A STUDY OF MOTORCYCLE TRAFFIC IN DHAKA CITY

BY

MD KAMAL HOSSAIN

A project thesis submitted to the Department of Civil Engineering of Bangladesh University of Engineering & Technology, Dhaka in partial fulfillment of the requirements for the degree.

of

MASTER OF ENGINEERING IN CIVIL ENGINEERING

July, 1996

DECLARATION

I hereby declare that the research work reported in this thesis was performed by me as a research project in partial fulfillment of the requirements for the degree of Master of Engineering in Civil Engineering from University of Engineering and Technology (BUET).

This thesis contains no material which has been accepted for the award of any other degree or diploma from any other institution. Further, to the best of my knowledge and belief, the project contains no material previously published or written by any other persons, except when due reference is made in the text of the project.

July, 1996

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ACKNOWLEDGMENT

All praises to Almighty Allah

This work was carried out under the direct supervision and guidance of Dr. Md. Mazharul Hoque, Professor, Department of Civil Engineering, The Bangladesh University of Engineering & Technology, Dhaka.

The author is greatly indebted to Dr. Md. Mazharul Hoque for his proper, sincere and dynamic guidance and encouragement. Without his valuable direction and cordial assistance it would have been impossible to carry out this study under a number of constrains, time limitation in particular.

The author expresses his gratitude to Dr. M. Azadur Rahman, Professor and Head, Department of Civil Engineer for sincere co-operation and encouragement.

The author likes to express his thanks to Ms. Sania Sharmeen for the permission to use her partial data in this study. I would like to extend my thanks to all the concerned teachers of the Bangladesh University of Engineering and Technology for their kind help and sincere co-operation throughout the course of my study at this university. I am grateful to Md. Shariful Islam, Md. Abul Basher, Gazi Mahedi Hossain and P. K. Das for their co-operation in traffic data collection.

ABSTRACT

Motorcycles serve as one of the modes of transport in Bangladesh and they contributed to an average of 4 percent of total motorized traffic on some major roads in Dhaka. This thesis deals with various aspects of motorcycle traffic in the study area of Dhaka city. In particular, investigation was made on traffic volume characteristics, traffic compositions and their temporal distribution. An assessment was performed on motorcycle rider's characteristics such as sex, age, occupation, trip purpose and trip length. It has also examined motorcycle accident characteristics towards suggesting safety improvements of motorcycle operation and riders.

The hourly motorcycle traffic volume of motorcycle showed considerable variation between the different hours of the day and between locations. The highest proportion of motorcycle traffic was found on Mirpur road, accunting for near 7 percent during 10:00 am-11:00 am. This was followed by 5 percent on New Airport road. In terms of numbers, the maximum hourly volume of motorcycle was found highest (377 motorcycle/hour) on New Airport road, which was followed by Tongi-Diversion road (182 motorcycle/hour). The distribution of motorcycle traffic is characterized as motorcycle with one rider 68 percent, motorcycle with two riders 31 percent and motorcycle with three or more riders 1 percent. Motorcycle with two or more riders were found mostly in morning and evening peak hours.

Overall a total no 5814 motorcycles were observed. The distribution of these motorcycles was 68 percent with single rider, 31 percent with two riders and 1 percent with three or more riders. Average occupancy was thus 1.3 riders per motorcycle in the study area. The field survey showed that overall 57 percent of all riders used helmets and this percentage for motorcycle drivers was about 90 percent. The percentage of pillion riders who used helmets varied between 3 percent and 5 percent. About ninety-nine percent of motorcycle drivers were male. Average distribution of pillion rider was male 79 percent, female 11 percent and children 10 percent.

Road side interview survey using a structured questionnaire was carried out for the study of users' (driver) characteristics of motorcycles. The variables studied include sex, profession, age, trip purpose, use of safety helmet and reason for using motorcycles.

It is notable that 15 percent of motorcycle accidents occurred involving passenger cars. About 21 percent of motorcycle accidents in Dhaka were involved with buses and trucks. Autorickshaws, micro-buses, rickshaws and tempos were responsible for remaining accidents. About 64 percent of motorcycle accidents occurred at straight roads, 25 percent at junctions and the remaining 11 percent were at unknown locations. According to present analysis 68 percent of total

motorcycle accidents occurred at day time and 32 percent at night time. About 53 percent of total accidents were rear-end collisions and 21 percent were side-swipe. Passenger cars were responsible for most of the rear-end collision types of motorcycle accidents. The study recommended some measures for the improvements of motorcycle operation and the safety of motorcycle riders in the study area of Dhaka city.

TABLE OF CONTENTS

CHAPTER 6 MOTORCYCLE ACCIDENTS IN THE STUDY AREA OF DHAKA CITY

CHAPTER 7 CONCLUSIONS AND RECOMMENDATIONS

LIST OF TABLES

LIST OF FIGURES

CHAPTER-1

INTRODUCTION

1.1 INTRODUCTION

Transportation engineering involves a wide spectrum of activities related to planning, designing, operation, control, management, maintenance and rehabilitation of multimodal facilities and services. Transportation facilities and services are needed for the safe and efficient movement of people and goods and providing basic mobility as well as accessibility to places of work, business and recreation. Transportation services are particularly related to social and economic opportunities which are vital to our standards of living and national economy.

At present, five modes of transport operate in Bangladesh. These are railway, road, inland water, maritime and air transport. The share of transport (both for passenger and freight) on road compared with other modes has been increasing steadily since 1971. In 1975, the share for total passenger traffic was 54 percent while the share of freight was 34 percent. The large scale shift of traffic from other modes (viz. rail and water) to road has resulted in enormous problems (viz. traffic congestion, delay and accidents) in safe and efficient movements of persons and good on road network. The problems are of great concern particularly in the urban areas. In addition, the process of rapid urbanization in conjunction with socio-economic parameters has resulted in an

ever-growing demand for transport and traffic services. (Hoque & Ahmed 1993)

The urban transport system in Bangladesh is predominantly road based with different types of motor vehicles viz. buses, minibuses, trucks, cars, autorickshaws, motorcycles etc. and non-motorized slow-moving vehicles viz. animal drawn carts, push carts, cycle rickshaws, rickshaw vans and bicycles. The motor vehicle composition is characterized with the dominance of motorcycles and motor cars. According to the 'The Statistical Year Book of Bangladesh 1994' about 42 percent of the registered motorized vehicles in this country are motorcycles. Traffic surveys in Metropolitan Dhaka revealed that the proportion of motorcycles on major roads varies between 3 and 7 percent. In 1993 the total number of registered motorcycles in Bangladesh was 1,65,000. The yearly registered number of motorcycles in Metropolitan Dhaka appears to be around 4100. The number of registered motorcycles in this country has increased tremendously in the past years with an average of 9.0 percent per year in the period 1986 to 1993. Due to the increasing number of motorcycles in conjunction with other vehicles, a number of undesirable and unwanted side-effects have developed. Of the most significant are the problems of severe traffic congestion, environmental pollution, road traffic crashes and their resulting fatalities and injuries.

From the above statistics it is apparent that motorcycles must be considered as a predominant traffic mode in formulating

transportation policies as well as in infrastructure design, traffic management and control strategies.

As a consequence in-depth research studying on vehicular movement, vehicle operational characteristics, modal usage and user characteristics have emerged as an urgent necessity. Of particularly significance in carrying out such studies is to focus on specific users or specific modes. Accordingly this study aims at to investigate in detailed the motorcycles as a travel mode, particularly the usage and its rider characteristics.

1.2. DEVELOPMENT OF MOTORIZED VEHICLES IN BANGLADESH

Traffic in Bangladesh is characterized as heterogeneous in nature. This comprises both motorized and non motorized vehicles. In Bangladesh different types of vehicles are found in traffic stream. These are passenger cars, single unit trucks, buses, mini-buses, motorcycles, tempos, baby taxis, mishuks, rickshaws, bicycles and pushcarts. Official statistics revealed that the number of motorized vehicles in Bangladesh was about 3,97,000 in 1993. Of these there were motorcycle about 1,65,000. The number of all motorized vehicles in this country has increased on an average of 7.0 percent per year over the period 1986-1993. However there has been a dramatic increases in the motorcycles. Motorcycles increased 8.8 percent per year in the period 1986 to 1993. Trends analysis of motorized vehicles has been given latter in chapter 3.

The number of motorcycles in metropolitan Dhaka were around 26076 in the year 1991 (see Table 1.1). About 24.5 % of motorized vehicles in Dhaka were motorcycles in the year 1991. Apart from these motorized vehicles, estimated number of rickshaws in Dhaka city were believed to be around 4,00,000 in the year 1992.

Table-1.1

Motorized vehicles by type on roads in greater Dhaka

Item	Total number (1991)	% growth 1990-91
Motor Car	26376	3.64
Jeep(Jeep/Station wagon/Microbus)	14336	6.65
Taxi	1531	5.08
Bus	4792	2.11
Mini-bus	3946	4.64
Truck	9961	3.86
Auto-rickshaw/tempo	18744	18.52
Motorcycle	26058	8.30
Other	804	1.90
Total	106548	8.26

Source: BRTA(Developed in cooperation with DITS and BBS)

1.3 SIGNIFICANCE AND OBJECTIVES OF THE STUDY

The proposed research aims at the detailed investigation of motorcycles as a travel mode with special emphasis on their riders characteristics in Dhaka city. The results that are obtained from this study are expected to contribute significantly towards understanding the behavioral patterns and characteristics of motorcycle travel in Dhaka. This knowledge is essential for policy

framing which is not presently available. The study is also expected to provide insights into the safety aspects of motorcycle riders. These results will assist in the development of safety programs and policies for reducing the casualties and mortalities among motorcyclists, particularly by the application of measures related to scientific traffic engineering.

The specific objectives of the research are:

i) to obtain detailed traffic data from selected major roads of Dhaka city and conduct field interviews on motorcycle riders.
ii) to assess motorcycle traffic volumes and their distributions with respect to time period by location, patterns of motorcycle use (trip purpose, distance travelled etc.).
iii) to determine average occupancy of motorcycles and rider characteristics (e.g. age distribution, sex, occupation, trip purpose, use of safety helmet etc.).
iv) to examine the motorcycle accident characteristics towards suggesting safety improvements of motorcycle riders as well as motorcycle operation.

1.4. ORGANIZATION OF THESIS

Apart from this chapter, the remainder of the thesis consists of six chapters and an Appendix. The chapters are organized as follows:

Chapter 2 includes the literature review in the light of transportation studies in Bangladesh and overseas research on usage of motorcycles and their users characteristics.

Chapter 3 discusses the study area and methodological concepts. Traffic studies and the methods for conducting such studies are briefly highlighted in this chapter. It also explained the methodology used in this study.

Chapter 4 gives an overview of a number of variables that have been used for the purposes of traffic data analysis. This chapter also examines motorcycle traffic volume characteristics and their distributions with respect to time period and by location.

Chapter 5 discusses the method which has been adopted for the study of users' characteristics of motorcycle. This chapter also examines the patterns of motorcycle use (trip purpose, distance travelled etc.) and assesses the motorcycle rider (driver) characteristics (e.g. sex, age distribution, occupation, use of safety helmet, etc.).

Chapter 6 presents the analysis of motorcycle accident characteristics. It assesses motorcycle accidents with regard to type of striking vehicle, accident by road geometry, age and sex of motorcycle rider, time of day and lighting condition etc. This chapter discusses the factors involved in motorcycle accidents.

Chapter 7 gives the summary and conclusions of the study. Some recommendations were made in this part to reduce the number of accidents and casualties relating to the motorcyclists.It also provides some recommendations for future studies in these areas.

CHAPTER- 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter presents a review of literature on transport studies with special emphasis on motorcycle traffic, particularly motorcycle usage and its rider characteristics. An attempt has been made to collect the published documents on relevant research studies and investigation carried out both within Bangladesh and overseas. After reviewing most relevant information and striking features of the literature are abstracted in this chapter.

2.2 THE NATURE OF TRANSPORT STUDIES IN BANGLADESH

Before entering in to the theme of the present study, it is desirable and informative to review the past transport studies in Bangladesh specially those relating to Dhaka metropolitan city. This section summarizes those studies.

2.2.1 Traffic Management and Safety

Ahmed (1980) discussed different aspects of failure in traffic management and administration for Dhaka city. It was found that existing transport facilities are not adequate to meet the travel demand and mixed mode situation has resulted in traffic

congestion and less safety. Suggestions for modifications of traffic management and policies have been made.

2.2.2 Home-based Trip Generation Modeling for Dhaka City

Esrar (1992) investigated the factors that are responsible for the selection of particular transport mode. In particular, Esrar's study analyzed the travel behavior of a number of households from some particular localities in the metropolitan Dhaka. It was found that total family income is the most important factor in determining its members' choice of appropriate transport mode for different trip purposes. Other factors those influence selection of travel mode are age and sex, transport ownership pattern etc.

2.2.3 Study on Urban Public Transport

Ahsan (1990) in his study investigated the status of the public transport systems in metropolitan Dhaka. Particular attention had been given to examine the necessity of a functional and cost effective 'mass transit' system. It pointed out that the existing mass transit system needs to be expanded in terms of both fleet size and route network. It also recommended to improve maintenance facilities, stop and terminal layouts, the quality of services and development of more advanced form of transit facility such as rapid transit system.

2.2.4 Planing and Policy Study

Though Dhaka is very old city, detailed study and research based on planing of the city is relatively few. The first on road network planing 'Dhaka City Master Plan' was made in 1964. In this study along with recommendations for the design and construction of the road, some suggestions were made on traffic control and traffic management.

