



Road Safety Analysis and Identification of Accident Black Spots in S.A.S. Nagar District



A Project Under



September 2019



Road Safety Analysis and Identification of Accident Black Spots in S.A.S. Nagar District

Detailed Report

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EXECUTIVE SUMMARY

A Report on “Road Safety Analysis and Identification of Accident Black Spots in SAS Nagar area” is published by the office of Traffic Advisor Punjab with the assistance of Senior Superintended of Police, SAS Nagar under Punjab Vision Zero and Tandrut Punjab Mission. This report is a detailed macro and micro-level analysis of traffic and road safety scenario for the entire SAS Nagar area and further up to Police station level. District wise SAS Nagar ranks at number 3 when it comes to road accident fatalities against per million populations. In the past three years, a total of 911 people lost their lives in various road accidents reported in SAS Nagar area. SAS Nagar as compared to the previous year has shown an inclined trend in road fatalities in the past two years, in fact, the total number of deaths has increased as compared to 2016. Month-wise if we see, February, September, October, November, and December months are relatively more dangerous from road fatalities and accidents point of view for SAS Nagar. District SAS Nagar can plan month-wise enforcement calendar and human resources deployment as per the available pattern of traffic movement and road accidents. Day wise Saturday, Sunday, and Mondays are more critical for SAS Nagar area and the majority of the road accidental deaths are reported between 6 PM to 12 AM. Based upon such indicators, the effective zero-tolerance micro-level enforcement strategy required to be put in place for the entire SAS Nagar.

For the detailed analysis, only a numbers of fatalities in road accidents are considered due to better reporting and recording of road fatalities. Underreporting of serious and minor road accident cases due to various reasons never provides a clear picture of the area.

Human Population wise it is estimated that 2.3% of Punjab’s total population lives in SAS Nagar area and vehicle wise its growing quite

rapidly as compared to total vehicles registered in Punjab for past three years, but from road accidental point of view, 6.4% total road fatalities of Punjab occurred last three year in the area.

The detailed police station wise analysis reveals that Lalru, Dera Bassi, Zirakpur, Sohana and Sadar Kharar are the five major police stations out of nineteen police stations, in which more than 63% road accident deaths are reported that also includes CrPC cases. All of them are located on either National Highways which are major contributors in road accidents fatalities. Lalru, Dera Bassi ,Zirakpur,Sadar Kharar and Sohana Police areas are the stations under which maximum Black spots are identified out of all the 92 identified accidental black spots in SAS Nagar area. District police require taking up special engineering improvement and enforcement emphasis in nearly all the police stations that have the majority of Black spots coming under their belt. Out of 92 accidental prone/critical area identified in the SAS Nagar, 61(66%) of them are on National Highway, this requires the immediate attention of National Highways and PWD authorities through district and state administration. On all such accidental black spot, immediately road marking, road signs and street light with more illumination than rest of the street/road shall be put in place to avoid any further road accidents. 17% of the total road fatalities in the last three years are reported on Municipal Corporation roads. This requires special attention of the Department of Local Government, Punjab.

Through notified “District Road Safety Committees” under the chairmanship of Deputy Commissioner, the matter of engineering improvement of 92 accidental black spots shall be take-up with the active support of National Highways Authority of India (NHAI), PWD (B & R) and local bodies at the earliest. People working under the administration who have a better knowledge of the entire area needs to be roped in to improve the stretches that are vulnerable through proper road safety and road engineering interventions. Bad road geometrics at intersections, Over speeding, wrong parking of trucks along the roadside, undivided

highways, non-existence of formal Bus Stops, safe pedestrian and cyclist facilities are the key areas where engineering and planning interventions are required immediately. It is pertinent to mention here that, while doing the engineering improvement, kindly avoid foot over bridges as a solution for the safe movement of the pedestrian. Research proved that no one use foot over bridges and such infrastructure do no facilities pedestrian or cyclist but the fast movement of the motorist. Honourable Punjab and Haryana High Court also made the same observation in one of the on-going cases CWP 17530 of 2010. Majority of the road accident victims are two-wheeler and pedestrian which amounts to 80% of total cases and are impacted largely by Truck/Buses and Cars/Jeeps, apart from engineering improvements effective enforcement at impacting vehicles and victim side is required (target hardening). School falling on National Highways or on Main roads requires special attention of the authorities.

Usage of helmet and seat belt found minimal in SAS Nagar area. Immediately to increase awareness regarding seat belt and helmet with consistent enforcement strategies and ground implementations are desirable. Overall with a target of reducing minimum 15-20% of road fatalities in 2019 is required to be fixed for this critical district. For any additional requirement of enforcement or challan machines, the request can be made through road safety fund. Each police station shall develop its own patrolling and challan strategy in order to improve enforcement within SAS Nagar.

1.1.About S.A.S. Nagar Police

Sahibzada Ajit Singh Nagar District has been carved out of areas falling in Ropar and Patiala district as 18th District of Punjab on 14th April 2006. Because of its connectivity with the union territory of Chandigarh, the district has been formed to achieve growth of development as this area is emerging as Major I.T Hub of Northern India. The district includes Mohali, Kharar and Dera Bassi Tehsils. It is located in the northeast part of Punjab and is part of Rupnagar division. The District includes 383 villages. The important township in the district is Kharar, Kurali, Mohali, Zirakpur & Dera Bassi. Kharar block is the largest administrative unit of the district with 138 villages followed by Majri block with 116 villages and Dera bassi block with 102 villages. 27 villages were newly added in the District Sahibzada Ajit Singh Nagar which were carved out from District Patiala.



Figure 1: Boundary Map of Various Police Stations within the SAS Nagar Police Commissionerate Area

S.A.S Nagar is well linked to the surrounding region by a satisfactory network of National Highway, State Highway, and other major district roads. NH-152 and NH-205 run along the periphery of S.A.S Nagar connecting to the other districts in Punjab and neighbouring states. National Highway connects SAS Nagar via Kharar to the Northern part of the State of Punjab such as Jalandhar, Amritsar, etc and State Highway connects Fatehgarh Sahib and Sirhind to S.A.S. Nagar. The National highway NH-152, NH-344 also connects the district to the State of Haryana and further to Delhi which is 244 km away. There is a vital rail link which is currently linking Chandigarh to New Delhi via Ambala

1.2. Road Accident Scenario in SAS Nagar District

- i. On average, 25 people are losing their lives every month in various Road Accidents within the SAS Nagar.
- ii. In the past two years, an increase from 295 road fatalities in 2016 to 312 in 2017 and a minimal decline to 304 road fatalities in 2018 respectively was observed in SAS Nagar. At the same time, the Punjab state recorded overall inclined trend of 6% in road fatalities.
- iii. Overall Ranking based upon road accident fatalities per million population of SAS Nagar is at number 259, amongst all the districts of Punjab is at number 3 in the year 2018.
- iv. Number of road accident fatalities per million populations (against 10 lakh) of SAS Nagar (Health burden due to traffic) in the year 2018 was 259, against the state's average of 155 and National average of 110.
- v. In SAS Nagar, 89.12% of the total road fatalities are occurring on National and Municipal Corporation roads. In which 66.30% is shared by National Highways and 22.80% being Municipal Corporation roads.
- vi. *Approximately 88 km long National Highways are passing through SAS Nagar area and are the most accidental prone stretches. The death rate on National Highway-152 alone passing through S.A.S. Nagar is approximately 7.2 per kilometer in the past three years. This is 7 times higher than the state average. 61 accidental black spot falls on 88 kilometers of NH length makes it the most critical road section within S.A.S. Nagar district.*
- vii. Over speeding, traffic violation and rough driving are the leading causes of deaths in SAS Nagar district. Police Stations of Zirakpur, Dera Bassi, Lalru, Sadar Kharar and Sohana contribute nearly 63% of total accidents in SAS Nagar (Figure 2).
- viii. Month-wise, mainly October, November, and December are the most critical months in SAS Nagar District In these months, the road accident fatality rate is much above the yearly average of 25 road accidental deaths per month in the past three years.
- ix. Saturday, Sunday and Monday are the most critical days accounting to 46% of total road fatalities in SAS Nagar district. On these days, 20-30% more road fatalities compared with a daily average of past three years i.e. 130 deaths/day occurred.
- x. Maximum road accident fatalities occurred between 06 PM to 09 PM & 9 PM to 12 AM in the SAS Nagar District. It accounts for 45.33% of total road accidental fatalities in the past three years.

- xi. S.A.S. Nagar district is recorded with one of the highest motor vehicle registration after Ludhiana district.
- xii. The gender-wise comparison in road accident deaths in SAS Nagar district area revealed that the total number of males and females killed during the last three years were in the ratio of 89%: 11% respectively.
- xiii. As per the socio-economic cost analysis, 966 Crore rupees were lost due to road accidents in S.A.S. Nagar district in the past three years.
- xiv. S.A.S. Nagar district has 92 accidental black spots, out of which 61 are on National Highways and 21 on Municipal Roads. On these black spot, more than 5 fatal or serious accidents took place in the last three years. On these spots, in the last three years, 420 people lost their lives and 489 got seriously injured.
- xv. Traffic Police enforcement-wise, a total staff of 152 police persons are deployed on various Traffic duties in the S.A.S. Nagar district.

Table 1: Comparison of Road Safety Indicators India, Punjab and SAS Nagar (2018)

Head	India	Punjab	SAS Nagar
Total Road Network (km)	54,72,144 (as per NHAI record)	70,912 (1.3% of country's total road network length)	240
The total length of National Highways(km)	96,260.72 (1.79% of total road network length)	2,677 (2.8% of the total road length within the state)	88 of the total road length within the district)
Total Area (Sq.km)	32,87,240	50,362	1098 appox.
Road length available per sq.km area	1.01	1.40	Unknown
Total Estimated Population (2018)	1,354,051,854¹	305,01,248 (2.3% of India's Population)	11,13,911 (3.6% of Punjab's Population)
Total road accident fatalities (2018)	1,48,697	4,725	304
Fatalities per million population (Health Burden due to traffic)	110	155	259

¹ <https://www.worldometers.info/world-population/india-population/> accessed on 16th May 2019.

2. Detailed Road Accidents Analysis of SAS Nagar areas

2.1. Police Station Wise Road Fatalities

Zirakpur, Dera Bassi, Lalru, Sadar Kharar and Sohana are the four Police stations in which 63% of the total road accident fatalities are reported in the last three years. Majority of the accidental black spot areas fall within the jurisdiction of these police stations only. This critical police have their major portion falling in the area from where National Highway crosses. These Police stations also contributes to most fatal accidents occurring in the district. It is to be taken into account that the Critical points falling on National Highway within these police stations need proper attention for their rectification. Police station wise distribution of road accidental fatalities is shown in Table 2.

