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Study of Traffic Parameters for Heterogeneous Traffic Flow

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Abstract

Road traffic in India displays a heterogeneous mix condition where in vehicles possessing distinguished physical and operational attributes constitute the vehicular flow. The behaviour of homogeneous flows, commonly observed in the developed Western nations, is characterized by a strict lane discipline and single-file motion of vehicles with restricted movement across the lanes. A heterogeneous flow, on the contrary, is differentiated by the presence of a loose lane discipline and use of the entire road space without any confinements for maneuvering. The behaviour of such traffic is ensued by the existence of flow variables that vary over space and time. Most of the injuries and crashes has chance to occur at intersection. With the rapid growth of the number of various vehicles, the ratio of the traffic accidents to vehicle number is increasing greatly. Hence in this research we were taken different intersections located in Amravati city (Two lane and Four lane). Studied different intersections and find out the heterogeneous behaviour of traffic. Data collected from different intersection manually. The study discussed in this research was performed in order to understand primary traffic parameters and their features pertaining to vehicle behaviour on the two-lane and four lane road. The objective of this research is threefold: to provide a comprehensive review of the studies on Heterogeneous conditions traffic in developing economies, to identify the limitations and gaps in the current understanding of the traffic characteristics and to supply a background and guidelines for the researchers in planning their future studies.

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Keywords: *- Traffic flow, Heterogeneous condition, two lane and four lane traffic.*

INTRODUCTION

Road traffic in India displays a heterogeneous mix condition where in vehicles possessing distinguished physical and operational attributes constitute the vehicular flow. The behavior of homogeneous flows, commonly observed in the developed Western nations, is characterized by a strict lane discipline and single-file motion of vehicles with restricted movement across the lanes. A heterogeneous flow, on the contrary, is differentiated by the presence of a loose lane discipline and use of the entire road space without any confinements for maneuvering. The lateral movement of vehicles, apart from usual longitudinal motion, results in mass queue formations that operate two-dimensionally. Furthermore, wide ranging vehicle types moving in these traffic flows add to the dynamic quality of the flow. The behavior of such traffic is ensued by the existence of flow variables that vary over space and time. Knowledge about these parameters is, therefore, essential for understanding the nature of a heterogeneous traffic mix moving on the road. Information derived from parametric studies can provide a crucial base for accomplishing tasks such as road design, planning and operation. The majority of them are undivided road facilities that are uniquely identified by the subjection of vehicles to traffic moving on the oncoming lane. Thus, the behavior of flows travelling in a particular direction is predominantly influenced by the prevailing traffic conditions on the opposing lane, as it constrains the passing/overtaking activity of vehicles. In India, these facilities carry a high volume of traffic comprising a variety of public, private and commercial vehicles. They serve a wide range of traffic requirements concerned with infrastructural potential and indirectly affect the economy and commerce of the country. Most of the injuries and crashes has chance to occur at intersection. With the rapid growth of the number of various vehicles, the ratio of the traffic accidents to vehicle number is increasing greatly. Safety on roads is a major concern in the developing world because of its impact on the global economy and people's welfare. Due to the rising population, the traffic risk has increased especially in developing nations like India, as the infrastructure is unable to cope up with the increasing traffic.

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LITERATURE REVIEW

Significant effort has been devoted, in the last several decades, for accident reduction particularly at intersections. This literature review has examined many of those proposed counter measures designed to either prevent crashes or reduce injuries in the event of crash at unsignalized intersection. In addition, the need of improvements to the effectiveness or methods of implementation of current counter measures has been assessed. This chapter presents a review of relevant literature to bring out the background of the study undertaken in this dissertation. The research contribution which has a direct relevance are treated in a greater detail and major findings summarized briefly. Some of the historical work which have contributed greatly to the understanding of the safety concerns of the unsignalized intersections. First, a brief review of the historical background is presented. The concept of safety of the unsignalized intersections and work on advance methodologies to improve safety of unsignalized intersections carried out in this thesis, are then discussed. The amount of the literature on the subject has increased rapidly in recent years, particularly to improve safety of intersection, several of this is available in the proceedings of the conferences which are very helpful to understand the recent developments in traffic engineering. The goal of the safety strategies is to reduce annual highway fatalities. This goal can be achieved through the widespread application of low-cost, proven countermeasures that reduce the number of crashes on the nation's highways. Many of the Guidelines and research for implementation of Safety Plan provides strategies that can be employed to reduce the number of unsignalized intersection collisions. The research will be of particular interest to safety practitioners with responsibility for implementing programs to reduce injuries and fatalities on the highway system. Though research done on the various macroscopic parameters on the road is not highly documented, the contributions from researchers across the nation and the world have proven to be significantly essential. This research indicates a very comprehensive review of literature for studies analyzing safety of congested intersection.

METHODOLOGY

To find out the Peak Hour Volume we collect the Traffic Volume data by conducting Traffic Volume Study. It is essential to know the magnitude of traffic data required or collected, which will then

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determine its quality and type of vehicle classification to be adopted. There is distinct difference between methods. However, the economic use or selection of an appropriate method of traffic counting to the function of level of traffic flow and the required data. We conduct the Traffic Volume Study by Manual Count. Manual count is the most common method of collecting traffic data which consist of assigning a person to record traffic as it passes. This method of data collection can be expensive in terms of manpower, but it is none of the less necessary in most cases where vehicle are to be classified with the number of movements recorded separately, such as intersection.

Location Survey Location: Location of the spot for traffic volume survey was chosen to be from Amravati, Maharashtra, India. All the vehicles from Badnera to Walgaon were observed at corresponding Intersections. We stood by the side of the road and different vehicles were counted by different persons. We selected one enumerator among us who was in charge of time. He commanded us when to jump from current time step, we were working to next time step. Date: Data for volume study was collected from November 2020 to February 2021. Time: Time of data collection for volume study was different for different groups, however for group the time was from peak hour at different intersections. Weather Condition: It was initially a sunny day but afterwards it became cloudy. Observation: Classified Vehicle Counts. Method: Direct Manual Method. Duration: 1 Hr. Equipment: Stop watch, Tally sheet, Clip board, video camera, measuring tape, etc. (A blank tally sheet is provided in the appendix) Number of Intersections: Fourteen.

Methodology of reconnaissance survey: Before going for the actual work, we have conducted a reconnaissance survey on the previous day of actual work. Due to lack of instruments, we could only adopt manual counting methods.

We just visited the spot of study and divided the whole intersections equally. And then we have selected the reference points where we collected volume data. And on the day of operation we went directly to the spot and collected volume data. For spot speed survey we measured 500m from intersection, further by measuring 50m we counted the time per vehicles required to cross 50m length with the help of stop watch and at the Signalized intersection we calculated the density of vehicles by calculating the timing required by 4th and last vehicle to

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cross the intersection. But if we could conduct the actual reconnaissance work then we would have good understanding of the whole formation of the study zone.

