Data Analysis of Road Accidents at Major Location in Jaipur City

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ABSTRACT

The statistical analysis of accident is conceded out periodically at grave locations or road stretch which will help to arrive at suitable measures to effectively decrease accident rates. It is the measure (or estimates) of the number and severity of accident. These statistics reports are to be maintained zone-wise. Accident prone stretches of various roads may be assessed by finding the accident density per meter of the road. The places of accidents are marked on the map and the points of their clustering (BLACK SPOT) are determined. With the help of statistical study of accident occurrence at a particular road or location or zone of study for a long period of time it is realizable to predict with logical accuracy the probability of accident occurrence per day or relative safety of different classes of road user in that location. The interpretation of the statistical data is very important to provide insight to the problem. Safety is the main goal for highway and traffic engineers that should be provided for drivers, road users and pedestrians. Road traffic accidents with their end results of fatalities and injuries are significantly related to safety on highways. One of the key measures of safety on a highway is the number of traffic accidents occurring on it. Consequently, records and statistics of traffic accidents should be available at traffic departments and agencies in each country for the country's highway network. Road traffic accidents get plenty of local attention where and when they occur, especially when they involve fatalities or injuries. Traffic accidents are considered obvious reminders of the harm which vehicles and their users can cause any time when there is a tragedy. This study is related to road accident study of Jaipur city, behavior of accident, accident statics and finding the flaws in road construction and safety aspects.

Keywords: Black Spot, Globalization, Prone stretches, Severity.

1. INTRODUCTION

The process of rapid and unplanned urbanization has resulted in an unprecedented revolution in the growth of motor vehicles world-wide. The alarming increase in morbidity and mortality owing to road traffic incidents (RTI) over the past few decades is a matter of great concern globally. At present motor vehicle accidents rank ninth in order of disease burden and are projected to be ranked third in the year 2020. India accounts for more than 200,000 deaths because of road accidents, according to the Global Road Safety Report, 2015 released on Monday by the World Health Organization (WHO). This is 46% more than the national statistics released by the National Crime Records Bureau (NCRB) in July. Jaipur, a 290 year old city is the state capital of Rajasthan. It lies on the arravali hills, 431 meters (1414ft) above sea level, over an area of 484.64 sq. km. Jaipur is now a Metropolitan area, is the tenth major city in India, with a population of above 3 million. Unlike other Indian metros it continues to attract considerable migrant population due to its strategic geographical location, multilingual and cosmopolitan culture, tremendous growth potential and investment. The existing road network in the city is inadequate. Functionally the road do not have any hierarchy as every individual road changes its characteristics after a short distance. At present 5.84% of the total developed area is belong to roads which is much below the desired level. Moreover, the vehicular population growth is quite high with just registered motor vehicles in 4.2million to 12.4 million vehicles on 31 ,march 2015 , an increase of around 3 fold in span of 10 years.

Most of roads in Jaipur city are heavily encroached by parked vehicle, hawker and by the person of road side business. These thing results not only increase in the traffic volume but also in the traffic accident and make our life at risk. This paper was an attempt to analyze the road accidents in Jaipur using annual data from 2005 to 2015.

2. DATA COLLECTION & REQUIREMENTS

Data of road accidents were collected in two steps. In the initial stage, data on road accidents of Jaipur city were collected from three Police Stations (East zone police station near Gandhi circle, West zone police station Bani park, South zone police station Ajmeri gate) in the city for three years. The data included Accident Date, Accident Time, Location of the Accident, Collision Type, Number of Vehicles Involved, Number of Deaths, Injury, Cost of Property Damage, Details of Driver and some more information about how accident occurred. It was found that more than thousand accidents occurred in Jaipur in last year.

After analyzing the accident data, the road intersection and mid-block having maximum frequency of accident is identified. Also for determine the present status of accident and traffic pattern we are taking data by self examining at the places.

Traffic police, Jaipur, categorized accident hotspot in four different zones and each zone covers major accident prone area of Jaipur. Each zone consist of minimum of six accident prone areas.