Table 2: Year & Police Station Wise Summary of Road Accident Fatalities in SAS Nagar District

Police Stations/Cases	IPC (Cognizable)				CrPC (Non-Cognizable)				Total			
	Cases	Fatal	Serious	Minor	Cases	Fatal	Serious	Minor	Cases	Fatal	Serious	Minor
Airport	1	0	2	0	0	0	0	0	1	0	2	0
Balongi	59	31	36	4	0	0	0	0	59	31	36	4
City Kharar	103	64	65	16	2	2	0	0	105	66	65	16
City kurali	6	6	2	1	2	2	0	0	8	8	2	1
DeraBassi	194	119	100	23	8	8	0	0	202	127	100	23
Dhakoli	12	8	6	1	0	0	0	0	12	8	6	1
Handesra	14	10	9	1	0	0	0	0	14	10	9	1
Lalru	213	122	126	19	13	13	2	1	226	135	128	20
Majri	3	3	1	0	1	1	0	0	4	4	1	0

Police Stations/Cases	IPC (Cognizable)				CrPC (Non-Cognizable)				Total			
	Cases	Fatal	Serious	Minor	Cases	Fatal	Serious	Minor	Cases	Fatal	Serious	Minor
Mataur	61	16	57	5	8	8	0	1	69	24	57	6
Mullanpur	52	35	26	7	13	13	3	1	65	48	29	8
Naya Gaon	5	3	2	0	0	0	0	0	5	3	2	0
Phase-1	103	39	83	15	8	8	1	0	111	47	84	15
Phase-11	67	27	49	1	5	5	0	0	72	32	49	1
Phase-8	54	13	42	9	1	1	0	0	55	14	42	9
Sadar Kharar	146	88	103	34	7	7	0	0	153	95	103	34
Sadar Kurali	93	45	72	16	3	3	0	1	96	48	72	17
Sohana	154	85	122	18	3	3	2	0	157	88	124	18
Zirakpur	250	116	184	31	7	7	1	1	257	123	185	32
Grand Total	1590	830	1087	201	81	81	8	5	1671	911	1096	206

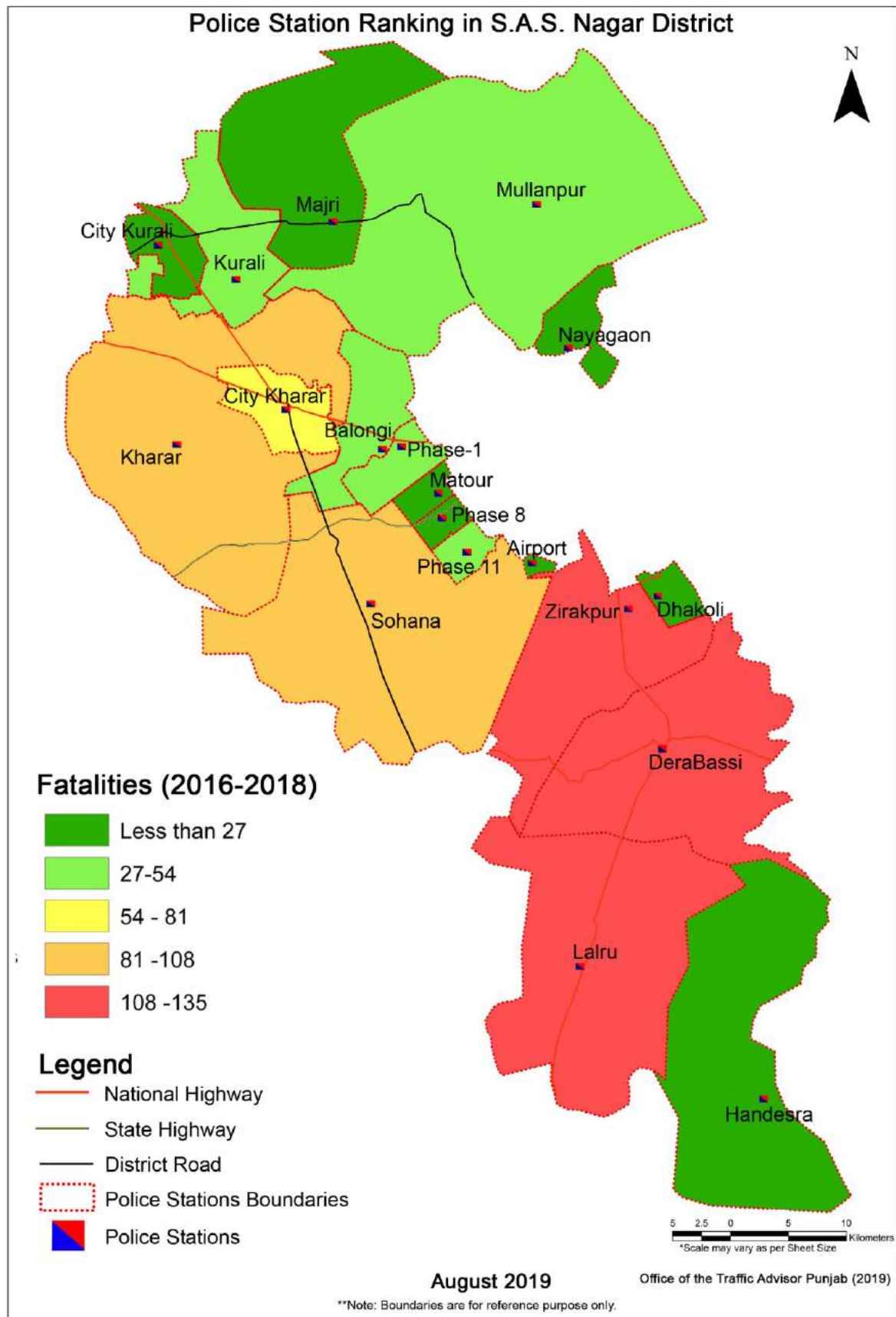


Figure 2: Thematic map showing police station wise road accident fatalities in SAS Nagar for the Year 2016, 2017 & 2018

2.2. Police Station Wise Summary of Accidental Black Spots

Out of total 92 accidental black spot areas identified within SAS Nagar district, 61 are on National Highways, 21 on Municipal Road, 5 on MDR, 3 on a state highway, and 2 on ODR as well. These accidental black spots are identified as per the Ministry of Road Transport and Highways Definition. *Road accident black spot on National Highways is a road stretch of about 500m in length in which either 5 road accidents (involving fatalities/grievous injuries) took place during last three calendar years or 10 fatalities took place during last three calendar years.* For the ease, the same definition has been followed for all other types of roads as well. However, it is suggested that Black spots on Municipal Roads within the core area of the city shall have lower fatalities rates to be considered as Accidental Black Spot, i.e. 3 deaths in three years.

Table 3 below provides police station wise summary of all accidental black spot as per the category of the road..

Table 3: Police Station and Road Category wise Summary of Road Accidental Black Spots within SAS Nagar District.

Sr.No	Police Station	Black Spots	Road Type					
			National Highway	State Highway	Municipal Roads	MDR	Link Roads	ODR
1	Airport	0	0	0	0	0	0	0
2	Balongi	4	3	0	1	0	0	0
3	City Kharar	5	5	0	0	0	0	0
4	City kurali	2	2	0	0	0	0	0
5	DeraBassi	10	7	0	0	0	1	2
6	Dhakoli	3	3	0	0	0	0	0
7	Handesra	2	2	0	0	0	0	0
8	Lalru	10	10	0	0	0	0	0
9	Majri	1	0	0	0	1	0	0
10	Mataur	4	0	0	4	0	0	0
11	Mullanpur	2	0	0	0	2	0	0
12	Naya Gaon	0	0	0	0	0	0	0
13	Phase-1	7	0	0	7	0	0	0
14	Phase-11	3	0	0	3	0	0	0
15	Phase-8	2	0	0	2	0	0	0
16	Sadar Kharar	10	7	3	0	0	0	0
17	Sadar Kurali	5	3	0	0	2	0	0
18	Sohana	8	5	0	3	0	0	0
19	Zirakpur	14	14	0	0	0	0	0
	Total	92	61	3	20	5	1	2

2.3. Month Wise Road Accidents in SAS Nagar District

Table 4: Month-wise Distribution of People involved in Different Type of Road Crashes for the Year 2016, 17 and 2018

Months/People Involved In accidents	Fatal	Serious	Minor
Jan	58	92	8
Feb	81	98	9
Mar	62	84	20
Apr	78	122	15
May	77	126	25
Jun	66	94	21
Jul	71	76	33
Aug	60	87	14
Sep	81	76	15
Oct	108	83	18
Nov	82	84	10
Dec	87	74	18
Grand Total	911	1096	206

Table 5: Month and Year Wise Distribution of Road Accident Fatalities in SAS Nagar District

Month/Years	2016	2017	2018	Grand Total
Jan	19	18	21	58
Feb	20	40	21	81
Mar	22	27	13	62
Apr	25	26	27	78
May	32	21	24	77
Jun	20	24	22	66
Jul	20	21	30	71
Aug	21	17	22	60
Sep	17	30	34	81
Oct	35	34	39	108
Nov	31	24	27	82
Dec	33	30	24	87
Grand Total	295	312	304	911

Month-wise, if we look into the data, mainly October, November and December are the most critical months in SAS Nagar District. In these months, as per the month-wise road fatal accident pattern, extra force in traffic enforcement and control can be deployed to reduce the number of road accident fatalities.

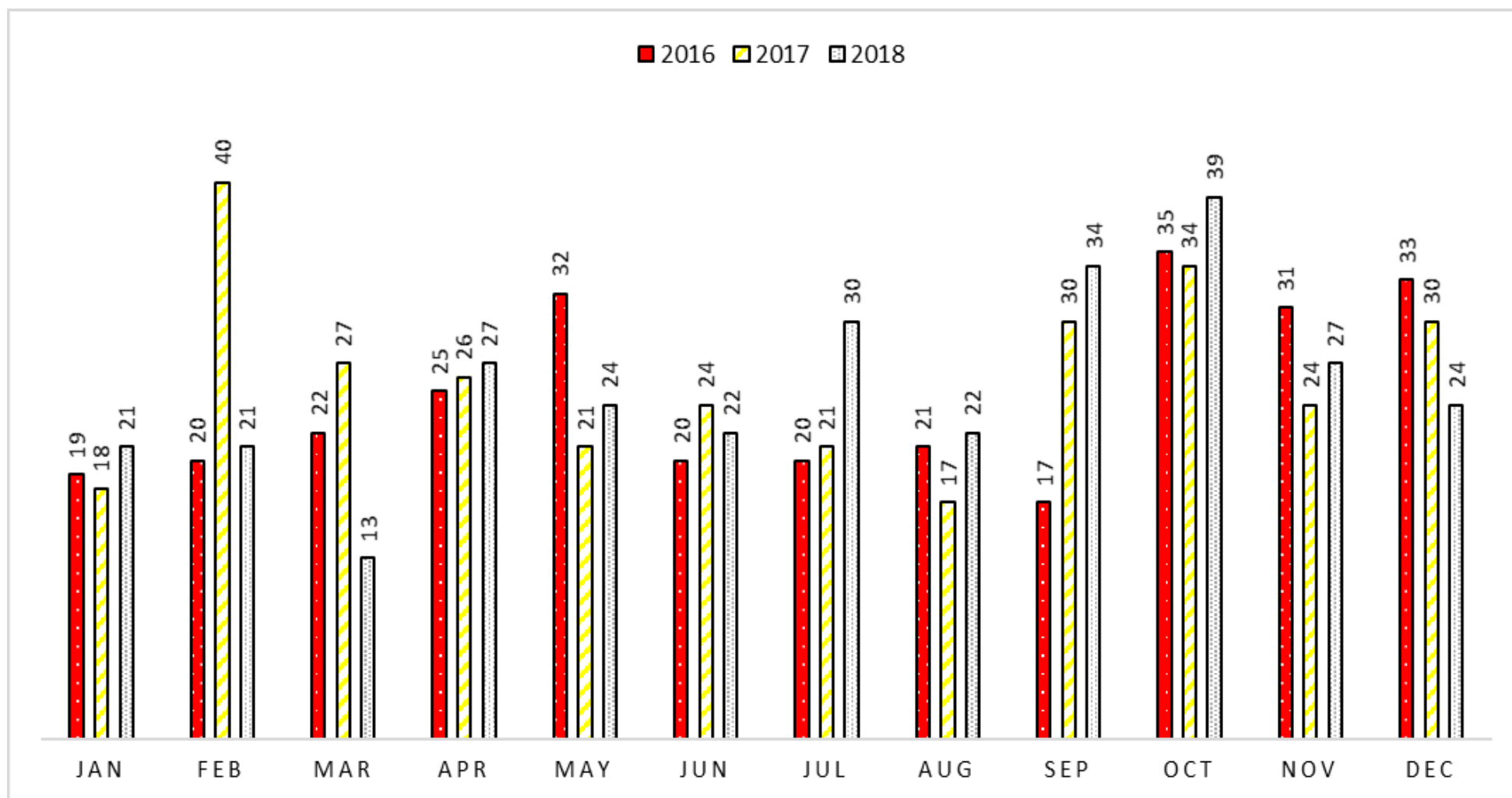


Figure 3: Month and Year Wise Distribution of Road Accident Fatalities in SAS Nagar District

