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# DRIVER FATIGUE AND ROAD SAFETY - IMPLICATION IN AN INDIAN CONTEXT

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## ABSTRACT

Nearly 1.3 million people die in road crashes each year, on average 3,287 deaths a day. An additional 20-50 million are injured or disabled. Hence Road safety is of utmost importance. Fatigue among drivers is a major cause of road accidents, Fatigue is defined as a gradual and cumulative process associated with 'a loss of efficiency, and a disinclination for any kind of effort'. Fatigue increases as time-on-task progresses. Grandjean (1979; p. 175). It is estimated that nearly 20% of all accidents is caused by fatigue as per The Royal society for prevention of accidents (RoSPA). This paper shall focus on fatigue its causes, effects, current laws and regulation against fatigue and driving time, and also analyze statistical data available of road accidents caused due to fatigue, solutions that can be implemented, solutions for reducing fatigue, suggestions for India along with the impact it will have based on the statistical data.

**KEYWORDS:** Road safety; Fatigue; Accidents; Driving Time; Implementation; Solutions; India

## I. INTRODUCTION

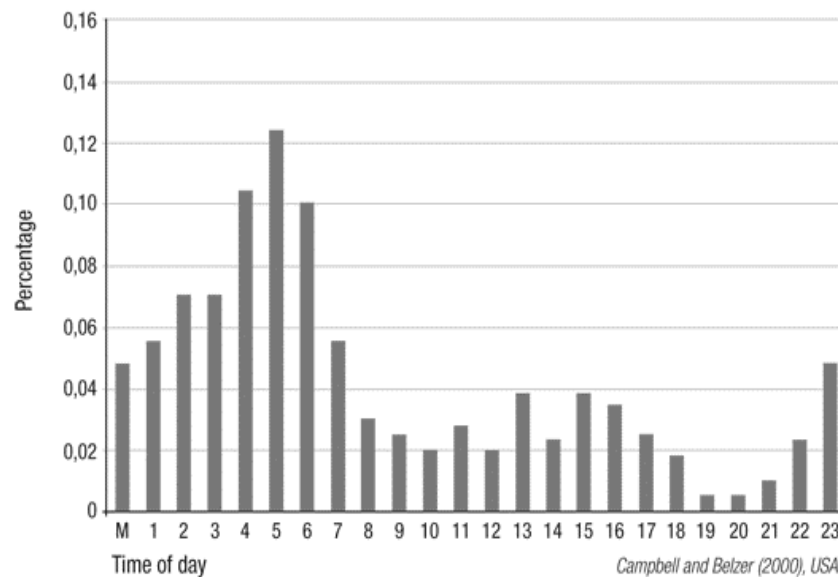
Road are means of transportation, we use them in some form or the other by driving, riding, walking or travelling as a passenger and we also depend on them for obtaining good or services. Nearly 1.3 million people die in road crashes each year, on average 3,287 deaths a day. An additional 20-50 million are injured or disabled. Hence Road safety is a critical challenge faced by road users and authorities. It is estimated that nearly 20% of all accidents is caused by fatigue as per The Royal society for prevention of accidents (RoSPA). Due to this reason learning about fatigue, creating awareness and working out way to curb it is necessary. Fatigue is defined as a gradual and cumulative process associated with 'a loss of efficiency, and a disinclination for any kind of effort' Grandjean (1979; p. 175). Fatigue increases as time-on-task progresses. Loss of efficiency of the driver to drive a vehicle due to prolonged driving, sleep deprivation, exhaustion is known driver fatigue.

## II. CAUSES OF DRIVER FATIGUE

Driver fatigue is caused due to a variety of reasons

- On long journeys on monotonous roads, such as motorways. [1]
- Between 2am and 6am
- Between 2pm and 4pm (especially after eating, or taking even one alcoholic drink)
- After drinking alcohol. [1]
- Shift workers and those working extended hours: Shift workers are 6 times more likely to be in a fatigue-related crash, whether that be at work (operating machinery or vehicles) or commuting [1]
- Sedative drugs
- Your level of physical or mental activity at the time

- The quantity and quality of your last period of sleep
- Young drivers: the combination of inexperience and night driving
- Drivers suffering from jet lag and crossing time zones often suffer from restricted and/or poor quality sleep [1]



*Heavy vehicles involved in fatigue-related fatal accidents according to time of day.*

**Figure 1** Time of day as an indication of Fatigue (2)

### III. EFFECTS TO FATIGUE ON DRIVING

Fatigue affects many of the skills necessary for the safe control of a vehicle. Fatigue can affect driving skills in three ways: by increasing the frequency of errors, the amplitude of errors, and/or the variability of errors.

