ALTERATION OF ROAD TRAFFIC ACCIDENT FROM MEHATPUR TO BHARWAIN NATIONAL HIGHWAY STRETCH IN UNA-HIMACHAL PRADESH

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Abstract

Road Accident is the most common problem over the road. This kind of problem is mostly observed over the National highways. A road traffic accident causes the loss of human life & property. The increase in the vehicular traffic causes the almost proportional change in the accidents. Even after put on all the safety measures, there is a less fall in the accidents. International reports shows that the road traffic accident causes the 1.35 million deaths per year. Where as in India, 1, 47,913 person losses their life in 2017. In Himachal Pradesh, the total deaths due to the accidents are 1202 in 2017. In Himachal Pradesh, the National highway stretch from Mehatpur to Bharwain is adopted in Una district. This stretch having the 62.3 km portion of NH. In Una district, this NH is mostly responsible for the accidents. To predict the normal traffic density on this NH, three day regular traffic count is done so that the hourly & the daily variation could be checked. For the collection of primary data various studies are done like road marking, pavement evaluation, road side parking etc. For the secondary data, the previous 5 year accidental data from year 2014 to 2018 is collected from police station and particularly data is maintained for the adopted stretch. The study listed the 25 black spots over the stretch. After all the inventory studies & the data evaluation, the study finally come to the

various safety remedies which needs to be set up so that the accidents come down in order to save the life.

Keywords: Black spots, National Highway, Road Safety.

I.   INTRODUCTION

Road transportation carries the major portion of the traffic & goods as compare to the other modes of transportation. This mode is accessible to the every part of country. It took almost average cost for its functioning. But the only problem is of travelling security which is just due to the road traffic accident. It is the most alarming situation in our country. Every accident leads to the loss to family, country development etc. Such type of losses is uncountable. Every nation work to reduce the impacts of accidents but unfortunately we lag behind by few steps. Every accidental bureau shows rising values of accidents in most cases.

A road traffic accident is now a day's common over the roads. It is generally termed as a human disaster. A road traffic accident may be cause due to some reasons like: vehicle to pedestrians over the road, vehicle to infrastructure, vehicle to vehicle. As we know that the road stretch, traffic density are increasing accidents are also increasing day by day.

1.1 International Road Traffic Accidents

If we put the road traffic accidents on the international platform, then it is a serious issue which make us think about the safety and various life values for that. With the increasing of vehicles, population, urbanisation the road accidents also increasing at an alarming condition. World level organisations like WHO (World health organisation) put it's every best effort to collect the accidental reports from various countries & suggest possible measures to prevent the accidents. Finally WHO flag the road traffic accident as the 8th leading cause of death. But due to increasing attributes of road traffic accidents, it totally become possible to control them. International data shows that, road traffic accidents contributes about 1.35 million deaths per year.

Table 1: Cross country comparison of incidence of road related deaths & injury accidents in 2015

Sl. No.	Country	Killed per 100,000 Population	Injury Accidents per 100,000 Population
1	Australia	5	286 *
2	Canada	5	330
3	China	4	14
4	Denmark	3	50
5	Finland	5	94
6	France	5	85
7	Germany	4	374
8	India	11	38
9	Israel	4	145
10	Japan	4	422
11	Korea, Republic of	9	2,238
12	Mauritius	3 #	217
13	Mexico	3	8
14	Myanmar	10	30
15	New Zealand	7	213
16	Norway	2	88
17	Poland	8	87
18	Portugal	6	344
19	Russian Federation	16	128
20	Singapore	3	143 $
21	United Kingdom	3	215
22	United States of America	11	545

(* Pertain to 2011, # pertain to 2013, $ pertain to 2014)

Source: World road statics, international road federation, Geneva

1.2 National Road Traffic Accidents

Every incident over the road which leads to the tremendous loss for the human life & the property over the road. Various losses like death, injury, property loss are the common issues which are commonly seen. Day by day increasing traffic volume, pedestrian volume also a major cause which invites the road accident. In 1970 the 1,14,100 road traffic accidents were reported out of which 14,500 killed & 70,100 persons injured. While in 2017, the values for road traffic accidents are 4,64,910. The killed & injured are1,47,913 & 4,70,975.In both the comparison this value is increasing which shows that the increasing population & increasing traffic intensity somewhere effects the road traffic accidents