Baquee (1979) conducted a study regarding traffic problems in old Dhaka city. It was a comprehensive study on nature, cause and probable solution of congestion in old Dhaka city. She recommended some traffic management techniques to solve the problems-such as time restriction for the related vehicles, parking provision's improvement, one way street system, banning of selected vehicles from selected roads, etc.

Shankland Cox Partnership (1979) study: It is a comprehensive study on transport development in metropolitan Dhaka, emphasizing on construction and management of road network. It also described physical characteristics such as capital cost, vehicles service life and capacity of different modes in the city area. Furthermore it suggested to include special design considerations for rickshaw in road construction.

Shankland Cox Partnership (1980) made a study on engineering infrastructure for flood protection in metropolitan Dhaka. It

suggested for surface railway on the proposed flood protection embankment.

2.2.5 An Overview

In Bangladesh only a few studies have been made on the transport sector. Of them, however, the urban sector transportation is richer than the rural sector and also public transport sector was given more emphasis than private sector. But these studies are not adequate to provide a comprehensive picture of urban passenger transport situation. Studies, concerning transport situation of metropolitan Dhaka, are mostly related to the transport inventory, traffic management and safety problems, and physical characteristics of different modes. None of them is related to the usage of motorcycle and its riders characteristics.

2.3 OVERSEAS RESEARCH ON MOTORCYCLE USER CHARACTERISTICS

2.3.1 Analysis of Motorcycle Riders in Thailand

Ishido (1986) conducted a study regarding motorcycle riders all over Thailand. He pointed out on the number of riders per motorcycle and the ratio of riders wearing helmet in the sub urban and urban area in Thailand. He carried out a comprehensive field survey and made analysis regarding the characteristics of motorcycle riders such as average number of riders on a

motorcycle, average helmet ratio of motorcycle riders and distribution of male, female and children riders. The results of field survey revealed that average occupancy of motorcycle was 1.4 riders/motorcycle, overall 45 percentage of all motorcycle riders used helmet, ninety nine percent of motorcycle drivers are male and average distribution of male, female and children riders are 50 percent, 40 percent and 10 percent respectively. Field interview survey of motorcycle present that average trip length was 16 km and average occupancy of motorcycle was 1.36 riders/motorcycle. This study attempts to highlight above items in the concepts of Dhaka.

2.3.2 An Analysis of Road Traffic Fatalities in Delhi, India.

Mohan and Bawa (1985) made a study on road traffic fatalities in Delhi. This study was an attempt to understand fatal crash patterns in Delhi in 1980 using police data. The results pointed out that fatalities patterns in Delhi were very different from those in highly industrialized countries. It also described that pedestrians, two-wheeler riders and bus commuters comprise eighty percent of fatalities. This study suggested some short term and long term measures to reduce traffic fatalities.

2.3.3 Regional Comparative Study of Motorcycle Accidents with Special Reference to Licensing Requirements

Mclean et al (1990) made a comprehensive study of motorcycle accident in Adelaides, Kuala Lumpur, Singapore and Suita. This study described the effect of licensing requirements for motorcyclist on the risk of serious injury in the first year of riding compared to the subsequent year of riding. It was found from this study that riders operating on a learner's permit had the highest risk of injury followed by those in their first year of riding. It described the reasons of differences in average level of injury severity among riders injured in the four cities (i.e. Adelaides, Kuala Lumpur, Singapore and Suita). Results of this study has discussed in chapter 6. Recommendations were made to reduce the casualty and mortality rates among the motorcyclist.

2.3.4 Impact of Ride-Bright Campaign and Regulation on Motorcycle Accident in Malaysia

Umar and Sohadi (1993) made a comprehensive study about motorcycle accidents in Malaysia. According to their analysis about 50 percent of motorcycle accidents in Malaysia occurred at junctions and 38 percent of incident involved other vehicles crossing motorcycle's paths especially at junctions. Based on the above analysis, the hypothesis on motorcycle conspicuity was strongly proposed and a nation-wide "Ride-Bright" Campaign and Regulation were implemented in July and September, 1992, respectively. Detailed analysis on the impact of "Ride-Bright"

Campaign and Regulation in the districts of Seremban and Shah Alam are presented in this paper.

2.4 CONCLUDING REMARKS

A review of this literature reveals that no research has been conducted on the usage of Motorcycle and its rider characteristics in Bangladesh. Overseas research provided some insights into the motorcycle user characteristics in Thailand, comparative assessment of licensing requirements, riding experience and its effect on safety in south east Asia and Pacific region cities. Aspects of motorcycle conspicuity in Malaysian context were also reviewed.

CHAPTER - 3

STUDY AREA AND METHODOLOGY

3.1 INTRODUCTION

This chapter discusses the study area and methodological concepts. Traffic studies and the methods for conducting such studies are briefly highlighted. Methodology used in this study is also explained.

3.2 THE STUDY AREA

This study is be based mostly on information that has been collected from the field traffic survey. Secondary data has been gathered from the published literature (international and national research reports). As mentioned earlier, field surveys were carried out on the selected major roads of Dhaka city. These survey sites are mostly located on Tongi-Diversion Road (Dhaka-Mymensingh Road), New Airport Road and Mirpur Road. These road locations are shown in Fig 3.1.

Tongi-Diversion Road connects the Moghbazar area to Mohakali area through Tejgoan industrial area. All types of vehicle movements are permitted on this road. Many industries have been established in the Tejgoan area on either sides of this road.

New Airport Road is one of the most busy roads in Dhaka and is the main thoroughfare for the motorized traffic movement. Movement of Rickshaws and rickshaw vans are restricted on this road. This road connects the city with the northeast part of the country. The study data was collected from the section between Farmgate to Mohakhali of the road.

Mirpur Road is a part of the Asian Highway which connects the city to the northwest part of the country. This road passes through Azimpur, Shamoli, Dhanmondi, Kalabagan and Mohammadpur area. The movements of all types vehicles are permitted on this road.

ROAD MAP OF STUDY AREA

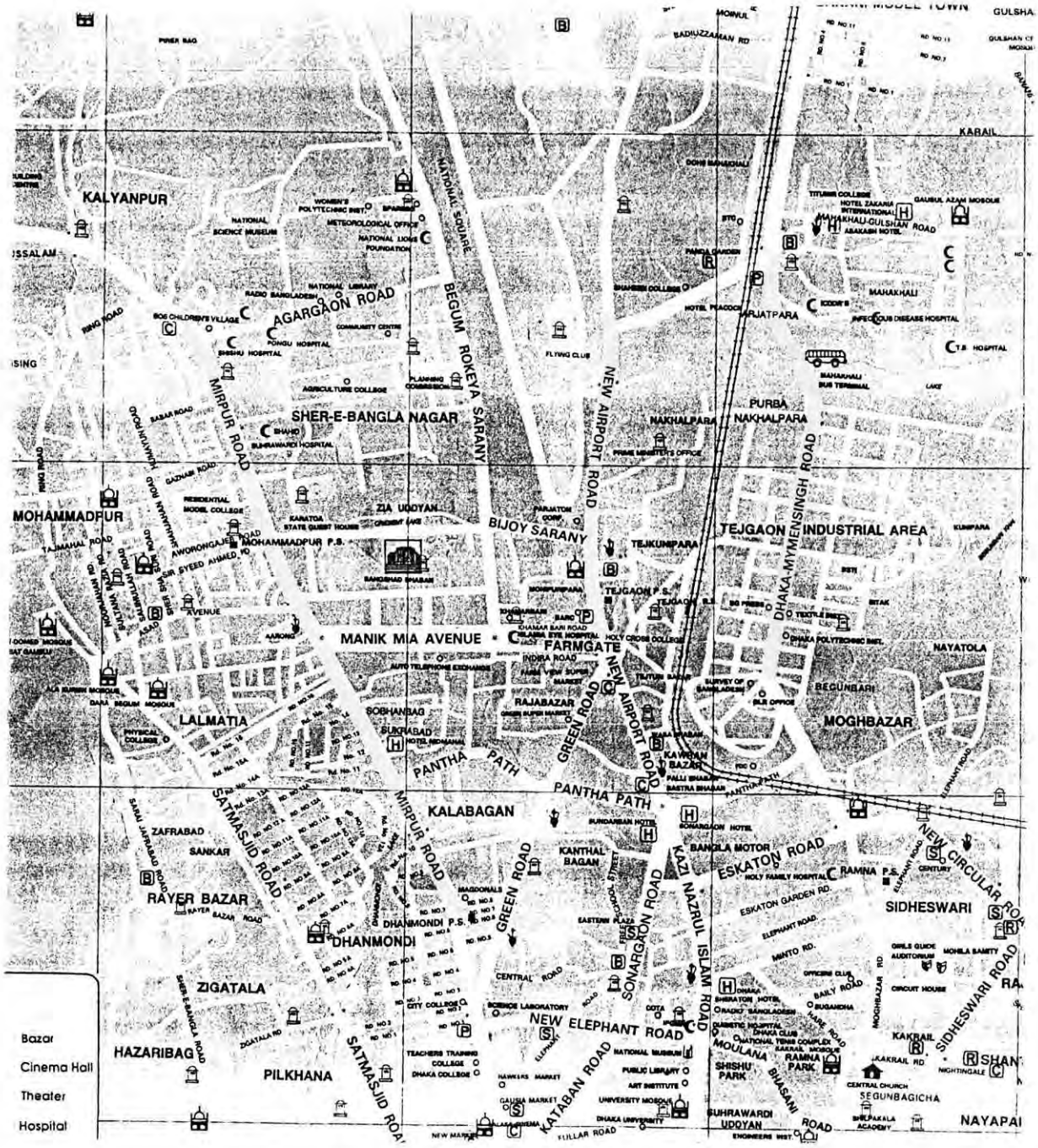

Fig 3.1:Part of the road network of metropolitan Dhaka showing the selected roads for traffic survey.

Source: Dhaka city guide map

3.3 METHODOLOGY

There are various methods for traffic studies. This section briefly highlights such methods with particular emphasis on the methodology used in this study.

3.3.1 Methodology for Traffic Studies

A traffic study is the collection and analysis of measurable factual data relating to traffic and its characteristics (NAASRA 1976).

The more common types of traffic studies are:

(i) traffic volume counts
(ii) origin and destination studies
(iii) speed studies
(iv) travel time and delay studies
(v) accident studies and
(vi) parking studies

This studies are of vital importance for determining the trends and characteristics of traffic on road. A complete transportation study would involve these and other studies conducted on an area basis of determine the patterns of land use. Vehicle ownership and use, trip generation, and other demographic and socio-economic characteristics which affect traffic.

In addition, many others studies such as axle load and lateral placement of surveys, driver and vehicle characteristics may be

carried out to examine special problems as the needs arise. When carrying out many types of traffic surveys useful supplementary information can be recorded on still of cine film, or video tape.

Depending on the purpose, such surveys may be carried out in one of several ways.

Table 3.1 provides a list of survey methods used to collect data on these traffic studies. Some survey types will be used to gather data on sets of parameters simultaneously. There is an obvious need for some integrating methodology to draw the techniques together.

This study is predominantly concerned with traffic volume studies as well as surveys of motorcycle users on the roadside.

Methods of traffic volume counting

Traffic volume counts are made to determine the number of vehicles passing a point. These traffic volume counts can be carried out either manually or by automatic traffic counters. Manual are usually undertaken at points where it is necessary to record the proportions of vehicles as well as traffic volume, at intersections where the volume of the various turning movements is required, or at sites being investigated for installation of pedestrian crossings and guard-controlled crossings.

Table-3.1

Survey methods used to collect data on given traffic studies

Traffic Parameters	Survey Methods
Volume	Link-based counts by time of day Junction turning movement studies Vehicle occupancy Pedestrian and bicycle counts
Speed, Delay and Queues	Radar surveys, enoscope surveys, amphometer survey, video surveys, floating car, chase-car, number plate surveys, input/out put surveys, path trace, interval-based queue length, event-based queue length
Heavy Vehicles	Vehicle classification, axle weight, vehicle dimensions
Concentration	Volume-density, lane occupancy
System inventory	Street characteristics, junction control, parking restrictions
Trip generation	Household interview, postcard, residential and employment densities by area
Parking Supply	Capacity, Cost by time and location
Parking Demand	Parking duration, spatial duration of demand, temporal duration of demand
Safety	Traffic conflict, driver behavior, regulation observance
Environmental Factors	Spatial and temporal distributions of noise, air quality and vibrations
Energy	On-road fuel consumption, dynamometer
Origin-destination	Number plate, cordon identification, roadside interview, postcard
Public Transport	Travel time and delay on-board, passenger loading/unloading, passenger origin-destin.

Source: Traffic survey methods by Taylor A. P. 1984

Equipment used in automatic counts normally consists of a devices to detect the passage of axles or vehicles, and a metering device to recording the number of axles or vehicles detected. Cost of

manual counting is very much greater than automatic counting and is generally not practical for long duration.

Roadside interview survey

In general, an interview survey is define as one in which an interviewer is present to actively assist the respondent in providing answers to a series of questions. In the roadside interview drivers are stopped and questioned about the origin, destination, purpose, etc. of their trip.

3.3.2 Methodology Used in the Study

This study was based mostly on information that was collected from the field traffic surveys. Secondary data were gathered from published literature (international and national research reports). As mentioned earlier, field surveys were carried out on selected major roads of Dhaka city by the field observations and roadside interview. The survey locations are on Tongi-Diversion Road, Old Airport Road and Mirpur Road. There are various methods of traffic volume studies. They may be manual counting or automatic counting. For this research work manual counting is made. Field assistants were posted at different sections and asked to count and record the number of vehicles in different categories in a prescribed form.

The motorcycle riders (drivers) interview survey was also conducted on the selected roads by using a questionnaire. Questionnaire survey are probably the most widely used form of survey technique in transport. Questionnaire surveys are defined to

be those which the respondent completes without the assistance of an interviewer. The chief advantage of a questionnaire survey is its relatively low cost compared with an interview survey.

