

Accident Analysis and Evaluation in Urban Areas using Goodness of Fit Test

T. Sowjanya

Abstract: An Accident is an uncommon, multifaceted occasion gone before by a circumstance or occasion wherein at least one street clients neglected to adapt to street condition, results vehicle crash. Traffic security is a significant key and vital job in maintainable transportation improvement zones. Presently a-days, the primary negative effect of current street transportation frameworks is wounds and passings in street mishaps. The accomplishment of traffic security and roadway improvement programs relies on the investigation of precise and dependable auto collision information. The examination of exact and dependable auto collision information gives the data of accident areas which can be acquired from police first data report. The area in a street where most elevated number of car crashes happens is known as a Black Spot. The ongoing examination led in Kurnool city serves to establish that, the most extreme quantities of high hazard mishap areas or the dark spots in Kurnool town. The present examination endeavors to distinguish the most defenseless mishap dark spots by gathering street mishap information from different sources in Kurnool city. Further mishaps patterns was found for the investigation region and a non parametric chi-square examination was led to know the reliance of mishaps on months, seasons and hours in Kurnool city. There are increasingly minor mishaps in winter season and moderate major and lethal mishaps recorded in summer season. The invalid theory is expected, which says that there would not be any critical variety because of the disseminations, minor and significant mishaps are rejected.

Key words: Accident Analysis, Black spots, Trend graphs, Goodness of fit test

I. INTRODUCTION

Fast development of populace combined with expanded financial exercises has supported in huge development of engine vehicles. This is one of the essential elements in charge of street mishaps. It is seen that few works have been done on measurable examination of mishaps especially on two-way National Highways. The wellbeing of vehicular developments turns into a worry for everyone because of detailing of loss of lives and properties alongside lethal wounds and periodical block of traffic stream. National expressways give the proficient portability and availability work. The expanding street mishaps have made social issues because of loss of lives and human agonies. Street mishaps are basically brought about by associations of the vehicles, street clients and roadway conditions. Every one of these essential components involves various sub components like

asphalt qualities, geometric highlights, traffic attributes, street client's conduct, vehicle configuration, driver's attributes and ecological perspectives. According to "Indians Road Safety", study in India there is a demise for at regular intervals. The expense of these passings and property misfortune are more than 3.8 Lakhs, which is 3% in GDP. This review was directed for a workshop on "Indian Roads – Problems because of unequivocal vehicles" and is uncovered that if similar conditions will proceed for further years the mishaps rate may compasses to a demise for each at regular intervals continuously 2020. According to study results in India amid most recent 10 years more than 10Lakh individuals were killed in street mishaps.

A Road network in Kurnool City

Development of vehicles in Kurnool is quick. There is substantial increment in rush hour gridlock volume and traffic issues on the city streets of Kurnool. The street arrange shows that city is associated by a national parkways NH-7 and NH-18 and numerous other state thruways and area streets. This street organize makes running in of expansive vehicles into the city streets and expands the traffic volume. This street organize makes traffic a difficult issue in Kurnool city.

Study zone: Description of Kurnool city

Kurnool is known as the passage to Rayalaseema. It is a city which is the managerial head quarters of Kurnool area. Post bifurcation of state Kurnool is the fifth crowded city of Andhra Pradesh. Kurnool filled in as capital of Andhra from 1 October 1953 to 31 October 1956.

Open transport framework in Kurnool

Open transport framework in Kurnool primarily relies upon its middle open transport. There is no between city rail and transport offices in the town. There is no city transport administration under state Road Transport Corporation. The trickiness of transport administration and its wasteful task combined with crumbling street systems has brought about high support of halfway open transport. IPT modes for the most part auto-rickshaws assume imperative job in gathering over 95% of open transport request. The absence of successful mass transport has offered ascend to a gigantic increment in IPT modes and customized vehicles. The city streets are blocked prompting sticking conditions, which has turned out to be terrible disturbing pretty much every arrangement of the city. Because of high thickness of auto – rickshaws out and about, traveler development is exasperatingly moderate.

Revised Manuscript Received on 22 May 2019.

* Correspondence Author

T.Sowjanya*, Civil Engg. Dept.,G.Puula Reddy Engg. College, Kurnool, A.P., India.

