SHORT TERM ON-STREET PARKING EFFECTS ON TRAFFIC

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Abstract
Every day the vehicular traffic and traffic congestion on roads are increasing in exponential form throughout the world. These traffic problems cause a lot of frustration among the road users and there is disturbance due to parking of vehicles on road users. This on-street parking creates accidents, reduction in road width, congestion, pollution, wear and tear of vehicle and increase in operating cost. Hence, this study aims to investigate the effect of the On- Street Parking on road traffic and how it reduces the efficiency of traffic movement near Educational Institutions. This paper presents traffic and parking data collected near important schools in and around Chennai. The criteria used for selection of location, duration of data collection and method used for data analysis. Volume count, number of vehicles parked, Parking duration, Parking accumulation, legal parking and illegal parking data were collected. A questionnaire survey is also conducted to know about the problems faced by the road users. The collected data is analysed using Statistical Package for Social Science (SPSS) and results are presented.
Keywords: *On-street parking, Accident, Delay, Count survey, Registration survey*

1.0 INTRODUCTION

Economic and population growth have led to urbanization and development of world. Due to which, the demand for local amenities such as on-street parking for developments adjacent to transport corridors has increased. Traffic congestion can be a result of several factors including the lack of capacity during peak periods, disruptions in traffic networks due to breakdowns, road works and traffic control measures. Traffic congestion can be reduced by either controlling the travel demand or increasing the road capacity. The study is focussed mainly on understanding the capacity of on-street parking in schools during peak hours and to analyse the traffic flow due to an on-street parking in order to give a better solution. On-Street parking is a type of parking in which the vehicles are parked on street, anywhere on or along the pavement of streets. Legal parking and illegal parking are two different form of parking followed generally in the study area. The main objective of the study is to find out the effect of on-street parking near school on the flowing traffic and other problems.

2.0 LITERATURE REVIEW

The authors surveyed on-street and off-street parking on Friday and Saturday from 9:00 AM-5:00 PM. The existing parking conditions were analysed and relationships were developed for estimating on-street and off-street utilized parking spaces of selected streets and off-street parking facilities in the study area. The utilized parking spaces showed nearly full utilization of the available parking capacity (Abu and Mahto, 2019). Using a sample of 21 street segments, the authors studied how parking length and demand are distinguished by the characteristics of street and land use. Characteristics were assessed through a field survey, complemented by remote sensing and GIS. This research investigated the ability of remote sensing images to define demand and amount of on-street parking and in analysing how they are affected by several street and land use characteristics. (Ajeng and Gim, 2018)

Aliyah and Aulia have collected empirical data based on a Category Based Classification system for the grouping of period of use, area size and special arrangement of parking spaces. In this study, the region of Pasar Gede provided a technique for spatial usage in the parking area with the flexibility of time cycle and time management (Aliyah and Aulia, 2019). The authors have highlighted issues related to the impact of on-street parking on urban roads and have argued that on-street parking problems are more serious in developing countries, although limited research has so far been conducted in their context. The study highlighted these grey areas and further investigations in developing countries are needed to arrive at a precise quantification of this influence through developing some models or adjustment factors. (Biswas, Chandra and Ghosh, 2017)

The authors focused on heterogeneous traffic flows and roadside activity levels in urban streets, and the primary assumption is that ZoSS will improve the safety of pedestrian crossings by controlling and reducing traffic speeds. This study aimed to quantify the impact of roadside activities and the ZoSS facility on speed behaviour. Findings showed that the number of motorcycles exceeded more than 70% at all locations and that the introduction of the ZoSS was not successful in reducing the speed of vehicles. (Hidayati, Liu and Montgomery, 2012). This study identified the factors influencing the option of car park models for motorcycle drivers in the developing world, Viet Nam. Data were usually collected in a motorcycle-dependent city, Ho Chi Minh (HCM) City. A stated preference (SP) survey was developed and was able to obtain 318 answers from motorcycle drivers. The findings showed that the mixed logit model matches the data of motorcycle users. The impact factors, including the cost of parking, walking distance, queuing time and the efficiency of the parking lot, have had significant effects on the choice of parking actions. (Hoang, Zhao and Houn, 2019)