Four major zones are-

- South Zone
- East Zone
- West Zone
- North Zone

Places of Accident Analysis:

1. Haldi Ghati Marg
2. Chomu Pulia
3. Meena Kaa Service Station

SOUTH ZONE

1	200 Feet Bypass Circle.
2	Badarwas Tiraha Gopalpura Road.
3	Dwarkadas Park Circle.
4	Government Hostle Circle.
5	Jyoti Nagar Thana Moad Sahkar Marg.
6	Dhuleshwer Garden Circle.

Fig 1. South zone for accident hotspot in Jaipur

EAST ZONE

1	B-2 Bypass Circle
2	Goushala Tonk Road
3	Front Road of India gate Tonk Road
4	In Front of Saras Parlour
5	Trimurti Circle
6	In Front of M.N.I.T Gate
7	Bajaj Nagar

Fig 2. East zone for accident hotspot in Jaipur

(Coutsey- http://jaipurtrafficpolice.rajasthan.gov.in/AccidentHotspots.aspx)

WEST ZONE

1	Panipetch Tiraha
2	Dahar Ka Balaji
3	Khetan Circle
4	Alka Tiraha
5	Road No. 14 Sikar Road
6	Jodla Power House
7	In Front of Hyper City Jhotwarw Pulia
8	Kanta Choraha
9	Road No. 5 Cut Express Highway
10	Dhabas Pulia Express Highway
11	Gandhi Path Queen's Road

Fig 3. West zone for accident hotspot in Jaipur

NORTH ZONE

1	Road Towards Nahargarh and Jaigarh
2	ICICI Bank Circle Vidhyadhar Nagar
3	In Front of Vidhyadhar Nagar Stadium
4	Galta Gate Circle
5	Meena Petrol Pump Cut Dehli Road
6	RAC Cut Dehli Road
7	Idgah Pada Mandi Dehli Road
8	Dhobi Ghat
9	Ram Garh Moad
10	Bandh ki Ghati
11	Kanak Ghati
12	Manbagh
13	Sarva Moad

Fig 4. North zone for accident hotspot in Jaipur

(Coutsey-http://jaipurtrafficpolice.rajasthan.gov.in/AccidentHotspots.aspx)

Table 1: Black spot in Rajasthan as per MORTH

S no.	Name Of District	Location Of Accidents Including Change (Km To Km)	NH no.	No Of Fatalities During 2011	No Of Fatalities During 2012	No Of Fatalities During 2013	Reasons For Frequent Accidents	Nature Of Treatment Required At The Spot/Stretches
1	Vishwakarma Jaipur West	Road No.1,5,6,9,12,14 Vishwakarma Area	11	15	9	9	BRTS cut heavy traffic, over speeding and careless driving	Construct pedestrians foot path on every cut of BRTS and to create awareness about traffic rules
2	Chomu Jaipur West	Jaitpura	11	3	6	2	Industrial area and no speed limit	Fix speed limit, install signage, construct speed breakers and provide parking lights.
3	Bagru Jaipur West	Thikriya More	8	5	1	2	Near construction of vatika city and movement of labors and movement of heavy vehicles through thikana village to avoid toll tax	Provide traffic lights
4	Bagru Jaipur West	Bhakrota	8	9	8	26	Heavily populated area and traffic movement of crossing	Need of bridge
5	T.P. Nagar Jaipur East	Ghat Ki Ghuni Agra Road	11	4	5	4	Roads are steeply sloped and curved and there are no street lights	Provide street lights, install caution boards and speed breakers in accident prone Areas.
6	Kanauta Jaipur East	Mali Ki Kothi Bahrana	11	9	11	7	Damage of railing near highway and no	Repairs of damage railing behind Highway construct railing in some area where it is necessary. It is good to construct bridge on densely populated area on both side of the road.
7	Bajaj Nagar Jaipur East	Tonk Puliya And Nearby	12	1	2	3		
8	Chaksu Jaipur South	Chaksu	12	41	5	33	Heavy traffic	Need of four lanes on state highway.
9	Shivdaspura Jaipur South	Shivdaspura	12	19	5	4	Construction of four lane in progress	Completion of construction work will mitigate the problem
10	Shyam Nagar Jaipur South	Shalimar Bagh To Ajmer Road Crossing	8	6	2	2	Heavy traffic and cuts at many places in the divider of road.	Widening of road and closer of un necessary cuts on road divider.
11	Shahpura Jaipur Rural	Bhabhru	8	13	5	4	Cuts of NHW, crossing points and curved roads.	Close cuts on NHW and install caution boards on crossing and turning points. To coordinate with NHAI to improve accident prone area.
12	Pragpura Jaipur Rural	Bus Stand Pawta	8	9	3	3	Heavily populated area	Close cuts on NHW and install caution boards on crossing and turning points.