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an [open access](https://creativecommons.org/licenses/by-nc-nd/4.0/) article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

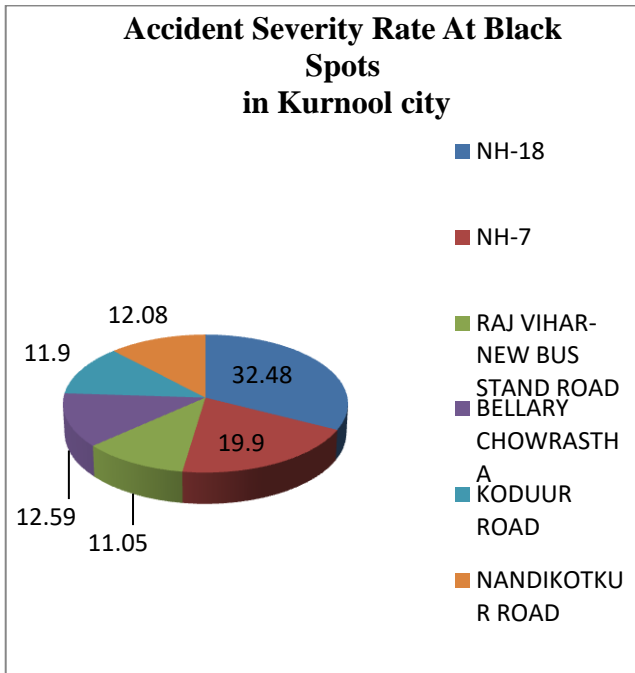


Fig.1: Block spots Severity Rate in Kurnool.

B. Objectives

The particular targets of present examination are:

- To do mishap investigation of existing state of Kurnool city
- To distinguish the dark spots dependent on mishaps happened in Kurnool city
- To realize the variety drifts in real, minor and deadly mishaps
- To lead the Chi-Square test to survey the mishaps speculation.

(II) LITERATURE REVIEW

The chi-square test is utilized to test if an example of information originated from a populace with a particular conveyance. Another method for seeing that is to inquire as to whether the recurrence dispersion fits a particular example. Two qualities are included, a watched esteem, which is the recurrence of a classification from an example, and the normal recurrence, which is determined dependent on the guaranteed circulation.

The thought is that on the off chance that the watched recurrence is actually close to the asserted (anticipated) recurrence, at that point the square of the deviations will be little. The square of the deviation is isolated by the normal recurrence to weight frequencies. On the off chance that the entirety of these weighted squared deviations is little, the watched frequencies are near the normal frequencies and there would be no motivation to dismiss the case that it originated from that conveyance. Just when the aggregate is vast is the motivation to scrutinize the dispersion. Consequently, the chi-square decency of-fit test is dependably a correct tail test.

The chi-square test is characterized for the theory:

H_0 : The information pursue a predetermined conveyance.

H_1 : The information don't pursue the predetermined conveyance.

Test Statistic: For the chi-square decency of-fit calculation, the information are partitioned into k containers and the test measurement is characterized as
Where O_i is the watched recurrence and E_i is the normal recurrence. The information are acquired from an arbitrary example

Presumptions

- The normal recurrence of every classification must be no less than 5.
- This returns to the prerequisite that the information be regularly appropriated.

Properties of the Goodness-of-Fit Test

- The information are the watched frequencies. This implies there is just a single information esteem for every classification.
- The level of opportunity is one not exactly the quantity of classes, not one not exactly the example estimate.
- It is dependably a correct tail test.
- It has a chi-square conveyance.
- The estimation of the test measurement doesn't change if the request of the classifications is exchanged.

(III) DATA COLLECTION, ANALYSIS AND RESULTS

Kurnool city is watched by four police headquarters, one town PS, two town PS, three town PS and fourth town PS. They are situated at A-Camp region, Narasimha Rao Peta region, Bhudhwarapeta region, Bellary Chowrastha region in Kurnool City. The mishap subtleties with time, date and zone are recorded in the FIR of the separate police headquarters for every single year. The Accidents Data from the year 2009 to 2015 was chosen for the present investigation as the expansion in mishaps are seen in the middle of these years This information is noted down and arranged remembering the yearly, month to month, hourly and quarter year varieties in mishaps.

