International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2014): 5.611

An Analysis of Spatialy Explicit Scenario of Road Traffic Accidents in Kerala Using GIS

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Abstract: ***Geography as a multidisciplinary subject deals with wide variety of subject matter. Almost any area of human knowledge can be examined from a spatial perspective. Transport geography as a sub-discipline of geography is concerned about the spatial mobility by considering its attributes and constraints as they relate to the origin, destination and extent nature and also the purpose of movement. These movements sometimes lead to some accidents, and study of these accidents is also a vital part of transport geography. Road traffic accidents are now the leading cause of deaths globally. The study area for the present study is Kerala. The major objective of the study is to examine the variation in the patterns of road traffic accidents, both negative and positive perspectives, to find the factors leading to road accidents, suggestion and remedial measures that can be taken to avoid accidents. Mainly secondary data is used for the study. Accident records and vehicular situation are obtained from Kerala police force department, Motor vehicle department Kerala and NATPAC (national transportation planning and research centre). Data's are obtained for the years 2001 to 2014. The analysis revealed that the number of accidents have been decreased from 2001 to 2014. This is due to the some severe steps and measures taken by police department and also ministry of road transport and highways. Major percentages of road accidents are due to reckless of the drivers and annoying of traffic signals and also over speeding.***

Keywords: Multi-disciplinary - Spatial Mobility - Road accidents - Traffic signals

1. Introduction

Road accidents happen on a daily basis and the range and severity of injuries caused by road accidents is enormous. The World Health Organization (WHO) estimates that road traffic crashes cause over 1.2 million deaths and probably more than 25 million severe injuries per year. Accidents, tragically, are not often due to ignorance, but are due to carelessness, thoughtlessness and over confidence. Human, vehicle and environmental factors play roles before, during and after a trauma event. Accidents, therefore, can be studied in terms of agent, host and environmental factors and epidemiologically classified into time, place and person distribution. Moreover, the WHO's Global Status Report on Road Safety states that over 90% of the world's fatalities on the roads occur in developing countries, although these countries only have about 48% of the world's registered vehicles. The spectacular growth in the Road Transportation Sector in India has been a key element in the economic development. In India mobile phones and personalized vehicles are increasing with the same growth rate. As an estimate India have that number of cars only if put them together in a single lane, it will reach from New Delhi to New York. Projection of the present trend of vehicles usage reveals a rather ugly and unsustainable situation both in terms of traffic congestion and safety.

For instance while the population of India increased by 17.64 percent over the past ten years, the number of licensed vehicles increased by 132 percent over the same period. According to official statistics, 430,654 people were killed in road traffic crashes in India in 2010 (NCRB 2010). Even though it can be observed that the accident rate has been steadily decreasing over the past years, the accident rate is still very high compared to the other developed nations The situation in India has worsened in recent years. Taking the case of Kerala more than 50 lakh vehicles are running on the road. Other than that 10% of vehicles is registered every year. But increasing number of vehicles is not paving way for broader roads and road safety measures in kerala. This has to be taken seriously. if accidents are caused by some, surely the ones responsible for could be identified and appropriate remedial measures developed and implemented to the extent is feasible. Unless immediate action is taken, that over the next 15 years, the number of people dying annually in road traffic crashes may rise simultaneously. The road traffic injuries will become one of the major causes of death.

2. Objectives Of The Study

- To examine the temporal variation in the patterns of road traffic accidents.
- To identify the factors leading to road accidents.
- To formulate suggestions to avoid road traffic accidents.

3. Methodology

- Mainly secondary data is used for the study from various government departments.
- Road Accident details are taken from Kerala police force department, numbers of vehicles registered are taken from Motor vehicle department Kerala and NATPAC (national transportation planning and research centre). Data's are obtained for the years 2001 to 2014.
- Data's are analyzed with the help of statistical and cartographic techniques like Arc gis.