**Table 2:** Road accidents, person killed, person injured in India

Years	Total Number of Road Accidents (in numbers)	Total Number of Persons Killed (in numbers)	Total Number of Persons Injured (in numbers)	Population of India (in thousands)	Total Number of Registered Motor Vehicles (in thousands)	Road Length (in kms)	Number of Accidents per Lakh Population	Number of Accidents per Ten Thousand Vehicles	Number of Accidents per Ten Thousand Kms of Roads	Number of Persons Killed Per Lakh Population	Number of Persons Killed Per Ten Thousand Vehicles	Number of Persons Killed per Ten Thousand Kms of Roads	Number of Persons Injured per Lakh Population	Number of Persons Injured Per Ten Thousand Vehicles	Number of Persons Injured Per Ten Thousand Kms of Roads
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1970	1,14,100	14,500	70,100	5,39,000	1,401	11,88,728	21.2	814.4	959.8	2.7	103.5	122.0	13.0	500.4	589.7
1980	1,53,200	24,000	1,09,100	6,73,000	4,521	14,91,873	22.8	338.9	1,026.9	3.6	53.1	160.9	16.2	241.3	731.3
1990	2,82,600	54,100	2,44,100	8,35,000	19,152	19,83,867	33.8	147.6	1,424.5	6.5	28.2	272.7	29.2	127.5	1,230.4
1994	3,25,864	64,463	3,11,500	9,04,000	27,660	28,90,950	36.0	117.8	1,127.2	7.1	23.3	223.0	34.5	112.6	1,077.5
1995	3,51,999	70,781	3,23,200	9,24,359	30,295	29,75,035	38.1	116.2	1,183.2	7.7	23.4	237.9	35.0	106.7	1,086.4
1996	3,71,204	74,665	3,69,502	9,41,579	33,786	32,02,515	39.4	109.9	1,159.1	7.9	22.1	233.1	39.2	109.4	1,153.8
1997	3,73,671	76,977	3,78,361	9,59,792	37,332	32,98,788	38.9	100.1	1,132.8	8.0	20.6	233.3	39.4	101.4	1,147.0
1998	3,85,018	79,919	3,90,674	9,78,081	41,368	32,28,356	39.4	93.1	1,192.6	8.2	19.3	247.6	39.9	94.4	1,210.1
1999	3,86,456	81,966	3,75,051	9,96,130	44,875	32,96,650	38.8	86.1	1,172.3	8.2	18.3	248.6	37.7	83.6	1,137.7
2000	3,91,449	78,911	3,99,265	10,14,825	48,857	33,16,078	38.6	80.1	1,180.5	7.8	16.2	238.0	39.3	81.7	1,204.0
2001	4,05,637	80,888	4,05,216	10,28,610	54,991	33,73,520	39.4	73.8	1,202.4	7.9	14.7	239.8	39.4	73.7	1,201.2
2002	4,07,497	84,674	4,08,711	10,45,547	58,924	34,26,603	39.0	69.2	1,189.2	8.1	14.4	247.1	39.1	69.4	1,192.8
2003	4,06,726	85,998	4,35,122	10,62,388	67,007	35,28,654	38.3	60.7	1,152.6	8.1	12.8	243.7	41.0	64.9	1,233.1
2004	4,29,910	92,618	4,64,521	10,79,117	72,718	36,21,507	39.8	59.1	1,187.1	8.6	12.7	255.7	43.0	63.9	1,282.7
2005	4,39,255	94,968	4,65,282	10,95,722	81,502	38,09,156	40.1	53.9	1,153.2	8.7	11.7	249.3	42.5	57.1	1,221.5
2006	4,60,920	1,05,749	4,96,481	11,12,186	89,618	38,80,651	41.4	51.4	1,187.7	9.5	11.8	272.5	44.6	55.4	1,279.4
2007	4,79,216	1,14,444	5,13,340	11,28,521	96,707	40,16,401	42.5	49.6	1,193.1	10.1	11.8	284.9	45.5	53.1	1,278.1
2008	4,84,704	1,19,860	5,23,193	11,44,734	1,05,353	41,09,592	42.3	46.0	1,179.4	10.5	11.4	291.7	45.7	49.7	1,273.1
2009	4,86,384	1,25,660	5,15,458	11,60,813	1,14,951	44,71,510	41.9	42.3	1,087.7	10.8	10.9	281.0	44.4	44.8	1,152.8
2010	4,99,628	1,34,513	5,27,512	11,76,742	1,27,746	45,82,439	42.5	39.1	1,090.3	11.4	10.5	293.5	44.8	41.3	1,151.2
2011	4,97,686	1,42,485	5,11,394	12,10,193	1,41,866	46,76,838	41.1	35.1	1,064.2	11.8	10.0	304.7	42.3	36.0	1,093.5
2012	4,90,383	1,38,258	5,09,667	12,08,116	1,59,491	48,65,394	40.6	30.7	1,007.9	11.4	8.7	284.2	42.2	32.0	1,047.5
2013	4,86,476	1,37,572	4,94,893	12,23,581	1,81,508	52,31,922	39.8	26.8	929.8	11.2	7.6	262.9	40.4	27.3	945.9
2014	4,89,400	1,39,671	4,93,474	12,38,887	1,90,704	54,02,486	39.5	25.7	905.9	11.3	7.3	258.5	39.8	25.9	913.4
2015	5,01,423	1,46,133	5,00,279	12,54,019	2,10,023	54,72,144	40.0	23.9	916.3	11.7	7.0	267.0	39.9	23.8	914.2
2016	4,80,652	1,50,785	4,94,624	12,68,961	2,30,031	56,03,293	37.9	20.9	857.8	11.9	6.6	269.1	39.0	21.5	882.7
2017	4,64,910	1,47,913	4,70,975	12,83,601	*	*	36.2	*	*	11.5	*	*	36.7	*	*