RESEULT AND DISCUSSION

Intersection Details

Intersection 01 — Biyani Square, Old By-Pass Road, Amravati

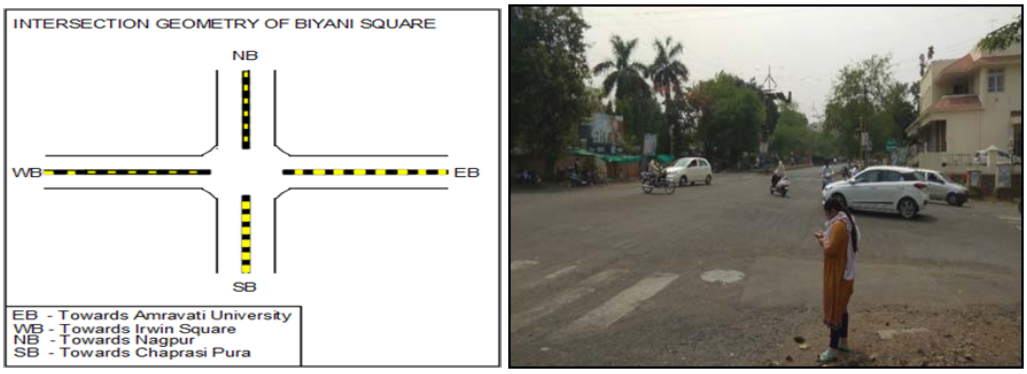


Fig1: Intersection Geometry of Biyani Square

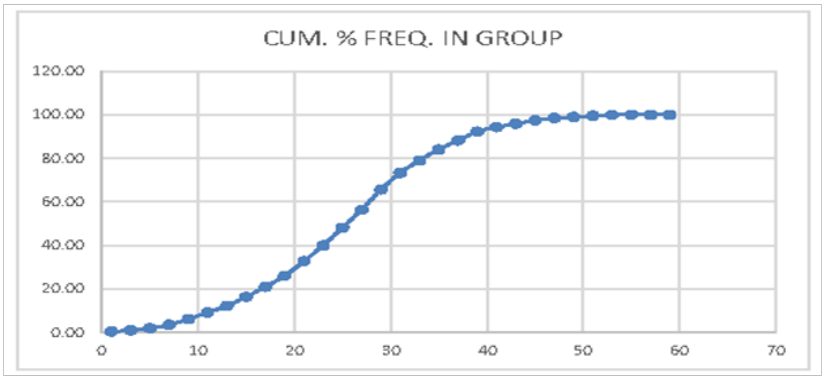


Fig: 2 -Cumulative Percentage Frequency in Group

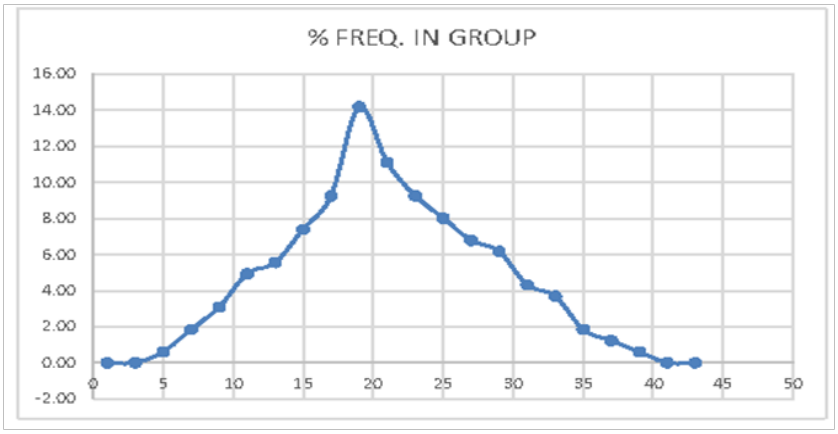


Fig: 3 - Percentage Frequency in Group

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Intersection 02 – Dastur Nagar Square, Amravati

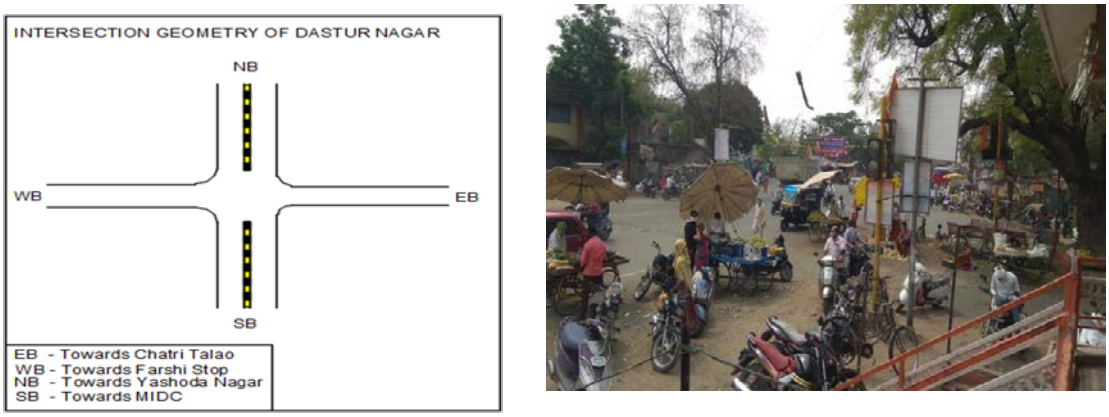


Fig 4: Intersection Geometry of Dastur Nagar Square

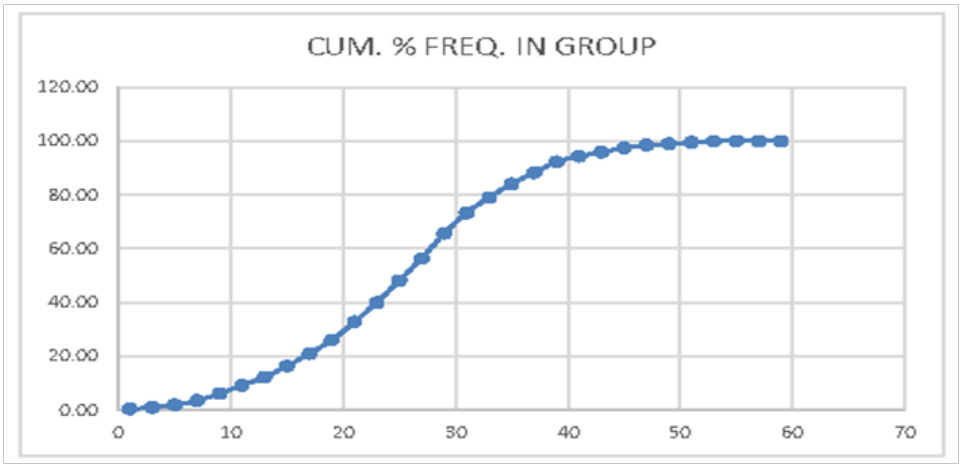


Fig:5 -Cumulative Percentage Frequency in Group

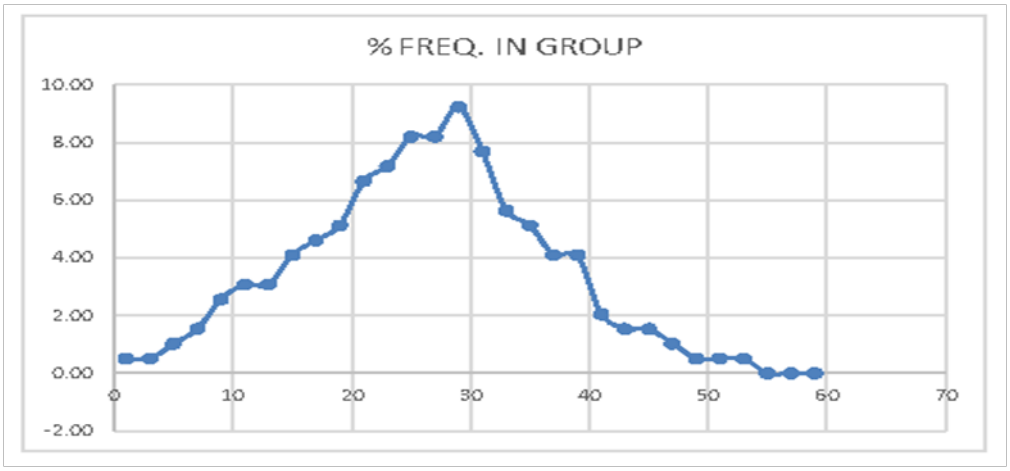


Fig:6: Percentage Frequency in Group

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Intersection03 –Girls high school square, Old By-Pass Road, Amravati