There are several variations of the basic questionnaire survey format depending on the methods used for distribution and collection of the questionnaire forms. These variations include:

(a) Mail-out/Mail-back

(b) Delivered to responded/Mail-back

(c) Delivered to responded/Collected from responded

(d) On-board transit vehicle distribution/Mail-back

(e) Roadside distribution/Mail-back

(g) Activity centre distribution/ Mail-back

(f) Media (e.g. newspaper) distribution/ Mail-back

None of the above forms could be used in the study. Desired information was recorded by the filling questionnaire(designed for the study) through interviewing at roadside (as highlighted earlier).

The roadside interview survey covered the following main items:

i) driver, male or female

ii) age and occupation

iii) trip purpose

iv) travel distance

v) number of riders with or without helmet

vi) origin and destination

v) occupancy of motorcycle

vi) reason for using motorcycle etc.

It was also necessary to have the data on traffic accidents involving motorcycles. Data on accidents exclusively related to motorcycles were difficult to obtain from the relevant sources viz. Police Department as well from the BRTA. As such some accident data collected by Sharmeen (1996) were used for the purpose of accident analysis.

CHAPTER - 4

ANALYSIS OF MOTORCYCLE TRAFFIC DATA

4.1 INTRODUCTION

This chapter presents an overview of the trend analysis of motorized vehicles in Bangladesh with particular consideration of changes in motorcycle growths. Details of field data collection and analysis of traffic volume characteristics are also presented. Most striking features of traffic analysis include hourly volume of motorcycles and all other vehicles, occupancy of motorcycles and distribution of pillion riders.

4.2 TRENDS ANALYSIS OF MOTORIZED VEHICLES

As highlighted earlier in chapter 1, the number of registered motorized vehicles in this country has increased tremendously in the past years with an average of 6.7 percent per year in the period 1986 to 1993. In 1993 the estimated total number of motorized vehicles in Bangladesh was around 3,97,000. The distribution of different types of motorized vehicles and their increasing rates are presented in Table 4.1 and Table 4.2. Motorcycles contributed about 42 percent of the registered motorized vehicles in this country. In 1993 the total number of registered motorcycles in Bangladesh was 1,65,000. The yearly registered number of motorcycles in Metropolitan Dhaka is appeared to be about 4100. The

number of registered motorcycles in this country has increased tremendously in the past years with an average of 8.7 percent per year in the period 1986 to 1993. Trends in growths of motorcycles in comparision with all other motorized vehicles are shown in Fig 4.1 and Fig 4.2.

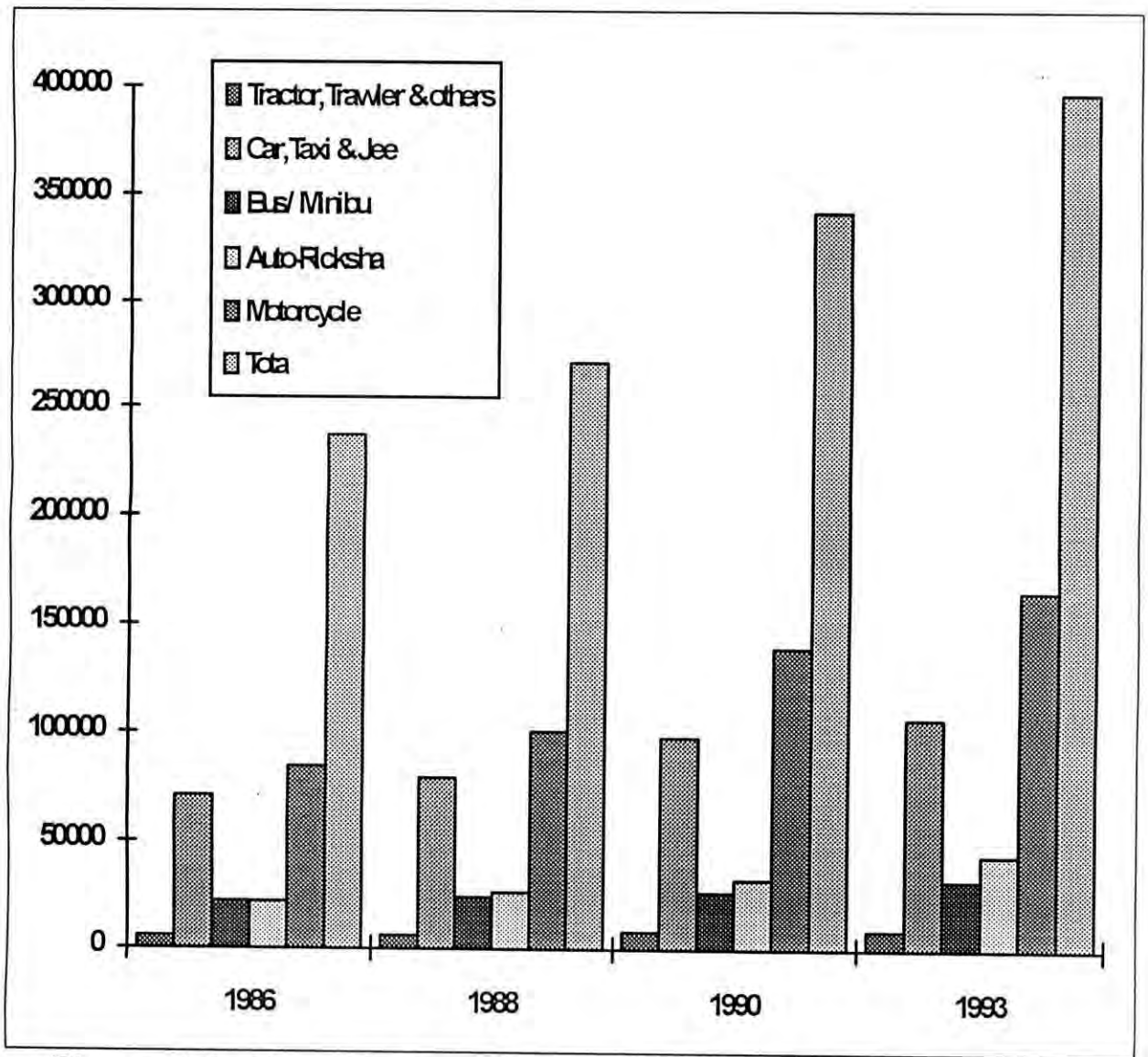

Figure 4.1: Growth of numbers and types of motorized vehicles in Bangladesh

TABLE 4.1

Number of motor vehicles registered by type in Bangladesh(1986-1993)

Year	Bus/ Minibus	Truck	Jeep	Car	Taxi	Auto-Rick shaw	Motor cycle	Tractor	Trawler	Others	Total
1986	22050	31830	17640	51820	1590	21780	84700	2650	1060	1910	237030
1987	23150	32780	18520	54480	1640	23958	93170	2730	1092	1910	253430
1988	24250	33800	19650	58000	1850	26460	100750	2950	1150	2000	270860
1989	25000	35200	25105	65000	2500	30200	125000	3025	2000	2500	315530
1990	26750	37312	26913	68380	2650	32616	138750	3327	2200	2750	341648
1991	28890	38448	27762	71373	2671	36796	150171	3394	2304	2817	364626
1992	30444	38307	28102	72719	2690	40014	158588	3419	2325	2871	379479
1993	32335	40403	28611	75153	2780	43763	165360	3427	2350	2876	397058

Source: The statistical year book of Bangladesh 1994

TABLE-4.2

Numbers of all motorized vehicles and their increasing rates, Bangladesh 1986-1993

Type of vehicle	Number of vehicles		Increase	
	1986	1993	Ratio	Annual rate (%)
All motorized vehicles	237030	397058	1.68	6.7
All motorized vehicles except motorcycle	152330	231698	1.52	5.4
Motorcycles	84700	165360	1.953	8.7

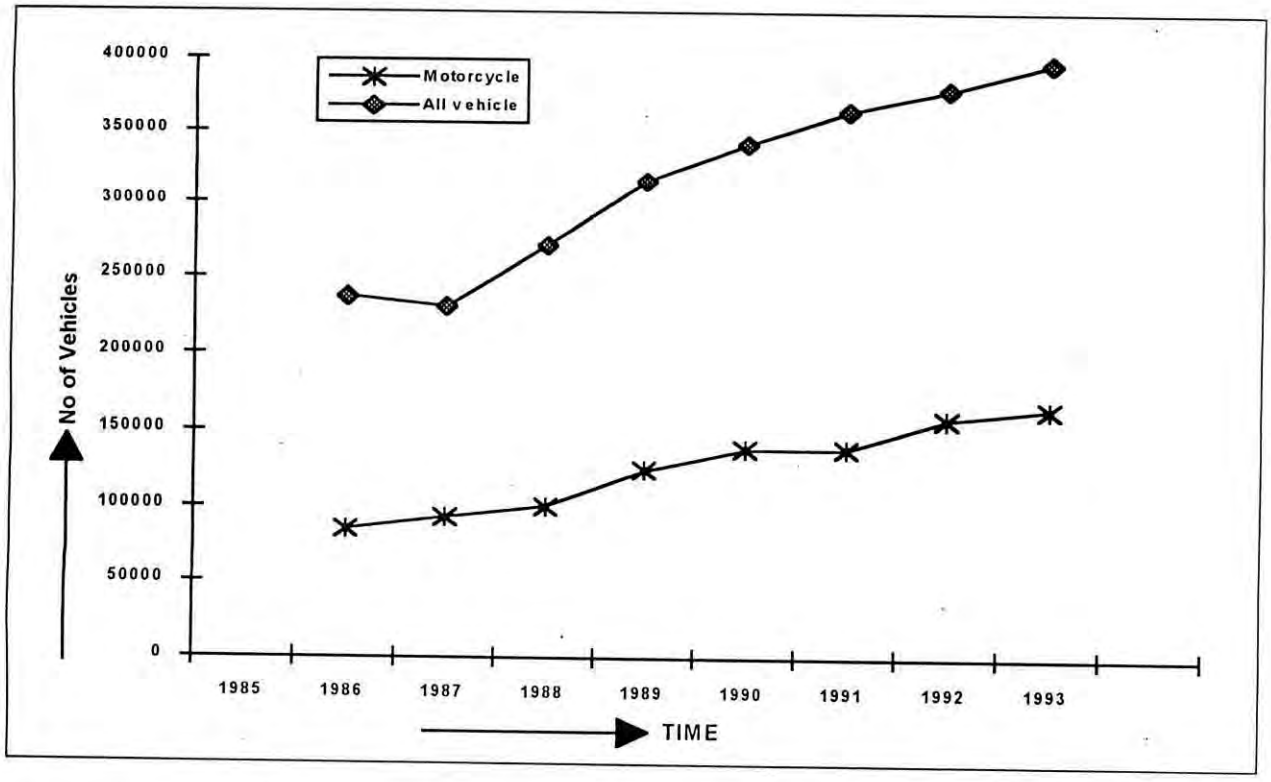

Figure 4.2: Variation of motorcycles and all other motorized vehicles with time.

4.3. ANALYSIS OF TRAFFIC SURVEY DATA

4.3.1 Introduction

A comprehensive data set is required for design and planning of streets and highways. The results of the collected data may be used in (i) traffic planning (ii) traffic management (iii) economic studies and (iv) traffic and environmental control and monitoring. Traffic survey was thus conducted and the data are used to analyze volumes of total traffic and their distributions on road networks with particular regard to motorcycle component.

The traffic studies can be classified into many categories such as O-D, speed, purpose etc (as explained in section 3.3.1 in chapter 3). Of these categories the following two types were done for this research work.

a) Traffic volume studies

b) Motorcycle riders (driver) interviews survey

A field survey has been carried out on major roads of Dhaka city to analyze the motorcycle rider characteristics. Table-4.3 presents the survey details such as location, time and items of the field survey.

TABLE-4.3

Location, duration and time of field survey

Location	Item	station	Duration	Time
Tongi-Diversion Road	Traffic volume, motorcycle riders	one station	three days	6a.m.-12p.m., 12p.m.-3p.m., 3p.m.-6p.m.
New Airport Road	Traffic volume, motorcycle riders	one station	three days	6a.m.-12p.m., 12p.m.-3p.m., 3p.m.-6p.m.
Mirpur Road	Traffic volume, motorcycle riders	one station	three days	6a.m.-12p.m., 12p.m.-3p.m., 3p.m.-6p.m.

4.3.2 Description of Variables

The variables used in this study included hourly volume, trip purpose, distribution of traffic flow, peak hour volume, rider's age, sex, occupation etc. Traffic volume is a very important variable in traffic studies. It is the amount of traffic movement per unit of time at a specific location. The elements of traffic movement are composed of motorcycles, buses, trucks, auto-rickshaws, taxi, cars, jeeps etc. The volume data is required to study relative importance of any route, distribution of traffic flow, fluctuation in flow etc.

Trip purpose is the most fundamental and dominating variable related to travel demand and travel characteristics of motorcyclists. People make trips because they cannot perform all

the activities in one place. Activities are normally grouped into a number of trip purpose. For this study trip purposes were stratified in the following groups:

a) Work trips	home to work
	work to home
b) Educational trips	home to school
	school to home
c) Shopping trips	home to shop
	shop to home
d) Social-Recreation	home to place of social visits or of recreation
	place of social visits or of recreation to home
e) Others	home to other place
	other place to home

Work trips: These trips include all journeys to and from various places of works.

Educational trips: Educational trips include as all journeys to and from various educational institutions such as schools, colleges, different technical institutes, coaching centres and universities solely for educational purposes.

Shopping trips: Trip to and from shopping centres.