Source: Ministry of road transport & highway, India

1.3 State Level Road Traffic Accidents in India

Himachal is the land of hills, forests and rivers. After the existence of Himachal Pradesh in 1948, the major focus of the Government is over the road connection between the various areas of the Himachal. The road became the Life Line for the people of the Himachal Pradesh. Himachal consist of 12 districts over the area of 55,673 km². Himachal have the various national highways, state highway, major district road, other district road, village roads..The congestion of these roads is increasing day by day. Increase in the vehicle growth directly leads to the road traffic accidents over this stretch.

Fig 1: Graphical Representation for Accidental data for Himachal
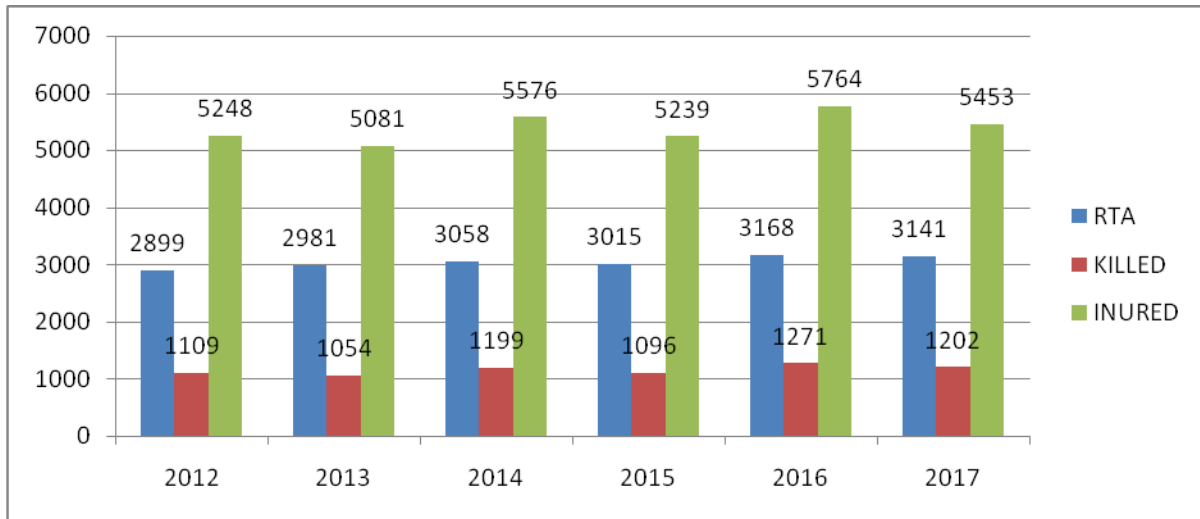
Source: DIG Police office, Traffic Tourist & Railway, Shimla- Himachal Pradesh

1.4 District Level Road Traffic Accidents for Una Himachal

Una district is situated in the lower hill periphery of the hill state Himachal. It is situated within the wide range of the Shivalik hills (Manak Parbat). It has a coverage area of the 1,549km². It has the longnitudal stretch of the Swan River over the western side of the Una district. As per the distribution of the road network, this district has the National highway, State Highway Major District Road, Oder District Road, Village Road. The NH passing through the Una district are NH-503-A, NH 503 EXTN, NH-70 (NEW NH- 03), NH-20A (NEW NH- 503).The total NH length in the Una district is 139.87 km.Where as the roads like state highway , Major district road, PMGSY, Other district road consist the total length about 1982.098 km. It has the longest National highway from Mehatpur to Bharwain via Una Amb Mubarkpur. This stretch having the length of 62.3 km. Where the Bharwain is the highest peak in the Una district. But at the point of NH & the link road connection, the possibility of accident increases. Many times the pedestrians come under the influence of the accident. In spite of the vehicular & natural object collision, a common type of the accident is the animal crossing collision to the vehicle. Normally at night, it causes the serious problem.