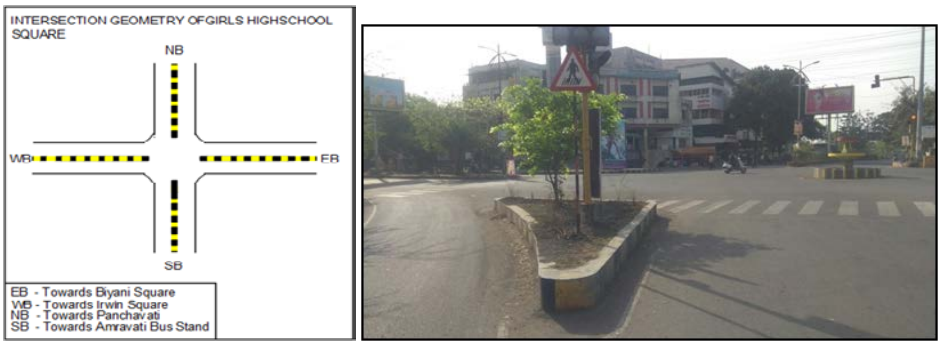


Fig7: Intersection Geometry of Girls High School Square

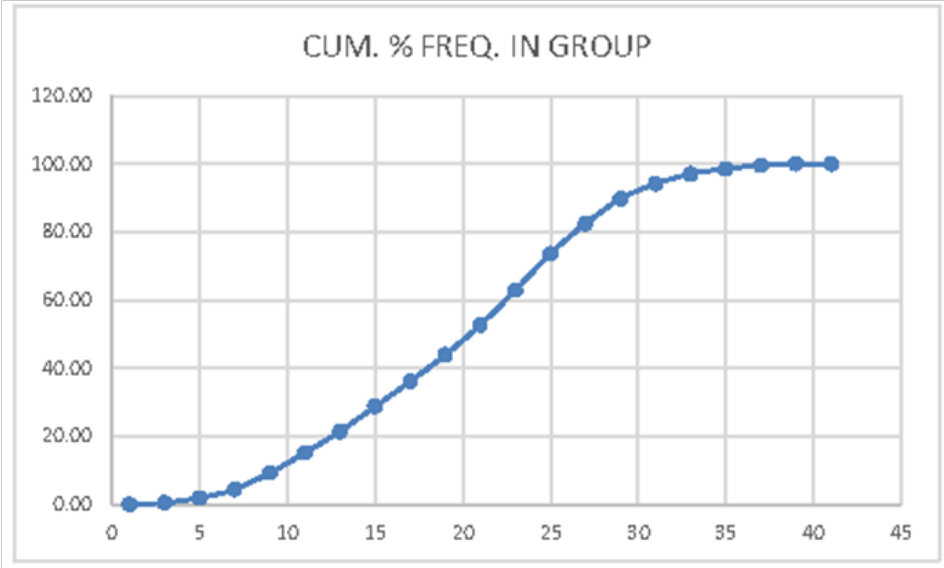


Fig 8: Cumulative Percentage Frequency in Group

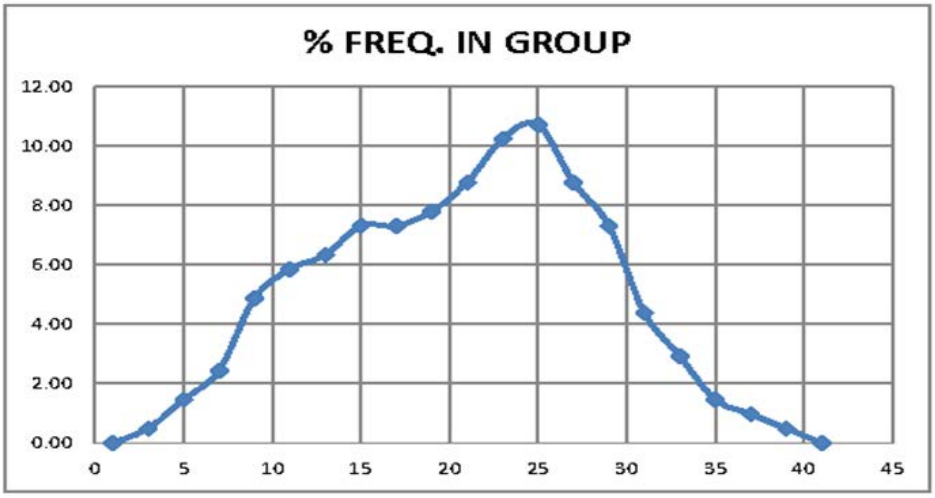


Fig 9: Percentage Frequency in Group

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Intersection 04 – Jaistambh Square, Main Road, Amravati



Fig 10: Intersection Geometry of Jaistambh Square

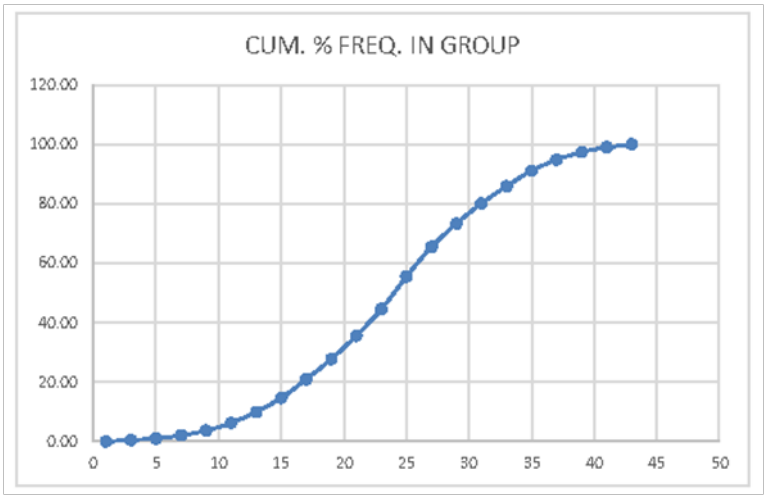


Fig 11: Cumulative Percentage Frequency in Group

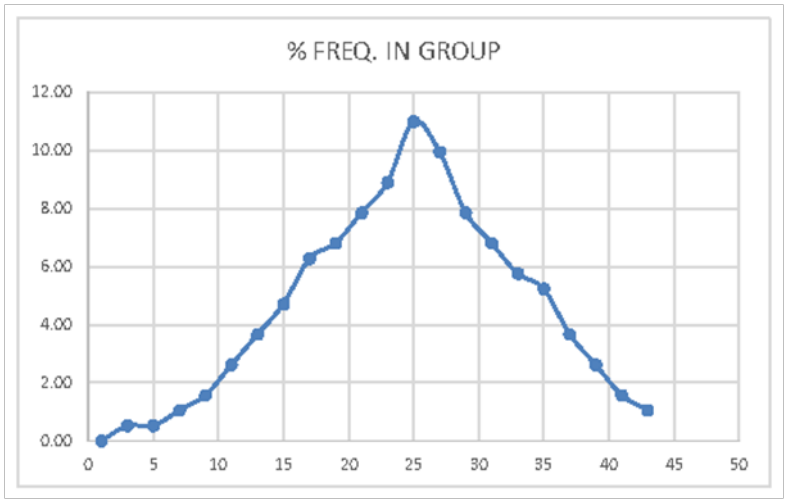


Fig 12 : Percentage Frequency in Group

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Intersection 05 –Nawathe square, Badnera Road ,Amravati



Fig 13: Intersection Geometry of Nawathe Square

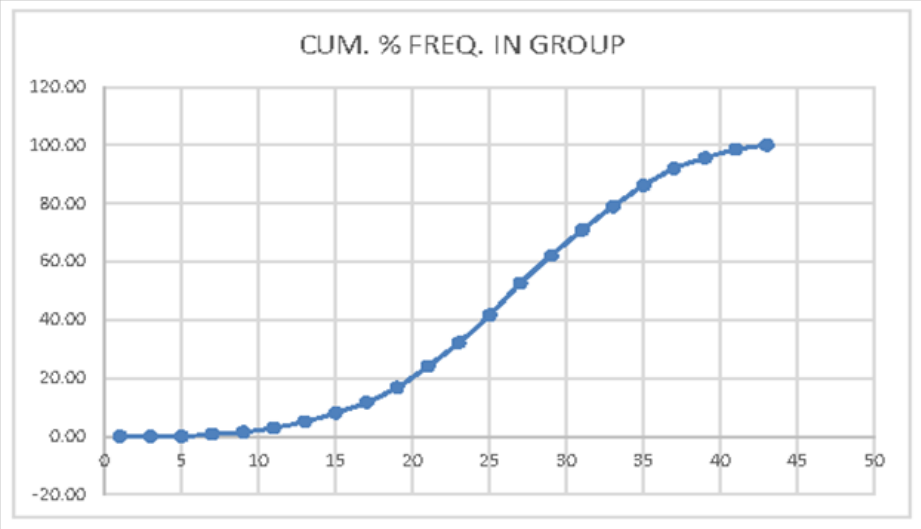


Fig 14: Cumulative Percentage Frequency in Group

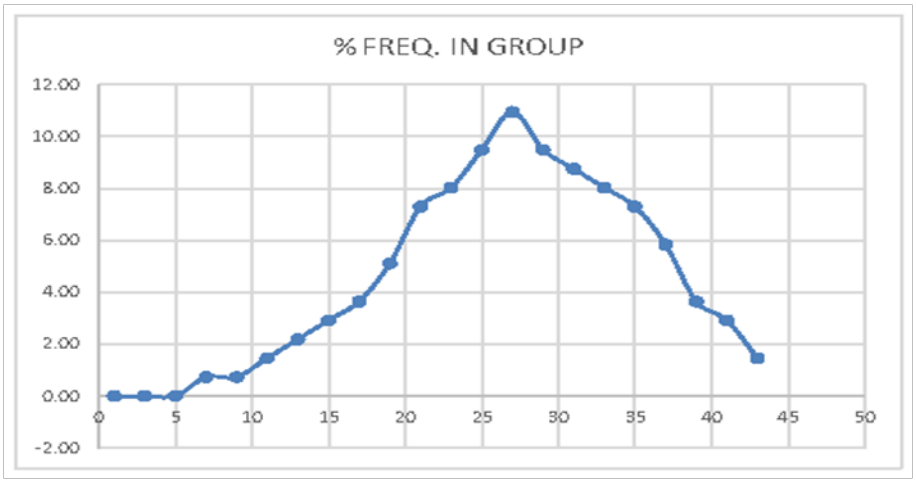


Fig 15: Percentage Frequency in Group

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Intersection6 –Panchavati square, morshi Road, Amravati