(Courtesy- http://morth-roadsafety.nic.in)

Table 2: (Data of accident of Chomu Pulia)

DATA OF ACCIDENT OF CHOMU PULIA				
S.NO.	YEAR	FATAL	GRIEVOUS	MINOR
1	2006	14	27	42
2	2007	16	22	69
3	2008	13	27	51
4	2009	17	36	46
5	2010	8	31	53
6	2011	14	29	61
7	2012	7	37	69
8	2013	13	36	71
9	2014	9	28	84
10	2015	4	24	74

Table 3: (Data of accident of MeenaPetrol Pump)

DATA OF ACCIDENT OF MEENA KA PETROL PUMP				
S.NO.	YEAR	FATAL	GRIEVOUS	MINOR
1	2006	7	19	24
2	2007	9	17	40
3	2008	11	16	49
4	2009	16	24	39
5	2010	17	21	37
6	2011	13	19	33
7	2012	22	22	45
8	2013	16	24	57
9	2014	19	35	59
10	2015	30	47	51

Table 4 : (Data of accident of Haldhi Ghati)

DATA OF ACCIDENT OF HALDHI GHATI				
S.NO.	YEAR	FATAL	GRIEVOUS	MINOR
1	2006	12	32	61
2	2007	14	49	72
3	2008	8	37	68
4	2009	13	26	59
5	2010	9	28	53
6	2011	11	34	61
7	2012	9	37	69
8	2013	7	42	50
9	2014	11	39	74
10	2015	13	51	81

3. FORMULA AND METHOD

1. Accident rate per kilometer

$$R = (A/L)$$

R= total accident rate per km for one year

A= total number of accident occurring in one year

L=length of control section in kms

2. Accident rate based on population

$$R = (B*100000)/P$$

R= death rate per 100,000 population

B= population of area

P= total number of traffic death in one year

Table 5: (Data Interpretation of Chomu Pulia)

CHOMU PULIA					
S.NO	YEAR	TOTAL ACCIDENT	LENGTH OF ROAD	ACCIDENT RATE PER KM	DEATH RATE BASED ON POPULATION PER LAKH
1	2006	83	5.5	15.09	802
2	2007	107	5.5	19.45	622
3	2008	91	5.5	16.54	732
4	2009	99	5.5	18	673
5	2010	92	5.5	16.72	724
6	2011	104	5.5	18.9	640
7	2012	113	5.5	20.54	589
8	2013	120	5.5	21.81	555
9	2014	121	5.5	22	550
10	2015	102	5.5	18.54	653

Table 6: (Data Interpretation of MeenaPetrol Pump)

MEENA KA PETROL PUMP					
S.NO	YEAR	TOTAL ACCIDENT	LENGTH OF ROAD	ACCIDENT RATE PER KM	DEATH RATE BASED ON POPULATION PER LAKH
1	2006	50	4	12.5	1332
2	2007	66	4	16.5	1009
3	2008	76	4	19	876
4	2009	79	4	19.75	843
5	2010	75	4	18.75	888
6	2011	65	4	16.25	1025
7	2012	89	4	22.25	784
8	2013	97	4	24.25	687
9	2014	113	4	28.25	589
10	2015	128	4	32	520

Table 7: (Data Interpretation of Haldi Ghati)