The authors studied the spatial distribution of vehicle violations in a city that suffers from heavy traffic and highly polluted air pollution. While there are two separate forms of urban segregation in the north and south of the study area, in both areas, around 70 per cent of all curb parks are legal, while the remainder is illegal. The analysis revealed a particular trend of car parking infringements. Also, the spatial analysis revealed a direct relationship between some POIs (Point of Interest) and the occurrence of car park infringements. (Koohpayma *et al.*, 2019). This study aimed to examine the effect of On-street Parking on vehicle velocity and Level of Service (LO). This research was conducted on Cik Di Tiro Street, around Panti Rapih Hospital, Yogyakarta. The analysis of road segmentation was guided by the Indonesian highway capacity manual (1997). On-street parking has a significant effect on decreasing vehicle velocity. The decrease in vehicle velocity has an impact on the level of service. When the traffic volume exceeds or approaches the road capacity, then congestion will occur as shown by the analysis data. (Mustofa and Hidayah, 2020)

The research was performed in three phases, i.e. preliminary survey (determining the time and location of the test), data collection (geometric street data, traffic volume, parking volume, pedestrian volume, number of slow vehicles and roadside vehicle access), data analysis (calculation of street capacity and level of service). The authors concluded that there is an influence of on-street parking activities on the performance of street segments, especially the Kaliurang Street. (Putra and Hidayah, 2019). In order to accommodate large volumes of vehicles, small towns and cities must develop their infrastructures. The authors suggested a systemic survey and management of traffic and pedestrians to decongest roads and solve parking and pedestrian problems. According to the parking report on the current traffic state of the road network, an active transport system exists and must be eliminated from the road parking system. Careless manoeuvring of parking and un-parking leads to accidents referred to as accidents. (Subramani and Jayalakshmi, 2012)

3.0 METHODOLOGY

Parking position is key to making optimal usage of parking lots. One of the major problems near school is on-street parking. Because the duration of parking is very short and most of the time near road only it is followed. On-street parking, such as road width, parking allowed or not, parking period, accumulation of parking spaces, type of vehicle parked, number of people traveling

Chennai has some of the schools with the most prestige and heritage. In the last 10 years, the number of schools in Chennai has increased 35 percent. The schools believe in appointing staff that are well experienced and in synchronise with the current standing of the world and various subjects. Chennai schools fall into two types of administration-government schools called as corporate schools, and private schools. Private schools fall into the following categories: schools with the syllabus of central board, schools with the syllabus of state board, schools with the syllabus of matriculation, schools with the syllabus of Anglo Indian and schools with the syllabus of Oriental. There are two groups of private run state board syllabus schools: self-financing and government-helped schools. Some sections may also be self-financing in certain government-helped colleges.

The locations identified based on the student strength in a school, Number teachers, Number of school buses, number of students using private vehicles and public transport and parking facility available inside school and outside school. Ten schools identified by considering above factors. The parking survey data is collected from these different schools and same presented in Figure 1.

1. DAV Matric Hr Sec School, (Mogappair)
2. Velammal Matric Hr Sec School, (Surapet)
3. Valliammai Matric Hr Sec School, (Anna Nagar)
4. Seventh Day Matric Hr Sec School, (Veppery)
5. Sethu Baskara Matric Hr Sec School, (Pudur)
6. Padma Seshatri Bala Bhavan Senior Secondary School, (K.K Nagar)
7. Sherwood Hall Senior Secondary School, (Chetpet)
8. Alagappa Matric Hr Sec School, (Purasaiwalkam)
9. Nazareth Matric Hr Sec School, (Avadi)
10. Jaya Matric Hr Sec School, (Thiruninravur)
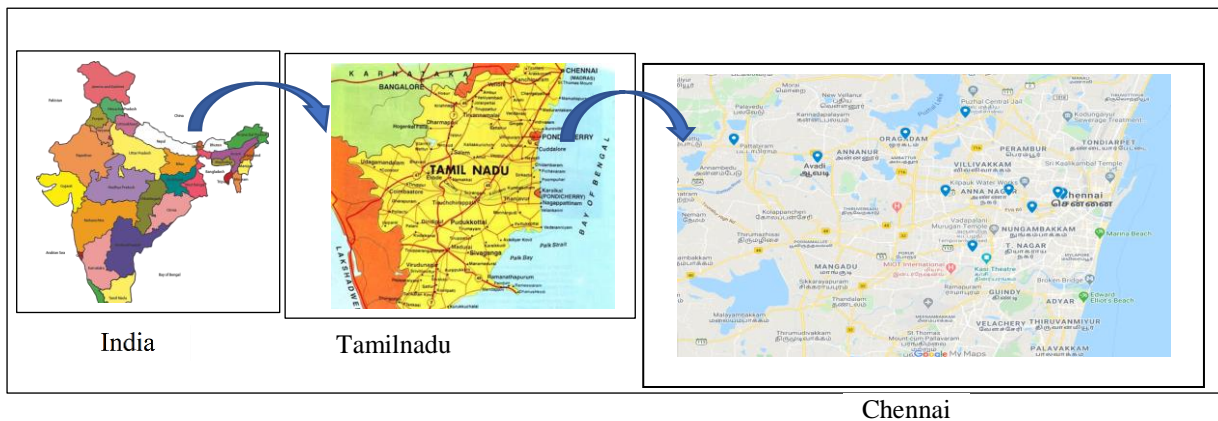