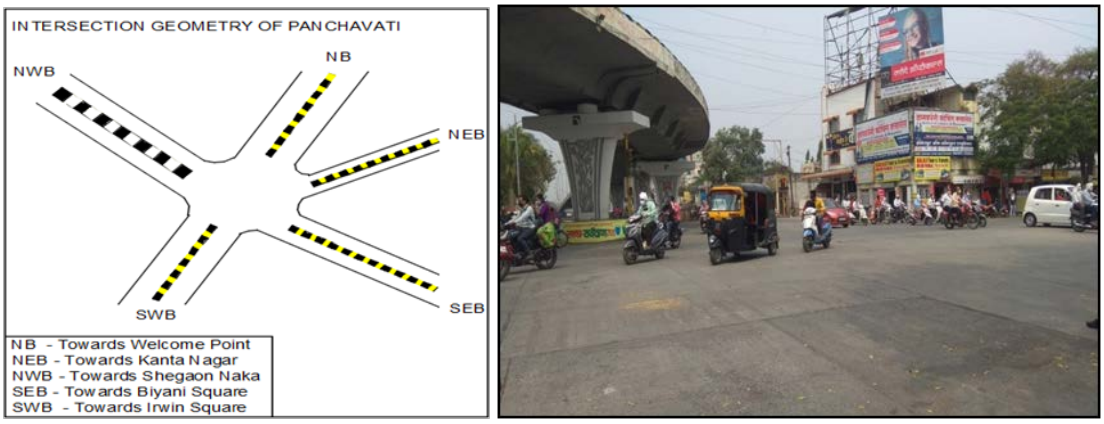


Fig 16: Intersection Geometry of Panchvati Square

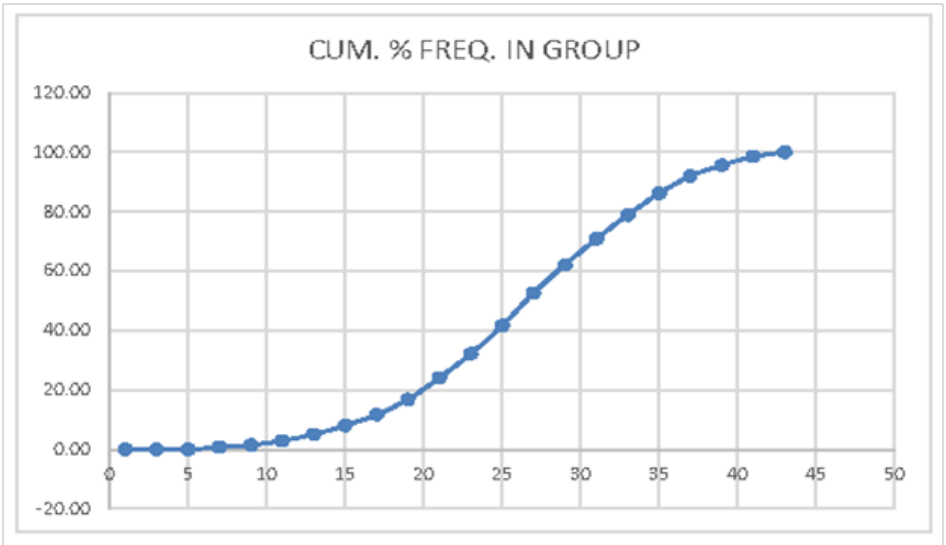


Fig 17: Cumulative Percentage Frequency in Group

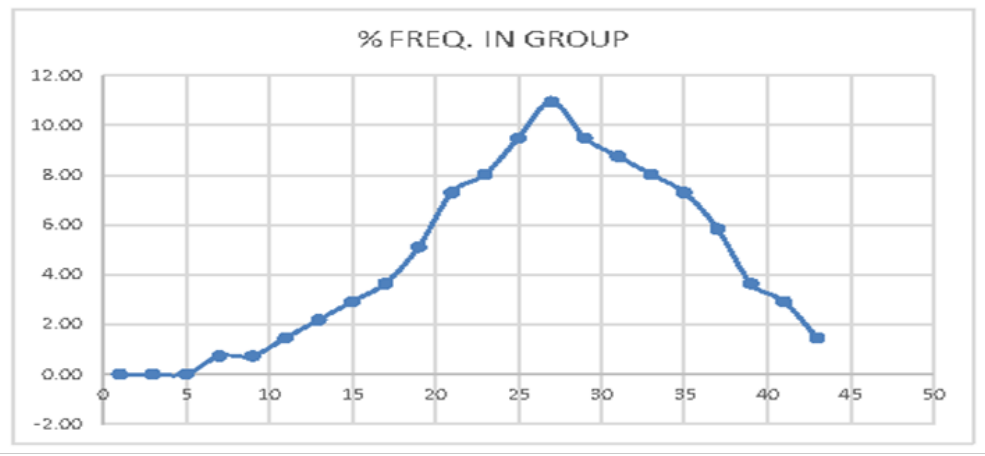


Fig 18: Percentage Frequency in Group

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Intersection7–Railwaystationsquare, Amravati