Segments under IPC for seriousness of the mishap:

- Segment 279-Minor mishap,
- Segment 337-Minor Injury,
- Segment 338-Major Injury
- Segment 304(A) – Fatal

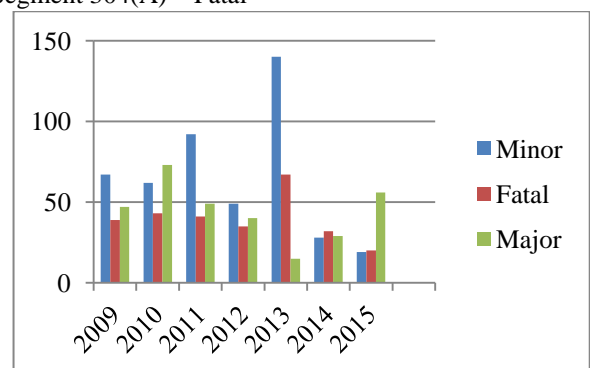


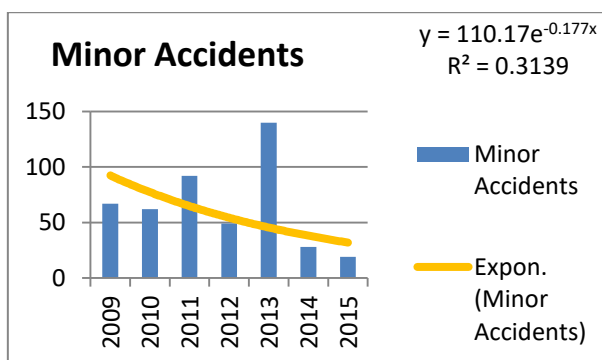
Fig.2: Yearly Accidents Variation



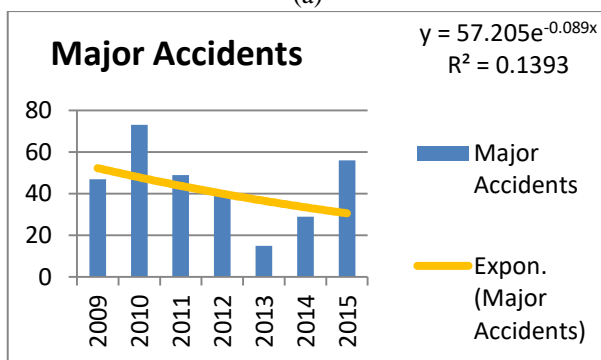
Table1. Accidents in Kurnool city (2009-2015)

Year	Minor Accidents	Fatal accidents	Major Accidents	Total Accidents
2009	67	39	47	153
2010	62	43	73	178
2011	92	41	49	182
2012	49	35	40	124
2013	140	67	15	222
2014	28	32	29	89
2015	19	20	56	95
Total	457	277	309	1043

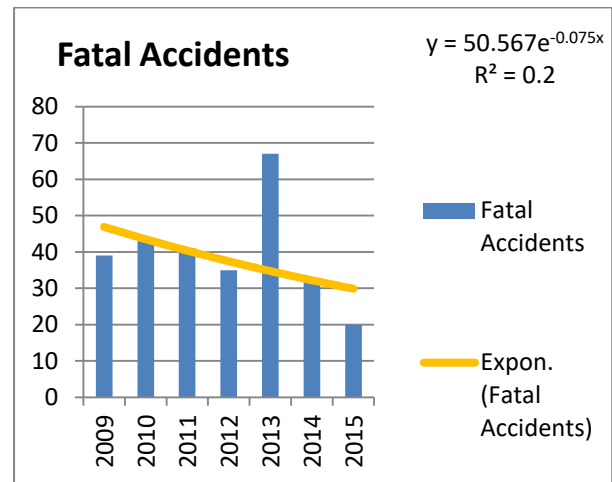
The pattern diagrams were attracted to know the variety in exponential and R-Square esteem. Increasingly number of major and lethal mishaps were recorded in the 2013. At the point when the diagrams are watched it can say that, there is an observable variety in the event of the mishaps as the R² esteem for a direct pattern line for the charts is in the middle of 0.1 to 0.3. It very well may be seen that the variety in exponential(Y) esteem because of abatement in mishap rates for most recent two years 2014 and 2015 because of the measures taken by the R&D and RTO in Kurnool city.