India   Tamilnadu   Chennai

Fig. 1: Study Area Map Showing the Survey Location of Schools

The data is collected at all these 10 different schools in at 8:00 am to 10:00 am (Morning peak hour) and 3:00 pm to 6:00 pm (Evening peak hour) for two days. The data collection is done by count survey and vehicle registration survey for each school to find out the parking duration and parking accumulation.

4.0 RESULTS AND DISCUSSION

The data were collected all ten schools and analysed. Figure 2 show the vehicles are parked around a school in the study area but not authorised parking area. From the Figure 3, it is seen that more than 90 number of vehicles are parked in 8:30 am to 8:45 am and minimum 45 number of vehicles parked in 9:15 am to 9:30 am at School in the study area. In the evening, it is seen that more than 80 number of vehicles are parked in 3:00 pm to 3:15 pm and minimum 15 number of vehicles parked in 4:15 pm to 4:30 pm. Overall it is seen that maximum number of vehicles are parked in the morning during 8:30 am to 8:45 am.

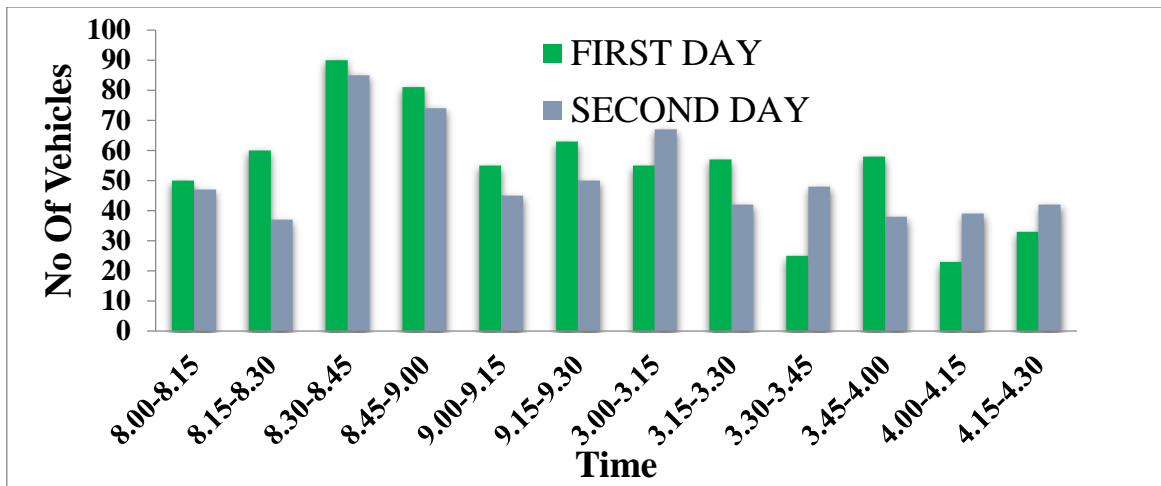Figure 2 Illegal On-Street Parking around School

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Figure 3 Number of Vehicles Parked in the Study Area