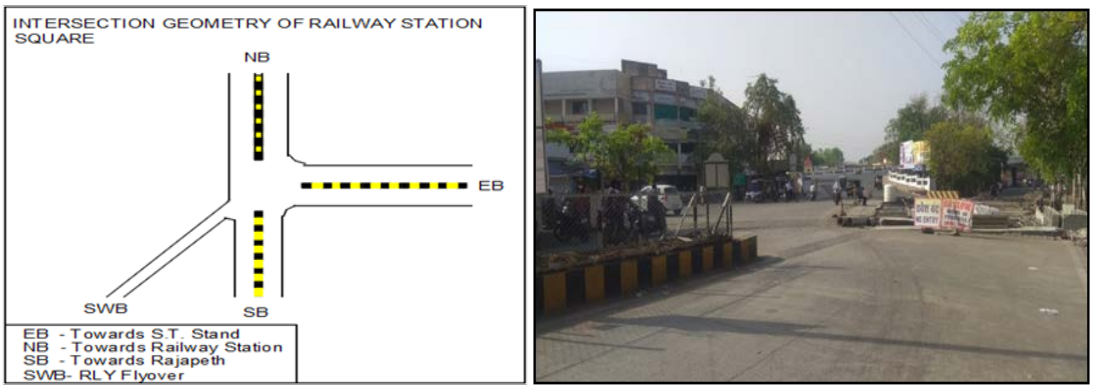


Fig 19: Intersection Geometry of Railway Station Square

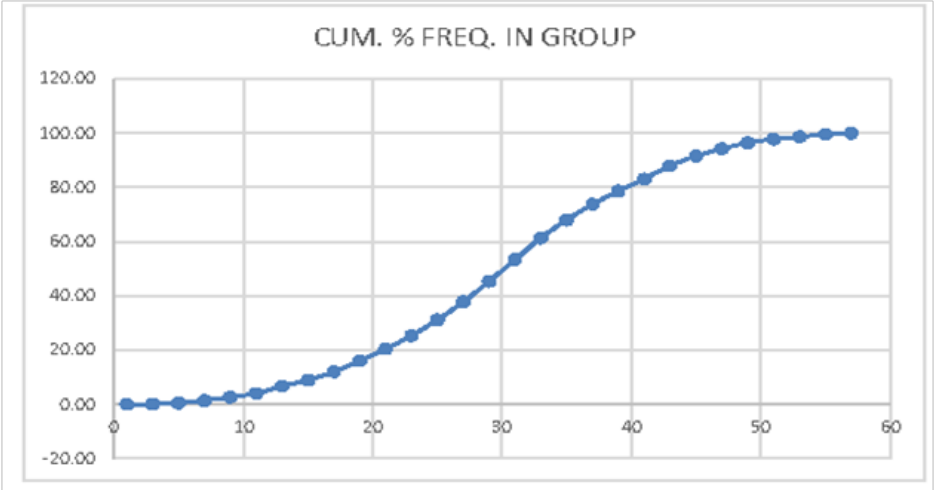


Fig 20: Cumulative Percentage Frequency in Group

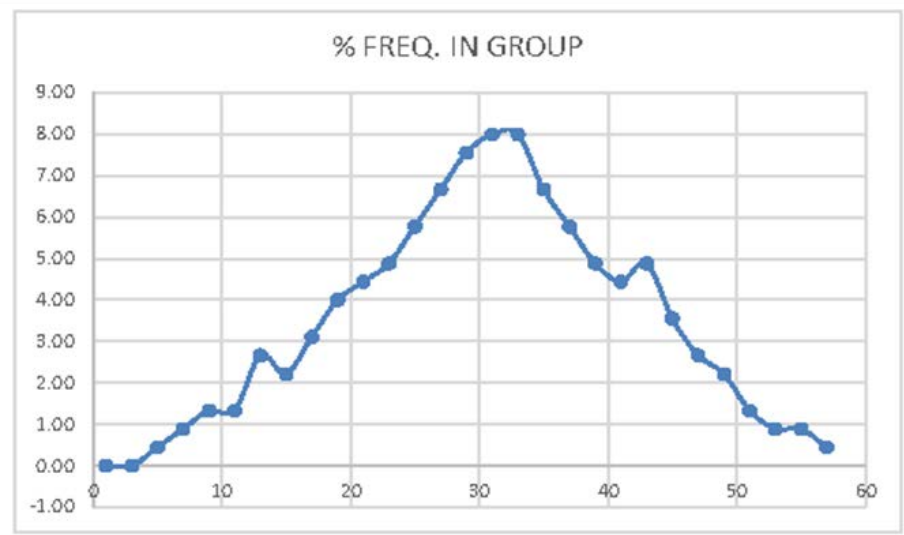


Fig 21 : Percentage Frequency in Group

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Intersection 8 –Rajkamal square, Amravati

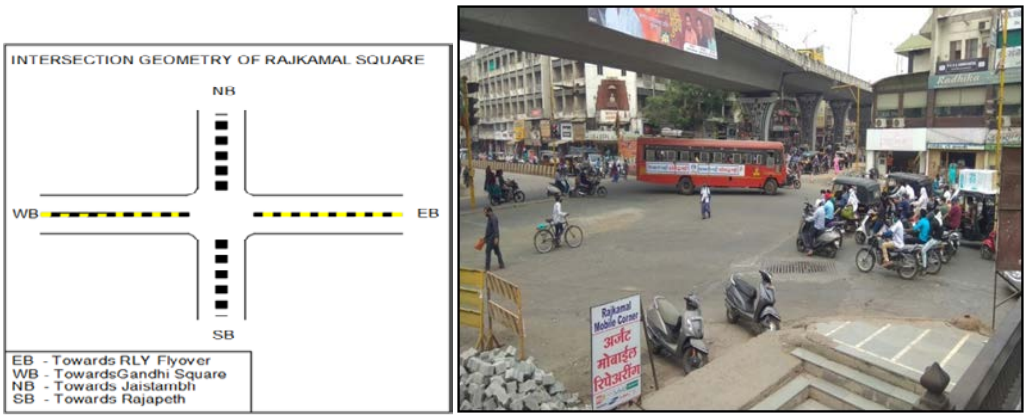


Fig 22: Intersection Geometry of Rajkamal Square

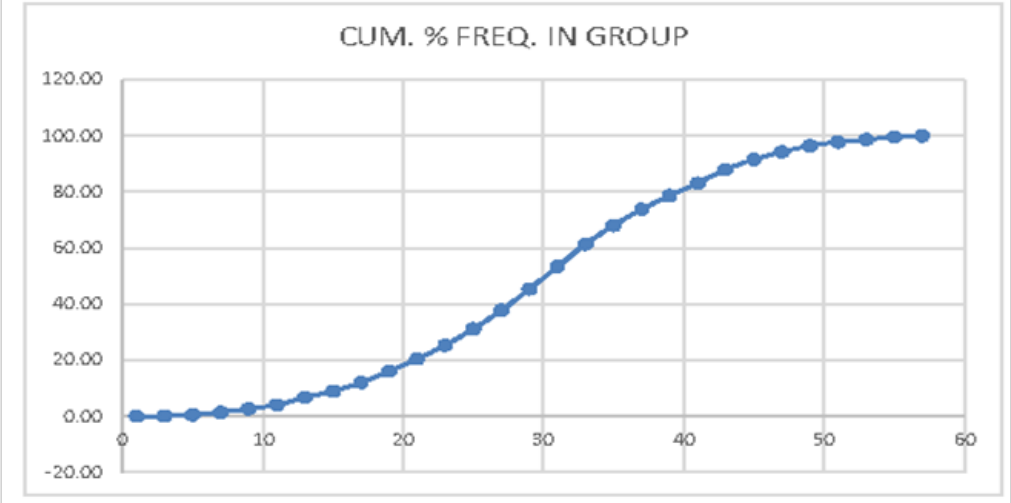


Fig 23: Cumulative Percentage Frequency in Group

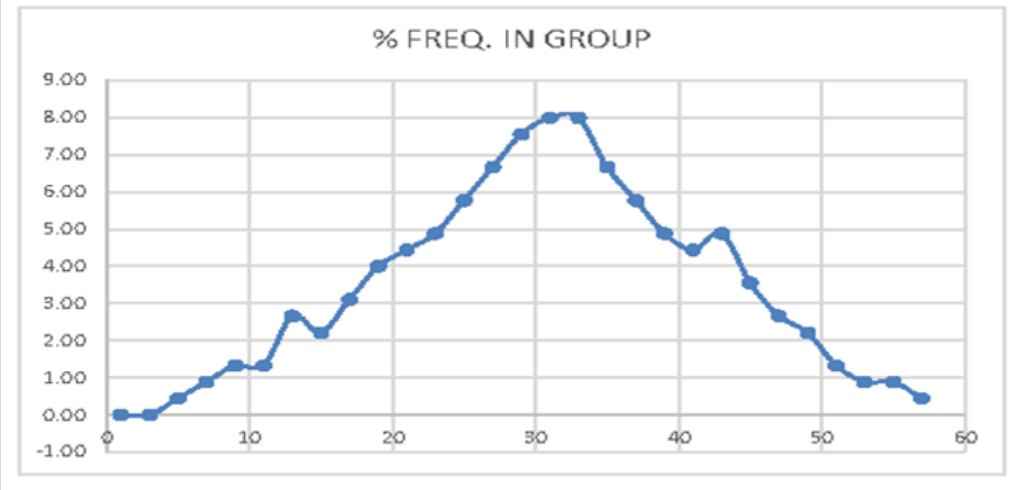


Fig 24: Percentage Frequency in Group

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Intersection 9 –Bus stand square, Amravati