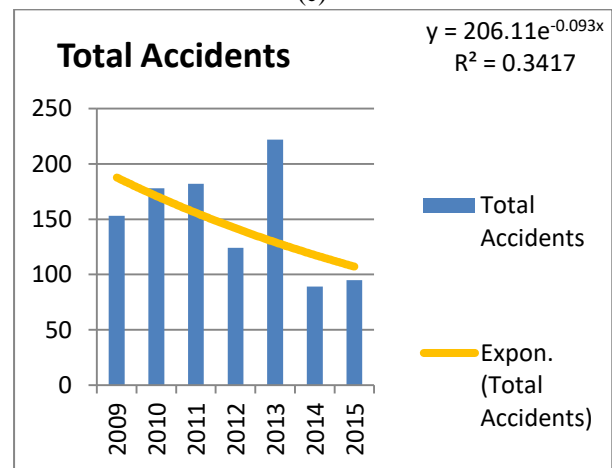
(a)



(b)



(c)



(d)

Fig.3 Yearly trends in accidents in Kurnool city
3.1. Monthly Variation

Table 2: Accidents in Kurnool city (2009-2015)

Month of years 2009-2015 (cumulative)	Fatal accidents	Major accidents	Minor accidents	Total
January	29	30	36	95
February	22	26	30	78
March	25	27	39	91
April	29	21	45	95
May	21	30	46	97
June	16	17	42	75
July	18	27	38	83
August	33	27	39	99
September	21	18	31	70
October	20	19	33	72
November	24	19	55	98
December	28	23	39	90
Total	286	284	473	1043



Accident Analysis and Evaluation in Urban Areas using Goodness of Fit Test

The accessible information is arranged month to month, checked and recorded. Its subtleties are exhibited in the table 2. Likewise the mishaps varieties in every month are displayed graphically. Total accident recurrence of long stretches of years from 2009 to 2015 and the quantity of significant, minor and fatalities are referenced here.

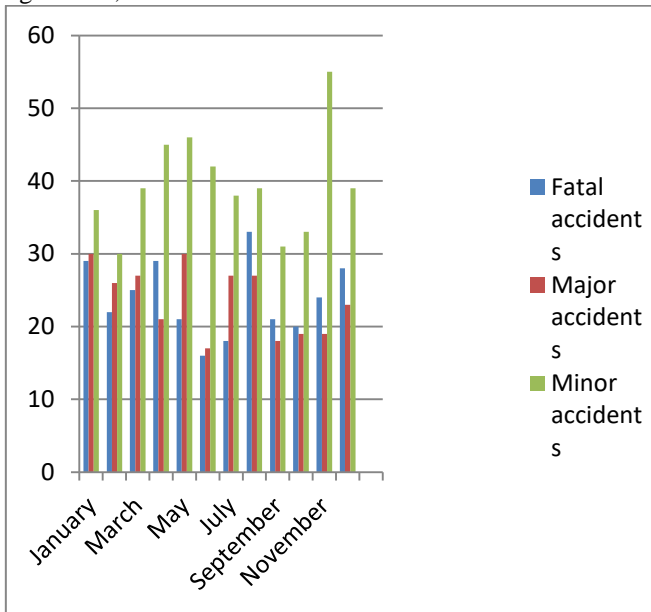
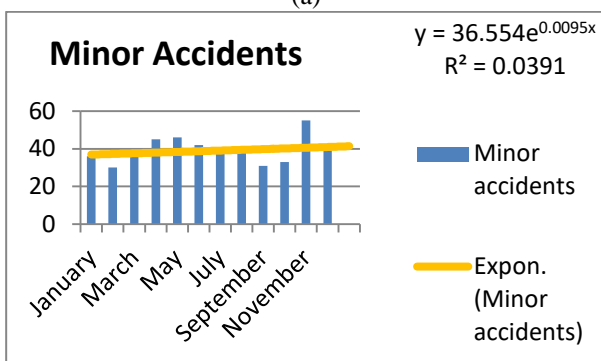
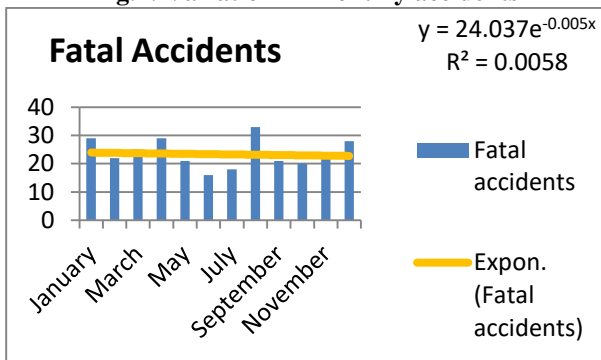
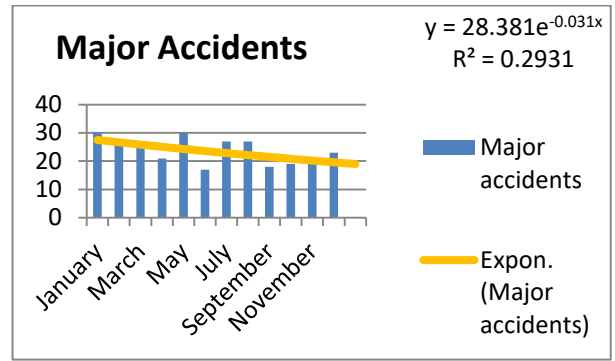