Social-recreational trips: All trips made for social (such as trips made to visit a patient in hospital or in his home or to meet with kith and kin etc.), religious, leisure and recreational purposes fall into this class.

Other trips: Any trips undertaken by an individual which do not fall into any one of the above classes and also other undefined trips are included in this group.

Traffic volume: Traffic volume is a very important variable in traffic studies. It is the quantity of quantity of traffic movement per unit of time at a specific location. The elements of traffic movement are composed of motorcycles, buses, trucks auto-rickshaws, cars, jeeps etc. The volume data is required to study relative importance of any route, destination of traffic flow, fluctuation in flow etc.

4.3.3. Traffic Survey on Tongi-Diversion Road

Traffic surveys were carried out on three different days. The results of field survey which were carried out on Tongi-Diversion road revealed that auto rickshaw (including mishuk and tempo) accounted for about 58 percent of total motorized vehicles. The next highest groups were passenger cars 18 percent, micro-buses/Jeeps/pickups 12 percent, buses/mini-buses 12 percent, trucks 4.4 percent and motorcycles 3.6 percent of total motorized vehicles. It is observed from Fig-4.3 that motorcycle traffic was

the maximum (4.2 percent of total motorized vehicle) during 12:00 pm to 1:00 pm and the minimum (2.9 percent of total motorized vehicle) during 6:00 am to 7:00 am. Fig 4.4 shows that peak hour traffic volume (two way) was about 5650 during 2:00 pm to 3:00 pm and the minimum traffic volume was about 925 during 6:00 am to 7:00 pm. It appeared that children and female pillion riders were relatively more at morning time than at any other times. Pillion riders were mostly male after 2:00 pm. Percentage of motorcycle drivers used helmets was relatively more and this percentage for pillion riders was found to be very low on this road.

Fig 4.5 presents the distribution of motorcycle traffic according to the number of riders per motorcycle. This Figure shows that motorcycles with one rider were the maximum at 12:00 pm to 1:00 pm and tended to remain higher during 3:00 pm to 4:00 pm The minimum level was observed during 6:00 am to 7:00 am. Motorcycles with two riders were maximum during 11:00 am. to 12:00 pm. The hourly volume of different types of motorized vehicles are presented in Table -A4.1 & Table -A4.2 in Appendix A.

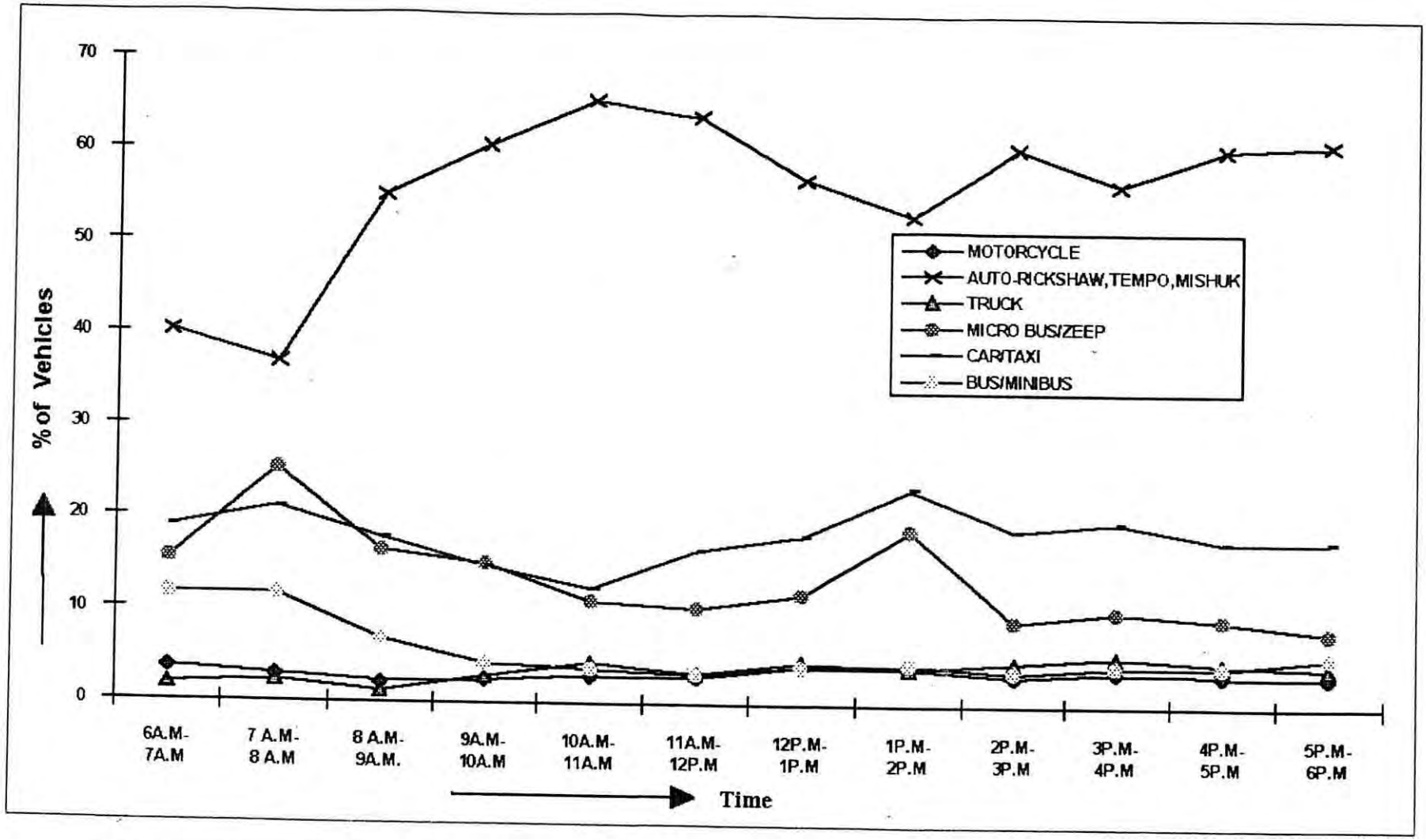

Fig -4.3: Hourly volume of different types of motorized vehicles on Tongi-Diversion Road

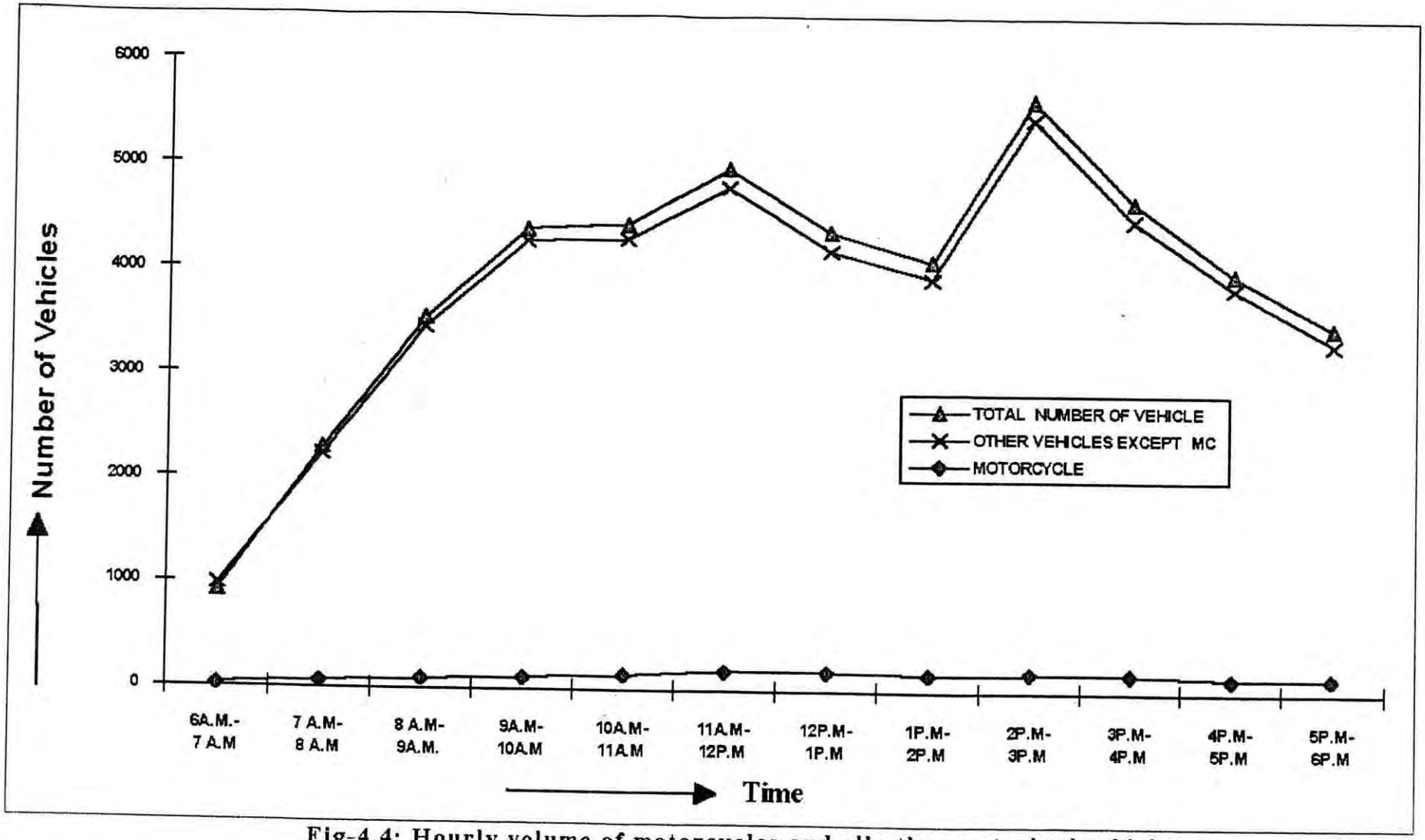

Fig-4.4: Hourly volume of motorcycles and all other motorized vehicles

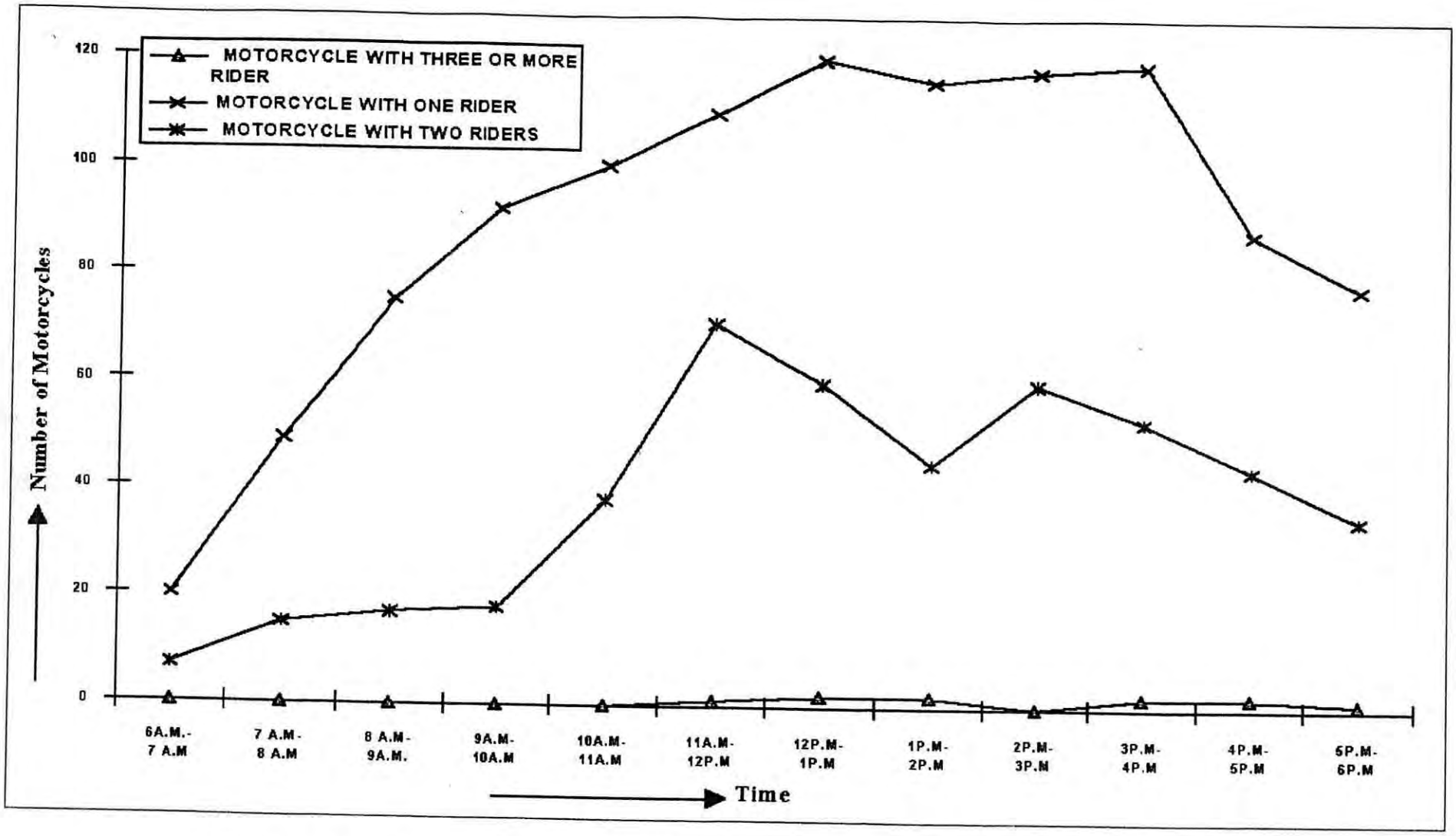

Fig-4.5: Hourly volumes of motorcycles with respect to different numbers of riders

4.3.4. Traffic Survey on New Airport Road.

The results of field survey which were carried out on New Airport Road revealed that auto rickshaw (including mishuk and tempo) accounted for about 58 percent of total motorized vehicles. The next highest groups were cars 26.2 percent, motorcycles 4.5 percent, micro-buses 4 percent and bus/mini-buses 2 percent of total motorized vehicles. It is observed from Fig-4.6 that motorcycle was the maximum (5.2 percent of total motorized vehicle) during 9:00 am to 10:00 am and the minimum (4.2 percent of total motorized vehicle) during 6:00 am to 7:00 am. Fig 4.7 shows that peak hour traffic volume (two way) was about 7900 during 10:00 am to 11:00 and the minimum traffic volume was about 1630 during 6:00 am to 7:00. Percentage of motorcycle drivers and all riders used helmet were higher (about 65 percent) than any other roads that was surveyed.