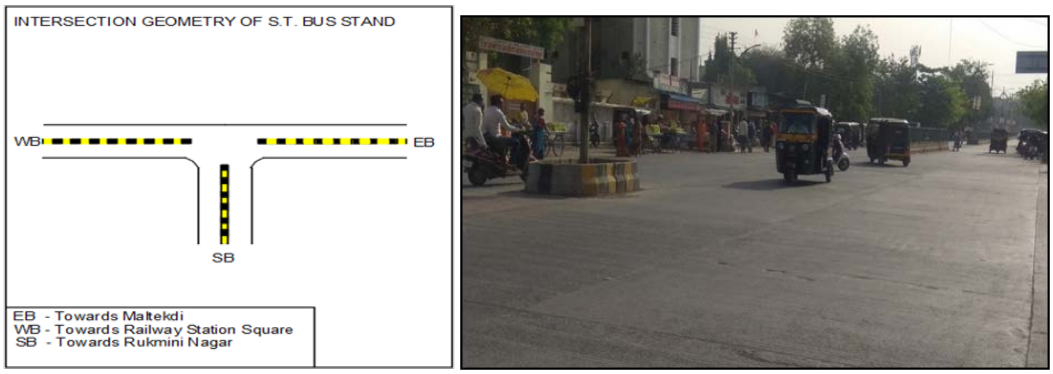


Fig 25: Intersection Geometry of Bus stand square

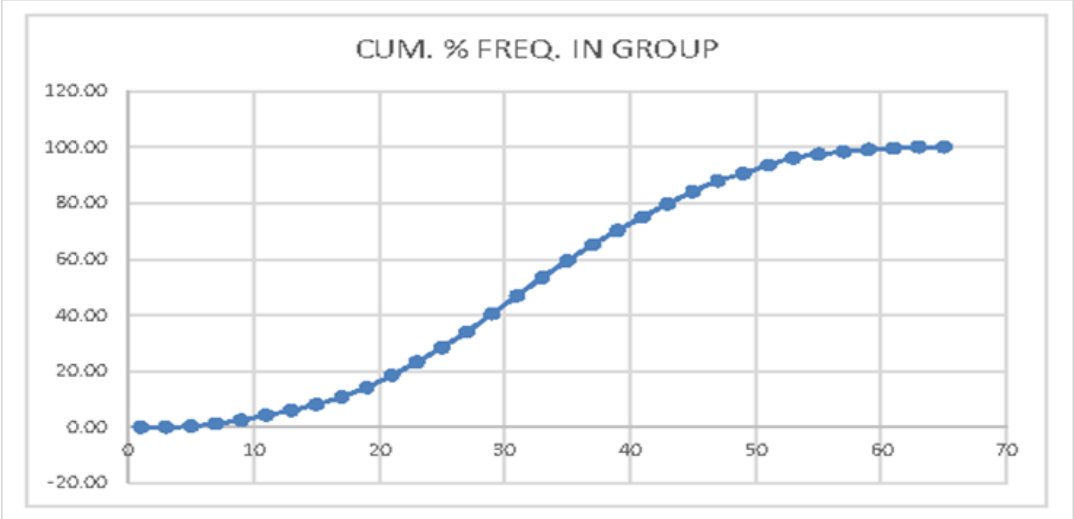


Fig 26: Cumulative Percentage Frequency in Group

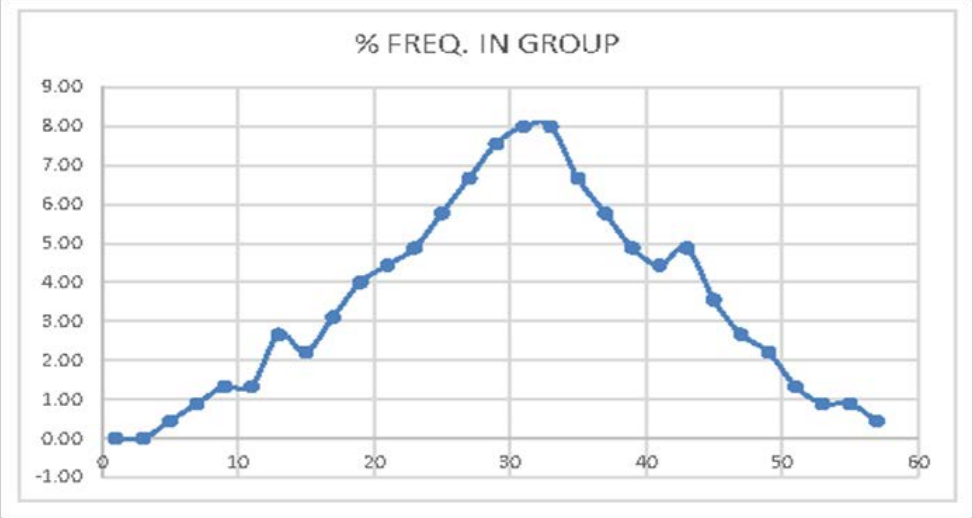


Fig 27: Percentage Frequency in Group

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Intersection 10 – Shegaon naka, walgaon road, Amravati



Fig 28: Intersection Geometry of Shegaon Naka Square

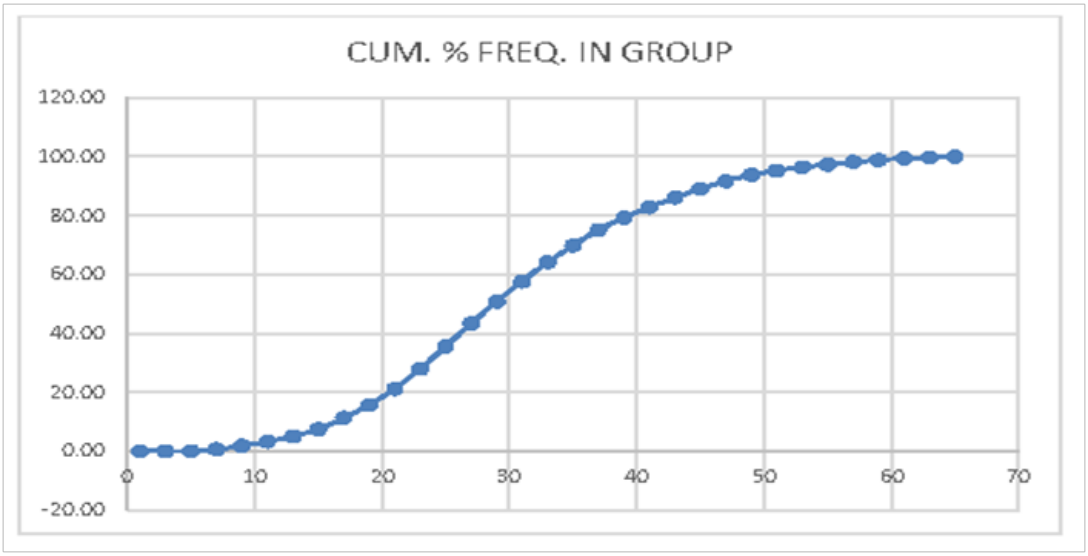


Fig 29: Cumulative Percentage Frequency in Group

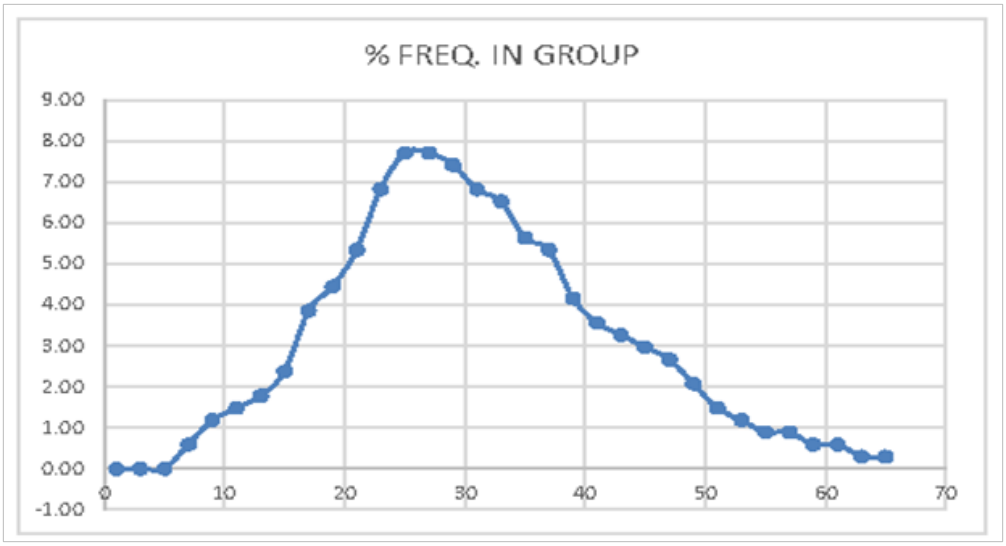


Fig 30: Percentage Frequency in Group

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Intersection 11 – Old Cotton Market Square



