(16). Studies in the Indian context are not available for passengers.

The proportion of vehicles with passenger exposure to drink-driving violators was higher among younger drivers and users of powered two-wheelers (PTWs). This finding is consistent with the Indian urban context, where PTWs constitute a substantial share of registered vehicles, and risk-taking behaviours are more commonly observed among younger individuals. Notably, 4.4% of passengers travelling on powered two-wheelers (PTWs) were exposed to drivers who violated drink-driving norms. In absolute terms, such exposure may represent a substantial public health burden in countries such as India, where the number of registered PTWs exceeds 250–300 million. Even a relatively small prevalence, when applied to a vehicle fleet of this magnitude, translates into a considerable number of passengers potentially exposed to alcohol-impaired driving.

Traditionally, countermeasures against drink-driving have primarily targeted drivers through enforcement and punitive measures. However, passenger-centric strategies are needed as a complementary approach to discourage individuals from travelling with alcohol-impaired drivers. Such strategies would require random check of passengers, sustained implementation of awareness campaigns, social media engagement, and social marketing initiatives to disseminate passenger-focused messaging and promote the concept of passive drink-driving.

Refusal to travel with an intoxicated driver may also exert social pressure on drivers to reconsider their decision to operate a vehicle under the influence of alcohol. Over time, this approach could contribute to the social stigmatisation of drink-driving within communities and facilitate broader behavioural change among drivers. The concept of “passive drink-driving” extends beyond conventional driver accountability and emphasises the social dimensions of alcohol-impaired driving. It reframes drink-driving as a shared public safety concern by recognising the role and responsibility of passengers, analogous to community participation in injury prevention.

By incorporating passenger-centric interventions, this approach has the potential to reduce the fatalities-to-crash ratio by decreasing the number of drivers under alcohol influence indirectly and passengers who choose to travel with alcohol-impaired drivers. We recommend the implementation of passenger-focused strategies to complement existing driver-centric enforcement measures, with particular emphasis on younger drivers and powered two-wheelers (PTWs), given their higher observed exposure. Multi-centric studies across different regions of the country are warranted to better understand the epidemiology and determinants of passive drink-driving in the Indian context. Furthermore, we recommend the inclusion of the indicators used in this study to measure passive drink-driving in the annual road traffic injury reports published by the Traffic Police. Institutionalising such reporting would facilitate sustained surveillance and enable monitoring of trends and the effectiveness of targeted interventions over time.

This passenger-centric strategy would also contribute to achieving progress towards the United Nations Decade of Action for Road Safety, which aims to reduce all road traffic deaths by 50% (17). However, implementing passenger-centric strategies to supplement ongoing driver-centric efforts would require supportive regulatory amendments, strong political commitment, and active community participation.

Conclusion

This study highlights the concept of ‘passive drink driving’ in road traffic injury epidemiology and advocates for implementing passenger-centric interventions to complement existing driver-centric enforcement strategies to reduce drink-driving fatalities in India.

Declarations

Ethics approval and consent to participate - Ethics clearance was obtained from the institutional ethics committee, NIMHANS [No. NIMHANS/IEC (BS and NS DIV.)/2020-21] and IERB, Johns Hopkins

International Injury Research Unit (IRB No.13638). Permission was obtained from Bengaluru Traffic Police. Consent to participate was deemed unnecessary according to national regulations.

Consent for publication – Not applicable

Availability of data and materials – The data that support the findings of this study are available from John Hopkins Injury Research Unit and National Institute of Mental Health and Neuro Sciences. Still, restrictions apply to the availability of these data, which were used under license for the current study, and are not publicly available. Data are available from the corresponding author upon reasonable request, and with permission of John Hopkins Injury Research Unit and National Institute of Mental Health and Neuro Sciences.

Competing interests – none

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