HALDI GHATI					
S.NO	YEAR	TOTAL ACCIDENT	LENGTH OF ROAD	ACCIDENT RATE PER KM	DEATH RATE BASED ON POPULATION PER LAKH
1	2006	105	3	35	634
2	2007	135	3	45	493
3	2008	113	3	37.67	589
4	2009	98	3	32.67	679
5	2010	90	3	30	740
6	2011	106	3	35.33	628
7	2012	115	3	38.33	579
8	2013	99	3	33	673
9	2014	124	3	41.33	537
10	2015	145	3	48.33	459

3.1 ACCIDENT SEVERITY RATE:

The accident severity rate measure the seriousness of accident and the availability of medical facilities in the city. Fig 5 Shows the accident severity rate of Jaipur which show the number of death per 100 accidents are relatively high in the city. Moreover high level of accident severity index may also be a result of poor data collection and its reporting process.

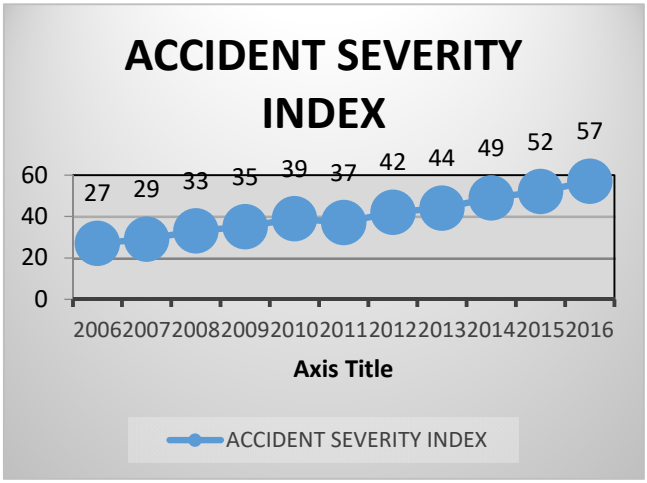

Fig 5 (Accident severity rate)

4. WORKING ON PROBLEM:

4.1 CHOMU PULIA CIRCLE

This is the existing structure of the chomu pulia circle so here the main reason behind the accident is the low space available for the vehicle for merging and diverging so here, we do some changes in the existing design.