Fig 31: Intersection Geometry of Old Cotton Market Square

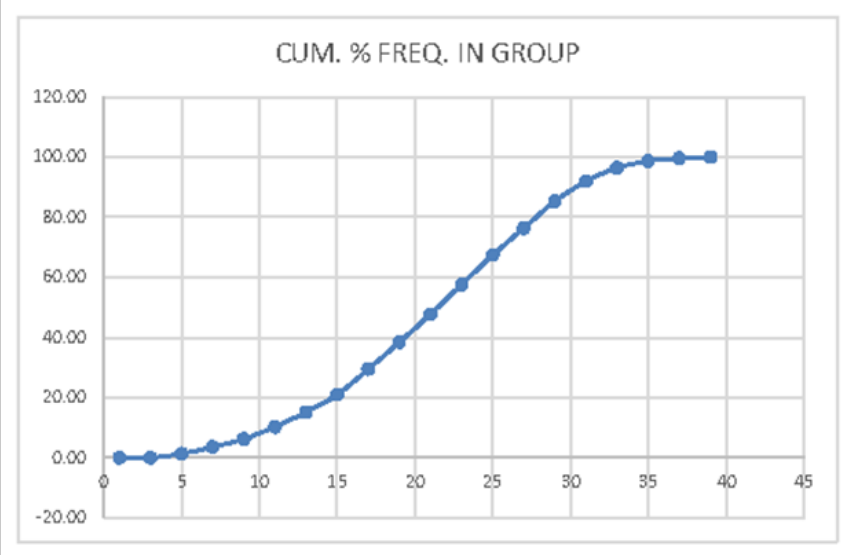


Fig 32: Cumulative Percentage Frequency in Group

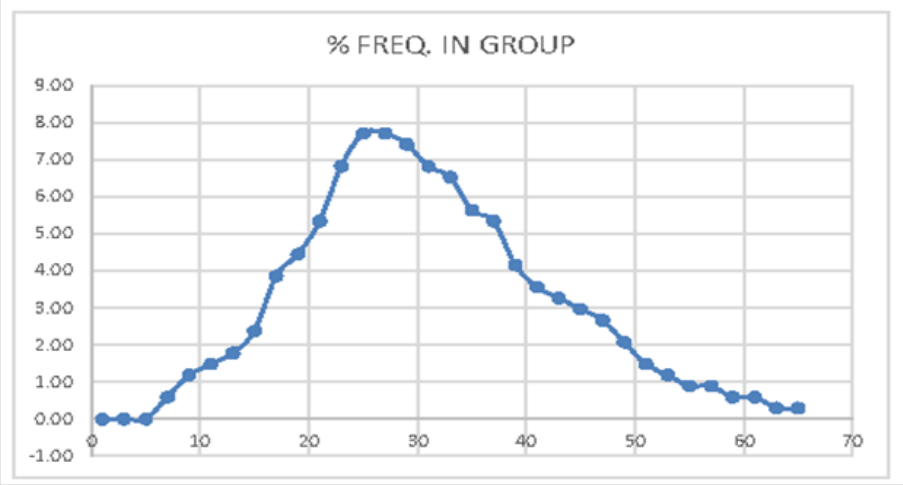


Fig 33: Percentage Frequency in Group

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Intersection12–Welcome Point, Morshi Road, Amravati.



Fig 34: Welcome Point, Morshi Road, Amravati.

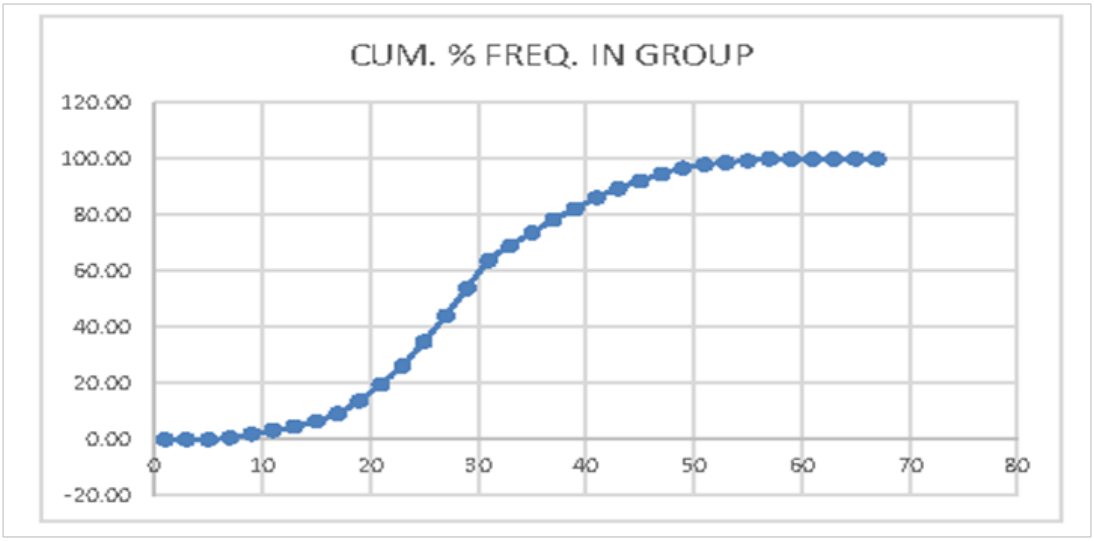


Fig 35: Cumulative Percentage Frequency in Group

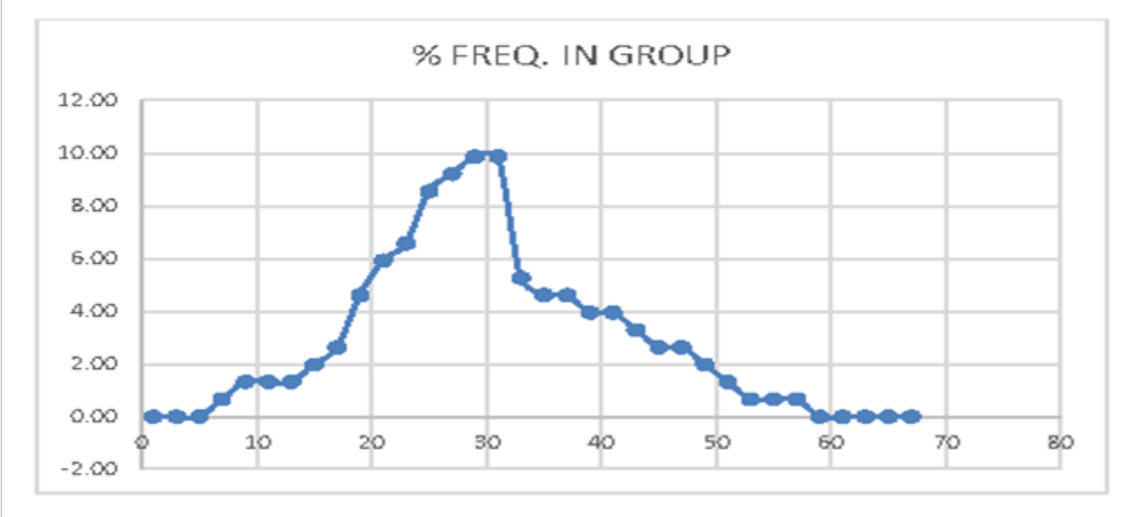


Fig 36: Percentage Frequency in Group

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Intersection13–Yashodhanagarsquare, Amravati