Fig 4.8 presents the distribution of motorcycle traffic according to the number of riders per motorcycle. This Figure shows that motorcycles with one rider were maximum during 9:00 am to 10:00 am and the minimum during 6:00 am to 7:00 am. Motorcycles with two riders were maximum during 2:00 pm to 3:00. The hourly volume of different types of motorized vehicles are presented in Table -A4.3 & Table -A4.4 in Appendix A.

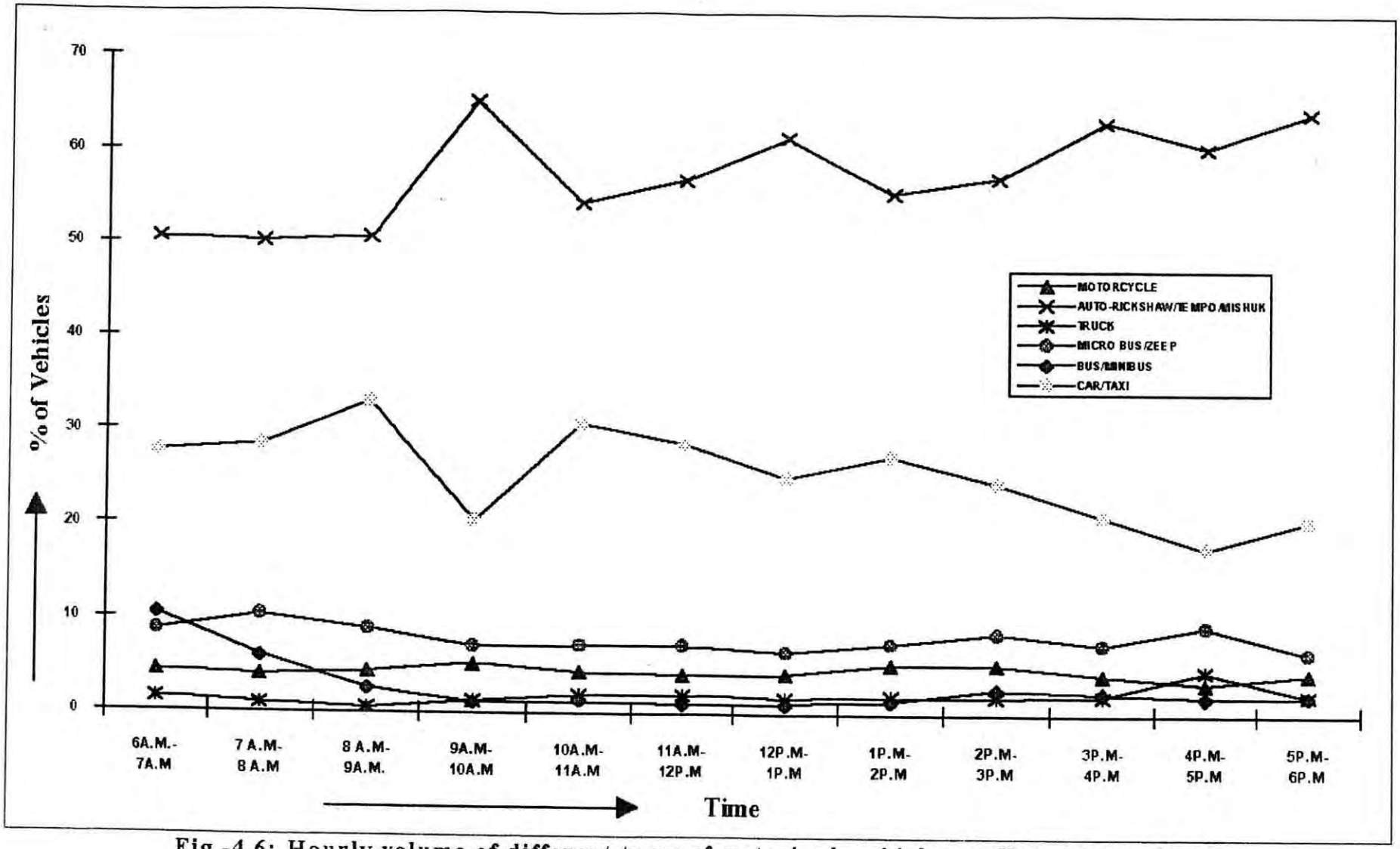

Fig -4.6: Hourly volume of different types of motorized vehicles on New Airport Road

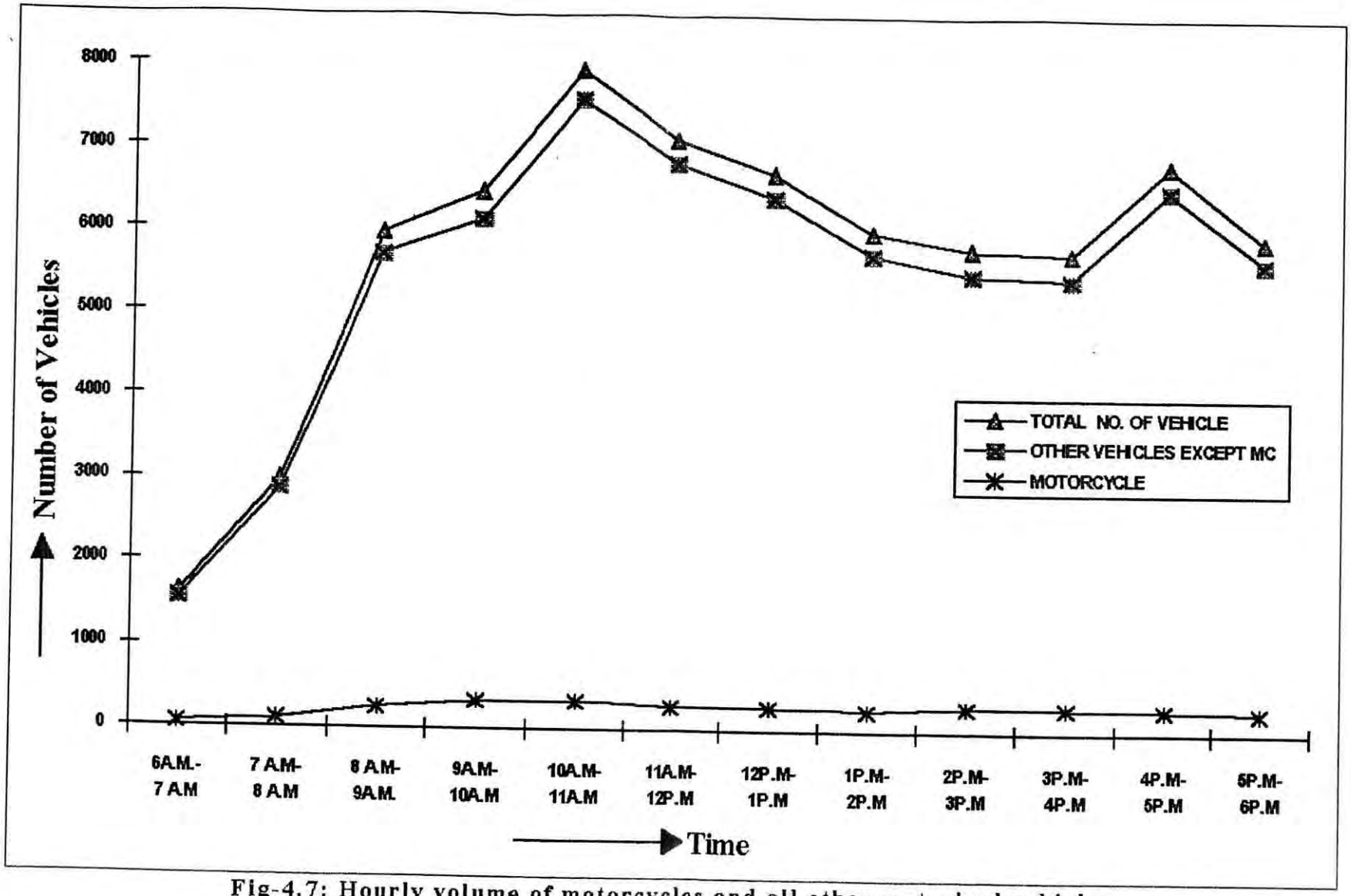

Fig-4.7: Hourly volume of motorcycles and all other motorized vehicles

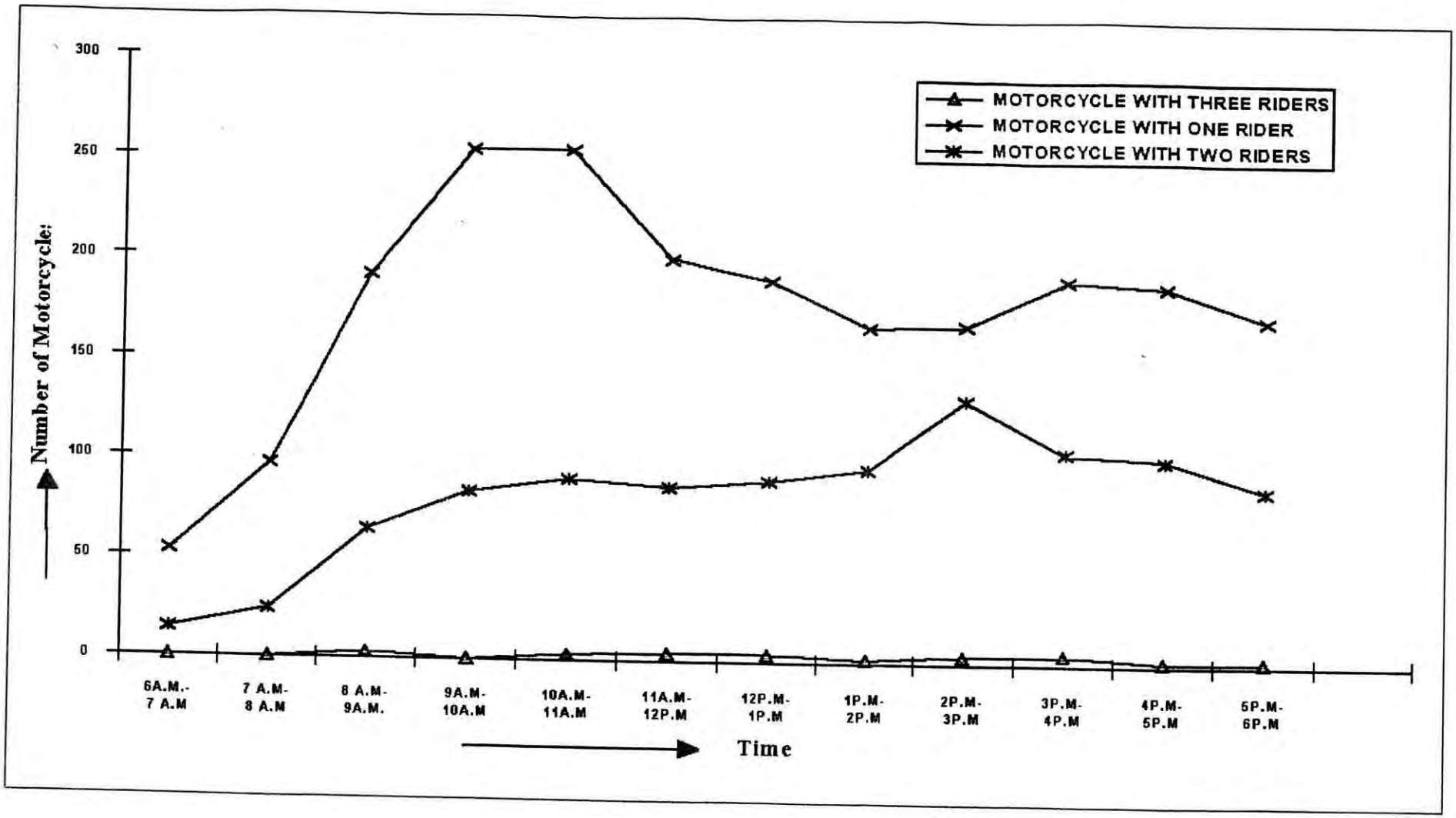

Fig-4.8: Hourly volumes of motorcycles with respect to different numbers of riders

4.3.5. Traffic Survey on Mirpur Road

The results of field survey which were carried out on Mirpur Road revealed that auto rickshaw (including mishuk and tempo) accounted for about 62 percent of total motorized vehicles. The next highest groups were bus/mini-buses 11.8 percent, cars 10.5 percent, trucks 10.3 percent and motorcycles represented about 4.6 percent. It is observed from Fig-4.9 that motorcycle traffic was the maximum (6.8 percent of total motorized vehicle) during 10:00 am to 11:00 am and the minimum (2.3 percent of total motorized vehicle) during 6:00 am to 7:00 am. Fig 4.10 shows that peak hour traffic volume (two way) was about 2760 during 4:00 pm to 5:00 pm and the minimum traffic volume was about 1400 during 6:00 am to 7:00. It appeared that children and female pillion riders were relatively more at morning time than at any other times. Pillion riders were mostly male after 2:00 pm. Percentage of motorcycle drivers and all other pillion riders used helmet were relatively low (about 45 percent of total motorized vehicle).