Fig. 6: Satellite Map Of Chomu Pulia Circle

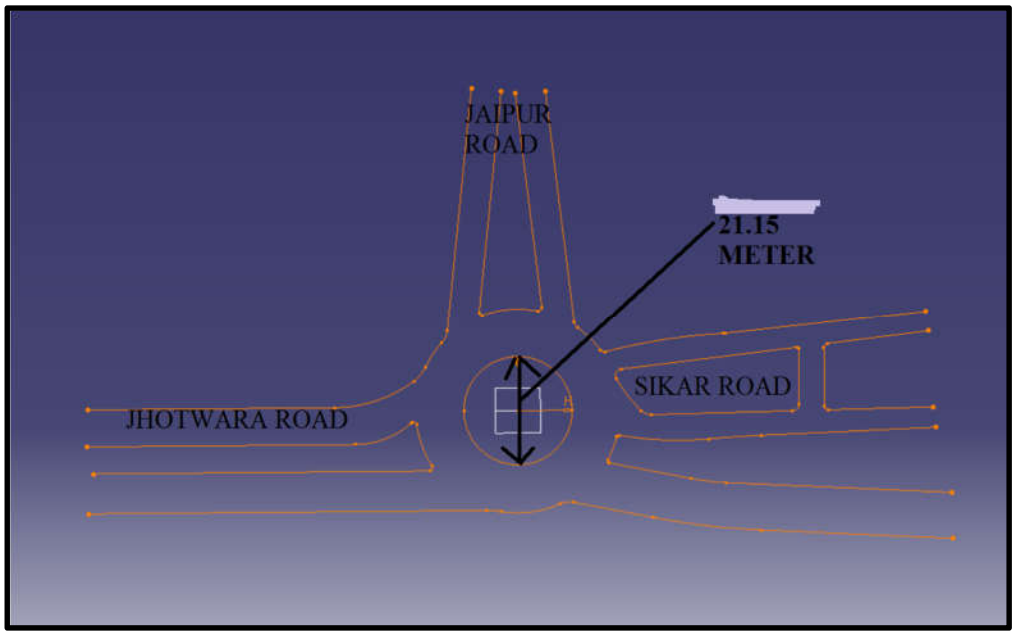

Fig. 7: Auto Cad Diagram Of Chomu Pulia Circle

So, as we see in the figure that there is a central circle so it is having a diameter of 36.27meter so the vehicle that are crossing here are having a difficulty while there is increase in the traffic volume so here we are decreasing down the diameter of the circle so the width near the circle got increase the nearby road width also the merging and diverging radius got increases so that the vehicles are easily merges and diverges. The width of the nearby road of the circle is change to 11.10 meter and 9.8 meter towards Jaipur road of 7.6meter and 6.1 meter towards sikar road respectively.