2.4. Day Wise Analysis

Table 6: Day wise analysis of road accident in SAS Nagar District for the year 2016, 2017 & 2018

Day / Number of People Died	Fatal	Serious	Minor
Monday	136	141	54
Tuesday	124	161	21
Wednesday	124	186	41
Thursday	112	143	21
Friday	134	152	24
Saturday	139	136	22
Sunday	142	177	23
Grand Total	911	1096	206

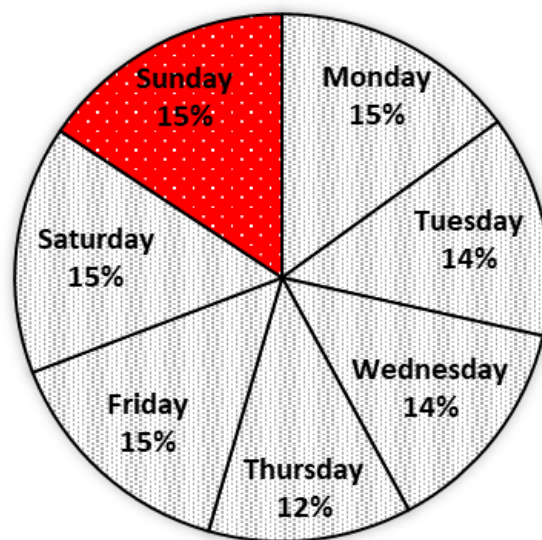


Figure 4: Day-wise analysis of road accident fatalities in SAS Nagar District for the year 2016, 2017 & 2018

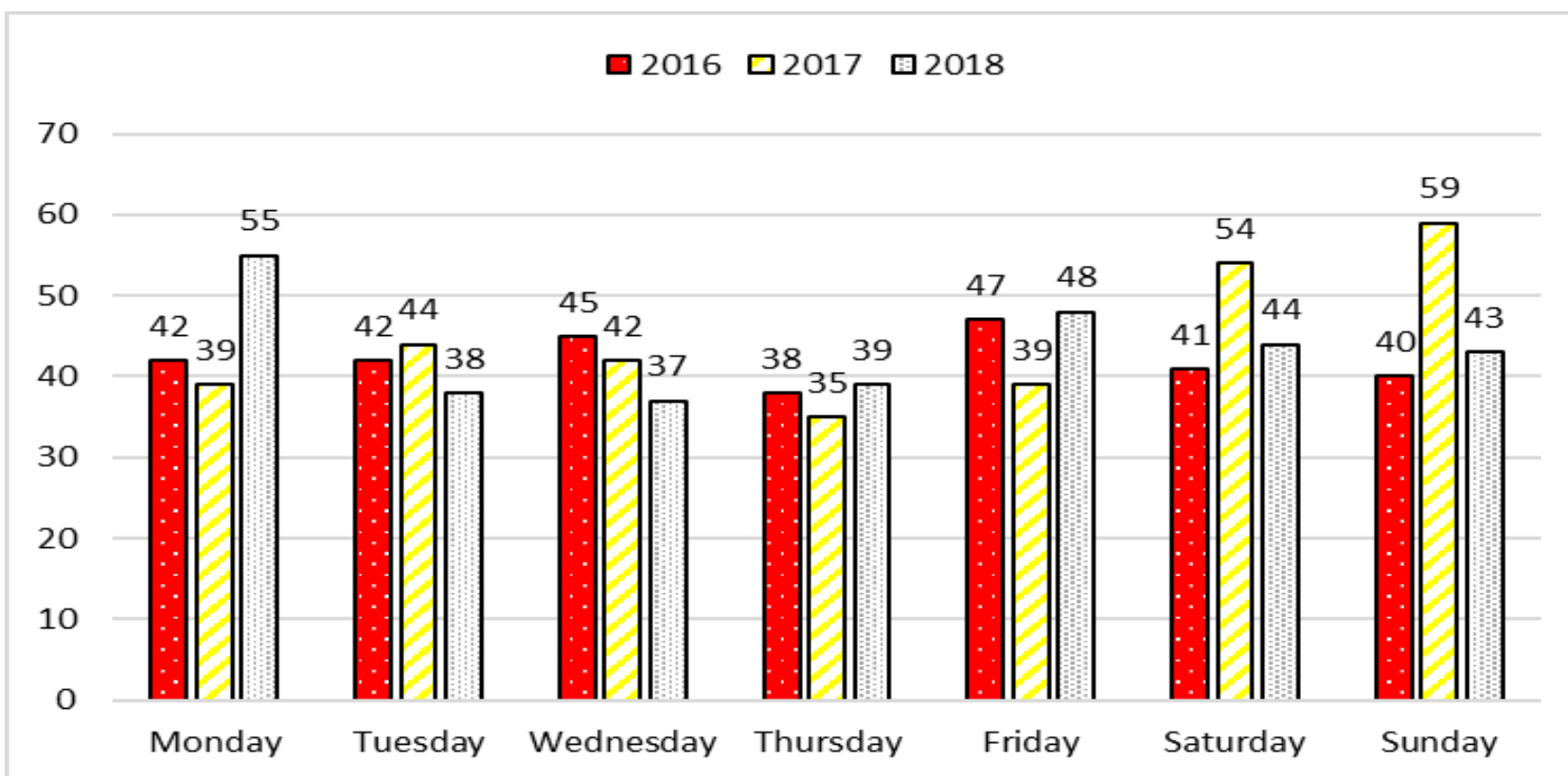


Figure 5: Day-wise analysis of road accident fatalities in SAS Nagar District for the year 2016, 2017 & 2018

Day wise, if we look into the data mainly Saturday, Sunday and Monday are the most critical days accounting to 46% of total road fatalities in SAS Nagar district. On these days, 20-30% more road fatalities compared with a daily average of past three years i.e. 130 deaths/day occurred. On the critical days, as per the day-wise road fatal accident pattern, extra force in traffic enforcement and control can be deployed to reduce the number of road accident fatalities.

2.5. Time Wise Analysis

Table 7: Timewise analysis of road accident fatalities in SAS Nagar District for the year 2016, 2017 & 2018

Time Slot	Fatalities
12AM-03AM	49
03AM-06AM	63
06AM-09AM	87
09AM-12PM	99
12PM-03PM	73
03PM-06PM	127
06PM-09PM	216
09PM-12AM	197
Total	911

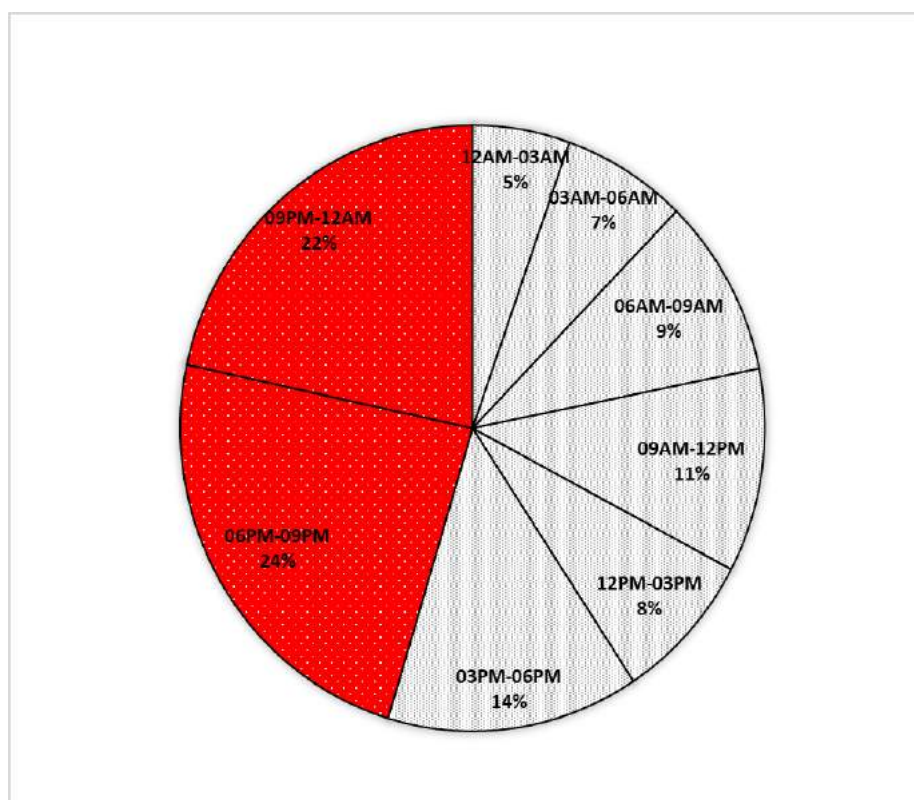


Figure 6: Timewise analysis of road accident fatalities in SAS Nagar District for the year 2016, 2017 & 2018

Maximum road accident fatalities occurred between 6 PM to 9 PM in the entire SAS Nagar District. It accounts for 24% of total road accidental fatalities in the past three years. For effective enforcement, time of road crashes is very important. So, in that slot of time, extra force in traffic enforcement and control can be deployed to reduce the number of road accident fatalities. Each police station can develop a zero-tolerance enforcement strategy for such identified critical hours.

2.6. Crash Type Wise Analysis

Table 8: Collision wise analysis of road accident fatalities in SAS Nagar District for the year 2016, 2017 & 2018

Collision Type	Fatal	Serious	Minor
Head-on Collision	97	177	30
Hit Animal	22	4	3
Hit Cyclist	62	33	3
Hit Fixed Object	3	2	15
Hit from Back	249	353	59
Hit from Side	147	352	76
Hit Pedestrian	247	157	12
Other	25	9	0
Overturning	6	3	7
Parked Vehicle	4	0	0
Skidding	29	3	1
Unknown	20	3	0
Grand Total	911	1096	206

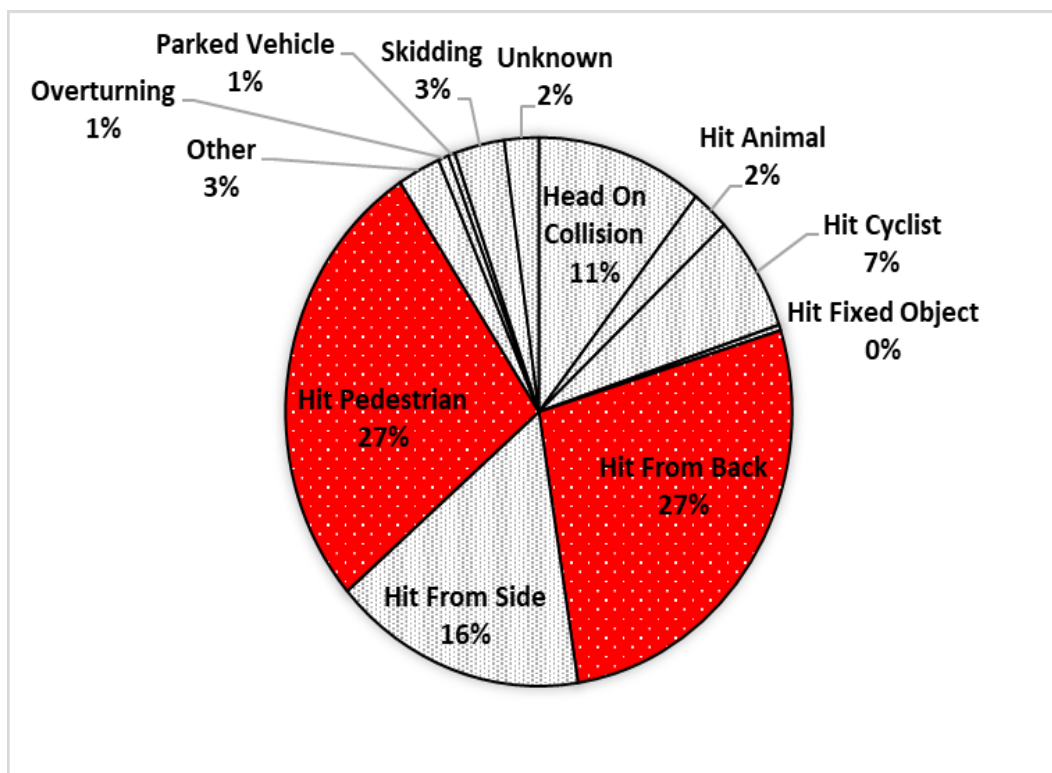


Figure 7: Collision wise analysis of road accident fatalities in SAS Nagar District for the year 2016, 2017 & 2018