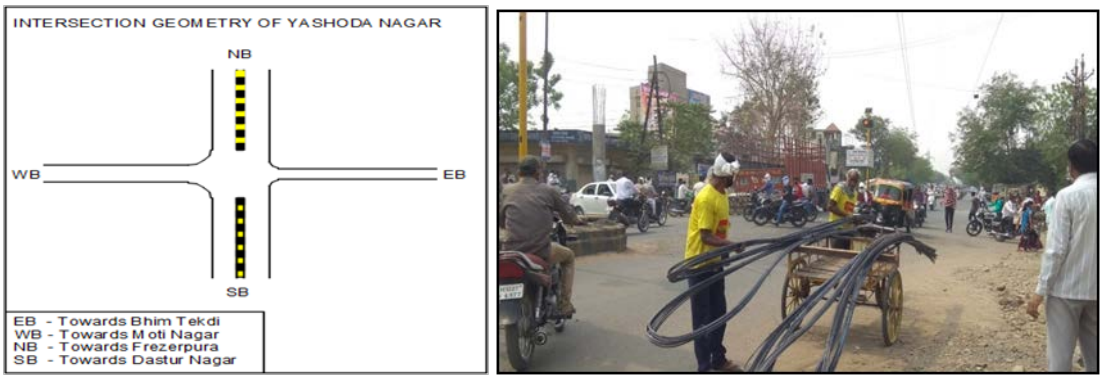


Fig 37: Intersection Geometry of Yashodha Nagar Square

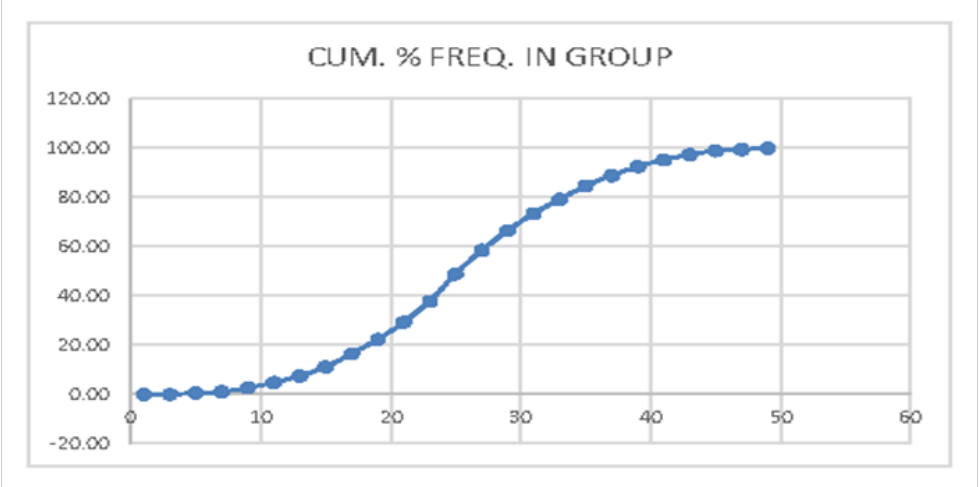


Fig 38: Cumulative Percentage Frequency in Group

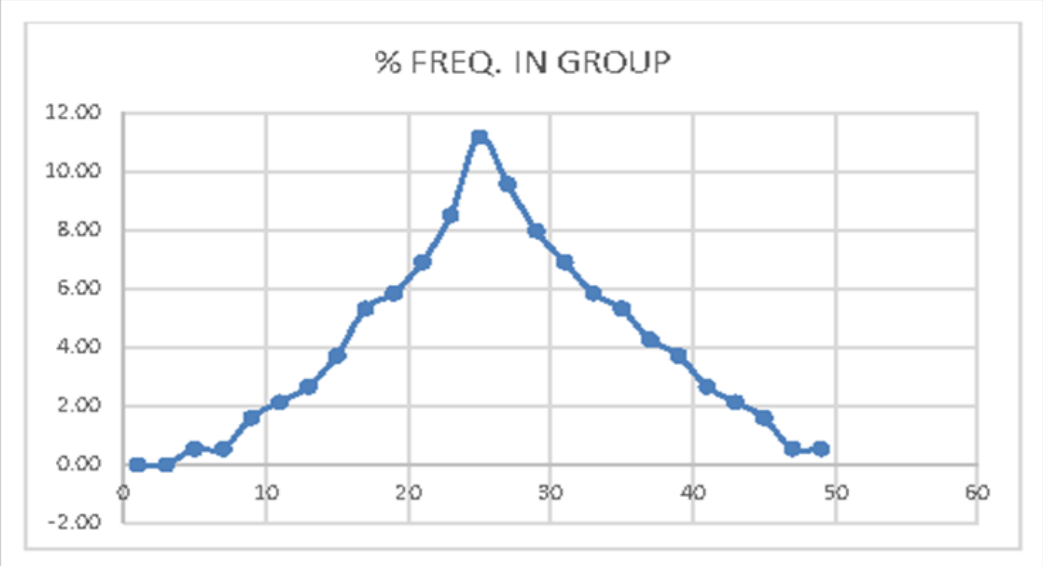


Fig 39: Percentage Frequency in Group

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Intersection14– Irwin Square, Amravati.

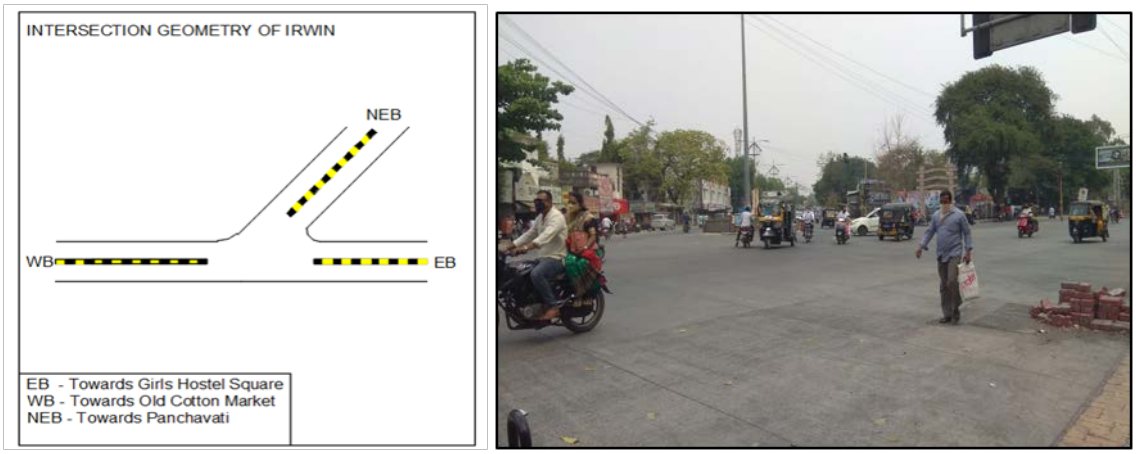


Fig 40: Intersection Geometry of Irwin Square, Amravati

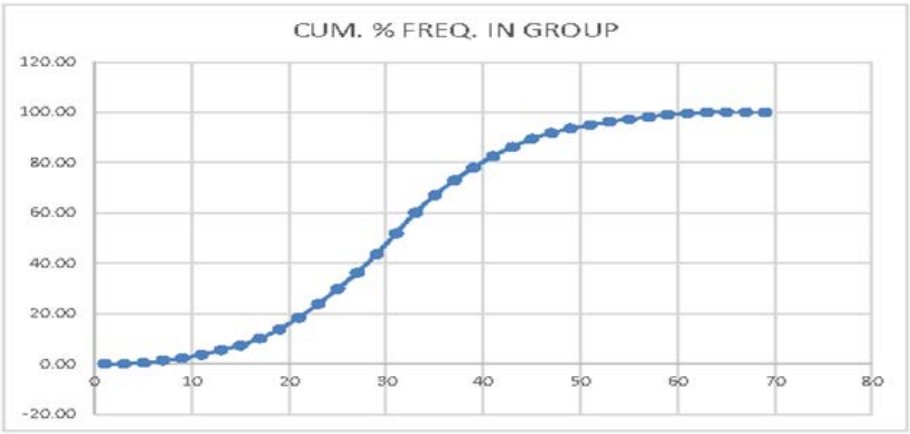


Fig 41: Cumulative Percentage Frequency in Group

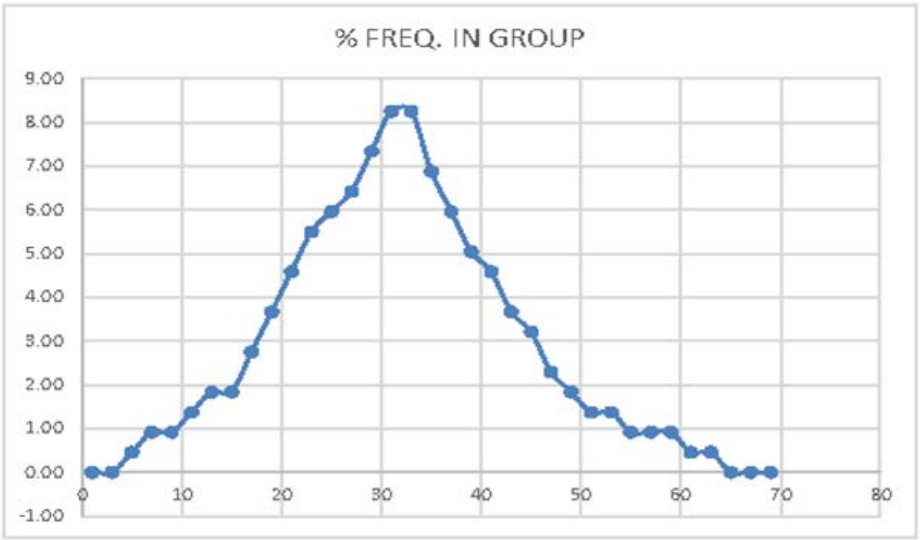


Fig 42: Percentage Frequency in Group

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CONCLUSION

The study discussed in this research was performed in order to understand primary traffic parameters and their features pertaining to vehicle behavior on the two-lane and four lane road. The objective of this research is threefold: to provide a comprehensive review of the studies on Heterogeneous conditions traffic in developing economies, to identify the limitations and gaps in the current understanding of the traffic characteristics and to supply a background and guidelines for the researchers in planning their future studies. It is generally observed that the concepts of Heterogeneous traffic have formed the basis for many of these studies. The following are the important conclusions drawn based on this study:

a) Light vehicles (car, jeep, etc.) occupied 35% of total vehicle
b) Percentage of two wheelers is relatively high
c) Percentage of public transport is very less need to be strengthened
d) PCU value of a vehicle significantly changes with change in traffic volume.

From the above data collected it can be concluded that in Amravati city Irwin square, Rajkamal square, Jaistambh square and old cotton market are the most congested intersection in Amravati city having traffic volume counting in passenger car unit is 2638.5, 1193.4, 1086.25 and 1873 respectively and the spot speed in (kmph) is 50 kmph, 38(kmph), 37(kmph), and 32(kmph) respectively. From that it can be conclude that if the traffic volume is maximum then spot speed is minimum at same point. In India traffic is mixed in nature having level of safety is “F” out of “A, B, C, D, E, F” Thus we need improve loss up to “C”. Thus, we need to form new equation for heterogeneous traffic of India.

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