Fatigue can lead to

- Trouble focusing, or narrowing of attention
- Head nodding, or inability to keep the eyes open
- Not remembering the last few minutes
- Poor judgement, slower reaction time
- "Zoning out"
- Daydreaming and wandering thoughts
- Constant yawning or rubbing your eyes
- Drifting in the lane [3]
- Poor speed control [3]
- Reduces a driver's field of vision [3]

### IV. STUDY ON REACTION TIME

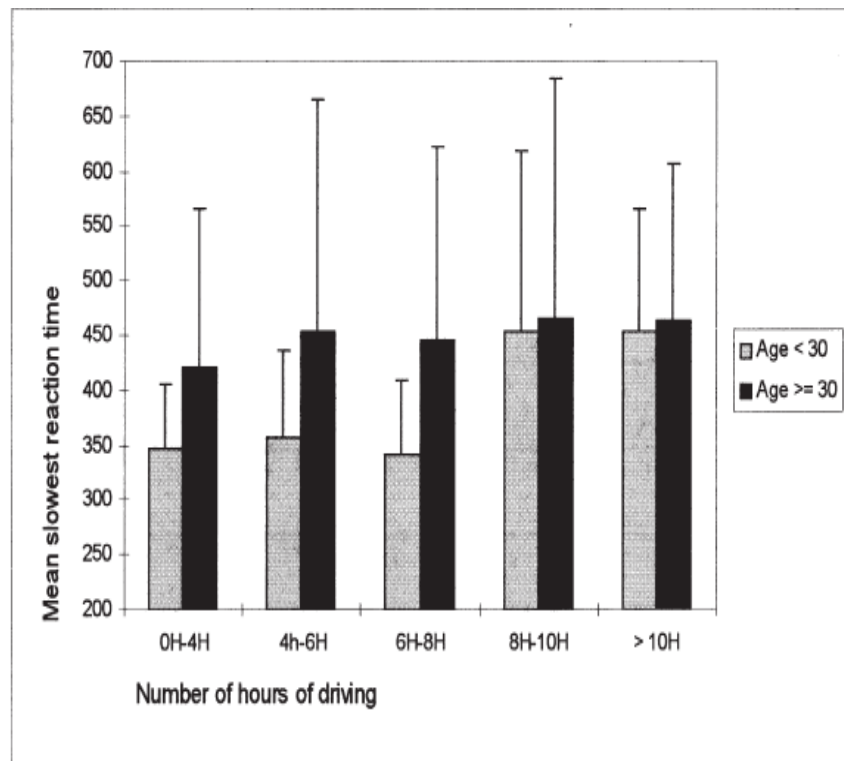
In order to study the effect of fatigue on the driver caused by driving duration, a reaction time test can be used as an indicative.

#### 4.1 Study on Reaction Time Based On Duration of Drive

A study was conducted during three peak week ends in the summer in Sweden. As soon as a car stopped in the rest area, drivers were asked if they were involved in a long distance journey. Only subjects between 18 and 55 years of age were asked. After responding to a questionnaire, the subjects were brought to a quiet hotel room to carry out a simple reaction time test. The simple reaction time test

(SRTT) lasts 10 min and is based on a PSION personal organiser. [4] The task of the subject is to respond by pressing a key and thus turn off the square. If no response is given in 1s a new interval is started. Pressing the key before the square is displayed, or within 100 ms, causes the response to be discarded and a warning to be displayed. Another part of the program calculates the median reaction time and the mean of the 10 % Slowest RT during the 10 min task.

#### 4.2 Results of the reaction time test



**Figure 2** Effect of no of hours of driving on reaction time of driver

The study shows a significant increase in mean slowest reaction time in the age group <30 with an increase in the number of driving hours. This study suggest that driving time should be limited to 6hr at a stretch. Also suggests that public awareness needs to be raised in excessive lengths of driving. [4]

## V. DRIVING TIME AND REST PERIODS

In order to reduce the effect of fatigue and subsequently road accidents, rules and regulations have been developed in the EU, USA, and UK.

### 5.1 Regulation in the EU

The EU provides a common set of rules for maximum daily and fortnightly driving times, as well as daily and weekly minimum rest periods for all drivers of road haulage and passenger transport vehicles, subject to specified exceptions and national derogations. The aim of this set of rules is to avoid distortion of competition, improve road safety and ensure drivers' good working conditions within the European Union.