II.   LITERATURE REVIEW

The literature review part for the road traffic accident provides overall information about the various causes & prevention strategies for the accidents. Various studies done earlier give a brief idea to know what is the exact solution & what is the present need for control such incidents.

RAKESH SAINI, VIVEK et.al (2015): put the study over the NH 3 stretch in the Una district of the Himachal Pradesh. In this study the author uses the weighted severity index method of the road traffic accidents to put out the severity for the black spots over the stretch. The primary & the secondary data were collected for the work. Detailed road inventory & the signage inventory were done to perform the road traffic analysis. As the conclusion for the study, it emphasis on the provision for the parking on the required areas. The use of the guard rails, road marking is the need of the hour. The drivers should need to wear the helmet to reduce the road traffic accidents.

SIMARJOT SINGH, DR. TRIPTA GOYAL (2017): study the road accidental behaviour for the state highway 12A Patiala- Sirhind-Mohali. They perform the traffic volume study & the spot speed study analysis for their study. They also analysed the road accident data. They emphasis over the improvement. Proper enforcement is needed for the traffic safety. The results show that the cars & the two wheeler contribute that total 93% of the total vehicles. Average design speeds at the accidental prone points are 110 kmph.

NEHA BHAGRIA, AJAY KUMAR DUGGAL (2017): studies the World health organisation (WHO) to show that the by 2030, the road traffic accident will be the 7th leading cause of the death. The pedestrian, cyclist & the motor bikes forms about the 49% of the total road accidents in the world. The author perform the traffic count, road condition survey reports, accidental data from the police stations & the geometric designs studies. At the various accidental points, various signs, reflectors, road markings are needed.

FSHATSYON BRHANE GEBRETENSAY, JAYESH JUREMALANI (2018): comes to the point that the increasing population, increasing in the number of the vehicles cause the higher increase in the road traffic accidents. There is death in the every 2.75 minute due to the accident over the road. For the analysis, the road traffic accidental data from the police station from 2010 to 2016 is collected and then analysed. The analysis is based upon the various factors like time, type of accidents, sex, weather condition etc. The study shows that the road traffic accidents are a human disaster. It causes the huge cause the socioeconomic cost. After all the required analysis over the accidental data, they propose a model which is based on vehicular composition.

III.   **METHODOLOGY**

Methods used for accidental study:

3.1 Primary Method
3.2 Secondary Method

3.1 Primary Method:

In this method, all the physical inventory:

- Traffic volume count
- Road marking inventory
- Road signage inventory
- Signalling Inventory
- Road parking inventory
- Geometric design inventory

3.1.1 Traffic Volume count

For the route Mehatpur to Bharwain in the Una district, we have conducted the traffic survey at the Baduhi Market centre near the Garni Khad (River) of Takarla. This point located in between the stretch between the Mehatpur to Bharwain. For this we have adopted the Manual method of traffic volume count. This survey is conducted for the 3 days (day & night) 72 hours on the regular basis. The following data is collected.

