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Abstract:-

The deadly unwanted and awkward events that happen in roads causing damage cumulating to serious injury or death of human beings unexpectedly or unknowingly are known as road accidents.

Increasing population along with gradual transformation in socio-economic spectrum of inhabitants of Assam have been the key cause responsible for steep rise in the number of motor vehicles on the roads and which in turn results in frequent road accidents leading to huge number of injuries and deaths. In fact, when the state has witnessed population growth of 18.92 per cent during 1991-2001, the growth of motor vehicles has been as high as 149.23 per cent during the same period. The growth of motor vehicles has also been significantly high in the state (128.67 per cent during 1995-2005). The incidence rates of injuries and deaths due to road accidents, however markedly vary across the state depending on a variety of factors. It is worth mentioning in this context that the growing population and number of motor vehicles are not solely responsible for the increase of road accidents in the state.

With this background an attempt is made in this paper to study and analyse the existing relationship among various important parameters of road accident phenomena among growing population, motor vehicles and road accidents governing the state of Assam based on data from relevant secondary sources including census of India, state police department, Assam and directorate of economics and statistics, Assam.

Keywords:

oad accidents, motor vehicle, population, persons killed, persons injured, Assam.

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POPULATION, MOTOR VEHICLES AND ROAD ACCIDENTS IN ASSAM: A SPATIAL RELATIONSHIP ANALYSIS



1. INTRODUCTION

Unnatural deaths in the form of suicide, homicide, accident etc often leads to severe emotional reactions to the near and dear relatives of the victim immediately after the event and later. Of all types of unnatural deaths road-traffic accidental death probably has the highest incidence worldwide.

There are in multiple factors relating to steep rise of population and increase in the number of motor vehicles. Up gradation and improvement of science and technology, rapid transformation socio-economic settings are worth mentioning. The growth of transport system has been and continues to be a key element in socio-economic transformation throughout Assam. Moreover, recent trends in population growth, industrialization and urbanization are triggering tremendous pressure on the transport network in general and on road system in particular. The rising number of deaths and injuries from road accident are apparent and discloses a burning and growing problem, with absolute killed and injured figures rising steeply in majority of the districts of Assam and with death rates considerably high.

With the above background an attempt has been made to study the increasing number of road traffic accidents and the existing relationship among growing population, motor vehicle and road accidents in Assam based on data from relevant secondary sources including census of India, state police department, Assam and directorate of economics and statistics, Assam. It is hoped, that this study will help in understanding spatio-temporal pattern and the existing relationship among growing population, motor vehicles, road traffic accidents and related issues.

DATABASE AND METHODOLOGY

The study is primarily based on secondary data collected from census of India and publication of directorate of economics and statistics, government of Assam and relevant documents and reports of the Assam police department roughly covering the period 1970-2006.

In order to analyse the collected data tables, simple percentage and Pearson correlation were applied. Moreover co-relationship graphs have been used to explain and understand the existing relationship among population, motor vehicles and road accidents.

TREND OF GROWTH OF POPULATION, MOTOR VEHICLES AND ROAD ACCIDENTS

Assam's population has been rising rapidly since 1901 as compared to the country's growth rate. It is worth mentioning in this context that the decennial growth of population in the state was as high as 34.80 per cent during 1951-1961 as against the present growth of 18.92 per cent during 1991-2001 (Table 1).

The sharp fall of death rates accompanied by only a very slow decline of birth rates has contributed immensely to such increased population growth rate in the State. Gradual disappearance of severe epidemics and famines coupled with up gradation of health and medical facilities among others are responsible for the significant decline of death rates. On the other hand, the measures to control the birth rate could not make any remarkable headway. A host of inter related socio-economic factors such as universality of marriage, marriage at lower age, religious belief, illiteracy, poverty, high infant mortality rate etc. are responsible for keeping the birth rate high here as elsewhere in the country. This is also reflected in the steady fall of crude birth rates and death rates in Assam during 1971-1990.

According to the office of the commissioner of transport, Assam the total number of vehicle in the state has increased from 53,821 to 135,322 during 1975-1985 by witnessing a decennial growth of 151.42 per cent. The growth in this respect during 1995-2005 in the state has become as high as 163.74 per cent (Table 2).

However, according to the census of India, population growth in Kamrup district during 1991-2001 records as high as 26.11 per cent, where as Bongaigaon records as low as 12.05 per cent among all the districts of Assam (Table 3).

Comparison of both 1991 and 2001 data depicts that there is noticeable spatial variation in the steep rise of population within the districts of Assam and which is quite inevitable. Some districts shows higher population growth rate while other shows lower growth rate of population (Table 3) depending upon multiple factors related to socio-economic strata.