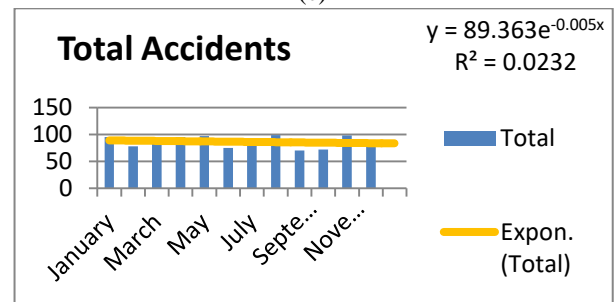
Fig.4: Variation in Monthly accidents



(b)



(c)



(d)

Fig.5 Monthly Accidents trends in Kurnool city

There is increasingly number of minor mishaps in winter season. Indeed, even in summer days record progressively number of minor mishaps. This demonstrates the drivers might be pompous about their driving capacities amid get-away days.

When we see the month to month variety of the information accessible, there is practically straight pattern in the event of the mishaps in every one of the diagrams. The R^2 esteem for a direct pattern line is seen exceptionally close to zero demonstrates that the pattern line does not pursue any pattern straightly but rather the exponential variety of the pattern line has some variety and in this way the line may pursue an exponential variety.

3.2. Quarter year Variation

The accessible information is arranged quarterly, tallied and recorded. Its subtleties are accessible in the accompanying table 3. The year is partitioned into 4 sections, i.e multi month parts or occasional parts and the total accident recurrence of quarter years and the quantity of significant, minor and fatalities are referenced here. The information is additionally displayed graphically.

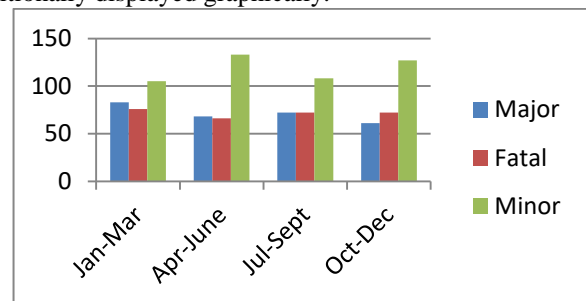
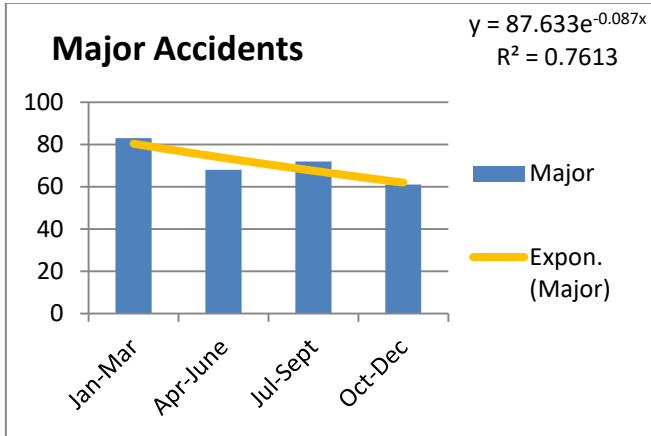