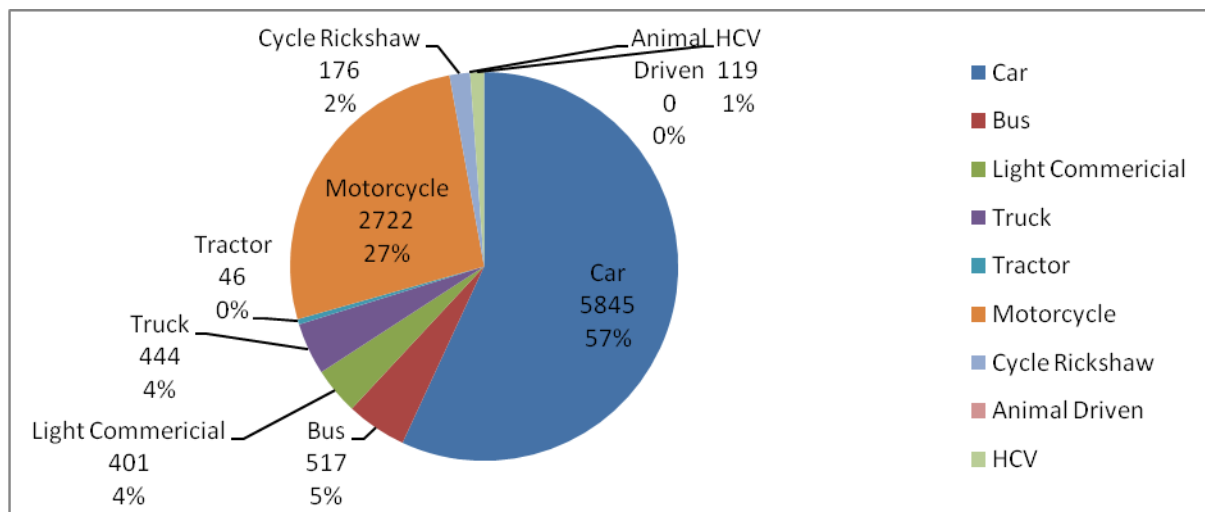**Fig. 2:** Vehicular distribution at road on first day
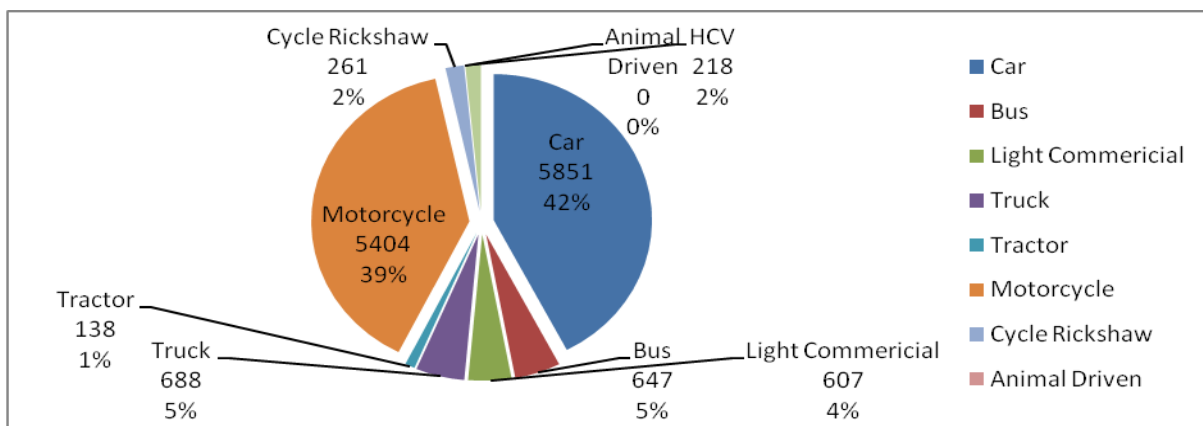
Source: Traffic surveys at Baduhi market centre Una- Himachal Pradesh.

Fig. 3: Vehicular distribution at road on second day
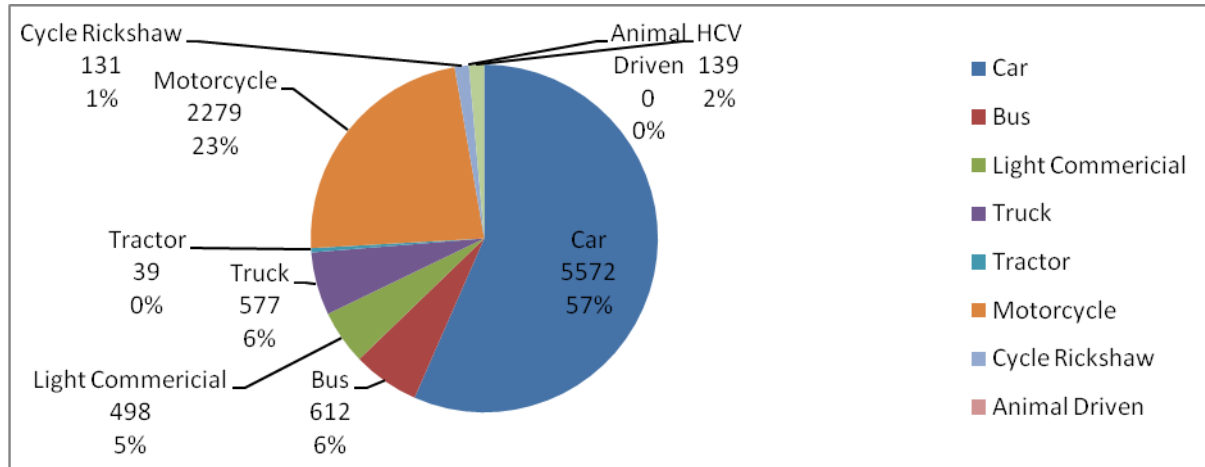
Source: Traffic surveys at Baduhi market centre Una- Himachal Pradesh

Fig. 4: Vehicular distribution at road on third day

**Source:** Traffic surveys at Baduhi market centre Una- Himachal Pradesh.

3.2 Secondary Method

In this method the road accident data is collected from the Police department. The data which is collected is analysis for the particular stretch. From the available data the various black spots are observed by accounting the accidental threat records.