Steep rise of motor vehicles is due to many key factors, such as better transport and communication facilities, increased ownership of private means of transport, well developed road ways, urbanization, swift and affordable banking loan facilities and overall transformation of the socio-economic strata of the people. It is significant to note that growth rate of population varies spatially within the state depending upon the nature and extent of migration and a number of socio-economic and socio-cultural factors influencing the natural growth.

There is also spatial variation in the growth of motor vehicles within the state depending upon the growth of population, status of road networks, transport and communication facilities, socio-economic and socio-cultural factors too.

Again, according to the office of the commissioner of transport, Morigaon records as high as 654.77 per cent district due to industrialization, urbanization and rapidly growing trend of ownership of private motor vehicles along with other socio-economic factors are responsible for the considerable rapid growth of population and motor vehicles in different parts of the state (Table 3).

Availability of vacant land in the hilly areas as against a heavy pressure of population on the plains attracted the migrants to Karbi Anglong and N.C Hills districts in the recent past, resulting in high growth rates of population in these districts. On the other hand, the districts like Tinsukia (537.8 per cent),

Karimganj (349.66 per cent) and Hailakandi (427.28 per cent) have recorded a surprisingly high growth of motor vehicles during 1991-2001 (Table 3) due to urbanization, industrialisation, and improvement of road networks and betterment of socio-economic condition of the people.

There exists a significant spatial variation in the growth pattern of road accidents and associated injury and death in the state. Among the districts in Assam, the growth rate of road accidents during 1990-2003 in Cachar and Morigaon have been as high as 244 per cent and 167 per cent respectively mainly because of improved road condition, rapid increase of a variety of fast moving vehicles and lack of proper management of vehicle movement on the roads. It has been observed that the growth rate of road accidents in N.C Hills, Karbi Anglong and Sonitpur during the same period have been somewhat lower than that of the state average (Table 4). Comparatively poor quality of roads along with rugged terrain in the hill districts may be one of the reasons behind very low incidence of road accidents.

In the case of growth of road accident related injury and death among the districts in Assam during 1990-2003, Barpeta district has witnessed as high as 233 per cent in respect of injuries and Kamrup has witnessed as high as 49 per cent in respect of death (Table 4).

The variation in the trend of growth of population, growth of motor vehicles and growth of motor vehicle accidents may possess many causes related to it; different level of socio-economic development in different districts at different time period can be mention to be the most important among them.

SPATIAL RELATIONSHIP BETWEEN GROWTH OF POPULATION AND GROWING ACCIDENTS

Existence of a co-relationship between population, motor vehicles and road accident cannot be denied and ignored. Increasing population significantly leading to the increase in motor vehicles which in turn results in the increase of the number of road accident and thus affecting the numbers of killed and injured persons scenario cannot be at all undermined and under marked. In order to study and analyze the whole scenario of spatial relationship among population, motor vehicles and road accidents, an attempt has been made in this regard through this paper to fulfil the required purpose in a meaningful way.

After studying the spatial relationship between the distribution of population (in per cent age) and distribution of motor vehicles accidents (in per cent age) in Assam during 1991-2001, the existence of a positive and less significant relationship is observed. Thus it reveals that growth of motor vehicles accidents does not solely depend upon the growth of population and there may be many factors along with it associated to the growth of motor vehicles accidents (Fig. 1).

Analyzing the spatial relationship between population distribution of urban population (in per cent) and distribution of the motor vehicles per 100000 of population in 2001 it is found that there exists a highly significant positive co-relationship (Fig. 2). In other words, increase in urban population distribution leads to the increase of motor vehicles number. For instance Kamrup has recorded as high as 26.47 per cent of urban population distribution in the state and at the same time as high as 4300.94 numbers of motor vehicles per 100000 populations has been recorded among the entire districts in the state. The main cause of such significant relationship is due to the development of technology, socioeconomic transformation and upgraded transport and communication opportunities.

SPATIAL RELATIONSHIP BETWEEN GROWTH OF MOTOR VEHICLES AND ROAD ACCIDENTS

Analyzing the spatial relationship between motor vehicles distribution (in percentage) and distribution of motor vehicles accidents (in percentage) in 2001 it is reveals the presence of a highly significant positive co-relationship (Fig. 3). In other words, the percentage of motor vehicles increases with the increase in the percentage of motor vehicles accidents. For instance Kamrup district has the highest percentage of motor vehicles and also the highest percentage of motor vehicles accidents distribution. The main cause of such significant relationship is due to the enhancement of technology, socioeconomic up gradation and better transport and communication facilities.