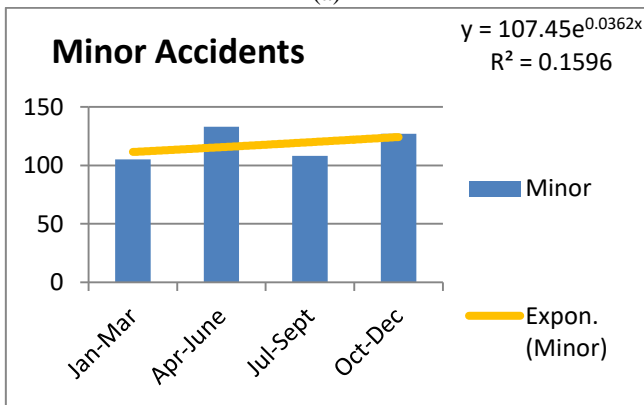
Fig.6: Variation in Quarter- year accidents

Table-3 Quarter Variation in Accidents

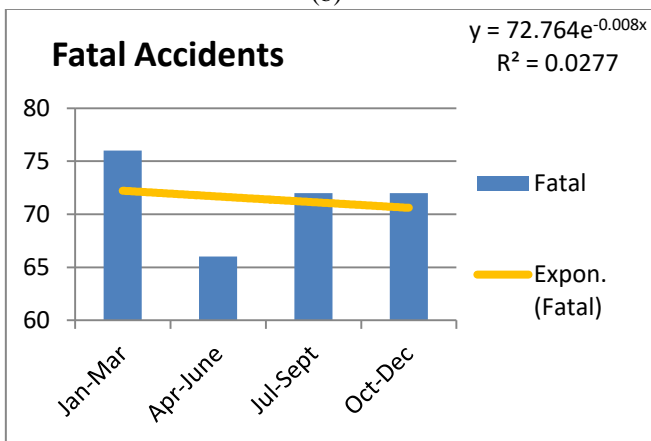
Quarter Year Variation	Major Accidents	Fatal Accidents	Minor Accidents	Total Accidents
Jan-Mar	83	76	105	264
Apr-June	68	66	133	267
Jul-Sept	72	72	108	252
Oct-Dec	61	72	127	260
Total	284	286	473	1043



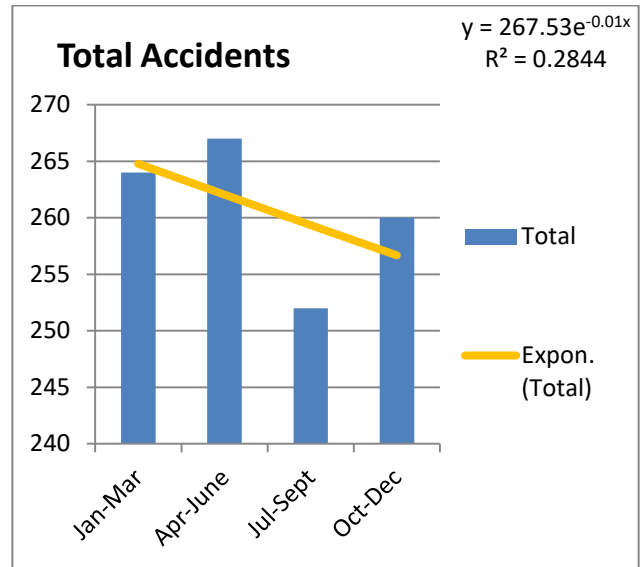
(a)



(b)



(c)



(d)

Fig.7: Quarter- year Accidents trends in Kurnool city

In the mid year and winter seasons the mishaps are more. The reasons might be less driving conditions amid winter and increasingly carelessness of the driver amid summer. It might likewise be conceivable that there might be more upkeep work for the street. Major mishaps are diminishing while the minor mishaps are in expanding pattern. The R^2 esteem for a direct pattern line is close to zero demonstrates that the pattern line does not pursue any pattern straightly. In any case, slight variety the exponential in exponential esteem.

3.3. 6-Hourly Variation

The accessible information is arranged hourly, tallied and recorded. Its subtleties are accessible in the accompanying table. Multi day is isolated into 4 sections, i.e 6-hour parts and the total accident recurrence of 6-hours consistently and the quantity of major, minor and fatalities are referenced here. The information is likewise displayed graphically.

