REVIEW ON MODE CHOICE BEHAVIOUR FOR EDUCATION PURPOSE

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Abstract: Student's trip pattern is an important component of overall transportation demand. This paper is done for the selected area for the educational land use purpose. Educational trips are one of the main parts of urban trips and planning students' trip is a vital part of urban planning. Schools and Universities occupy large number of population. Urban campus students have travel patterns that are distinct from other members of a city's population. The paper explains the analysis of travel behaviour of students. The current paper's goal is to examine various aspects of students' travel behaviour such as travel cost, travel distance and travel time. This paper also examines the relationship between student's mode of travel and the full range of factors that might affect their mode choice. This paper will provide the review of all literature papers and the travel behaviour, underlying travel patterns, existing mode choices, and factors influencing potential mode switching of students are examined. The routes taken by the drivers will also play very important role in this project. This study also encourages the use of van or bus for the trip purpose of schools.

Keywords - **Mode choice, School trip, Travel behaviour, Travel demand, Urban planning.**

I. INTRODUCTION

Mode choice is the process where the means of traveling is determined. The means of travel is referred to the travel mode, which may be by private automobile, public transportation, walking, bicycling, or other means. This study is about the reviewing the papers related to mode choice behavior for educational purpose, that is, students in schools and universities. Numbers of studies have been done all over the world about the mode choice behavior and numbers of factors affecting the mode choice behavior have been explained.

In first study it was found that low efficiency and poor planning of public transport stimulates car use and motorcycle, and to quantify the trips is useful to support improve measures of infrastructure around to the study center and to ensure short-term mobility.

In another study it was found out that university employees and staff members often have travel patterns that are distinct from other members of a city's population, potentially due to densified living situations. It was found that proximity of residence to campus strongly affected travel mode choice. Other factors were, increase in congestion around the university's campus and parking shortages which affected their mode choice.

It was noticed in the next study that there are various issues related to safety, comfort and over occupancy of children regarding these current travel modes. Traffic blocks especially at the entrances of school and congestion by illegal parking of vehicles during peak hours are the other problems due to van and auto-rickshaw. Because of non-availability of the school bus facility for many primary school children, the parents have to resort to other service providers or they themselves have to spare time for school trips of their children. Students with shorter walk or bike times to school proved significantly more likely to walk or bike, students traveling through areas with sidewalks on main roads were also more likely to walk, school enrollment was not significant after controlling for travel time between home and school, and larger schools may draw students from larger areas and thereby indirectly affect mode choices. Apart from distance, child's age, school affiliation and perceived safety, regular walking/cycling was associated with parents' travel mode to work and with father taking the child to school. Also frequent walking/cycling was associated with child's level of independence and the perceived benefits of active commuting. Also individual, social-environment and physical-environment factors are important in explaining bicycling to school for high school students. Parental encouragement and student's comfort with bicycling are key factors, and perceived distance is more strongly associated with bicycling than actual distance. Commute patterns of the mother is significantly associated with walking and biking to school for children aged 5-14 years. It is also suggested that household interactions are important because children make nearly half of their school trips with a family member and policymakers may therefore want to create programs that allow parents to share chaperoning responsibilities for the school trip to address parental time constraints. Parents and children with negative perceptions of neighbourhood safety tended to use motor vehicles or to escort their children while walking to and from school. The results also reveal that low-income children had a higher rate of walking to and from school, because they would like to avoid travel costs.

The next study revealed vehicle ownership as the prime factor linked with student modal choice conclusions. Local topography and sidewalk availability are to be significantly connected with the appeal of non-motorized transportation for campus commuters. Bicycling is often proposed as the most promising modal switch in a university setting given the often short distances separating off campus student housing and main campuses. It was also noted that bicycle commuting is regarded as an

active mode of commuting, which contributes to reducing CO2 emissions and promoting health. However, excessive bicycle use may increase the risk of traffic accidents between bicycle commuters and cars or pedestrians on narrow streets that do not have a separate bicycle path. Other factors affecting the mode choice are namely; fare, travel time, service quality, comfort, reliability, availability and costs of alternative travel modes, purpose of travel and lastly the level of public transport dependency.