Interestingly, N.C. Hills has the lowest percentage of motor vehicles accident because it has the lowest percentage of motor vehicles.

Again an important relationship can be explained between the distribution of motor vehicles accidents (in percentage) and the distribution of persons killed in motor vehicles accidents (in percentage) in Assam as it has been observed that there exists a very high significant positive relationship between them (Fig. 4). In other words, the increase in the distribution of motor vehicles leads to the increase in the distribution of persons killed in motor vehicles accidents remarkably. Such as, Kamrup has as high as 22.83 per cent distribution of motor vehicle accidents in Assam and thus also have as high as 21.12 per cent distribution of distribution of persons killed in motor vehicles accidents in Assam in 2001.

In this context, N.C. Hills has as low as 0.64 per cent of motor vehicle accidents and thus it also has as low as 0.97 per cent of distribution of persons killed in motor vehicles accidents in Assam in 2001.

There may be many causes related to such variation and existence of relationship among various parameters of road accident and related issues governing road accident phenomena in the state, mention can be made of different level and pace of socio-economic transformation and technological development varying to different regions.

CONCLUSION

The growth of population combined with socio-economic transformation has a great bearing on the abrupt rise of motor vehicles in the state which is well reflected in the relationship between population density and density of motor vehicles among the districts in the state.

Whatever be the cause behind steep rise of road accidents in the state, it continues to be a serious threat involving heavy loss of worthy manpower or human resources having significant implications and unbearable after effects, yet to be addressed and overcome rationally. Among various factors lack of desired efficiency of the motor vehicles drivers and proper monitoring of the traffic rules has been no less significant in the incidence of road accident in the state. Necessary holistic measure required to be taken towards controlling population growth rate to both high fertility and migration. Improvised integrated policies and programmes are the biggest challenge to be targeted to deal with the road accident issues systematically and meaningfully.

Emphasis needs to be given on the improvement of road condition throughout the state with the provision of four lane/two lane traffic including separate and well defined roads for slow moving vehicles and pedestrians. The concerned authorities should take every possible measure to monitor that the traffic rules and regulations are not violated at any cause and provision should be made for proper punishment in case of any violation. Apart from that utter consciousness and ever ready awareness on the part of public in both ways in terms of following and abiding the traffic rules and laws honestly and strictly, thereby helping the concerned authority and by observing, correcting and encouraging the guilty one to realise and rectify their fault in a sensible way for the better cause of all, is one of the best possible way to overcome this herculean challenge.

However, undertaking an in-depth study in evolving effective ways and means for controlling the rising road accidents in the state is the urgent need of the hour.

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Tables

Table 1: Pattern of population growth in Assam during 1971-2001

Year	Total Population	Growth of Population (in %)
1971	14,625,152	
1981	18,041,248	23.35
1991	22,414,322	24.24
2001	26,655,528	18.92

Source: Census of India, 1971,1981,1991,2001

Table 2: Growth of Number of Motor Vehicles in Assam during, 1975-2005

Year	Total Number of Motor Vehicles	Growth of Motor Vehicles in (%)
1975	53,821	
1985	135,322	151.42
1995	294,726	117.79
2005	777,328	163.74

Source: Office of the Commissioner of Transport, Assam

Table 3: Spatial Variation in the Growth of Population and Motor Vehicles in Assam, (1991-2001).

Sl. No.	Districts	Total Persons		Decadal Growth Rate (1991-2001)	No. of Motor Vehicles		Growth of Motor Vehicles in (%)
		1991	2001		1991	2001	
1	Dhubri	1324404	1637344	23.68	2421	5038	108.09
2	Kokrajhar	800659	905764	12	2703	7431	174.91
3	Goalpara	668138	822305	23.03	3013	9222	206.07
4	Bongaigaon	807523	904835	12.05	2128	7330	244.45
5	Barpeta	1385659	1647201	18.87	5158	8351	61.9
6	Nalbari	1016390	1148824	13.03	5633	2424	120.55
7	Kamrup	2000071	2522324	26.11	86022	27133	215.42
8	Darrang	1298860	1504320	15.82	4950	10063	103.38
9	Sonitpur	1424287	1681513	18.06	12654	27634	119.38
10	Lakhimpur	751517	889010	18.3	8625	15234	76.62
11	Dhemaji	478830	571944	19.45	1006	4711	368.29
12	Morigaon	639682	776256	21.35	942	7110	654.77
13	Nagoan	1893171	2314629	22.26	16684	40157	140.69
14	Golaghat	828096	946279	14.27	3066	13351	335.42
15	Jorhat	871206	999221	14.69	34906	53170	52.32
16	Sivsagar	907983	1051736	15.83	12966	22183	71.08
17	Dibrugarh	1042457	1185072	13.68	29347	46861	59.67
18	Tinsukia	962298	1150062	19.51	4984	31788	537.8
19	Karbi Anglong	662723	813311	22.72	3693	7723	109.12
20	N.C Hills	150801	188079	24.72	1661	3866	132.75
21	Karimganj	827063	1007976	21.87	1490	6700	349.66
22	Hailakandi	449048	542872	20.89	612	3227	427.28
23	Cachar	1215385	1444921	18.89	12428	25863	108.1
	Assam	22414322	26655528	18.92	257092	257092	257092