Table 4:6-hour variation in Accidents inKurnool

6- Hour Variation	Fatal Accidents	Major Accidents	Minor Accidents	Total Accidents
6.00AM-12.00PM	43	56	110	209
12.00PM-6.00PM	92	98	163	353
6.00PM-12.00AM	94	80	154	328
12.00AM-6.00AM	49	44	60	153
Total	278	278	487	1043



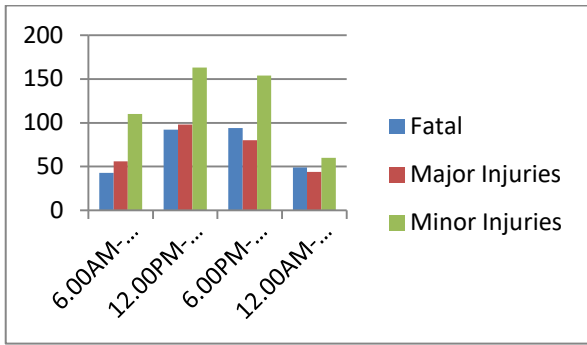


Fig.8 : 6-hour variation in Accidents in Kurnool city

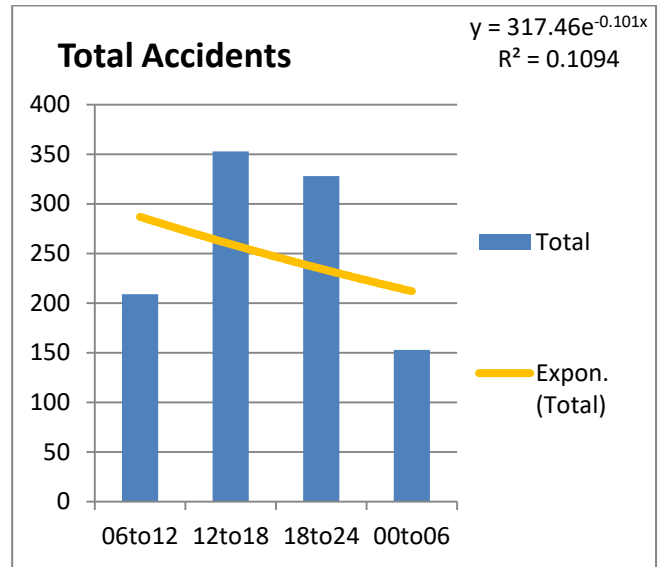
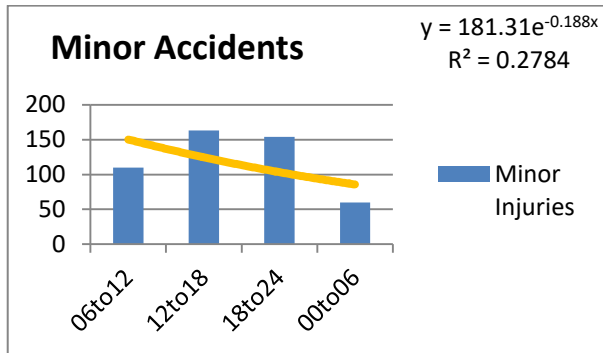
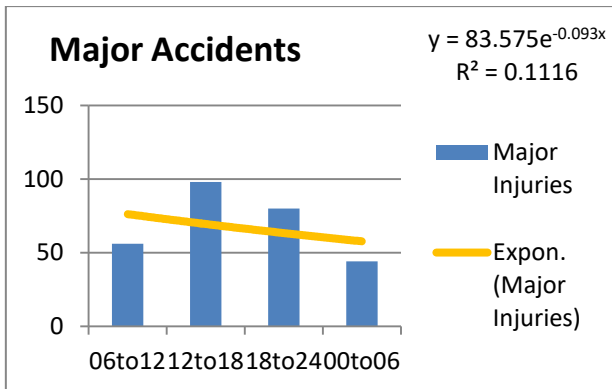


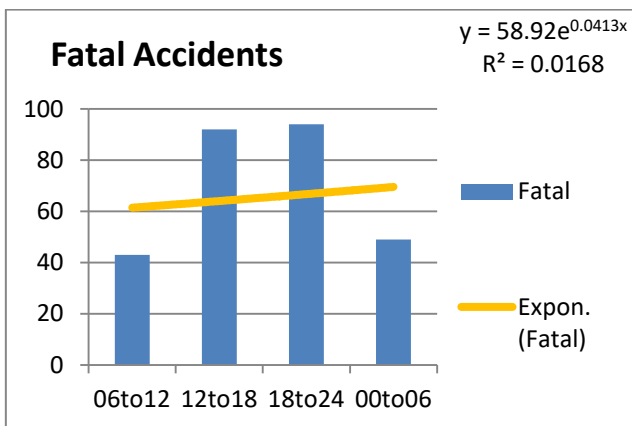
Fig.9: Quarter- year Accidents trends in Kurnool city



(a)



(b)



(c)

Amid the pinnacle times of the day, it implies from 12am to 6pm the fatalities are progressively because of more traffic volume. Indeed, even the minor mishaps are additionally amid evenings.