3.2.1 Accidental Statics Analysis

From the consecutive five years since from the 2014 to 2018, the accidental attributes are shown in the statically manner. This data shows the annually change in the all the three attributes like total road traffic accidents, killed, injured.

Fig. 5: Statically performance of the accidental attributes on route Mehatpur to Bharwain.
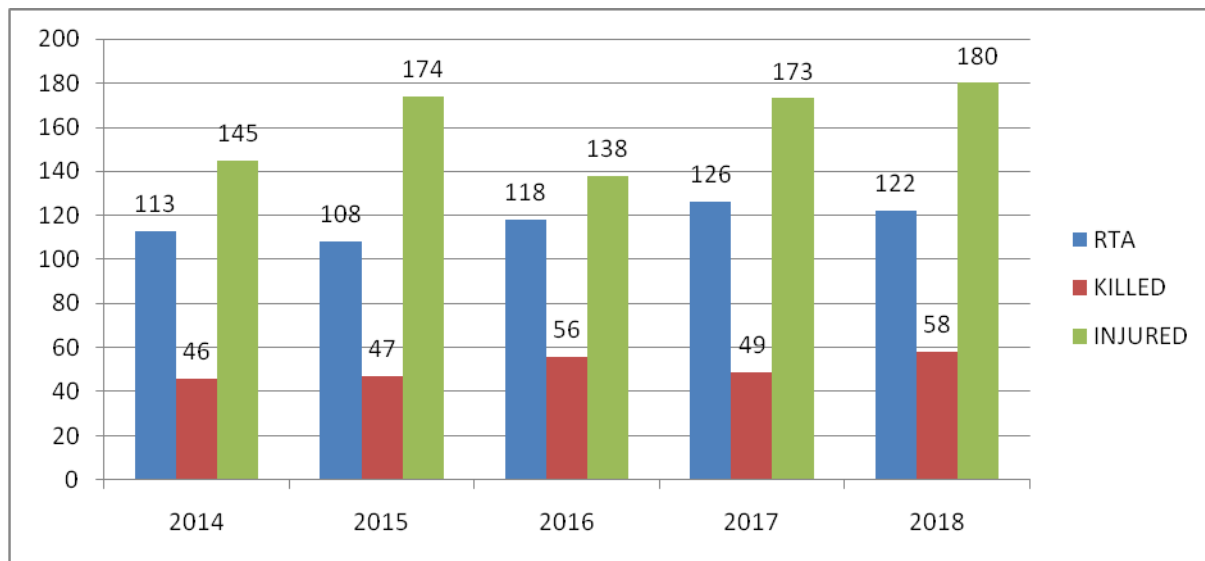
Source: Segregated from the data obtained from SP office Una Himachal.

Weighted Severity Index Method

In the WSI method, previous accidental data up to some expected years are collected on the particular station. After that the loads are assigned for the killing threats, injured & non injured threats.

The expression for the WSI is:

WEIGHTED SEVERITY INDEX= (5 x Killed + 3 x Injured + 1 x Non injured)

In this formulated method only the killed events, injured & non injured events are considered for the calculations. The station which have more weighted severity index is the most prone accidental area.

Table 3: WSI value for the black spots

SR. NO	Station	RTA	KILLED	INJURED	WSI
1	Basal	27	20	42	226
2	Rakkar Colony	26	11	44	187
3	Mubarikpur	12	5	51	178
4	Amb	32	12	34	162
5	Behdala	25	8	40	160
6	Jhalera	24	8	33	139
7	Mehatpur	32	2	37	121
8	Panoh	18	10	23	119
9	Baduhi	17	7	26	113
10	Nandpur	17	11	17	106
11	Dhusara	18	10	17	101
12	Dehlan	19	3	27	96
13	Pukka Paroh	17	9	17	96
14	Tararla Morh	11	9	14	87
15	Bharwain	2	0	22	86
16	Dilwan	15	8	9	67
17	Kuthairi	11	3	16	63
18	Bhera	8	4	11	53
19	Karluhi	8	4	8	44
20	Bus Stand una	9	5	6	43
21	Chururu	6	3	7	36
22	Teuri	5	2	8	34
23	Sabzi Mandi Una	9	0	10	30
24	Diara	6	3	5	30
25	Rotary Chownk Una	6	2	3	19

IV. RESULT & DISCUSSION

From the accidental data analysis, about 25 black spots are listed over the NH stretch on route from Mehatpur to Bharwain. With respect to their physical inventory, public questionnaire various causes of accidents are drafted.