Source: Census of India, 1991 and 2001: Office of the Commissioner of Transport, Assam, 1991, 2001

Table 4: Pattern of Accidents and Persons Injured and Killed in Assam during 1990-2003

Sl. No.	Districts	Avg. No. of Accidents in (%)		Growth of Accidents in (%)	Avg. No. of Injured in (%)		Growth Rate in (%)	Avg. No. of Killed in (%)		Growth Rate in (%)
		1990-92	2000-03		(1990-1992)	(2000-2002)		(1990-1992)	(2000-2002)	
1	Dhubri	78	146	87	89	94	6	28	39	39
2	Kokrajhar	64	83	30	133	89	-33	27	30	-19
3	Goalpara	71	92	30	123	139	13	34	29	-15
4	Bongaigaon	48	83	73	130	102	-22	45	37	-18
5	Barpeta	77	135	75	95	316	233	30	40	33
6	Nalbari	51	80	57	304	354	16	34	26	-23
7	Kamrup	521	639	23	572	665	16	146	217	49
8	Darrang	54	102	89	83	168	102	39	40	1
9	Sonitpur	131	142	8	189	142	-22	72	70	-3
10	Lakhimpur	63	86	37	76	150	97	29	40	38
11	Dhemaji	17	30	76	41	48	17	13	10	-23
12	Morigaon	33	88	167	85	143	68	18	39	117
13	Nagoan	121	226	87	97	167	72	64	57	-11
14	Golaghat	65	73	12	68	56	-18	35	32	-9
15	Jorhat	59	74	25	69	70	1	39	28	-28
16	Sivsagar	63	106	68	80	88	10	30	42	40
17	Dibrugarh	97	132	36	142	143	1	65	67	3
18	Tinsukia	87	114	31	67	122	82	36	55	53
19	Karbi Anglong	38	41	8	78	64	-18	20	29	45
20	N.C Hills	17	18	6	31	33	6	12	10	-17
21	Karimganj	41	46	12	108	128	19	23	17	-26
22	Hailakandi	22	33	50	64	43	-33	9	8	-1
23	Cachar	81	279	244	126	372	195	44	68	48
	Assam	1899	2798	47	2850	3696	30	902	1027	273