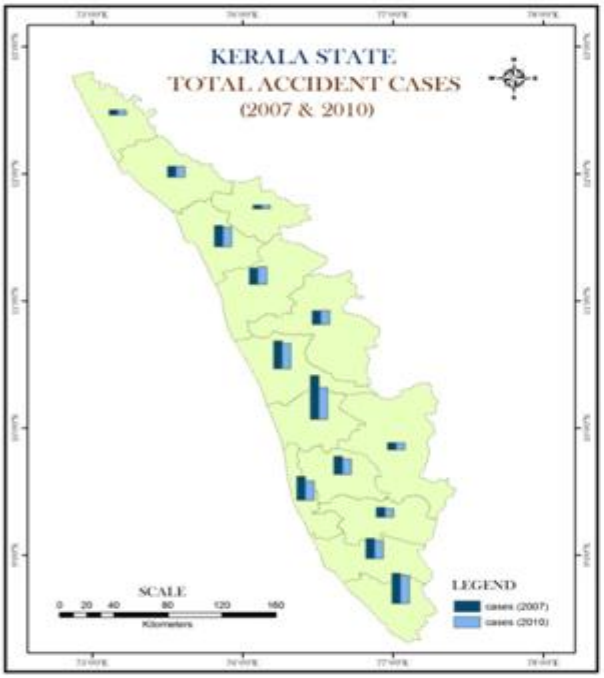
4. Analysis of Temporal Variations of Road Traffic Accidents

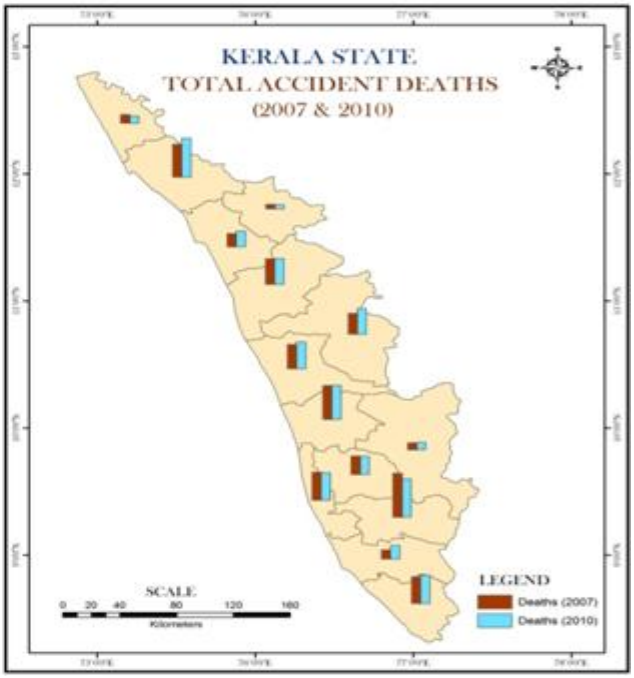
4.1 Road Accidents (2007 & 2010)

The table (1.1) below shows the number of accidents that took place in the year 2007 and 2010. It depicts that in 2007 highest number of accidents were recorded in Ernakulum (6905) and the lowest road accidents were reported in Wayanad (607). There is a great variation between the highest and lowest accidents occurred in the districts. Next to Ernakulum, Thiruvananthapuram the capital city of Kerala records the highest number of accidents (4798) followed by Thrissur (4396) and Alappuzha (3774). Taking the case of 2010 most number of accidents cases were registered in Ernakulum (4982) and lowest recorded in Wayanad (586), just behind Ernakulum comes Thiruvananthapuram (4447) after that comes Thrissur (3967). The scenario is same as that of 2007. The accidents have reduced in numbers but overall ranking is the same as 2007.Fig(1.1)

