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VEHICLE ROLL-OVER

A rollover accident is defined as when a vehicle tips over onto its side or roof. A car driving at a certain speed creates inertia which can only be gradually slowed down with brakes or turning the vehicle. If you make too sharp of a turn, your car may begin skidding on the road, moving forward despite no longer pursuing the direction your car had been traveling. Because your tires keep their grip on the road, your automobile's force will force the car to tip over. The car may skid over along its side or roll over several more times.

Certain light passenger cars, such as sports utility vehicles, are particularly well known for their rollovers.

Frequently, rollover incidents are a result of **"tripping"** incidents that take place when a car's tire makes contact with an obstruction such as a curb, bump, or soft soil, that interrupts the vehicle's forward momentum and leads to it rolling either forward or sideways.

Another type is **Untripped** Rollover which is caused by the interaction of the vehicle's own movements with the forces of gravity. For example, if a top-heavy vehicle takes a corner too fast, the vehicle's weight, speed, and momentum will contrast with the centripetal forces, centrifugal forces, and gravity involved in

making a turn. As a result, the driver may not be able to control the vehicle and the car may flip.

VEHICLES PRONE TO ROLLOVER:

Passenger vehicles and compact SUV's have higher probability of rollover accidents. The accident data of 64 rollover crashes is shown below, The body type for passenger vehicles involved were distributed as follows: "sedan", 12%; "hatchback", 27%; "SUV", 23%; "MUV", 27%; "van", 11%.

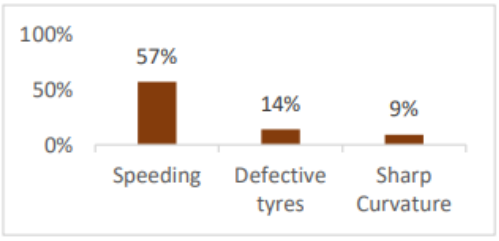


Fig. 1. Major accident contributing factors.

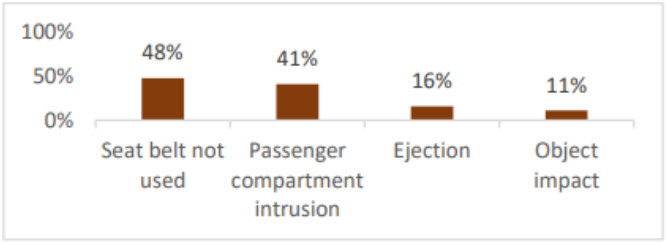


Fig. 2. Major injury contributing factors.

Of the 64 vehicles involved, 29 (45%) rolled due to tripping over, 19 (30%) due to turn over, 13 (20%) due to fall over and three (5%) vehicles due to end-over-end. In 19 (30%) of the 64 crashes, rollover motion was interrupted by an object, which in turn increased the severity of the accident.

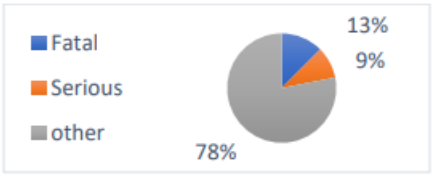


Fig. 3. Injury severity of belted occupants.

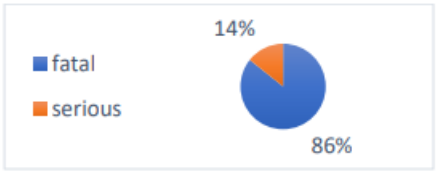


Fig. 4. Injury severity of ejected occupants.

As I live in Thane, I would like to share about a rollover incident on Mumbai-Pune Expressway in this assignment

JP Research India pvt. limited conducted research in Mumbai-Pune Expressway between October 2012 and October 2014. One of the incidents was of rollover.