Fig 4.11 presents the distribution of motorcycle traffic according to the number of riders per motorcycle. This Figure shows that motorcycles with one rider were maximum during 10:00 am to 11:00 am and the minimum during 6:00 am to 7:00 am. Motorcycles with two riders were maximum at 8:00 am to 9:00 am. The hourly volume of different types of motorized vehicles on Mirpur Road are presented in Table -A4.5 & Table -A4.6 in Appendix-A.

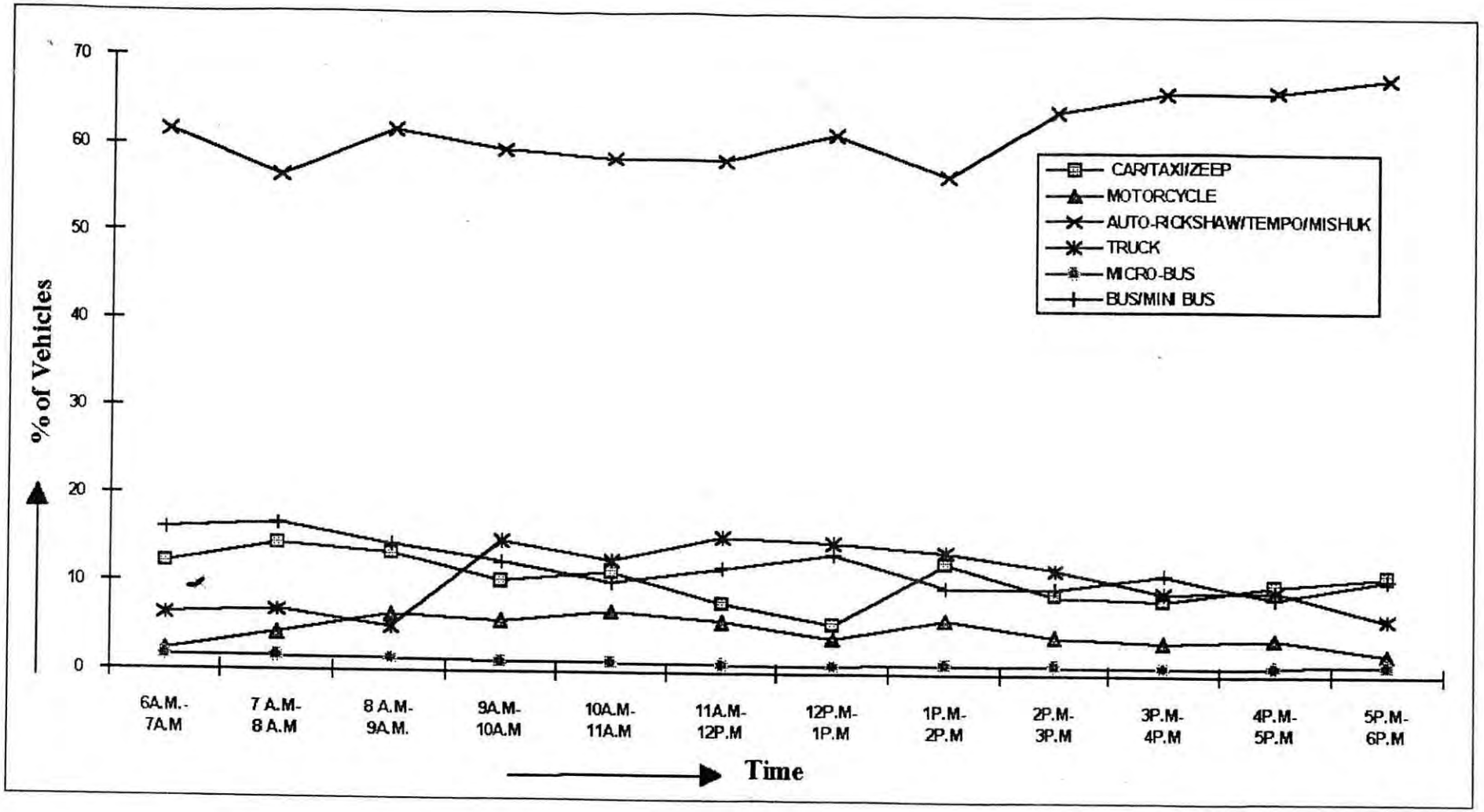

Fig -4.9: Hourly volume of different types of motorized vehicles on Mirpur Road

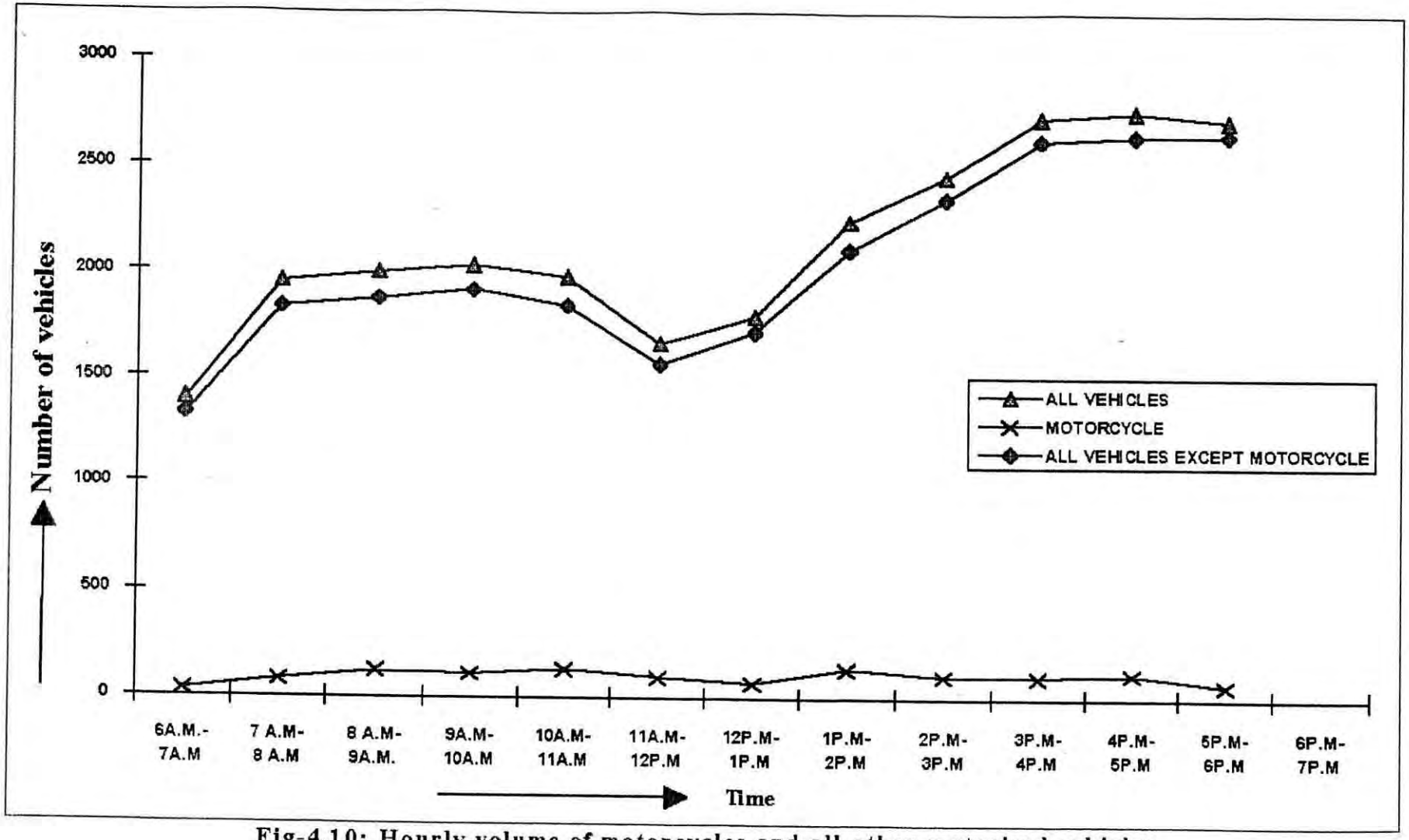

Fig-4.10: Hourly volume of motorcycles and all other motorized vehicles

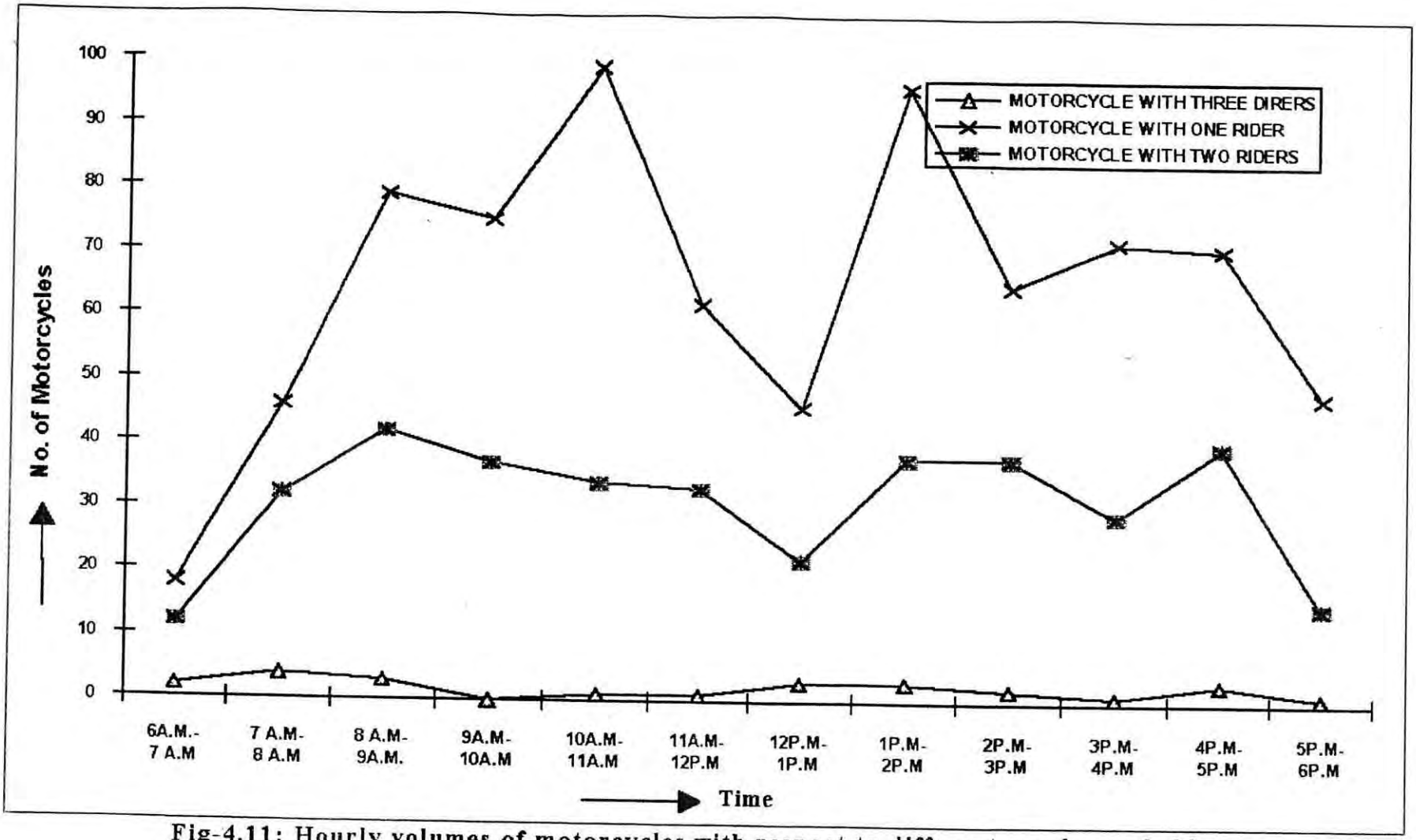

Fig-4.11: Hourly volumes of motorcycles with respect to different numbers of riders

4.4 SUMMERY OF SURVEY RESULTS

The results of field observations are summarized in the following sections.

Hourly Volume of Motorcycles and all other vehicles: The hourly traffic volume on any highway varies considerably with time. Two dominant peak hours could be found in the morning and the afternoon. The morning and evening peak hours of motorcycle traffic in the study area were found between 8:00 am to 11:00 am and 2:00 pm to 5:00 pm respectively. The morning peak hour motorcycle traffic volumes varied between 4 percent and 7 percent of total motorized vehicles. The evening peak hour motorcycle traffic varied between 3 percent and 6 percent of total motorized vehicles.

Number of Riders per Motorcycle: The distribution of motorcycles according to number of riders per motorcycle are presented in Table 4.4.

Table 4.4

Number of riders per motorcycle

No of rider per motorcycle	Percentage of motorcycle
One rider	60% to 75%
Two riders	25% to 35%
Three or more	0% to 5 %

Motorcycles with 2 or 3 riders were mostly found during the morning and evening peak hours. Average occupancy of motorcycle was 1.3 persons per motorcycle in study area of

Dhaka city. The difference in the occupancy per motorcycle depends on both the survey time and the localities. The observed maximum number of riders per motorcycle was 4 with two adults and 2 children in the present analysis. The comparative observations are given in Table 4.5.