Table 1.1: Spatio Temporal variations in Accidents of 2007 and 2010

District	*cases (2007)*	*Cases (%)*	*cases (2010)*	*Cases (%)*	*variation %*
Thiruvananthapuram	4798	12.01	4447	12.67	-0.66
Kollam	3166	7.93	2801	7.98	-0.05
Pathanamthitta	1572	3.93	1396	3.97	-0.04
Alappuzha	3774	9.45	3029	8.63	0.82
Kottayam	2870	7.2	2436	6.94	0.26
Ernakulam	6905	17.29	4982	14.2	3.09
Idukki	1123	2.81	1080	3.07	-0.26
Thrissur	4396	11.01	3967	11.3	-0.29
Palakkad	2173	5.44	2182	6.21	-0.77
Malappuram	2617	6.55	2806	7.99	-1.44
Kozhikkode	3361	8.41	3089	8.8	-0.39
Wayanad	607	1.52	586	1.67	-0.15
Kannur	1729	4.33	1671	4.76	-0.43
Kasaragod	826	2.06	789	2.24	-0.18
STATE TOTAL	**39917**		**35082**		





4.2 Accident Deaths 2007 & 2010

The table given below (1.2) shows the number of deaths occurred in road accidents registered during the year 2007 and 2010. The largest number of deaths recorded in the year 2007 is in Ernakulum (557), and the least number is in Wayanad (58). The second position in the state is recorded in Thrissur (427), just after that comes Thiruvananthapuram (417). In 2010 highest number of deaths is recorded in Thiruvananthapuram (492) and the lowest is recorded in Wayanad (53). Then comes Ernakulum (484) and after that comes Thrissur (430).

Table 1.2: Spatio temporal variation in number of deaths in 2007 and 2010

District	*Deaths (2007)*	*Deaths (%)*	*Deaths (2010)*	*Deaths (%)*	*variation %*
Thiruvananthapuram	417	11.03	492	12.45	-1.42
Kollam	342	9.05	361	9.13	-0.08
Pathanamthitta	117	3.09	171	4.32	-1.23
Alappuzha	358	9.47	350	8.86	0.61

Kottayam	232	6.14	227	5.74	0.4
Ernakulam	557	14.74	484	12.25	2.49
Idukki	89	2.35	93	2.35	0
Thrissur	427	11.3	430	10.88	0.42
Palakkad	311	8.23	342	8.65	-0.42
Malappuram	265	7.01	326	8.25	-1.24
Kozhikkode	326	8.62	331	8.37	0.25
Wayanadu	58	1.53	52	1.31	0.22
Kannur	167	4.42	200	5.06	-0.64
Kasaragod	112	2.96	91	2.3	0.66
State Total	**3778**		**3950**		

4.3 Grieviously Injured in Road Accidents 2007 and 2010

The table given below (1.3) shows the number of grievously injured individuals in accidents during 2007 and 2010. The table shows that in 2007 and 2010. The table shows that in 2007 Ernakulum stands first in grievously injured (4377). And the lowest grievously injured is recorded in Wayanad (372). The second highest number is that of Thiruvananthapuram (4063), followed by Thrissur (3365) and kollam (2407). In 2010 the highest grievously injured district is Thiruvananthapuram (3527) and lowest recorded is the same Wayanad 376. Thiruvananthapuram is followed by Ernakulum (3499) Thrissur (2962) and Kollam (2291).

4.4 Spatio temporal variation grievously injured in road accidents 2007 and 2010 (table1.3)

District	*Gr. injured (2007)*	*Gr. injured %*	*Gr. injured (2010)*	*Gr. Injured %*	*variation %*
Thiruvananthapuram	4063	15	3527	14.11	0.89
Kollam	2407	8.92	2291	9	-0.08
Pathanamthitta	1137	4.21	1016	4	0.21
Alappuzha	2367	8.77	2180	8.72	0.05
Kottayam	2010	7.45	1912	7.64	-0.19
Ernakulam	4377	16.22	3499	14	2.22
Idukki	717	2.65	732	2.92	-0.27
Thrissur	3365	12.47	2962	11.85	0.62
Palakkad	921	3.41	1015	4	-0.59
Malappuram	2014	7.46	2101	8.4	-0.94
Kozhikkode	1976	7.32	2040	8.16	-0.84
Wayanadu	372	1.37	376	1.5	-0.13
Kannur	807	2.99	823	3.29	-0.3
Kasaragod	444	1.64	520	2	-0.36
State Total	26977		24994		