4.2 HALDI GHATI MARG

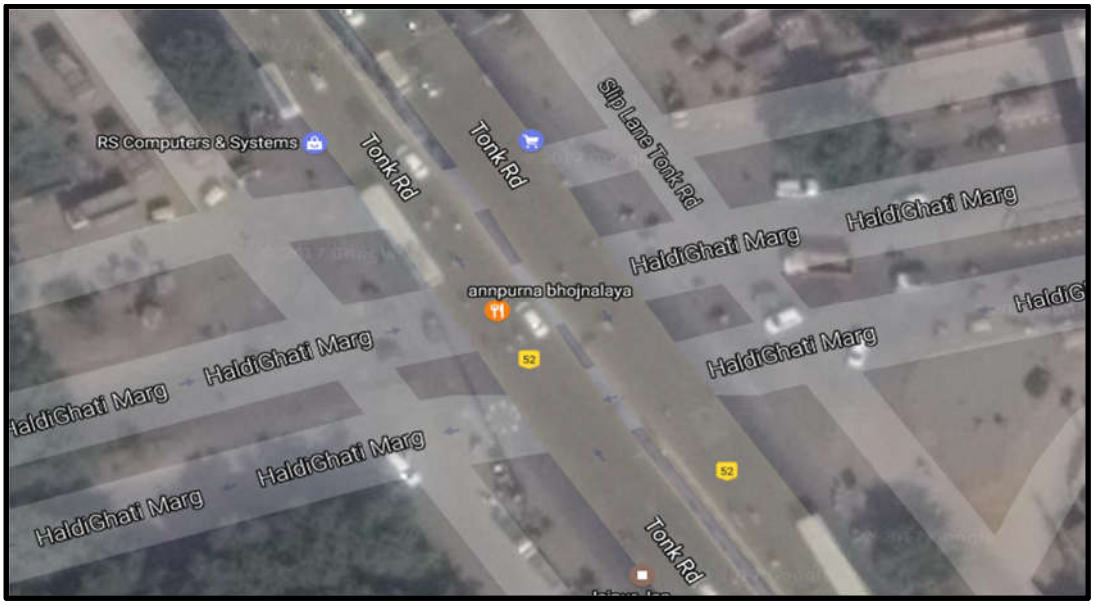

Fig. 8: Satellite Map of Haldi Ghati Marg

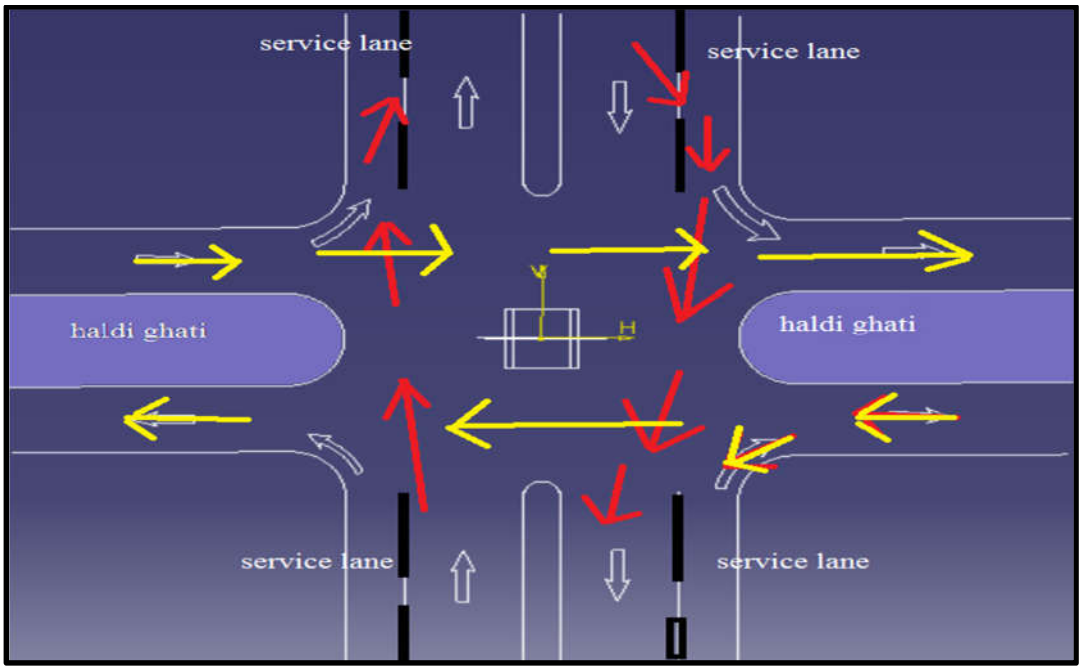

Fig. 9: Auto Cad Diagram of Haldi Ghati Marg

As we know that here there is one side a 3 way lane while on another side there is a 2 way road so as many time there is people prefer the shortcut so that they are opt the service lane so that they will move out fastly and due to which the people come from the straight 3 lane they will get crashed by each other and it will leads to accident.

Here, the main reason behind the accident is due to the unavailable of any traffic police so that they get easily cross the light and not follow the traffic rule, so here we have to provide camera also.

4.3 MEENA KA SEVICE STATION

Fig. 10 : Satellite Map of Meena Ka Sevice Station

In the fig as shown above it can be easily understand that the accident occur here is due to the merging of the traffic of colony to the highway as there is a merging so as to reduce the number of accident here have to provide the energy absorbent so that when the vehicles are approaches towards to merge in to the highway lane than they have to slow down there speed as also we have to provide warning sign to the highway road so that the driver get easily about this merging system. Here we provide a diagrammatic system to understand this problem.

5. CONCLUSIONS

5.1 CHOMU PULIA

Decreasing down the diameter of central island also by providing the signalised channel section. There is a central circle so it is having a diameter of 36.27meter so the vehicle that are crossing here are having a difficulty while there is increase in the traffic volume so here we are decreasing down the diameter of the circle so the width near the circle got increase the nearby road width also the merging and diverging radius got increases so that the vehicles are easily merges and diverges.

The width of the nearby road of the circle are change to 11.10meter and 9.8 meter towards Jaipur road of 7.6meter and 6.1 meter towards sikar road respectively.

5.2 MEENA KA SERVICE STATION

Here we are providing traffic triangle. The accident occur here is due to the merging of the traffic of colony to the highway as there is a merging so as to reduce the number of accident here have to provide the energy absorbent so that when the vehicles are approaches towards to merge in to the highway lane than they have to slow down there speed as also we have to provide warning sign to the highway road so that the driver get easily about this merging system.

5.3 HALDI GHATI MARG

Here we are providing traffic police presence and also providation of cameras to deduct the person who violate the rules.There is one side a 3 way lane while on another side there is a 2 way road so as many time there is people prefer the shortcut so that they are opt the service lane so that they will move out fastly and due to which the people come from the straight 3 lane they will get crashed by each other and it will leads to accident.

Here, the main reason behind the accident is due to the unavailable of any traffic police so that they get easily cross the light and not follow the traffic rule, so here we have to provide camera also.

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