Figure 4 shows the percentage of vehicles parked in the study location. It is seen from the figure that the two-wheeler contribution about 54% and shared auto is 28%. Another data collected is parking accumulation. The duration of parking is also collected. In the study area it is observed that vehicles are parked for maximum 30 minutes and minimum 5 minutes. Further it calculated that the average parking time is about 20 minutes.
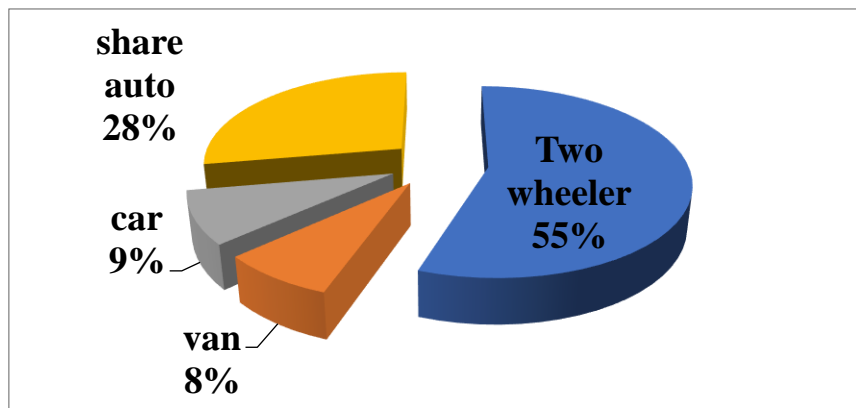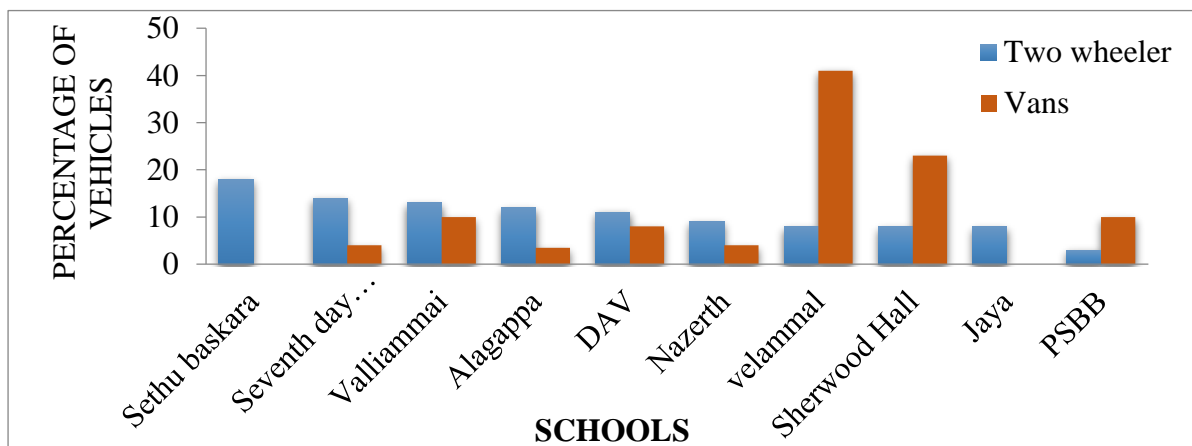

Figure 4 Percentage of Total Vehicles Parked

Figure 5 Percentage of Two-wheelers and Vans in each school

From the Figure 5, it is seen that the school with high illegal parking of two wheelers (18%) is at Sethu Basakara Matric Hr Sec School. Nearly 15% two wheelers are illegally parked in Seventh Day Adventist School and 15% of two wheelers are illegally parked in Valliammai School. The school with least illegal parking of two-wheeler is Padma Seshadri Bala Bhavan School. At the same time, it is seen that maximum number of vans are illegally parked in velammal School (40%). Nearly 25% vans are illegally parked in Seventh Day Adventist School and 10% vans are illegally parked in PSBB School. The least of 4% vans are parked illegally in Alagappa School. It is observed that maximum percentage of vehicles are illegally parked in most of the schools.

Statistical Package of Social Science (SPSS) is used to analyse the relationship between parking is legal or illegal. This method is widely used programme for statistical analysis in social science. It is used for market researcher's health researchers, survey companies, educational researchers etc. This study is used to calculate percentage of vehicles parked illegally around Chennai. Table 1 shows that 55% of the vehicles are parked on left side and 46% of the vehicles are parked on right side.

Table 1 Vehicles Parked on Left Side or Right Side of the School

Side	Frequency	Percentage
Left Side	121	55.3
Right Side	98	44.7
Total	**219**	**100**

Table 2 show the survey observations, it was found that 2783 vehicles are illegally parked in the study area locations. More than half (56%) of the vehicles are Two-Wheelers. Nearly 27% of them are Share Autos, 16% vehicles are Car and Van. On an average 7 Two-Wheelers, 1 Van, 2 Cars and 3 Share Autos are illegally parked in a day for 12 different timings.

Table 2 Mean and Standard Deviation of Vehicles

Particulars	Frequency	Percentage
Two-Wheelers	1556	55.911
Van	217	7.797
Car	249	8.947
Share Auto	761	27.345
Total	2783	100

5.0 CONCLUSIONS

Various types of on-street parking are examined in this study and they are parallel (legal), parallel (illegal) and angle parking (legal). Multiple parking manoeuvre patterns have been observed. The use of various patterns is influenced by various factors such as type of parking, travel distance, presence of parked vehicles, traffic conditions and driver manoeuvre preferences. All parking manoeuvres involving reversing to park relatively took longer time to complete the manoeuvre. Reversing manoeuvre is only required when parallel parking whereas for angle parking reversing is not required. These manoeuvres may cause operational problems such as congestion, delay and possible accidents.

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