4.5 Injured in Road Accidents 2007 and 2010

The table given below 1.4 shows the number of individuals injured in accidents during 2007 and 2010. In 2007 the highest number of injuries in accidents was recorded in Ernakulum (3477) and the lowest numbers were recorded in Wayanad (583). Just after Ernakulum come Thrissur (1941) which is in a great level lower than compared to Ernakulum, followed by Palakkad (1875) and Alappuzha (1863).In 2010 the highest numbers of injuries were recorded in Ernakulum (2016) and lowest numbers of injuries were recorded in Wayanad (443). The second position in the number of injuries is of Malapuram (1785) which is followed by Kannur (1559) and Thrissur (1447).

Table1.4: Spatio temporal variation in number of injured in road accidents 2007 and 2010

District	*Injured (2007)*	*Injured %*	*Injured (2010)*	*Injured %*	*Variation %*
Thiruvananthapuram	1364	6.41	1140	6.91	-0.5
Kollam	1157	5.43	814	4.93	0.5
Pathanamthitta	687	3.23	593	3.5	-0.27
Alappuzha	1863	8.75	1298	7.87	0.88
Kottayam	1325	6.22	1016	6.16	0.06
Ernakulam	3477	16.34	2016	12.23	4.11
Idukki	729	3.42	854	5.18	-1.76
Thrissur	1974	9.28	1447	8.78	0.5
Palakkad	1875	8.81	1437	8.72	0.09
Malappuram	1731	8.13	1785	10.83	-2.7
Kozhikkode	1941	9.12	1486	9	0.12
Wayanadu	583	2.74	443	2.68	0.06
Kannur	1755	8.25	1559	9.46	-1.21
Kasaragod	808	3.79	591	3.58	3.79
State Total	21269		16479		

5. Results

By analyzing the above data's and calculations we can come to a clear cut conclusion about the actual scenario of road accident trend in Kerala. In 2007 and 2010 the most number of road accidents are recorded in Ernakulum. As Ernakulum is an important and a busy district the traffic flow of vehicles is in a much larger rte than that of any other place. But the good thing in this study is that the number of accidents has reduced from 2007 to2010 to 3.09%. In the same way the second highest position in the number of accidents is Thiruvananthapuram the capital city. The accident rate in the district has just reduced to0.66% in the given years. Taking the case of Ernakulum the deaths have reduced to 2.49% but in Thiruvananthapuram it shows an increase of 1.42% which i9s distinctly a negative sign. In the case of injuries in Ernakulum there is a decrease of 2.22% and in Thiruvananthapuram it has decreased but not in a bigger margin just 0.89 %. In the case of grievously injured also the pattern is same as above. Ernakulum is showing a high decrease in grievously injured i.e. is 4.11% and Thiruvananthapuram is showing just a marginal decrease of0.5%. All other district like Thrissur Malapuram kollam there are marginal variation in the number of accidents and its fatalities. The accidents as a whole are mainly due to9 the carelessness of the drivers or the pedestrians all other reasons like bad weather bad roads mechanical failures are secondary things to be taken into care. Almost all accidents are the outcome of driver's mistakes. Careless driving, overspeed not following the traffic rules and signals are the major reasons.

Wayanad has eroded the minimum number of accidents and deaths in the states in both the time periods. The number of accidents cases recorded and deaths are very much lesser compared with the state average rate. Even the numbers of cases are reducing in the coming years. The main reason behind this pattern here is the geographical location situation and forested area. The road network here is also not very busy one and most importantly vehicles are not allowed to cross this area during night time through pass and forested area, it is restricted here, this reason is playing a very importantly role in less accidents rate and its fatalities.

As a whole it can be seen that numbers of road accidents and deaths have been decreasing from 2007 to 2010. Almost all the district has a trend of decreasing trend of. But taking the case of injuries and deaths many district are showing an increasing trend. This shows the total mortality rate of individuals is rising in Kerala. Government and police force department have to take necessary steps and measures to reduce these trends of accidents, with more aggressive and strict rules and laws. But most importantly the drivers have to understand the human lives and their own lives and have to be more careful and should use their commonsense while driving.

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