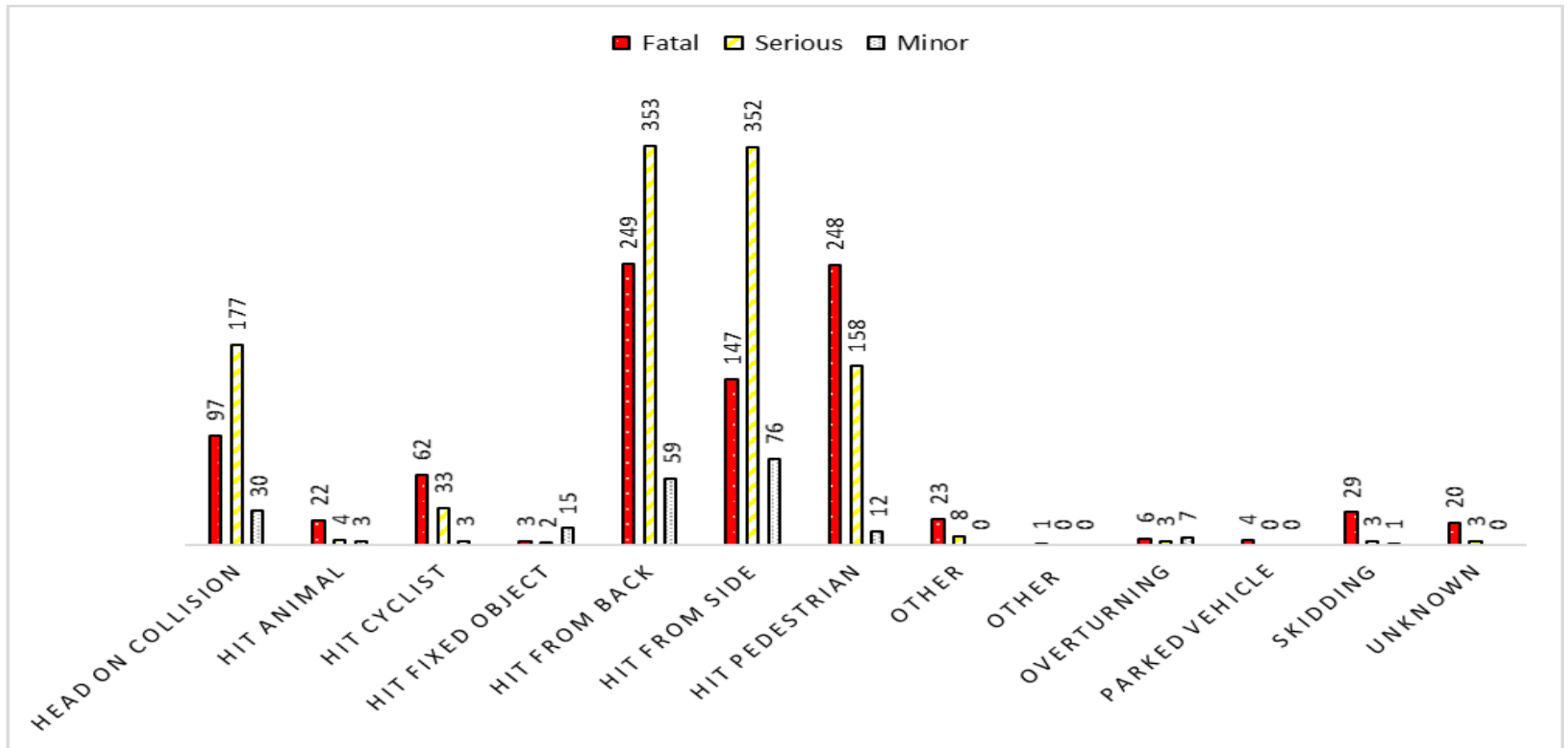


Figure 8: Collision wise analysis of road accident fatalities in SAS Nagar for the year 2016, 2017 & 2018

From the above data, it is observed that 27% of the collisions observed are **hit pedestrians** in various road accidents, followed by 27% **hit from the back** and 16% **hit from the side**. This indicates the need for better and safe infrastructure for the pedestrians e.g.; footpaths and Cycle tracks.

2.7. Vehicles Wise Analysis

Table 9: Collision Matrix of impacting and victim vehicles in SAS Nagar District for the year 2016, 2017 & 2018

First Vehicle / Second Vehicle	Animal Driven	Bus/ Truck	Car/Jeep/ Van/Taxi	Cycle Rickshaw	Cyclist	LCV	Other	Pedestrian	Three Wheeler	Tractor Trolley	Two Wheeler	Grand Total
Animal Driven	0	0	0	0	0	0	0	0	0	0	3	3
Bus/Truck	0	3	19	0	14	5	4	30	1	4	108	188
Car/Jeep/Van/Taxi	1	0	18	3	29	0	1	117	8	5	202	384
Construction Machinery	0	0	0	0	0	0	1	0	0	0	0	1
LCV	0	0	9	1	2	0	1	3	0	0	26	42
Multi Axle Vehicle	0	0	3	0	1	1	0	3	0	0	13	21
Three-Wheeler	0	0	0	0	0	0	2	4	0	0	6	12
Tractor Trolley	0	0	0	0	3	0	1	8	0	0	19	31
Two-Wheeler	0	0	1	0	10	0	1	32	1	0	20	65
Unknown	0	0	3	0	4	0	0	49	0	0	27	83
(blank)	1	1	13	0	0	3	0	6	3	3	51	81
Grand Total	2	4	66	4	63	9	11	252	13	12	475	911
	0.2%	0.4%	7.2%	0.4%	6.9%	1.0%	1.2%	27.7%	1.4%	1.3%	52.1%	100.0%

From the collision matrix (Table 9), it is clear that there are three major victim groups are Pedestrian, Two-wheeler, Car/Jeep/Van/Taxi and Cyclists (Table 11) and the majority of these fatal accidents are caused by Bus/Truck and Four Wheelers like Car/Jeep (Table 10). This matrix let us find the relation of vehicles moving on the road and how vehicles are vulnerable to each other. A detailed plan and provision of infrastructure need to be provided to mitigate all these mishaps in future.

Table 10: Impact profile of vehicles in for the year 2016, 2017 & 2018

Impact Profile	People Killed
Animal Driven	3
Bus/Truck	188
Car/Jeep/Van/Taxi	384
Construction Machinery	1
LCV	42
Multi Axle Vehicle	21
Three-Wheeler	12
Tractor Trolley	31
Two-Wheeler	65
Unknown	83
(blank)	81
Grand Total	911

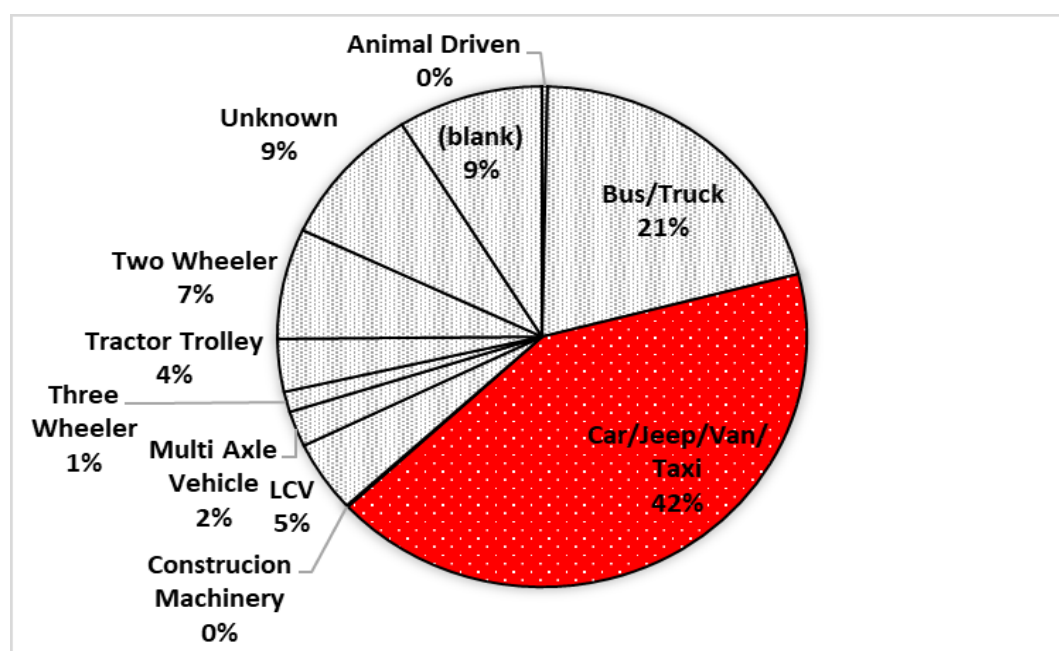


Figure 9: Impact profile of vehicles in SAS Nagar for the year 2016, 2017 & 2018

From the table above it is made very clear the most impactful vehicles on the roads of S.A.S. Nagar district are the Buses/Trucks and Car/Van/jeep/Taxi which are involved in maximum number of road crashes. Other vehicles moving on the road requires the equally same amount of attention but these two needs to be tackled on immediate basis.

Table 11: Victim profile of vehicles in SAS Nagar District for the year 2016, 2017 & 2018.