1. **Basal**
   - Maximum pedestrian crossing.
   - Presence of the bus stop over the curve on the corresponding sides which leads to bus to stop there and causes the congestion over the curve.
   - Connected link road over the super elevated portion of national highway.
   - Presence of sharp circular curve.
   - Presence of the market along the circular curve.

Fig. 6: Basal Market

Bus stop at the sharp curves on road & causes the problem of traffic jam.

2. **Rakkar Colony**
   - Maximum pedestrian crossing near the colony.
   - Presence of the sharp curves roads over the hilly terrain.
   - Attaining the over speeding over the road.
   - Presence of the steep slope over the hill road.
   - Here over the NH stretch in the Rakkar colony, there is the four lane road having the divider between them. A large number of passage between the dividers allows the sudden crossing of vehicle while the lane interchanging. This causes the most of the accidents.
   - Sudden increase in the traffic volume during peak hours due to the presence of the various schools, offices near it.

Fig. 7: Rakkar Colony NH stretch

Presence of sharp curve on the hill side.

3. Mubarikpur

- Act as a junction towards the Shri Chintpurni ji – Bharwain - Daulatpur - Hoshiarpur road. Thus have a maximum traffic density.
- Absence of the bus stop causes the congestion.
- In the peak hours, there exists a heavy traffic jam.
- Possible sharp curves over the hill terrain.
- Very congested market near the junction.
- Presence of the temporary bus stand over the shoulder region.
- Due to the insufficient parking facility, drivers park their cars over the road side.

Fig. 8: Mubarikpur Junction

Temporary bus stop on road causes congestion.

4. Amb

- Insufficient parking space in the city market centre.
- Highly congested bus stand leads to the traffic jam conditions.
- Huge market near the road side.
- Increasing urbanisation.

- Presence of the long longitudinal stretch.

Fig. 9: Amb Market

Traffic congestion during peak hours & absence of road marking.

5. **Behdala**
   - Higher length of the straight longitudinal stretch which leads to attain the high speed.
   - Maximum due to the pedestrian crossing.
   - Absence of the warning signs like ACCIDENTAL PRONE ZONE.

Fig. 10: Behdala NH Stretch

Higher longitudnal stretch near Behdala.

4.1 Possible causes of the accidents over the adopted stretch

We know that the every accidental black spot have the different issues that leads to the hazardous event. But mostly these causes are seems to be common over the different station of the black spots. Some of the possible causes are listed here:

- Pedestrian Crossing.
- Congested Market Centre.
- Over speeding of vehicle.
- Improper planning at link road - National highway junction which creates the problem of visibility for the road users.
- Animal Crossing.
- Overtaking issue.
- Accidental problem due to the overloading of goods & public over vehicles.
- Geometric design problem.
- Mechanical fault of the vehicle.

- Accidents due to the High beam of the light.
- Violation of the rules
- Intake of alcoholic content while driving.

4.2 Inventory Study Results
Over the adopted stretch from Mehatpur to Bharwain, physical inventory of various aspects is done to find out the causes of the accidental threats & the basic deficiency in the road.
Listed inventory results are below:

4.2.1 Traffic volume count
From the traffic volume count over the Baduhi Market centre near the Garni khad (River) of Takarla, the final results show that the average persons uses the cars or bikes. Less use of the bi-cycle is found. The use of animal drawn vehicle is extinct now days. Even during the survey not even the single animal drawn vehicle is found. This shows that the public is now moves towards the use of the cars & bikes. Even the young youth uses the more scooties & bikes rather than the use of bi- cycle. Even the peak hours the total running vehicles over the road become very high. During the night the road have very less traffic. Our study finds that the night time conditions are good for the heavy commercial vehicles as the traffic intensity is less during that time.

4.2.2 Road marking inventory
The centre white line marking become good in the condition. The white colour of pedestrian marking is not looking good. The colour of the marking becomes rough. Even near the curves the marking become rough which is not visible from the distance. The edge line of the pavement is good in condition where as at some locations it needs the new line over it.

4.2.3 Road signage inventory
Almost every type the signs like warning, cautionary & informatory are installed at the desired places. But near the possible black spots the ACCIDENTAL PRONE ZONE signs are absent. These types of the signs are the need of the hour. This is a type of warning sign which indicates the driver about the accidental proneness of the area.

4.2.4 Signalling Inventory
This type of the inventory is done over the road junctions. Over all the junctions every aspects founds to be good but only the signal timer is not indicating at the signal post. Th STOP & GO GREEN signal timing needs to be shown over the digital timer. By using this driver will switch

off the engine as per the signal time & can early switch on the engine. The use of the digital timer will help to reduce the air pollution & also saves the fuel for the future use.