Table 4.5

Maximum number of riders observed on a motorcycles

Source	Number of riders
Present analysis	4 (2 adult, 2 children)
News paper photo	5 (2 adult, 3 children)
From journal (New Delhi)	6 (2 adult, 4 children)

Percentage of Motorcycle Riders Used Helmet: Wearing of helmet for motorcycle riders in Bangladesh is not compulsory according to BRTA. Thus the percentage of motorcycle riders using helmet is not expected to be very high all over the country. One of the primary aims of the study was to assess the levels of helmet usage of motorcyclists. Overall a total no 5814 motorcyclists were observed. Of this 57 percent of all riders used helmet in the study area of Dhaka city. This percentage varied with time and the range of variation was between 50 and 60 percent, depending on traffic condition and places. While wearing of helmet is very much essential, it appears that many people still do not use such device. The lower rate of helmet use is may be due to prevailing social and economic reasons.

The percentage of pillion riders used helmet varied between 3 and 5 percent. About hundred percent of motorcycle drivers were male. The percentages of motorcycle drivers, male, female and children pillion riders using helmets are presented in Table 4.6

Table 4.6

Percentage of male, female and children riders used helmet

Location	Percentage of motorcycle driver used helmet	Percentage of pillion rider helmet used helmet		
		Male	Female	Children
Tongi-diversion road	85.3%	4.75%	0.2%	0.01%
New airpor road	95.0%	4.5%	0.5%	0.01%
Mirpur road	80.8%	2.5%	0.2%	0%

It has been seen from field observation that the percentage of rider used helmet is maximum on New Airport Road and minimum at Mirpur Road. This percentage varied from road to road and depend on traffic law and enforcement, specially number of traffic police present on that road.

Distribution of Pillion Riders

Pillion rider is defined as the riders behind the driver of a motorcycle. Overall a total number of 1950 pillion riders was observed. Average distribution of pillion riders are adult male 79 percent, adult female 11 percent and children 10 percent. Female and children pillion riders were relatively more at morning than any other times (approximately children 10.8% and female 21.5%). and decrease with time. Adult male pillion riders were relatively low at morning (approximately 67%) and increase with time. Average distribution of pillion riders is shown in Fig 4.12.

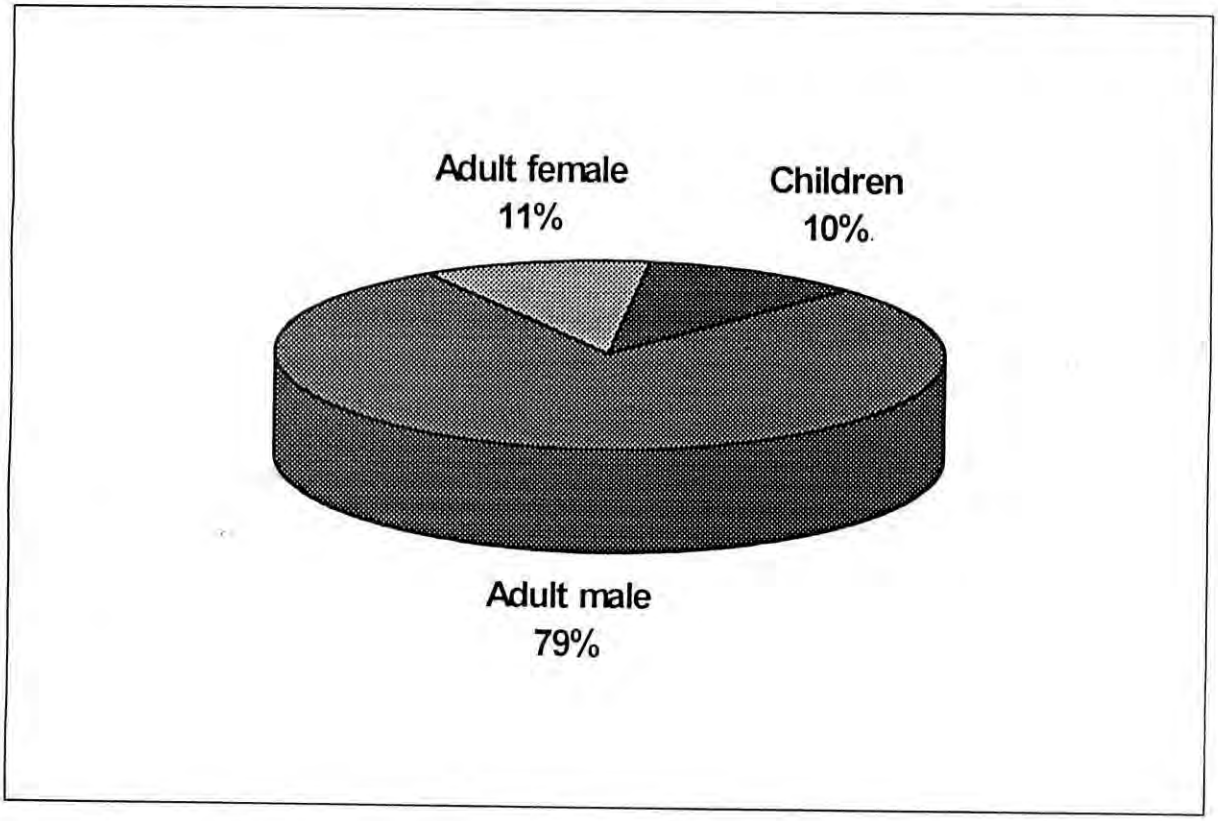

Fig 4.12: Distribution of male, female and children pillion riders of motorcycle.

CHAPTER 5

INVESTIGATION OF MOTORCYCLE RIDERS AND THEIR TRIP CHARACTERISTICS

5.1 INTRODUCTION

This chapter is concerned with motorcyclist (driver) interview survey. This interview survey was based mostly on information collected through the field traffic surveys. The motorcycle riders' interview survey was carried out on the selected roads. The survey sites were mostly on Tongi-Diversion Road, New Airport Road and Mirpur Road. Interviews of Motorcycle riders were taken at various points throughout the study area and the required information was gathered.

5.2 IMPORTANCE OF INTERVIEW SURVEY

Interview survey was carried out to study the characteristics of motorcycle users (drivers). A questionnaire form was designed to get information on sex, profession, age, trip purpose, occupancy of motorcycle, travel distance, use of safety helmet and reason for using motorcycle. The format of questionnaire is shown in the next page.

DEPARTMENT OF CIVIL ENGINEERING
BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY

A STUDY OF MOTORCYCLE TRAFFIC IN DHAKA CITY
(Roadside interview for motorcycle drivers-as a part of research work for the degree of M. Engineering in Civil Engineering)

Location: ..... Date: .....
Place of destination: ..... Time: .....

INFORMATION ABOUT MOTORCYCLE RIDER

1) **Driver- sex:** Male / Female

2) Age and occupation of rider (driver):

Age: .....
Occupation: Service / Business / Student / Others

3) **Purpose of the trip**: Official / Business / School, Market & others

4) Average distance travel per day per motor cycle rider .....km

5) Average number of accident experience per motorcycle driver
Major accident no: .....
Minor accident no: .....

6) **Occupancy per motorcycle**: one rider / two riders / three riders

7) **Level of helmet usage**: driver with/ without helmet
pillion riders with / without helmet

8) **Reason for use motorcycle**:
(i) To reduce travel cost
(ii)To save time
(ii) Inability to buy a car
(iii) Best for individual traveling

Figure 5.1: Questionnaire for motorcycle rider(driver) roadside interview

Such interview survey are needed for the following reasons:

a) The interview allows for considerable flexibility in the type of information collected.

b) The presence of an interviewer allows classifications that may be needed regarding the meaning of the questions or the methods in which answers are to be given.

c) An interviewer can be effective in maintaining respondent interest and ensuring that the full set of question is completed.

d) By noting the interest of the respondent in the survey and the way in which the question (specially attitudinal questions) are completed, the interviewer can make a valuable assessment of the validity of the recorded answers.

5.3 ITEMS OF INTERVIEW SURVEY

The interview survey covered the following main items:

i) age, occupation and income level

ii) trip purpose

iii) travel distance

iv) origin and destination

v) reason for using motorcycle

5.3.1 Total Motorcycle Driver and Riders

Initially planned to have at least 100 motorcycles interviewed. But due to time limitations it was possible to make interview for only 55 motorcycles. These motorcycles have 55 drivers and 22 pillion riders. These pillion riders were adult male 16, adult

female 4 and children 2. All motorcycle drivers were male. As expected female motorcycle drivers were extremely low in total no of motorcyclist (driver)..

5.3.2 Age Distribution of the Tripmakers

The age distribution of the population of drivers is often taken into consideration in trip generation analysis because people in different age groups demand different movements with varying trip characteristics. In this study motorcycle trip makers (motorcyclists) belonging to different age groups (cohorts) were classified in the following group (see Table 5.1)

Table 5.1

Age distribution of tripmakers (drivers)

Age group	No of motorcyclists (drivers)	Percentage of motorcycle drivers
0-16	0	0.0%
17-20	6	10.9 %
21-29	20	36.4 %
30-39	25	45.4 %
40-49	4	7.3 %
50-59	0	0.0%
>60	0	0.0%
Total	55	100%

5.3.3 Trip purpose

As discussed previous chapter, trip purpose is the fundamental and dominating variable related to travel demand and travel characteristics of motorcyclist. For this study trip purposes were stratified in the following form (see Table 5.2)

Table 5.2

Distribution of motorcyclists (drivers) by trip purpose

Trip Purpose	No of Motorcycle Drivers	Percentage of Motorcycle Drivers
Service	25	50 %
Business	16	32 %
Education	5	10%
Others	4	8 %
Total	50	100%

Occupation of the tripmakers had a significant effect on motorcycle trip purpose. Service holders were found to constitute the highest portion of all motorcycle trips that were interviewed.

5.3.4 Average Distance Travel Per Day Per Motorcycle Rider

Average distance travel per day per motorcycle can be summarized as follows (see Table 5.3):

Table 5.3

Distribution of motorcyclists (drivers) by travel distance

Distance travel in km	No of Motorcycle Drivers	Percentage of Drivers	Cumulative %
0-9	2	3.6 %	100%
10-19	11	20 %	96.4%
20-29	16	29.1 %	76.4%
30-39	14	25.4 %	47.3%
40-49	8	14.5 %	21.9%
>50	4	7.4 %	7.4%
Total	55	100 %	

It was found that highest number (29.1 percent) of motorcyclist (driver) travel 20 to 29 kilometer/day. Next higher travel distance categories were 30 to 39 km/day (25.4 percent), 10 to 19

km/day (20 percent) and 40 to 49 km/day (14.5 percent) respectively. The average distance travel per day per motorcycle driver was around 32.6 km.

5.3.5. Reasons for using motorcycles

Motorcyclist were asked to give their opinion for using their motorcycles. The reasons were claimed in to the following:

(i) to reduce travel cost

(ii) to save time

(ii) Inability to buy a car

(iii) best for individual travelling

It was found that main reason for using motorcycle (90 percent of motorcycle driver) was to reduce travel cost. Next reasons were inability to buy a car (70 percent), to save time (60 percent) and best for individual travelling (30 percent).

4.5 SUMMARY OF INTERVIEW SURVEY RESULTS

Results of the interview survey of motorcyclists (driver) are summarized as follows:

1) Motorcyclist (driver)-sex : It was found that male drivers were 100%

2) Age of motorcycle riders (driver):

The age group 30-39 year was the highest, accounting for 45 percent of total motorcyclists (driver). Next higher age groups were 21-29 year (accounting for 36 percent) and 17-20 year (accounting for 11 percent) respectively.

3) Occupation:

The highest occupation group of motorcyclist was service, accounting for 50 percent of total drivers. Next occupation groups of motorcycle driver were business (32 percent), student (10 percent) and others (8 percent)

4) Trip Purpose

It was found that 35 percent of motorcycle trips were generated for business purpose. About 28 percent of motorcycle trips were generated for official purpose and the rest for school, market & others purpose

4) Average distance travel per day per motorcycle rider=32.6 km

5) Average number of accident experience per motorcycle driver:

Overall a total no 55 motorcyclist (driver) were interviewed about the accident experience. They were faced 20 minor accident and 4 major accident (admitted to hospital).

6) Reasons for using motorcycles

It was found that main reason for using motorcycle (90 percent of motorcycle driver) was to reduce travel cost. Next reasons were inability to buy a car (70 percent), to save time (60 percent) and best for individual travelling (30 percent).

5.5 FIELD OBSERVATIONS AND PHOTOGRAPHS

The survey location characteristics shown in Figure 5.2 to Figure 5.4. The motorcycle operational characteristics are shown in Figure 5.5 to Figure 5.13. This shows sample of different types (sizes) of motorcycles, occupancies and parking characteristics. These Figures are presented as follows:

Figure 5.2: Tongi-Diversion Road

Figure 5.3: New Airport Road

Figure 5.4: Mirpur Road

Figure 5.5: Motorcycle with one rider

Figure 5.6: Motorcycle with two riders

Figure 5.7: Motorcycle with three riders

(one male, one female and children)

Figure 5.8: Motorcycle with one rider on New Airport Road

Figure 5.9: Different types of motorcycle parked at BUET campus

Figure 5.10: Motorcycle (Honda 50 c.c.)