Another study suggests that children are more likely to walk or bike to small schools in walkable neighborhoods than to large schools in remote locations. A study of public elementary school students showed that walking and biking rates were associated with neighborhood population density (positively) and school size (negatively). The number of intersections per street mile was also related to walking and biking rates. It was also found that walking and biking to school were more likely when a household lived within a mile of the school. Walking and biking were less likely when a household had more licensed drivers to provide rides. These were the primary influences on school mode choice. Certain pedestrian friendly design features had positive influences on walking and biking, such as the presence of street trees within a quarter mile of school; other features had negative influences, such as short blocks and mixed land uses. This study also found a significant relationship between mode choice and perceived distance from home to school, with the probability of traveling by automobile instead of by foot, increasing. Household automobile ownership and parent employment status were also significant determinants of school mode choice, as were parental attitudes about the natural environment and automobile culture.

Further studies suggested that weather conditions are a crucial factor in the mode choice decision making process, but only for males. More specifically, there was an observed variation in car usage between the winter and autumn months in males, while females did not exhibit behavioral changes throughout the year.

In this study it is explained that physical activities are necessary for children's health and their walking to and from school can be a source of daily physical activity. During the past decades, walking to and from school independently was a normal practice in most parts of the world. However, in recent times parents are often reluctant to allow their children to walk to school on their own. They are concerned about traffic, road conditions and the lack of supervision. However, children's travel mode will affect their future travel behaviour as an adult, as researches show people stick to their habitual pattern of travel mode. Therefore, children should be targeted to cultivate the habit of walking to and from school in them. This study have showed that for primary school aged children, physical environmental factors are less important than social factors; parents are more worried about their children being abducted rather than being physically injured.

In India, children comprise 39% of the population. India also has the largest student population in the world, with nearly 260 million students enrolled at various levels of school education- primary, secondary, and higher secondary. Hence, school trips can be considered a major factor affecting road traffic. Because most school, university and office timings are similar, educational trips become part of peak hour traffic. Because of various factors, Indian roads pose serious traffic risk. In addition, people belonging to middle- and low-income groups are highly dependent on motorized two-wheelers, which add to the overall traffic risks of road users. These poor conditions contribute to high road traffic injuries among youths.

The travel behaviour of students differs from that of remaining population and the school trips decisions of younger children are done by their parents. Thus, school-going teenagers should be considered as the major stakeholders in transportation policies and studying the travel patterns of this group of schoolchildren is crucial for understanding the travel mode choice decisions. As school students are entirely depended on their parents' decision regarding the transport mode they will use in order to complete a school trip. This paper investigates or analyse the behavioural change of students traveling to and from the schools, taking into account their locations. The various aspects of travel behaviour such as travel distance and travel time are also examined.

Further, understanding the thoughts of contemporary children and parents about travel and their opinions on different travel modes of transport may provide important answers on how to respond to current and future transport needs of students. In many Indian cities including metropolis, auto-rickshaw and van are the main modes opted by the parents for educational trips of students. There are various issues related to safety, comfort and over occupancy of students regarding these current travel modes. Traffic blocks especially at the entrances of campus and congestion by illegal parking of vehicles during peak hours are the other problems due to van and auto-rickshaw. Also in some schools and universities because of non-availability of the van or auto-rickshaw or bus facility, the parents have to resort to spare time themselves for the trips of their children, with the measures of two-wheelers or cars which lead to traffic congestion during the peak hours. There is necessity to change this current scenario and to find the satisfactory solution for travel modes of student's trips which this paper provides by using methods or models from the literature papers reviewed.

This paper is to examine the relationship between mode of travel to schools/universities and the full range of factors that might affect mode choice. In this paper the alternative routes are suggested which could reduce travel time and traffic accumulation during the peak hours. More the number of two-wheelers more is the pollution and traffic hence it is necessary to try to shift the private vehicle users and encourage/promote the use of public transports, or vans/buses provided by schools/universities. This would lead to reduce the trip time, with not much increase in the fare amount. Also problems like over capacity with high fare in vehicles like auto-rickshaws can be avoided.