These rules establish that

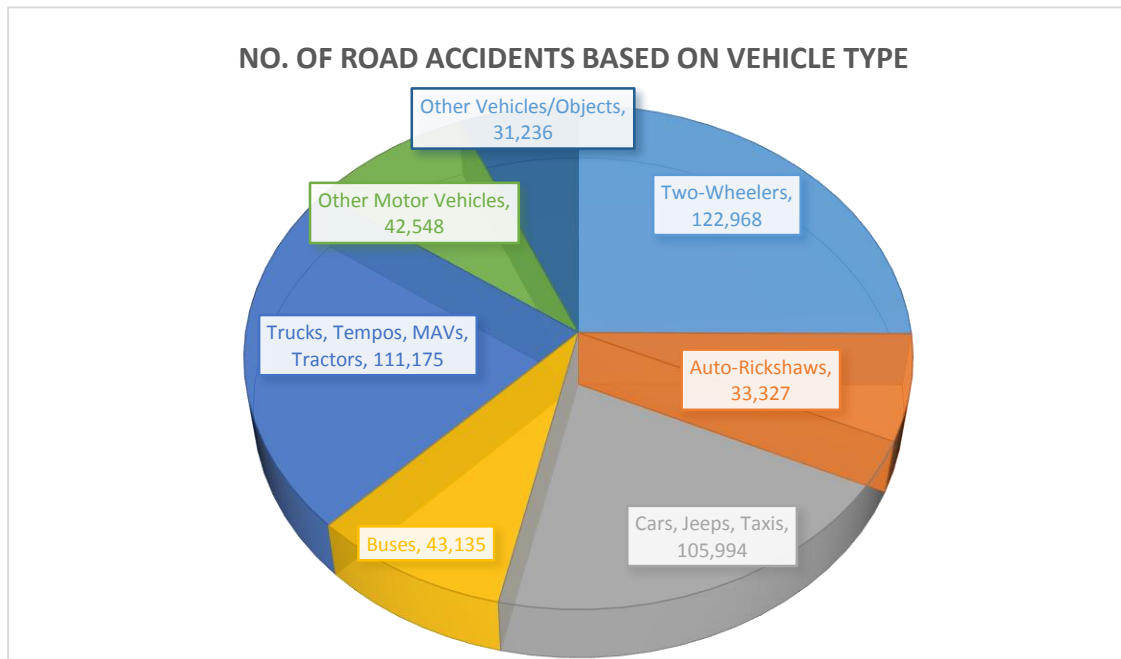
- Daily driving period shall not exceed 9 hours, with an exemption of twice a week when it can be extended to 10 hours. [6]
- Total weekly driving time may not exceed 56 hours and the total fortnightly driving time may not exceed 90 hours. [6]

- Daily rest period shall be at least 11 hours, with an exception of going down to 9 hours maximum three times a week. Daily rest can be split into 3 hours rest followed by 9 hour rest to make a total of 12 hours daily rest. [6]
- Weekly rest is 45 continuous hours, which can be reduced every second week to 24 hours. Compensation arrangements apply for reduced weekly rest period. Weekly rest is to be taken after six days of working, except for coach drivers engaged in a single occasional service of international transport of passengers who may postpone their weekly rest period after 12 days in order to facilitate coach holidays. [6]
- Breaks of at least 45 minutes should be taken after 4 ½ hours at the latest. [6]
- Similar regulation exist for UK and USA.

Driving time and rest periods are regulated by tachograph. All commercial vehicles first registered on or after 1 May 2006 must be fitted with a tachograph. A tachograph is a device fitted to a vehicle that automatically records its speed and distance, together with the driver's activity selected from a choice of modes. The drive mode is activated automatically when the vehicle is in motion, and modern tachograph heads usually default to the other work mode upon coming to rest.

### 5.2 Implementation of driving time and rest periods in India

Driving time and rest periods do not exist in India. In order to prevent fatigue, these regulation take a huge part.



**Figure 3** No. of road accidents based on type of vehicle

- Total road accidents in India in 2012 = 4,90,383 (9)
- Total accidents Due to Busses or Trucks = 154,310
- No of people killed in accidents from busses or truck = 53,286
- Therefore 32% of the total accidents are due to Busses or trucks. (Figure 3)
- Considering 20% of these accidents are due to fatigued driving (as per study by RoSPA)
- No of accidents due fatigued Bus and Truck drivers = 31,380.

So, just by implementing the driving hours and rests regulation in India we can reduce a significant amount of accidents.

## VI. COUNTER MEASURES

The counter measures which can be used in India

- Providing Rumble Strips at the end of lanes, which would alert the driver in case he is sleeping on the wheel.
- Fatigue signs on long straight roads, which are prone to accidents due to fatigue
- Rest stops available on highways at regular intervals which would allow the driver to rest in case he is fatigued
- Implementation of regulations on driving hours for the public vehicles similar to those which exist in the EU, UK, USA.

## VII. CONCLUSION

Out of the estimated 1.4 million serious road accidents/collisions occurring annually in India, hardly 0.4 million are recorded. Road safety can only be improved when we understand the causes and consequences of road accidents/collisions so as to work out remedial measures. Hence a better crash investigation is necessary. Carrying out a study on the number of accidents occurring on Indian roads due to fatigue would help us in carrying out more research on preventing such accidents, it would help us improve the overall drivability. Implementation of regulations on driving hours such as those of EU, would significantly reduce the accidents caused due to fatigue on Indian Roads. Spreading public awareness of fatigue and its causes and preventive measures is a must.

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