4.2.5   Road parking inventory

Due to the increasing traffic density, the problem of the parking is seen everywhere due to the insufficient space. But due to the limited space even for the road authority it becomes difficult to provide the space for it. Near the congested market centres the parking space is very in sufficient hence drivers tends to park their vehicle over the shoulder region. It becomes risky for them & also to the vehicle running over the road.

V.   CONCLUSION

As from the output results, the conclusion with respect to the reports finally reached to the various remedies to save the human life & the public property. As we know that now days the driving over the road is very risky. Government put best of the efforts to save the life. But with respect to the increasing traffic at the higher rate, it directly shows the higher increasing rate of road traffic accidents in India. We have the well maintained roads instead of that the accidental threats are increasing. Finally the basic cause of the accident is the driver's fault or may the possible generating situation which is out of control for the driver.

5.1 Recommendation for the Top 5 ranked black spots:

(1) Basal
- Provision for the foot over bridge over the curve to facilitate the pedestrian to cross the road even on the traffic conditions.
- The bus stop needs to be shifted from the present location because these are located almost on the super elevated portion and corresponding to each other. Hence the shifting of the bus stop will provide the less traffic condition over the curve.
- Due to the market centre over the curve side, there exists the parking problem. So No Parking signs are needs to be provided. To overcome the situation, separate parking facility needs to be provided.

(2) Rakkar Colony
- The passage between the dividers should have the appropriate sign of passage which can be seen from the farthest distance.
- ACCIDENTAL PRONE AREA sign should be used.

- Special pedestrian lane should be provided.
- A provision for the street light is the need of the hour, So that at night the risk of the accidents should be eliminated.

(3) Mubarikpur

- By-pass or increasing road width is the prime need of the hour towards the route Shri Chintpurni Ji.
- Provision for the parking lot need to be put on. The violator of the rules should be imposed fines.
- Special locations are needs to be selected for the Bus stoppage away from the junction so that
- Super elevated curve needs to be re-designing.

(4) Amb

- A large capacity bus stand is needed for the Amb city so that the congestion will get recuce.
- A foot over bridge is needed to provide the crossing facility to the pedestrians.
- At the road junction towards the Hamirpur road, a special signal lights are needed to easily regulate the traffic.

(5) Behdala

- ACCIDENTAL PRONE ZONE sign should be provided.
- Barricades pattern should be provided in between the longitudinal stretch of the road to control the movement.
- Proper road marking should be provided.
- Speed breaker should be provided near where link road connects to the National highway.

5.2 Overall Recommendations for the accidental safety:

- Police Control room in between the specified stretch of the National highway. So that they can put the regular monitoring of the vehicle speed & rule violators.
- Provision of the foot over bridge over the black spots to provide the safe road crossing to the pedestrians.
- Longitudinal and the lateral sight clearance at the link road & the National highway junction should be provided so that both the drivers can judge the running traffic over the road in opposite direction. If there exist a clearance then there will be the high visibility so that accidents can be prevented at such junctions.

- Installation of the CCTV over the highly accidental prone zones.
- Proper planning of the market along the road side.
- Space for the parking near the congested area of the city.
- Installation of the ACCIDENTAL PRONE ZONE sign near the accidental prone area.
- Regular maintenance of the pot holes to provide best pavement to the road users.
- Use of traffic convex mirrors.

VI.   FUTURE SCOPE

Increase in the urbanisation & modernisation in the rural areas leads to the active use of the large number of the vehicles over the roads. Even if we look over the Una district, all the remote areas of the villages are linked up with the great road network. The roads of Una are not only limited to the public transportation but extended up to the great transportation of the products of the industrial areas set up there. The industrial area for the Una district is boon in terms of the district growth & also for the employment. Increasing population causes mostly the proportional increase in the vehicular traffic. If we look over the statistics then it shows almost an increase in the accidental threats. Even after put all the changes over the black spots, we are not in the state to reduce the accidental threats.

The study over the stretch from Mehatpur to Bharwain provides the information about the black spots over the road. From Himachal Pradesh, in year 2017 the total road accidents reported are 3,114. Where as in Una district is about 292. Over route Mehatpur to Bharwain, it is 122. This data shows that this route have the maximum contribution to the road accidents. From the physical inventory various safety measures are drafted. These safety measures need to be put on so that we can save the lives from the accidents. It will reduce the black spots on the road. We know that the future development shows the best impression on the map of the Una district. By implementing the above recommendations, there will be a fall in the number of road accidents up to a great extent. Thus many lives & properties would be saved. To reduce the road accidents, safety measures are the prime concern. Regular research work over the route will provide the information about the various deficiencies over the road. Thus it will lead to the overall development.

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