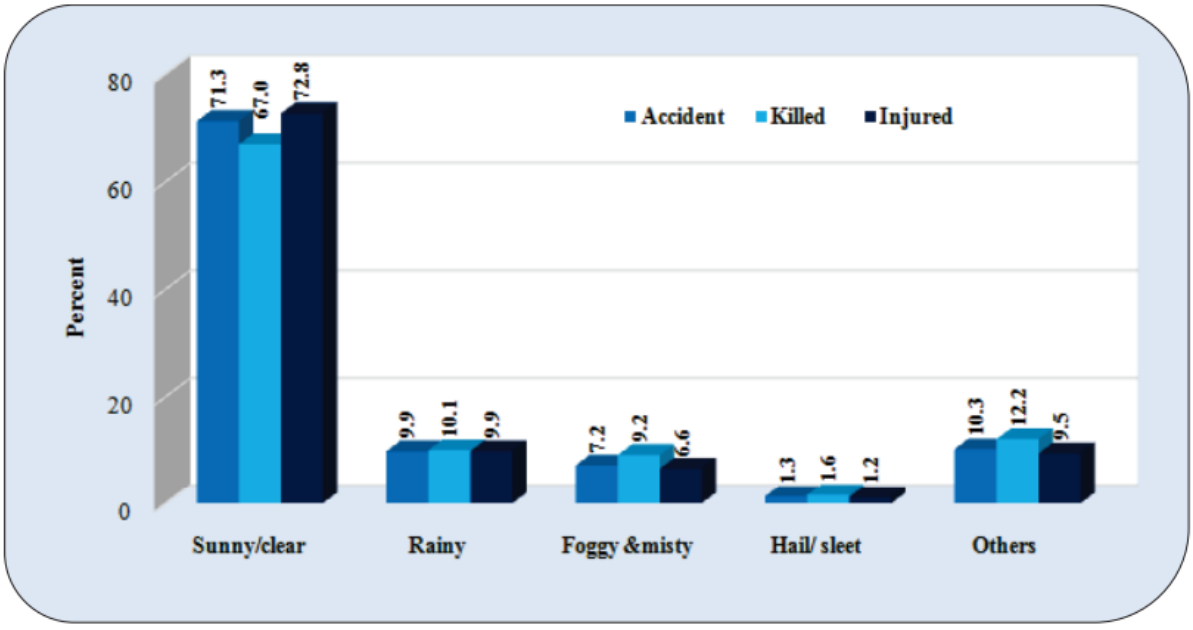
Details: A car was travelling towards Pune on the Expressway. Driver lost control went off road and rolled over after impacting a ditch in the median. The

car crossed over to the oncoming lane during the rollover. A second car was travelling towards Mumbai (opposite lane) and collided with the first car, which came in its lane during the rollover. Two occupants of first car and three occupants of second car were fatal on the spot. Accident was fatal and reason was over speeding.

As car collided with another car and then rolled over, it's case of ***TRIPPED ROLLOVER***

Which season Rollover accidents mostly occur?

Exact data specifically for rollover accidents regarding which season it's prone to occur the most, it was difficult to get. But from ministry of Road transport, we can say maximum rollover would have occurred during **summer season**. Although **Rainy season** also contribute in my localities due to **POTHOLES.**



VEHICLE SPEED VS ROLLOVER:

A vehicle which is traveling at a high speed, has a greater tendency to tip over, particularly during sharp turns or when swerving to avoid an obstacle.

Additionally, high-speed rollovers are more likely to result in serious injury or death than low-speed rollovers.

According to the National Highway Traffic Safety Administration (NHTSA), more than 40% of fatal rollover accidents involve excessive speed. The NHTSA also reports that 75% of fatal rollovers occur on roads with posted speed limits of 55 miles per hour or higher.

To plot the relation between vehicle speed and rollover accidents I have taken data from (NHTSA) website. The link is provided below-

https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/811435.pdf?refPageViewId=5fadbae432d9ec5a