II. LITERATURE REVIEW

(Singh & Vasudevan, 2018) Nine high schools were selected through random stratified sampling to obtain a sufficient representative sample of a school population, in the city of Kanpur. To collect the data on travel behaviour, this study opted for self-administered (drop-off type) questionnaire survey and then the Multinomial logit model of travel mode choice was adopted. This paper identified that children used non-motorized modes for their school trips if the school was not far and tended to travel by school bus or family vehicle if school was at a greater distance. For students who had to travel longer distances to school, the

objective must be to provide school bus service or reliable public transport, which can accommodate children. Another notable finding of this paper is the "second gender effect" on the travel mode choice. Girls, in comparison to the boys, were less likely to travel independently and odds were high that they would be dropped-off by their parents in personal vehicles. Girls were less likely to use bicycle or auto rickshaw or tempo for traveling to school. The primary survey conducted as part of the paper reveals that the larger section of school children in Kanpur travel shorter distances and opt for the most sustainable modes, namely walking, bicycle and cycle rickshaw.

(Kotoula, Sialdas, Botzoris, Chaniotakis, & Grau, 2017) This paper investigates the behavioral change of students traveling to and from the University in the city of Xanthi, northeastern Greece, taking into account the location of the University. The paper examines the travel patterns, taking into account the relocation of the university premises from the centre of the city (urban environment) to a more isolated area. A questionnaire survey was conducted on a sample of 235 students studying in the University. Different methods were deployed starting from the cross-classification of change of mode, the application of Discrete Choice Analysis, and quadrant analysis. Some interesting findings from the analysis are that students who used a private car for their travel to and from the university did not change their behaviour. The most significant variation was observed on students used to walk to and from the university in the past, while nowadays are mostly using the public transport system or private vehicles, due to the fact that the distance is now longer.

(Sisiopiku & Ramadan, 2017) The University of Alabama at Birmingham (UAB) is taken as the study area, and the methodology selected here is questionnaire survey. 5% percentage of UAB commuters are currently involved in organized ridesharing, approximately 20% of solo drivers expressed an interest and desire to consider ridesharing alternatives, should an opportunity and incentive is presented to them, and an additional 15% of employees are willing to share a ride to the campus with a relative or friend. It is recommended to encourage mode switching. It is recommended to take steps to allow flexible work schedules and encourage telecommuting options for employees and subsidizing necessary infrastructure needed for efficient remote work. There is a need to broaden transit presence and increase availability and frequency of service. It is recommended to increase on-campus shuttle ridership and optimize routes in response to user needs.

(Dibaj, Golroo, Habibian, & Hasani, 2016) Amirkabir University of Technology (AUT) located in Tehran a mega city in Iran is selected as a case study. The methodology includes questionnaire survey and application of Poisson model. Due to small area of AUT, walking is the dominant mode. Most of AUT students use active transportation i.e., Walking and bicycling. The second favourite mode among AUT students is public transit which has a proper level of access in CBD area. Private cars have only 4% of all modal changes among university students according to the location of AUT in CBD area. Off-campus students are more likely to have more activities compared to on-campus students. The students who don't access to a private car are making more activities than students who access to a private car. Students with more household cars make more activities in a day long.

(Quintero, Diaz, & Emilio, 2016) The data was obtained through surveys to a sample of 32 schools in Venezuela. Then, the TGMs (Trip Generation Models) and ANOVA test was performed. The trip generation rates based on the best variables for private, semi-private and public schools could be applied to the different modes, but the car (particular vehicle, school van, and taxi) is which most impact has on adjacent streets to the schools. The TGRs (trip generation rates) adjusted to a normal distribution with more reliability were: cars in private and semiprivate schools, and public transport and walking for public schools.

(Das, Kumar, Prakash, Dharmik, & Subbarao, 2016) The VIT University (Vellore University of Technology) situated in Vellore city is taken as the study area. The web based questionnaire was circulated among the students through online. Average trip rate is more in on-campus residents than off-campus residents. Many factors influences mode choice of students like travel time, travel cost, age, gender, distance, vehicle and license ownership. Among these factors, travel time, travel cost and vehicle ownership play a major role in travel patterns of off-campus residents. Off-campus residents are spending less travel cost for making trips when it compared with the on-campus residents. More than 50% of the students don't want a separate bicycle lane in campus.