Victim Profile	People Killed
Animal Driven	2
Bus/Truck	4
Car/Jeep/Van/Taxi	66
Cycle Rickshaw	4
Cyclist	63
LCV	9
Other	11
Pedestrian	252
Three-Wheeler	13
Tractor Trolley	12
Two-Wheeler	475

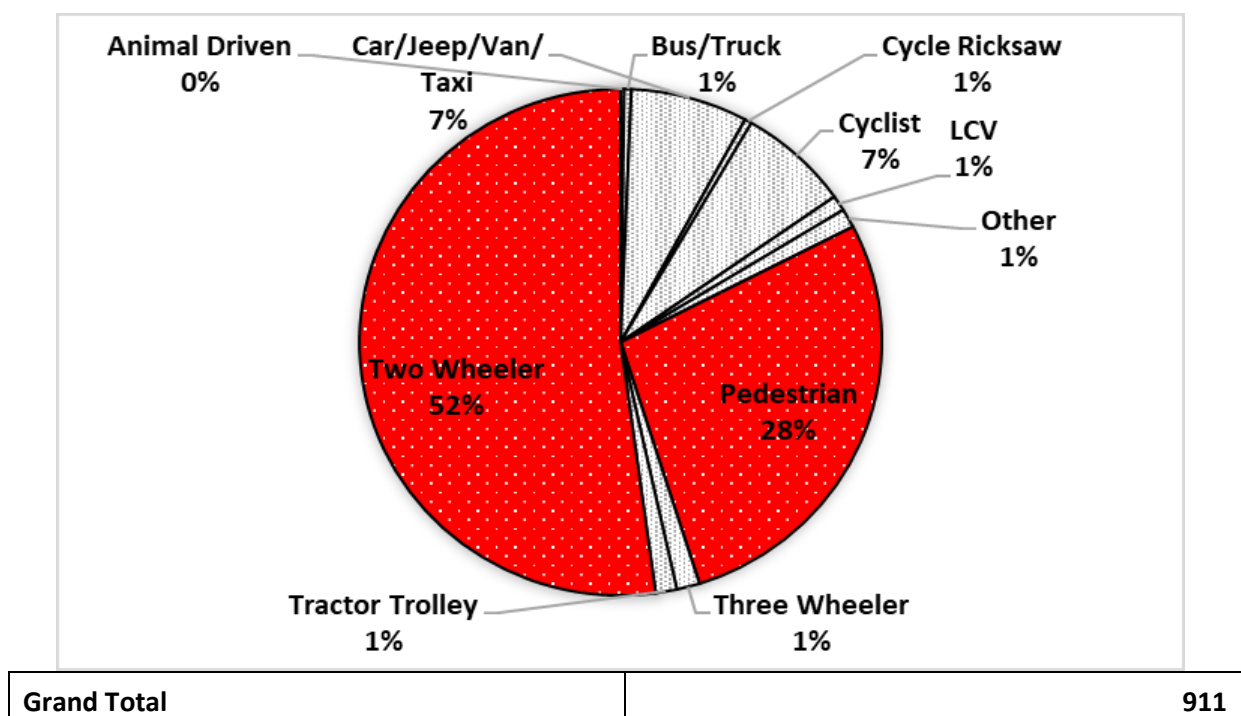


Figure 10: Victim profile of vehicles in SAS Nagar for the year 2016, 2017 & 2018.

Majority of the accidents are caused by the Car/Jeep/Van/taxi category of vehicle. However, the categories BUS/TRUCK and CAR/JEEP/VAN/TAXI comprise 69% of the total accident causing impact vehicles. Whereas the majority of the victim classes of vehicles in the road accidents are **Two Wheelers** and **Pedestrian**. These two vehicle classes comprise **80%** of total victim vehicles in road accidents. A two-wheeler rider requires target

hardening followed by control on the speed of Bus/Truck and Car/Jeeps through effective enforcement at selected locations.

2.8. Road Wise Analysis

Table 12: Road wise analysis of vehicle es in road accidents of SAS Nagar District in the year 2016, 2017 & 2018

Road Type	Fatal	Serious	Minor
Link Road	22	25	3
M.C	151	322	45
MDR	74	58	10
NH	510	564	113
ODR	38	29	6
SH	33	27	20
VILL ROAD	83	71	9
Grand Total	911	1096	206

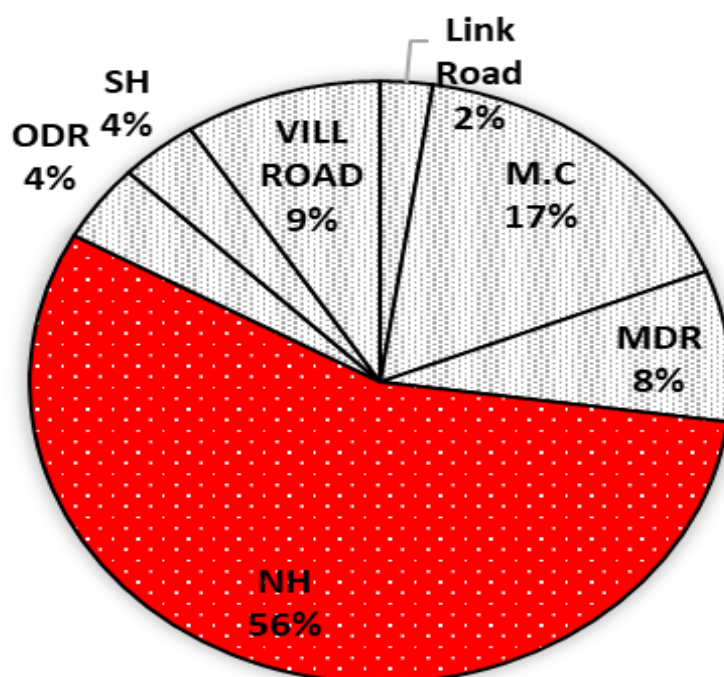


Figure 11: Road wise analysis of vehicles in road accidents of SAS Nagar in the year 2016, 2017 & 2018.

As per the analysis summarised in Table 12, majority of the accidents took place on the **National Highways (NH)** and **Municipal Corporation** which comprises of 73% of the total road accidental fatalities in SAS Nagar District.

2.9. Victim Vehicle wise fatalities on National Highways and Municipal Corporation roads in SAS Nagar District for the year 2016, 2017 & 2018

Table 13: Victim wise Fatalities on National Highway (NH) falling within SAS Nagar area

Year/Vehicle	Animal Driven	Bus/Truck	Car/Jeep/Van/Taxi	Cycle Rickshaw	Cyclist	LC V	Other	Pedestrian	Three Wheeler	Tractor Trolley	Two Wheeler	Grand Total
2016	0	0	14	0	10	3	1	50	0	4	82	164
2017	0	0	14	0	4	3	2	56	4	5	91	179
2018	1	3	11	0	14	2	1	54	1	0	80	167
Grand Total	1	3	39	0	28	8	4	160	5	9	253	510
Percentage	0%	1%	8%	0%	5%	2%	1%	31%	1%	2%	50%	100%

Table 14: Victim wise Fatalities on Municipal Roads (Urban Roads/Streets) falling within SAS Nagar area

Year/Vehicle	Animal Driven	Bus/Truck	Car/Jeep/Van/Taxi	Cycle Rickshaw	Cyclist	LC V	Other	Pedestrian	Three Wheeler	Tractor Trolley	Two Wheeler	Grand Total
2016	0	0	8	0	9	0	2	8	1	0	24	52
2017	0	0	5	1	5	0	1	8	1	0	27	48
2018	0	1	3	0	3	0	0	17	1	0	26	51
Grand Total	0	1	16	1	17	0	3	33	3	0	77	151
Percentage	0%	1%	11%	1%	11%	0%	2%	22%	2%	0%	51%	100%

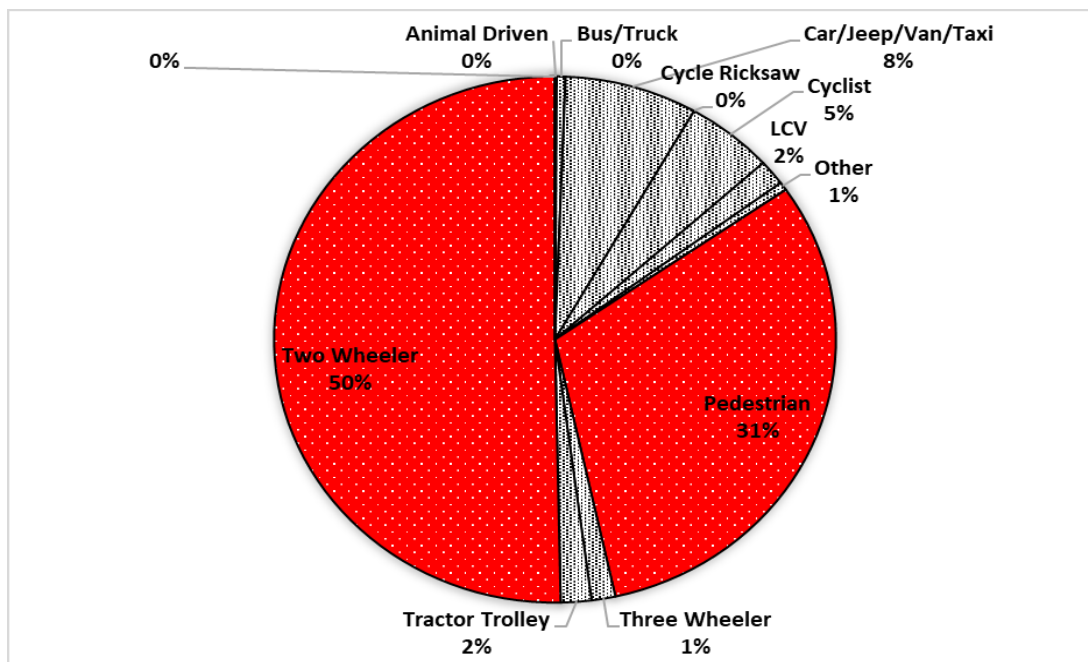


Figure 12: National Highway Victim vehicle wise fatalities percentage

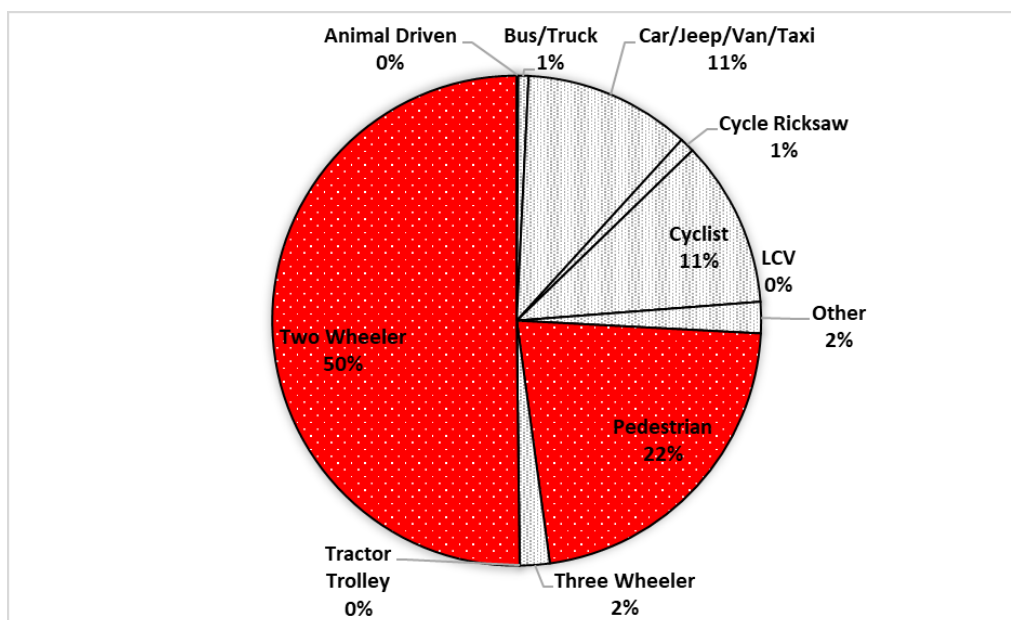


Figure 13: Municipal Corporation Roads victim vehicle wise fatalities percentage.