Source: Director General of Police (C.I.D Cell), Assam, 1990-2003

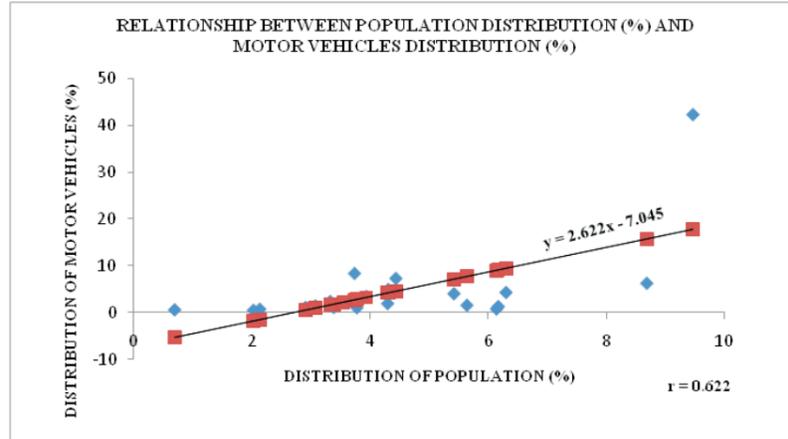


Fig.1

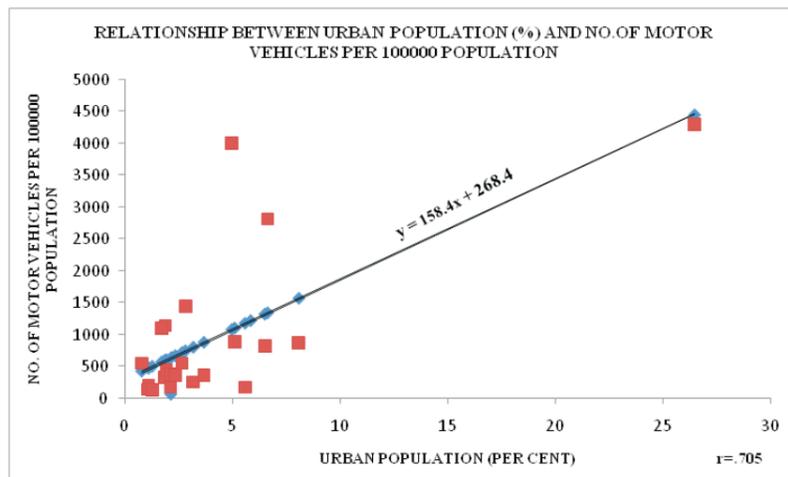


Fig.2

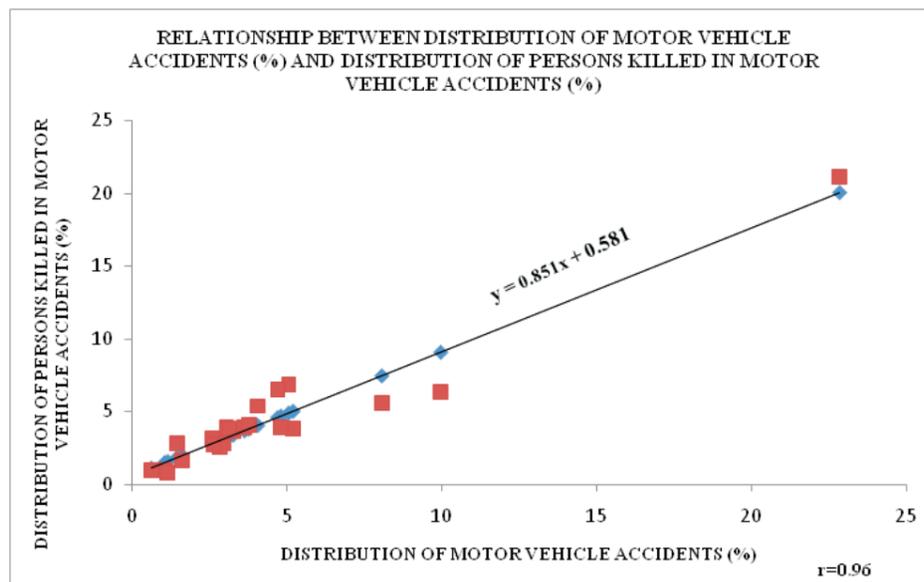


Fig.3

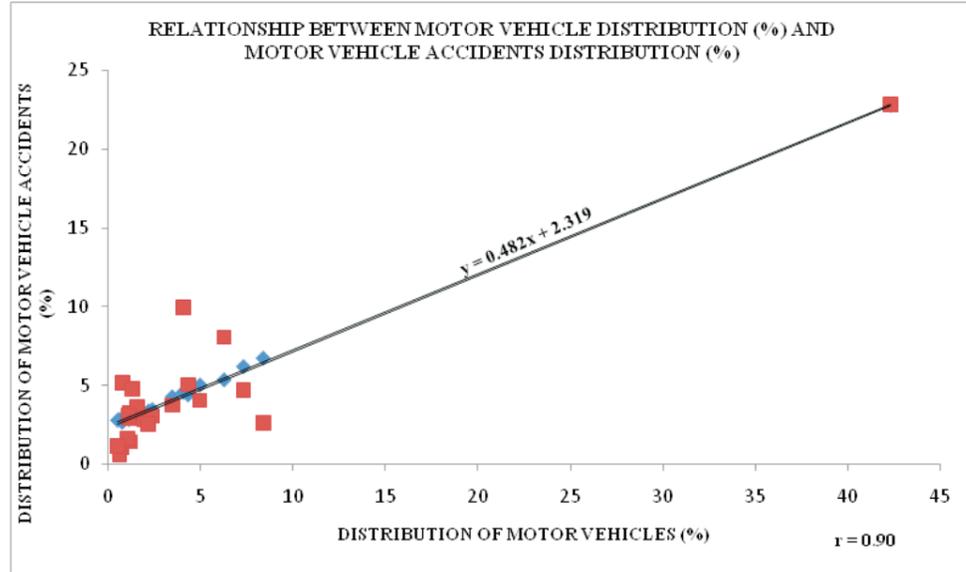


Figure 4