According to the information accessible, there is no specific pattern in the event of the mishaps due to the less fit due to R^2 esteem. The R^2 esteem for a straight pattern line is exceptionally close to zero demonstrates that the pattern line does not pursue any pattern directly. In the exponential variety of the pattern line on account of minor mishaps is progressively because of more number of minor mishaps. This infers the information is an awful fit for the given pattern line and has more varieties in plotting the pattern line.

3.4 Chi-square test for Goodness of Fit:

Chi Square test is led for the minor, major and lethal mishaps for the years 2009-15for the critical estimation of 0.05%. The outcomes are classified howl.

Table.5: Results of Goodness of fit Test

Accidents Variation	Significance level	D.F	Calculated χ^2	Critical χ^2	Null Hypothesis (h_0) (accepted/rejected)
Minor	0.05	12	39.32	21.026	Rejected
major	0.05	12	77.21	21.026	Rejected
Fatal	0.05	12	7.7	21.026	Accepted

IV CONCLUSION

Coming up next are the resolutions drawn from the proposed work:

1. The patterns in mishaps are unsure to foresee at times and pursue a specific pattern now and again. There are increasingly minor mishaps in winter season and moderate major and deadly mishaps recorded in summer season.
2. The invalid speculation is expected, which says that there would not be any noteworthy variety because of the conveyances, minor and real mishaps are rejected.
3. The present examination recorded that over half of the mishaps happened amid day time these occasions concur with period when individuals are increasingly dynamic and versatile. These hours are the busiest as there is overwhelming surge of workers from schools, workplaces, plants, business places, and so on.
4. Human qualities, for example, over speed, perilous driving and so on., make the most astounding commitment to the street auto collisions in the examination region. The asphalt qualities likewise add to the mishaps.

REFERENCES

1. Dr. L. R. Kadiyali, "Traffic Engineering and Transport Planning", Khanna Publishers 2009.
2. Dr. Tom V. Mathew, "A diary on mishap contemplates", IIT Bombay, Transportation Systems Engineering
3. Global Journal of Engineering and Technical Research (IJETR) ISSN: 2321-0869, Volume-2, Issue-3, March 2014.
4. Murray CJL, Lopez AD (Eds.) 1996. The worldwide weight of illness: a far reaching appraisal of mortality and handicap from ailments, wounds, and hazard factors in 1990 and anticipated to 2020. Cambridge, MA: Harvard School of Public Health for the benefit of the World Health Organization and the World Bank.
5. Street Accidents in India 2011, Transport Research Wing, M/o Road Transport and Highways.
6. Coincidental Deaths and Suicides in India 2011, National Crime Records Bureau, Ministry of Home Affairs.
7. Ajit Goswami and Ripunjoy Sonowal, A Statistical Analysis Of Road Traffic Accidents In Dibrugarh City, Indian committee of therapeutic research, 2010, Assam, India.
8. Mohan D., (2007), "Traffic wellbeing and wellbeing in Indian urban areas", Research and Injury counteractive action Program," IIT Delhi, New Delhi.
9. Report on Road Accidents in India 2010: Government of India, Ministry of street transport and roadways Transport Research wing New Delhi, 2010.
10. World Health Organization, Road car crashes in creating nations. Specialized Report Series No. 73. Geneva, WHO, 1984
11. Incidental passings and suicides in India - 2010. National Crime Records Bureau. Service of Home Affairs, Government of India, 2010

AUTHORS PROFILE



SOWJANYA. T. pursuing her Ph.D degree in Transportation Engineering and Management division, Civil Engineering Department, from National Institute of Technology Tiruchirappalli, India. She has completed M.Tech in Transportation Engineering from NIT Warangal, A.P, India. Currently working as Assistant Professorin G Pulla Reddy Engineering College, Kurnool, Andhra Pradesh., since last twelve years. Her areas of interest are driver behavior modeling and capacity and level of service analysis on urban mid-block sections for mixed traffic conditions. She has 12 years of teaching experience.