3. Police Station wise Detailed Road Accident Analysis in SAS Nagar Area

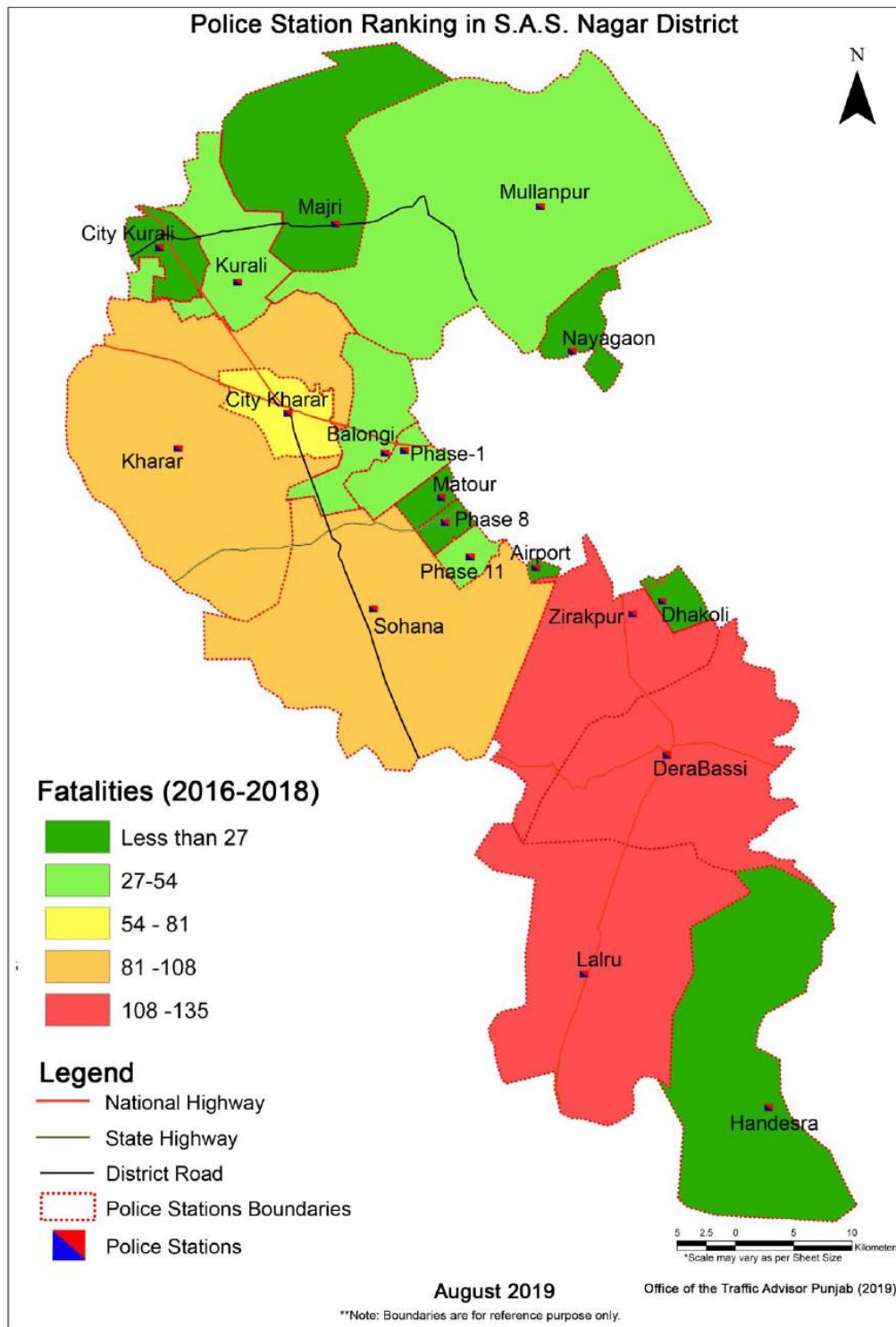


Figure 14: Geographical Boundaries of All Police Stations under SAS Nagar Police District.

In his section of the report, Police station wise detailed road safety analysis of all the Police Stations Falling within the district boundary.

3.1. Month Wise and Police Station Wise Analysis of Road Accidents

SAS Nagar is divided into nineteen (19) police stations. Airport, Balongi, City Kharar, City Kurali, DeraBassi, Dhakoli, Handesra, Lalru, Majri, Mataur, Mullanpur, Naya Gaon, Phase-1, Phase-11, Phase-8, Sadar Kharar, Sadar Kurali, Sohana, Zirakpur.

Table 15: Police Station wise analysis:

Police Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Grand Total	Percentage
Airport	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
Balongi	2	2	0	3	2	5	1	3	6	3	3	1	31	3%
City Kharar	8	4	5	13	6	5	8	2	3	6	4	2	66	7%
City kurali	0	0	0	0	2	4	0	0	0	0	1	1	8	1%
DeraBassi	8	15	9	9	10	7	12	6	9	20	13	9	127	14%
Dhakoli	0	0	0	0	0	0	1	2	1	1	1	2	8	1%
Handesra	0	0	0	0	0	0	0	0	2	3	2	3	10	1%
Lalru	10	15	6	8	14	5	12	12	12	15	16	10	135	15%
Majri	0	0	0	0	0	0	1	0	1	2	0	0	4	0%
Mataur	0	1	2	4	2	0	4	2	3	2	3	1	24	3%
Mullanpur	1	2	1	3	7	7	6	1	5	6	2	7	48	5%
Naya Gaon	0	0	0	1	0	1	0	1	0	0	0	0	3	0%
Phase-1	7	4	2	4	2	4	0	4	3	12	0	5	47	5%
Phase-11	0	2	6	4	3	1	2	2	4	0	3	5	32	4%
Phase-8	1	1	0	1	2	2	0	1	0	3	0	3	14	2%
Sadar Kharar	7	10	5	6	7	5	7	4	9	11	10	14	95	10%
Sadar Kurali	3	4	4	4	6	6	4	4	3	3	3	4	48	5%
Sohana	4	6	17	3	4	6	3	8	9	8	11	9	88	10%
Zirakpur	7	15	5	15	10	8	10	8	11	13	10	11	123	14%
Grand Total	58	81	62	78	77	66	71	60	81	108	82	87	911	100
Percentage %	6%	9%	7%	9%	8%	7%	8%	7%	9%	12%	9%	10%		

Day Wise & Police Station Wise Analysis of Road Accidents

Table 16: Day Wise and Police Station wise analysis

Name of Police Station/Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Grand Total	Percentage %
Airport	0	0	0	0	0	0	0	0	0%
Balongi	7	3	2	2	7	4	6	31	3%
City Kharar	9	9	10	7	15	6	10	66	7%
City Kurali	1	0	0	0	2	3	2	8	1%
DeraBassi	18	14	15	24	18	18	20	127	14%
Dhakoli	1	2	1	1	0	2	1	8	1%
Handesra	2	2	1	2	3	0	0	10	1%
Lalru	26	18	18	16	18	26	13	135	15%
Majri	0	1	0	0	0	1	2	4	0%
Mataur	4	6	3	4	2	2	3	24	3%
Mullanpur	5	5	6	5	7	12	8	48	5%
Naya Gaon	1	0	1	1				3	0%
Phase-1	8	3	5	7	9	4	11	47	5%
Phase-11	8	4	3	3	6	5	3	32	4%
Phase-8	1	3	1	1	5	2	1	14	2%
Sadar Kharar	12	11	16	12	10	18	16	95	10%
Sadar Kurali	7	9	12	5	5	3	7	48	5%
Sohana	12	16	9	10	10	11	20	88	10%
Zirakpur	14	18	21	12	17	22	19	123	14%
Grand Total	136	124	124	112	134	139	142	911	
Percentage %	15%	14%	14%	12%	15%	15%	16%		

3.2. Time Wise & Police Station Wise Distribution Analysis of Road Accidents

Table 17 : Police Station - time wise matrix for road accidental fatalities

Police Station/Hours	12AM-03AM	03AM-06AM	6AM-9AM	09AM-12PM	12PM-03PM	03PM-06PM	06PM-09PM	09PM-12PM	Grand Total	Percentage %
Airport	0	0	0	0	0	0	0	0	0	0%
Balongi	4	0	0	4	7	4	8	4	31	3%
City Kharar	7	6	6	9	3	9	15	11	66	7%
City kurali	0	0	0	2	0	0	0	6	8	1%
DeraBassi	5	6	14	10	15	15	36	26	127	14%
Dhakoli	0	2	0	0	0	1	5	0	8	1%
Handesra	0	0	0	2	0	3	3	2	10	1%
Lalru	1	11	16	13	10	25	42	17	135	15%
Majri	0	2	1	1	0	0	0	0	4	0%
Mataur	3	2	1	1	1	2	5	9	24	3%
Mullanpur	0	1	2	6	1	10	16	12	48	5%
Naya Gaon	0	0	2	0	0	1	0	0	3	0%
Phase-1	6	2	7	3	0	5	5	19	47	5%
Phase-11	1	4	5	5	3	0	5	9	32	4%
Phase-8	0	1	2	0	1	1	2	7	14	2%
Sadar Kharar	2	4	12	18	8	15	21	15	95	10%
Sadar Kurali	1	4	6	7	4	8	9	9	48	5%
Sohana	8	8	5	11	7	11	18	20	88	10%
Zirakpur	11	11	8	7	13	17	30	26	123	14%
Grand Total	49	64	87	99	73	127	220	192	911	
Percentage %	5%	7%	10%	11%	8%	14%	24%	21%		

4. Accident Black Spots in SAS Nagar District

4.1. Black Spot Identification – An Overview

This chapter deals with the procedure for identification of vulnerable locations or black spots as they are often called. The procedure described is based on recorded accidents through a thorough analysis of FIRs, data about accidents, traffic conditions, nature of accident, and accident per given road stretch. Other methods that can be used as complements to accident data are not dealt with in this chapter. Examples of such methods are field investigations, conflict studies, questionnaires, and interviews, etc.

Identification is a first step in improving road safety at a black spot. It has to be followed by a diagnosis of the selected spots, finding countermeasures, estimating effects and costs, prioritizing, implementation and at last follow-up and evaluation. These latter stages are discussed in the report. In this chapter, the identification method used by the researchers is purely based on the accident data available at the Police stations and then analysing the same by the help of various software like GIS and others.

4.2. Black Spot identification goals and targets

The overall aim for road safety exercise is to fulfil the safety goals and targets. The goals do not only decide what resources are needed but also influence which mitigation measures should be applied. Goals can, for instance, state that fatalities and severe injuries are to be decreased to or below a certain number. In such a case, mitigation measures aiming at severe casualties are most important and accidents can be allowed to happen as long as they do not result in severe or fatal injuries. On the other hand, if goals are set for accidents, then the mitigation measures should aim at reducing all accidents.

The process of deciding goals and targets is in itself a useful exercise. It increases the safety awareness among involved organizations. So, goals and targets are necessary for future safety work.

If severe accidents are to be reduced, it is necessary to decrease accidents occurring at high speeds and pedestrian accidents, since they often lead to severe consequences. In that case, slight accidents are less interesting, for instance, accidents when a vehicle leaves the roadway where the roadside is flat and without any hazardous objects.

4.3. Methodology adopted

Data Collection: In order to determine the accident-prone locations in SAS Nagar, the following data were collected and used.

Police stations limit map obtained from Head office as well as digitized the same using GIS. Accident FIR report analysis for the years 2016, 2017 and 2018. Mapping of the Blackspot as per the given definition.

Collection of Ground Control Points: The GCPs are collected with the help of the GPS. Here there are 92 GCPs collected. From the analysis of FIR reports of SAS Nagar area.

Data processing: data processing involves the following three steps. The flow chart of the data processing is shown below figure.

Georeferencing: Scanned maps usually do not contain information as to where the area represented on the map fits on the surface of the earth. To establish the relationship between an image coordinate system and a map (x, y) coordinate system we need to align or geo-reference the raster data.

Digitizing: Digitizing is the process of encoding the geographic features in digital form as x, y coordinates. It was carried out to create spatial data from existing hard copy maps and documents. In the Present work, the georeferenced raster image of SAS Nagar area is digitized using GIS software with the external help from a GIS expert. This type of digitization is called onscreen digitization. Road network of the study area was digitized as line features. Accident locations are digitized as point features. The above spatial data were organized in a personal geodatabase and feature class. The exact location of accidents was identified by using the measure tool in Arc GIS. By using the measure tool, the spatial location of a particular accidental black spot can be marked by knowing cluster that is vulnerable.