(Dave, Raykundaliya, & Shah, 2013) Vadodara city in Gujarat, India is selected as the study area. Total six schools were selected in Vadodara city for study in such a way that the distance between them is in the vicinity of 1.0-1.5 kilometres. A questionnaire survey for N=821 was conducted, and then the Binary logit model was developed. For travel modes of auto-rickshaw and van, there are problems and complaints related to safety, comfort, congestion and driver behaviour to the children and the respondents are required to compromise with travel attributes of the mode. The patronage for auto-rickshaw and van modes for school trips is mainly due to non-availability of school bus as a travel mode for children. The utilization of bicycle is found less in the paper. The probability of shifting to co-ordinated bus mode increases if reductions in travel distance and cost can be achieved. If the pickup point from home is located along the route then willingness to choose this mode increases because expected walk time variable is found significant in the analysis. The computation of revenue and cost analysis for the co-ordinated bus mode indicates that the service is economically viable for morning and afternoon timing of schools among the proposed routes.

(Shokoohi, Hanif, & Dali, 2012) Tehran was selected as the study area and 18 schools were selected for the questionnaire survey. All data was analysed using the statistical program, SPSS, and then the ANOVA test was used. The findings were consistent with results of other studies that showed that the most important dimension of social safety for children's trips to school was parental perception about personal and traffic safety in neighborhoods. The results also indicated, parents who had negative perceptions of neighborhood safety had tended to use motorized modes more rather than walking with their children to and from school. It also revealed that low-income children had a higher rate of walking to and from school, because they would like to avoid travel costs. The findings highlighted although children's travel mode to school varied across different areas, parental perception of safety in the neighborhood did not vary within different income groups.

(Guzman & Diaz, 2005) In Metro Manila, Ateneo de Manila University and Miriam College were selected as the study area. Car usage was found to be the mode choice of the students. Heavy car usage was the focal point of traffic congestion in the paper area. Alternative policies such as carpooling must be implemented to minimize car usage. There is also a need to improve public transport system to be able to motivate the student to switch to it.

(Busari, O.Osuolale, D.Omole, Ojo, & B.Jayeola, 2015) This research assessed the spatial commuting patterns of the three categories of universities in Southwestern Nigeria. This was achieved with the uniform distribution of 3000 questionnaires in all this three universities. In conclusion it was found that, the use of shuttle buses and private cars are predominantly adopted in the three universities considered in this paper. Also based on spatial assessment, the longer the trip, the lower is the frequency of trips. Trip distance is a very significant factor in estimating the travel behavior in a University environment. It can be deduced that the longer the distance the lower is the use of private cars, walking, and bicycles.

(Ewing, Schroeer, & Greene, 2004) In this study, students with shorter walk and bike times to school proved significantly more likely to walk and bike. If confirmed through subsequent research, this finding argues for neighborhood schools serving nearby residential areas. Students traveling through areas with sidewalks on main roads were also more likely to walk. If confirmed, this finding argues for "safe routes to school" sidewalk improvements.

III. CONCLUSION

The factors which affect the mode choice are namely travel time, travel cost and travel distance. For all this factors, the solution is found from the review of all the literature papers.

    i. To use non-motorized vehicles for schools and universities which are nearby. Also walking, bicycling, shuttles are the mode of travel for nearby campuses.

    ii. Due to the gender effect, parents drop their daughters personally in their private vehicles which affect the mode choice. Mode shifting from private to public is necessary in this case. Also use of school provided vehicles, such as bus or van, are suggestible for pick and drop of girls.

    iii. Schools in longer distance of the residence must prefer public transit instead of private vehicles. This would reduce pollution, cost, time. Also this way public transit use can be encouraged.

    iv. Another solution is to provide co-ordinated bus system for nearby schools/universities. Switching the travel mode to co-ordinated bus system will result in the reduction of pick and drop of students with the help of private vehicles, and increase in the usage of bus and van for students.

    v. For school going children, parental control is more as compared to the university students because the university students prefer going to campus on their own. While for school children, the parents prefer vans over auto-rickshaws, as they are less crowded.

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