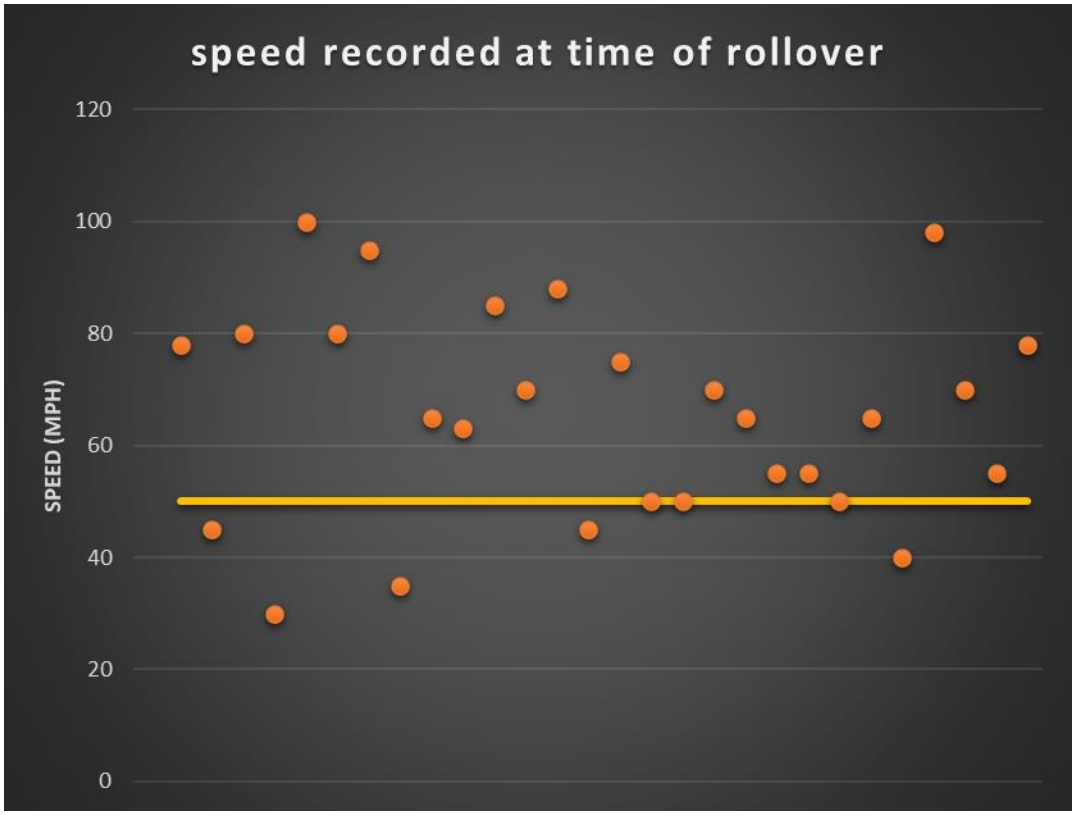
In the website mentioned above detailed case study of rollover accident is provided, it covers all the aspect like person's gender, person's age, model of vehicle, type of road, type of climate, vehicle speed etc. To find out at which speed most of the rollover accident occurred, I have taken some cases and their speed to plot a graph.

The data taken from the website is shown in the table below:-

VEHICLE	**CASE NO.**	**SPEED (Mph)**
Porsche Cayenne	R05004	78
BMW X3 SUV	R05006	45
Mercedes-Benz E320	R05010	80
Mercury Grand Marquis	R05011	30
Infiniti G35	R05014	100
BMW 525i	R05019	80
BMW 530i	R05021	95
Acura TSX	R05022	35
Mercedes-Benz C240,	R05023	65
Infiniti FX35 SUV	R05041	63

Lexus RX330 SUV.	R05044	85
Ford Explorer XLT SUV	R05046	70
Hummer H1 pickup	R05048	88
Hyundai Tucson GLS SUV	R05070	45
2000 BMW 323i	R05071	75
Mercedes Benz E320	R05073	50
BMW 325i	R05076	50
Volvo XC90 SUV	R05154	70
Cadillac CTS	R06080	65
Toyota Sienna LE minivan	R06089	55
Mercedes Benz C240	R06092	55
Lincoln Aviator	R06098	50
BMW 740	R06109	65
BMW 545i	R06110	40
Infiniti G35	R06119	98
Ford Explorer SUV	R06121	70
Cadillac four-door SUV	R06129	55
Lincoln Aviator SUV	R06130	78

On the basis of above data a scatter plot has been shown below for proper visualization.



From the above plot it can be clearly seen that most of the rollover accident occurred when the speed of the vehicle was above 50 Mph.

Hence it can be said that the vehicle which is at high speed is more prone to rollover accidents.

SAFETY MEASURES TO PREVENT ROLLOVER ACCIDENTS:

First of all, basic measures should be taken like wearing of seatbelt, the non-usage of seatbelts was the biggest human factor responsible in part for 46 percent of accidents resulting in serious or fatal injuries.

Passenger overloading (number of passengers exceeding the seating capacity of the vehicle) was another cause for injuries in the event of an accident.

Slow down on curves, Drive defensively, avoid distractions, perform regular maintenance, avoid sudden speed up and slow down are some of the measures which can avoid rollover accidents.

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