Listing of Black Spots: After Cluster analysis of accidents that are been marked on the map, a proper site visit was done to have photographic evidence of the vulnerable stretch which would be helpful in suggesting mitigation measures to the authorities to reduce the road fatalities.

Elimination of Black Spot

The process of eliminating or improving accident black spots in a road network is composed of several activities, as illustrated in the following figure.

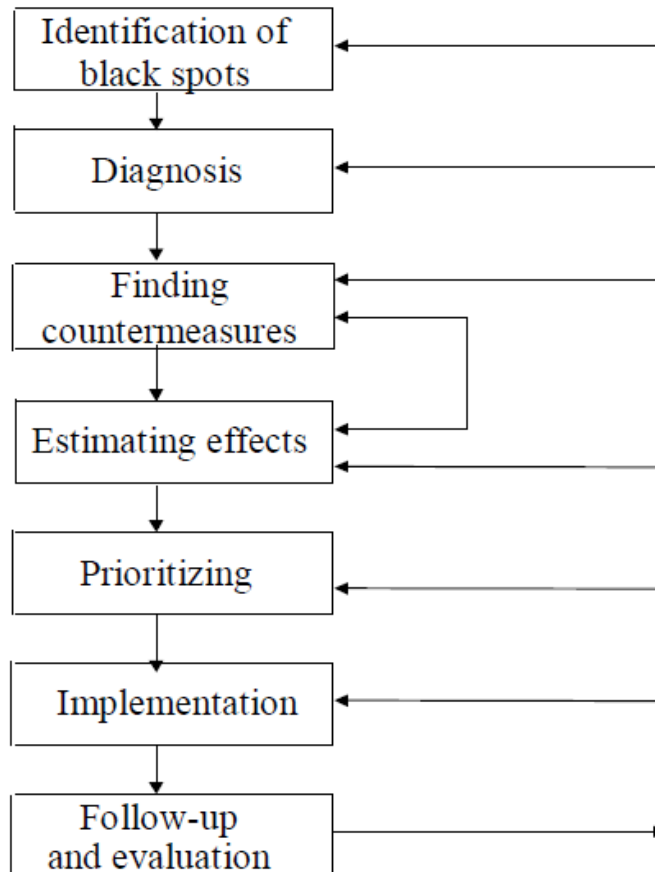


Figure 15: Process of eliminating Black Spot

Identification of black spots is the procedure to locate those spots in the road network that is particularly dangerous, that is, the black spots.

Diagnosis is the process to study what are the problems, the accident contributing factors and the deficiencies for each of the identified black spots.

Finding countermeasures implies a methodical analysis to design suitable countermeasures for each black spot, based on actual problems and deficiencies.

Estimating effects is the process to estimate the safety effects (and if necessary, also other effects) and costs of suitable countermeasures.

Prioritizing implies finding the best action plan (or investment program), according to some defined criteria, and based on estimated effects and costs as well as budget restrictions.

Implementation is the actual realization of the prioritized measures included in the action plan (or investment program).

Follow-up and evaluation are the last and very important step, which aim is to assess the actual results (effects and costs).

4.4. Prioritization of Accident Black Spots

The accident-prone spots were analysed based on the MoRTH definition of Black spots and prioritized based on the District-wise Accident Severity Index (ASI) value.

Definition of Black spot (MoRTH): According to Ministry of Road Transport & Highways (MoRTH), Government of India, road accident black spot on National Highways is a road stretch of about 500m in length in which either 5 road accidents (involving fatalities/grievous injuries) took place during the last three calendar years or 10 fatalities took place during the last three calendar years.

According to the National Highway Authority of India (NHAI), hazardous locations are evaluated based on *Accidents Severity index (ASI)*. Hazardous spots with Accidents Severity Index (ASI) more than the Threshold value (Average Severity + 1.5*Standard Deviation) will be treated as Black spots. For estimation of ASI, the weightage to the fatal accident will be assigned as 7 and to grievous injury accident as 3, was considered based on NHAI's criteria.

The threshold value computation formula for first order, second order, third order, fourth and fifth order priority black spots are given in Table 18.

Table 18: Threshold value of priority black spots

Priority	Threshold Value
First order black spots	Average Severity + 1.5*Standard Deviation
Second order black spots	Average Severity + Standard Deviation
Third order black spots	Average Severity + 0.5*Standard Deviation
Fourth order black spots	Average Severity
Fifth order black spots	Below Average Severity

A total of 21 accidental black spots have been identified in SAS Nagar area based on MoRTH's definition and prioritized based on district-wise ASI value. Out of these 92 black spots, 61 are on National Highways, 21 are on Municipal roads and 4 are on State Highways and Majority of these Accidental Black spots are road intersections. Table 19 provides the complete list of these identified accidental black spots, along with details of accidents and geographical coordinates.

Table 19: List of Accident Black Spots in SAS Nagar District.

ID	Location of Black Spot	Police Station	Road Type	Co-ordinates		No. of Cases Registered			Total people Involved 2016+2017+2018			Severity Score	Ranking
				Latitude	Longitude	2016	2017	2018	Fatal	Serious	Minor		
1	Sahauran Turn	Sadar Kharar	NH	30.78716	76.61165	5	3	5	9	10	1	94	1
2	Mamupur Turn	Sadar Kharar	NH	30.770434	76.58615	1	6	0	2	11	0	47	5
3	Patiala chowk	Zirakpur	NH	30.65551	76.82118	8	9	3	13	12	1	128	1
4	Chatt Light point	Zirakpur	NH	30.62201	76.78954	5	4	5	6	15	11	98	1
5	Cosmo plaza front	Zirakpur	NH	30.63729	76.82288	1	2	4	3	7	0	42	5
6	Bhoothgarh turn	Sadar Kurali	MDR	30.833831	76.68583	3	1	5	7	3	1	59	4
7	Jhanjheri Bus stop	Sadar Kharar	SH	30.68286	76.61486	5	1	3	5	6	0	53	4
8	JP Hospital front	Zirakpur	NH	30.66149	76.81867	5	3	3	7	7	0	70	3
9	Spice light point	Phase-1	M.C	30.72233	76.70305	2	1	2	5	4	0	47	5
10	Dau village Turn	Balangi	NH	30.73703	76.68549	1	0	5	4	2	2	36	5
11	ROB dhakoli	Dhakoli	NH	30.66282	76.83946	1	4	1	3	5	2	38	5
12	PTL Chwok	Phase-1	M.C	30.71978	76.71325	3	2	1	2	4	3	29	5
13	Nagla Turn	Handesra	NH	30.412475	76.88829	4	6	4	10	11	6	109	1
14	Desu Majra Turn	Sadar Kharar	NH	30.74191	76.66919	5	1	0	2	4	1	27	5
15	Kharar	City Kharar	NH	30.7524	76.63286	2	3	3	5	5	0	50	4

ID	Location of Black Spot	Police Station	Road Type	Co-ordinates		No. of Cases Registered			Total people Involved 2016+2017+2018			Severity Score	Ranking
				Latitude	Longitude	2016	2017	2018	Fatal	Serious	Minor		
	Hospital Front												
16	Kharar Bus stand	City kharar	NH	30.74972	76.64142	2	3	6	7	5	2	66	3
17	Shivpuri turn barwala road	Derabassi	ODR	30.58756	76.85785	4	1	1	4	5	1	44	5
18	Sekhon Banquet	Dhakoli	NH	30.66611	76.84692	1	1	4	2	4	1	27	5
19	Kohinoor Dhabha Zirakpur	Zirakpur	NH	30.64607	76.82221	3	3	1	1	8	0	31	5
20	Barwala Turn	Derabassi	NH	30.587322	76.846981	3	3	1	6	1	0	45	5
21	Light point kurali	City Kurali	NH	30.830577	76.580289	4	3	1	1	5	0	22	5
22	Padiala Bye pass	Sadar Kurali	NH	30.80981	76.59323	2	2	1	4	2	0	34	5
23	Hospital Front Derabassi	Derabassi	NH	30.58495	76.84481	4	2	2	2	6	0	32	5
24	Near Sukhmani College front	Derabassi	NH	30.576445	76.839284	5	4	2	8	4	2	70	3
25	Bhankharpur Light point	Derabassi	NH	30.60803	76.83596	2	4	6	10	3	2	81	2
26	Sawara Turn	Sadar Kharar	SH	30.685113	76.645139	2	3	2	6	2	1	49	4
27	Sydney	Sadar	SH	30.68451	76.6295	2	3	0	6	1	0	45	5

ID	Location of Black Spot	Police Station	Road Type	Co-ordinates		No. of Cases Registered			Total people Involved 2016+2017+2018			Severity Score	Ranking
				Latitude	Longitude	2016	2017	2018	Fatal	Serious	Minor		
	Resort	Kharar											
28	Electricity office lalru	Lalru	NH	30.497332	76.803529	3	5	0	5	3	0	44	5
29	Ballomajra Village	Balongi	M.C	30.724995	76.68231	2	3	1	3	5	1	37	5
30	Dhappar Bus stop	Lalru	NH	30.521513	76.810372	1	3	2	3	6	0	39	5
31	Sialba Turn	Sadar kurali	MDR	30.83401	76.65227	2	2	1	4	2	0	34	5
32	Janetpur Turn	Derabassi	NH	30.55322	76.82476	3	2	1	4	1	3	34	5
33	Village Majri	Majri	MDR	30.833629	76.673497	0	2	3	4	1	0	31	5
34	Near VR Punjab Mall	Balongi	NH	30.820465	76.585803	2	2	1	4	2	0	34	5
35	YPS Chowk	Mataur	M.C	30.70559	76.73459	4	2	0	2	7	0	35	5
36	Lohgarh turn	Zirakpur	NH	30.64929	76.81221	1	2	4	5	1	0	38	5
37	Vill Bhagomajra Banur Road	Sohana	NH	30.673855	76.6709	4	4	1	6	4	1	55	4
38	Omaxe tower mullanpur	Mullanpur	MDR	30.82208	76.73598	1	2	3	2	5	1	30	5
39	Gholumajra turn	Lalru	NH	30.538441	76.818126	1	4	1	6	0	0	42	5
40	Roorke pukhta	Sadar Kharar	NH	30.76455	76.59858	6	4	0	5	8	0	59	4
41	AKM Resort	Zirakpur	NH	30.645773	76.80890	2	3	0	2	3	0	23	5

ID	Location of Black Spot	Police Station	Road Type	Co-ordinates		No. of Cases Registered			Total people Involved 2016+2017+2018			Severity Score	Ranking
				Latitude	Longitude	2016	2017	2018	Fatal	Serious	Minor		
42	Kumbra light point	Phase -8	M.C	30.698198	76.723365	2	3	4	4	7	2	51	4
43	ROB kurali	City Kurali	NH	30.838359	76.574724	2	3	2	4	5	5	48	5
44	Tricity Autos Near	Zirakpur	NH	30.634377	76.800387	1	3	1	3	4	0	33	5
45	ITI Chwok Lalru	Lalru	NH	30.49337	76.80228	5	4	3	7	10	0	79	2
46	Mankheri Turn	Sadar Kharar	NH	30.77927	76.54719	3	2	0	3	3	0	30	5
47	Adda Jhungia	Zirakpur	NH	30.630286	76.797164	4	4	0	4	12	1	65	3
48	Sarsini turn	Lalru	NH	30.451366	76.784121	3	8	1	7	12	0	85	2
49	Reliance petrol pump	Sohana	NH	30.6579	76.678	4	3	0	4	5	2	45	5
50	Lalru Mandi	Lalru	NH	30.4792	76.7959	0	6	2	6	3	0	51	4
51	Forest Complex Lights	Phase-8	M.C	30.6923	76.7283	1	3	3	0	5	1	16	5
52	Tangori Village	Sohana	NH	30.5907	76.7055	3	1	4	7	5	1	65	3
53	Verka Light point	Phase-1	M.C	30.7309	76.7069	0	3	6	3	6	0	39	5
54	Bhagomajra Turn	City Kharar	NH	30.7596	76.6118	0	3	2	3	3	1	31	5
55	MC Doland Light point	Zirakpur	NH	30.6208	76.8246	1	9	4	6	12	1	79	2
56	Truck Union Derabassi	Derabassi	NH	30.5935	76.8466	2	8	6	13	4	1	104	1

ID	Location of Black Spot	Police Station	Road Type	Co-ordinates		No. of Cases Registered			Total people Involved 2016+2017+2018			Severity Score	Ranking
				Latitude	Longitude	2016	2017	2018	Fatal	Serious	Minor		
57	Baltana Light point	Dhakoli	NH	30.6608	76.8274	3	4	5	6	9	0	69	3
58	Sethi Dhabha Zirakpur	Zirakpur	NH	30.6342	76.8234	3	1	3	6	2	0	48	5
59	PCL light point	Phase-1	M.C	30.7106	76.713	5	2	6	4	16	3	79	2
60	Metro Mall Front	Zirakpur	NH	30.6404	76.8226	5	3	5	9	7	1	85	2
61	Bawa White house	Phase-11	M.C	30.6754	76.743	3	2	3	3	5	0	36	5
62	Electricity Grid Kurawala	Derabassi	ODR	30.5856	76.873	1	1	4	2	4	0	26	5
63	Airport Chowk	Sohana	M.C	30.6427	76.754	1	4	1	1	6	1	26	5
64	PWD guest house	Derabassi	Link Road	30.6177	76.8524	1	2	2	2	3	1	24	5
65	Quark Light point	Phase-1	M.C	30.7092	76.6961	5	1	2	5	8	0	59	4
66	Gas Plant light point	Phase-1	M.C	30.715	76.6913	2	1	2	3	4	0	33	5
67	Focal point Chanalo	Sadar Kurali	NH	30.8173	76.5881	4	4	5	10	6	5	93	1
68	Landran Light Point	Sohana	NH	30.6934	76.6635	1	2	3	2	6	1	33	5
69	Radha Swami Light Point	Mataur	M.C	30.7032	76.7012	1	2	3	2	8	2	40	5

ID	Location of Black Spot	Police Station	Road Type	Co-ordinates		No. of Cases Registered			Total people Involved 2016+2017+2018			Severity Score	Ranking
				Latitude	Longitude	2016	2017	2018	Fatal	Serious	Minor		
70	78/79 Light Point	Sohana	M.C	30.685	76.7165	1	4	2	0	8	2	26	5
71	Khanpur Turn	City Kharar	NH	30.7543	76.6277	3	0	4	6	4	0	54	4
72	Village Hoshiarpur Turn	Mullanpur	MDR	30.8353	76.7247	1	1	3	5	1	1	39	5
73	Chawla Light Point	Mataur	M.C	30.7083	76.7237	2	0	4	3	2	0	27	5
74	Near Shiva Petrol Pump	Zirakpur	NH	30.64	76.8043	1	2	3	3	6	0	39	5
75	Near Gurudwara Mata Sunder	Mataur	M.C	30.695	76.7076	1	2	3	3	2	1	28	5
76	ROB Saneta	Sohana	NH	30.6467	76.683	3	3	4	9	11	0	96	1
77	Lalru Bus Stand	Lalru	NH	30.4812	76.7968	11	2	6	19	4	0	145	1
78	Phase 11 Jagatpura Light point	Phase-11	M.C	30.6777	76.7486	2	1	2	2	4	1	27	5
79	Near Chandigarh Sweets Kharar - Banur Road	City Kharar	NH	30.7364	76.6466	1	0	4	4	1	0	31	5
80	Lelhi Turn	Lalru	NH	30.5086	76.8047	6	3	3	4	9	3	58	4
81	SBI Lalru	Lalru	NH	30.4878	76.799	2	1	3	3	3	0	30	5
82	Alamgir Turn	Lalru	NH	30.4673	76.7909	2	1	4	3	4	0	33	5

ID	Location of Black Spot	Police Station	Road Type	Co-ordinates		No. of Cases Registered			Total people Involved 2016+2017+2018			Severity Score	Ranking
				Latitude	Longitude	2016	2017	2018	Fatal	Serious	Minor		
83	Vill Sante Majra Bus Stop	Sadar Kharar	NH	30.7214	76.6526	2	2	3	5	3	1	45	5
84	Borha Kehra Turn	Handesra	NH	30.4296	76.9034	1	4	2	3	7	1	43	5
85	79/80 Light point	Sohana	M.C	30.679	76.7214	4	1	2	2	8	0	38	5
86	DBA Turn	Phase-11	M.C	30.6696	76.7358	5	3	1	3	9	0	48	5
87	Singhpura Light Point	Zirakpur	NH	30.6301	76.8236	2	2	3	2	5	2	31	5
88	Madanpur Chowk	Phase-1	M.C	30.7173	76.7246	3	1	2	3	3	1	31	5
89	Vill Lakhnaur Turn	Sadar Kurali	NH	30.7994	76.602	2	1	3	3	3	0	30	5
90	Balongi Tax Barrier	Balongi	NH	30.7332	76.6955	6	1	4	6	6	0	60	4
91	Dau Majra Turn	Sadar Kharar	NH	30.7731	76.6224	5	2	2	7	4	1	62	3
92	Jawaharpur Turn	Derabassi	NH	30.5623	76.8259	2	3	5	6	5	2	59	4
									Average Severity Score			48.9	
									Standard Deviation			24.5	

Based upon the severity score and the threshold value criteria given in Table 21 above, we found that only 24% black spots are on Municipal Roads, rest all 61 are on National Highways. The summary of accidental black spots, severity scope and summary are given in Table 22, Table 23, and Table 24.

Table 20: Priority Wise Number of Black Spots

Priority	Number of Black Spots	Road Type					
		NH	MC Roads	SH	MDR	Link Road	ODR
First order black spots	8	8	0	0	0	0	0
Second order black spots	6	5	1	0	0	0	0
Third order black spots	7	7	0	0	0	0	0
Fourth order black spots	13	8	2	2	1	0	0
Fifth order black spots	58	33	17	1	4	1	2
	92	61	20	3	5	1	2

Table 21: Police Station and Road Category wise Summary of Road Accidental Black Spots within SAS Nagar Area.

Sr. No	Police Station	Black Spots	Road Type					
			National Highways	State Highways	Municipal Roads	MDR	Link Roads	ODR
1	Airport	0	0	0	0	0	0	0
2	Balongi	4	3	0	1	0	0	0
3	City Kharar	5	5	0	0	0	0	0
4	City kurali	2	2	0	0	0	0	0
5	DeraBassi	10	7	0	0	0	1	2
6	Dhakoli	3	3	0	0	0	0	0
7	Handesra	2	2	0	0	0	0	0
8	Lalru	10	10	0	0	0	0	0
9	Majri	1	0	0	0	1	0	0

Sr. No	Police Station	Road Type						
		Black Spots	National	State	Municipal	MDR	Link	ODR
10	Mataur	4	0	0	4	0	0	0
11	Mullanpur	2	0	0	0	2	0	0
12	Naya Gaon	0	0	0	0	0	0	0
13	Phase-1	7	0	0	7	0	0	0
14	Phase-11	3	0	0	3	0	0	0
15	Phase-8	2	0	0	2	0	0	0
16	Sadar Kharar	10	7	3	0	0	0	0
17	Sadar Kurali	5	3	0	0	2	0	0
18	Sohana	8	5	0	3	0	0	0
19	Zirakpur	14	14	0	0	0	0	0
		92	61	3	20	5	1	2

The detailed map of Accidental Black Spot falling within SAS Nagar is shown in Figure 16 next.

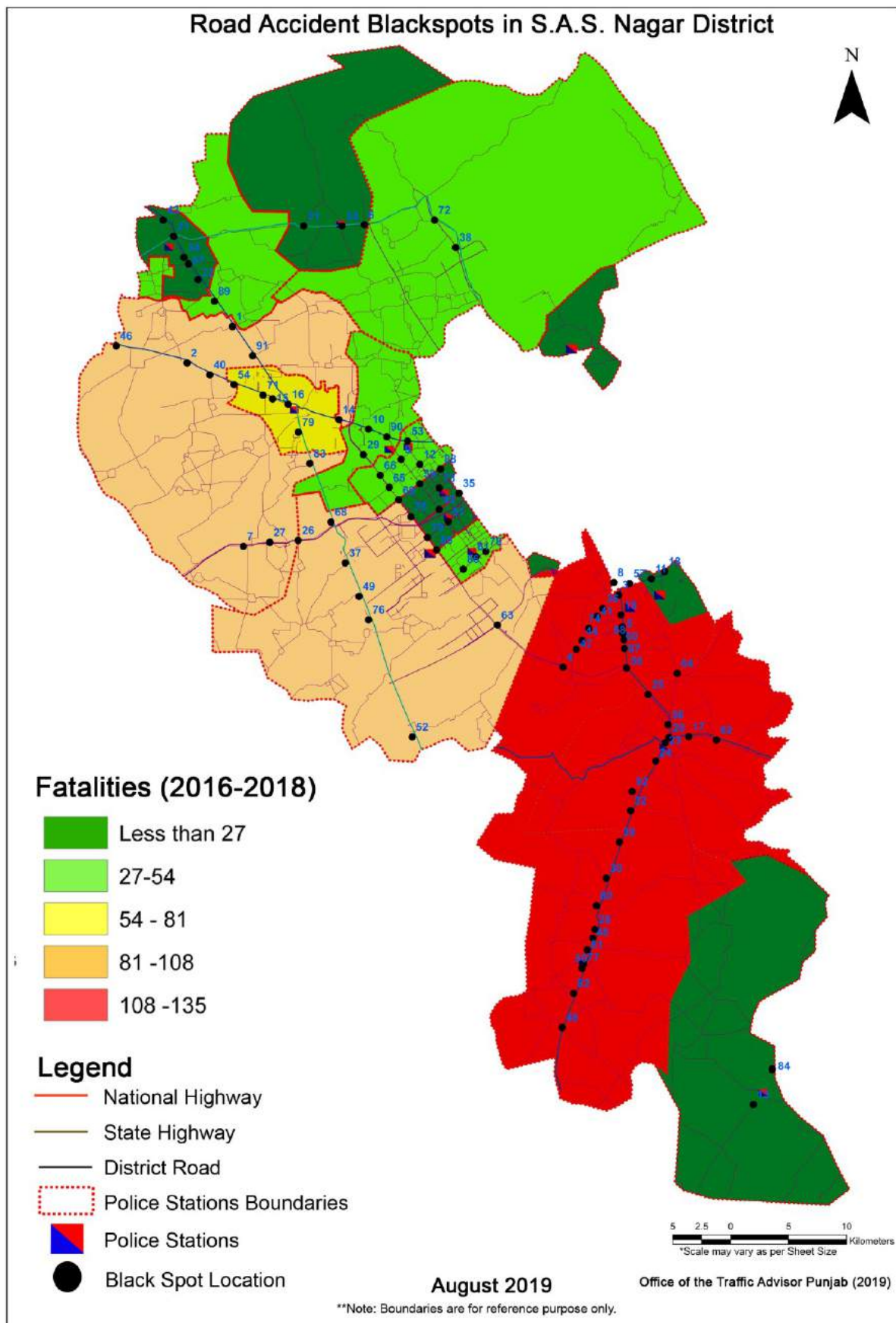


Figure 16: Index Map of Road Accidental Black Spot in SAS Nagar District.

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