Figure 5.11: Motorcycle (Honda MB-8)

Figure 5.12: Motorcycle (Hero Honda CD100 SL)

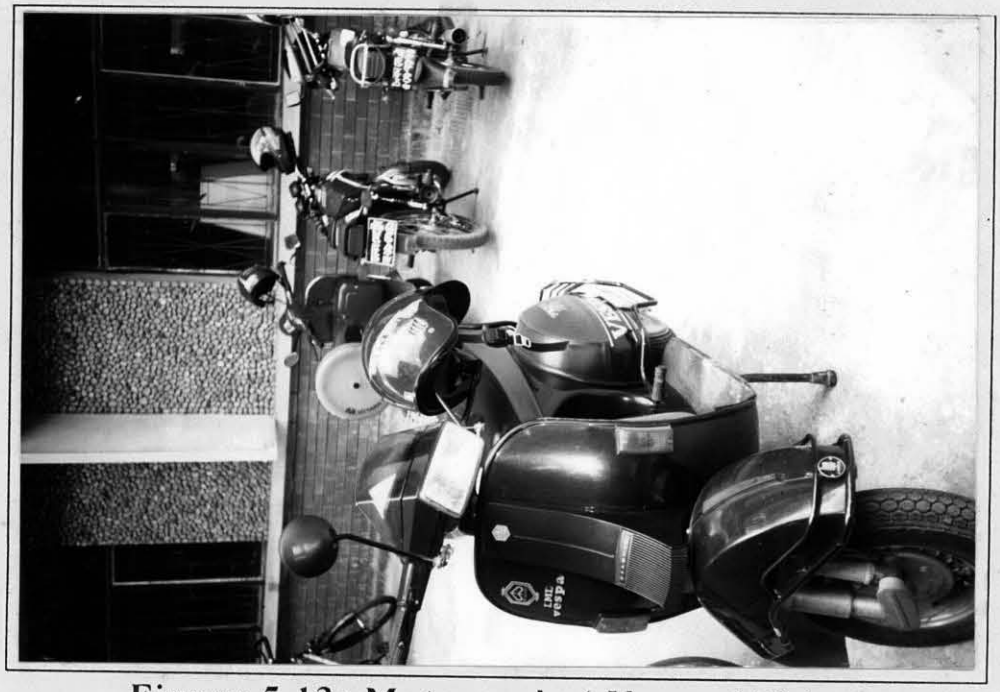

Figure 5.13: Motorcycle (Vespa 150)

CHAPTER - 6

MOTORCYCLE ACCIDENTS IN STUDY AREA OF DHAKA CITY

6.1 INTRODUCTION

In the previous two chapters motorcycle traffic characteristics, patterns of using motorcycles and riders (drivers) characteristics were investigated. It is also important to examine the safety aspects of motorcyclists as well. This chapter thus attempts to examine the characteristics of accidents involving motorcycles.

6.2 SOURCE OF ACCIDENT DATA

To provide the actual safety situation of motorcyclist in the study area of Dhaka city, comprehensive motorcycle accident data would be required. These data have to be collected from the First Information Reports of different police stations of the study area. However such data collection could not be possible because of limited scope of the thesis. Road accidents occurring in Tejgoan and Mirpur Thana during the period January 1993 to December 1994 were available from Sharmin (1996). These data are analyzed to identify accident problem characteristics. These problem characteristics are discussed in the following sections.

6.3 FACTORS INVOLVED IN OVERSEAS MOTORCYCLE ACCIDENTS

Human Factors: Because most accidents are caused by driver's error, many such striking variables related to driver's are reviewed below.

Age: There is no reliable information about the driver's age and education from traffic accident data which were collected from police report. Fatal crash pattern in Delhi shows that drivers in the 20-35 age group were involved in the largest percentage of motorcycle accidents.

Education: Fatal crash patterns in Delhi show that nearly one third of the people involved in automobile accidents in Delhi had never attended schools and were illiterate. Driving education for these drivers appears to be a desirable means of reducing traffic violations and accidents.

Mechanical Defects: Mechanical defects such as failure of brakes and streering causes a small but significant percentage of accidents. Accidents caused by vehicle defects can be avoided through annual vehicle inspections.

Road Factors: Being straight or curve, or surface conditions are the road characteristics which are the contributing factors in motorcycle accident.

Environmental Factors: Environmental factors such as unfavorable weather and night visibility are believed to influence traffic accidents.

6.4 STRIKING VEHICLES INVOLVED IN MOTORCYCLE ACCIDENTS

Vehicles involved in motorcycle accident are shown in Fig 6.1. It can be seen from the Figure that passenger cars/taxis accounted for (15%) the greatest proportion of vehicles involved in motorcycle accidents. The next higher proportions of vehicles involved in motorcycle accidents were auto-rickshaws (baby-taxi) 14 percent, mini-buses 14 percent, truck 13 percent, tempos 12 percent, micro-buses 10 percent and buses 8 percent of total motorcycle accidents. The jeep and others vehicle were responsible for remaining accidents. It can be shown that commercial vehicles viz. trucks, buses and minibuses accounted for about 35 percent of accidents. Baby taxis and tempos accounted for 26 percent of motorcycle accidents.

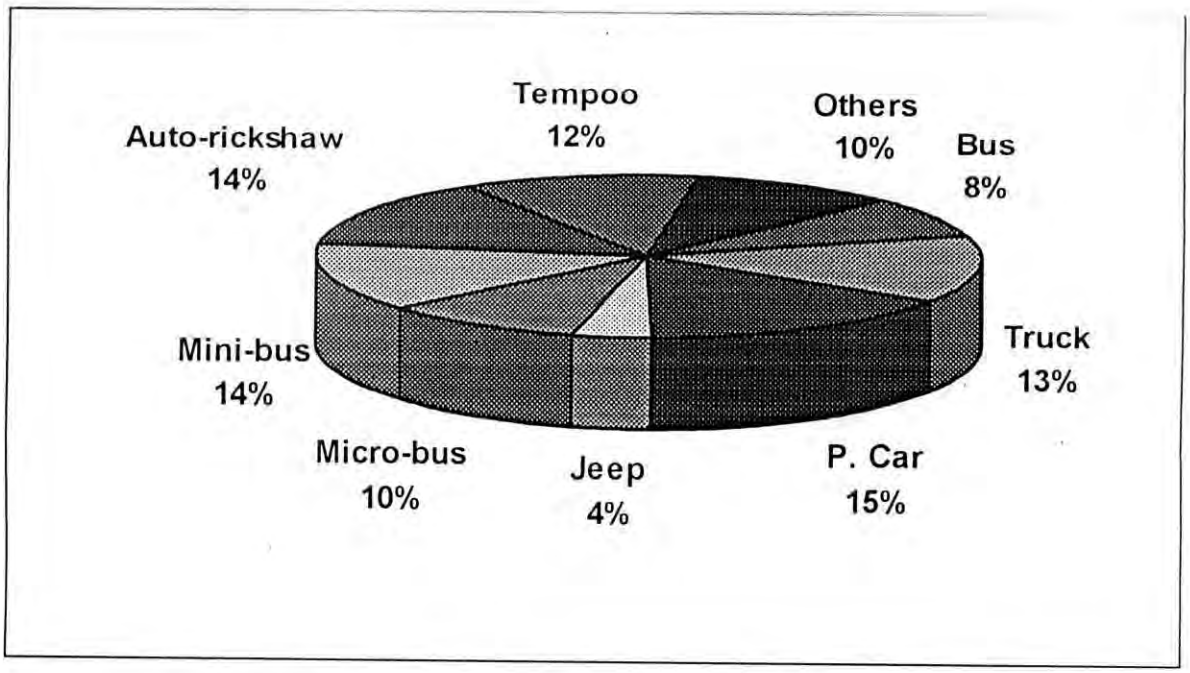

Fig 6.1: Vehicles involved in motorcycle accidents (Tejgong and Mirpur Thana, January 1993 -December 1994)

6.5 ACCIDENTS BY ROAD LOCATIONS

An examination of motorcycle accident locations was made by considering road location characteristics viz. intersection and mid-block section. Classification of the motorcycle accidents according to the road location is given in Table 6.1. It can be seen from the Table that 64 percent of motorcycle accidents occurred on mid-block sections and 25 percent of motorcycle accidents occurred at junctions. About 11 percent of motorcycle accidents occurred at unknown locations.

A large proportion of motorcycle accidents occurred at mid-block sections. This suggests that additional attention should be given

to the road link accidents in order to reduce further motorcycle accidents and their causalities.

Table 6.1

Motorcycle accidents at Tejgoan and Mirpur Thana by road locations

Road Location	No of Motorcycle Accidents	Percentage of Motorcycle Accidents
Mid-block	34	64%
Junction	13	25%
Unknown	6	11%
Total	53	100%

6.6 DISTRIBUTION OF ACCIDENTS BY TIME OF DAY AND DAY/NIGHT CONDITION.

Time of Day: The distribution of fatalities by time of day is presented in Table 6.2. The highest proportion about 62 percent of motorcycle accident occurred during the period 9:01-18:00 hours. This is perhaps related to the higher level of motorcycle traffic during this period. About 15 percent of total motorcycle accidents were occurred in the period 18:01-21:00 hours. A further 17 percent of total motorcycle accidents occured between 21:01-24:00 hours. This high accident involvement in the evening hours are probably due to lack of visibility, higher vehicle speeds due to less traffic and violation of traffic rules. Motorcycle traffic accident involvement was nil during the period 00:01-

06:00 hours in the study area. This may be because there are no shops and restaurants or bars open in those hours in the study area of Dhaka city.

Table 6.2

Motorcycle traffic accident by time of day

Hours	No of Motorcycle Accidents	Percentage of Motorcycle Accidents
00:01-06:00	0	0.0%
06:01-09:00	3	5.8%
09:01-12:00	11	20.7%
12:01-15:00	11	20.7%
15:01-18:00	11	20.7%
18:01-21:00	8	15.1%
21:01-24:00	9	17.0%
Total	53	100%

Accident by Day/Night Condition: The split of motorcycle accidents by day time and night time is shown in Figure 6.2. This showed that about 68 percent of the accidents occurred at day time and 32 percent at night. This is expected because greater number of motorcycles can be seen on the roads during the day time as compared with those of at night time. This day/night time distribution of motorcycle accidents is pretty similar to that of all accidents in Tejgoan and Mirpur thana, 65 percent at day and 35 at night (Sharmin 1996)

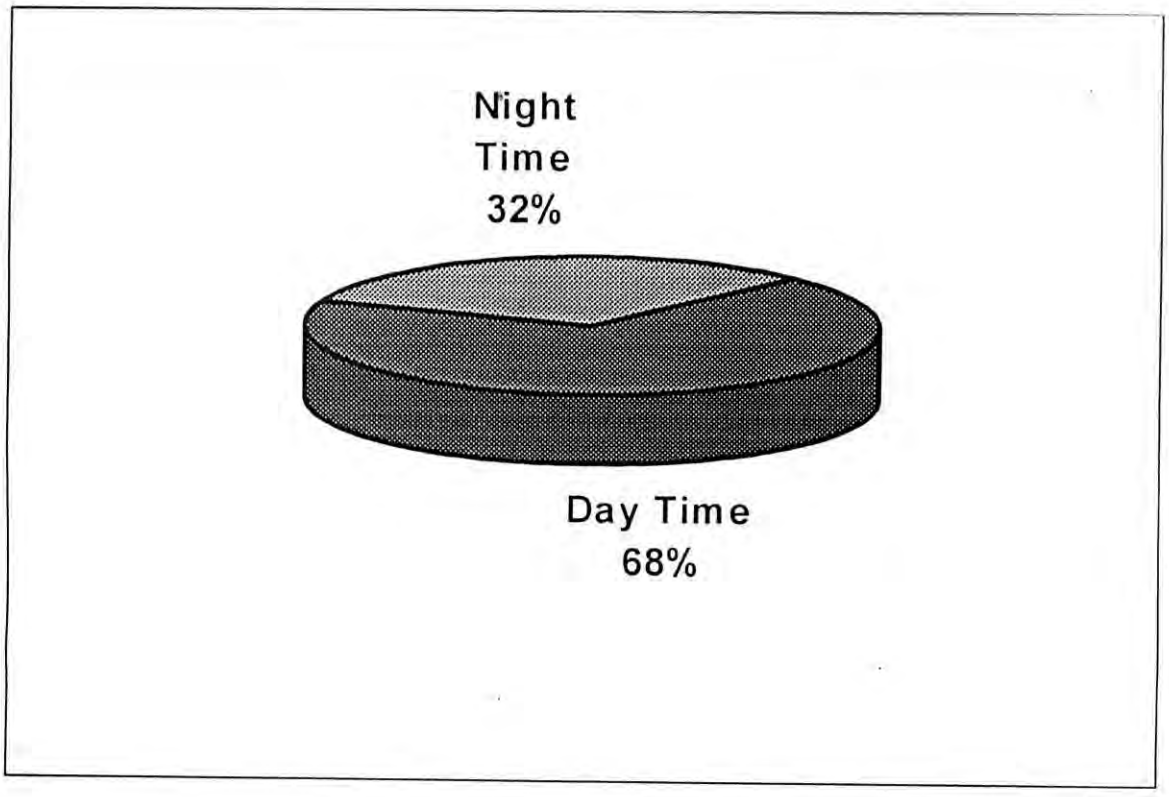

Fig 6.2: Day/Night time motorcycle accidents

It remains for further study to examine the over/under representation of motorcycle accidents by taking motorcycle travel data (day/night time travel) into consideration.

6.7 CLASSIFICATION OF MOTORCYCLE ACCIDENTS

Classification by Accident Types: Motorcycle accidents by collision types are shown in Fig 6.3. It can seen from the Figure that rear-end collision type of accident accounted for the greatest portion (52.8%) of motorcycle accidents. The sample data exhibited that about 21 percent of these accidents were side-swipes, caused by unsafe weaves or merging into narrow gaps and

11.3 percent were head on collisions, caused by driving into the opposing traffic lane. By far the biggest proportion of rear-end accidents is perhaps associated with poor visibility of motorcycles as well as overspeeding of the vehicles hitting the motorcycles.

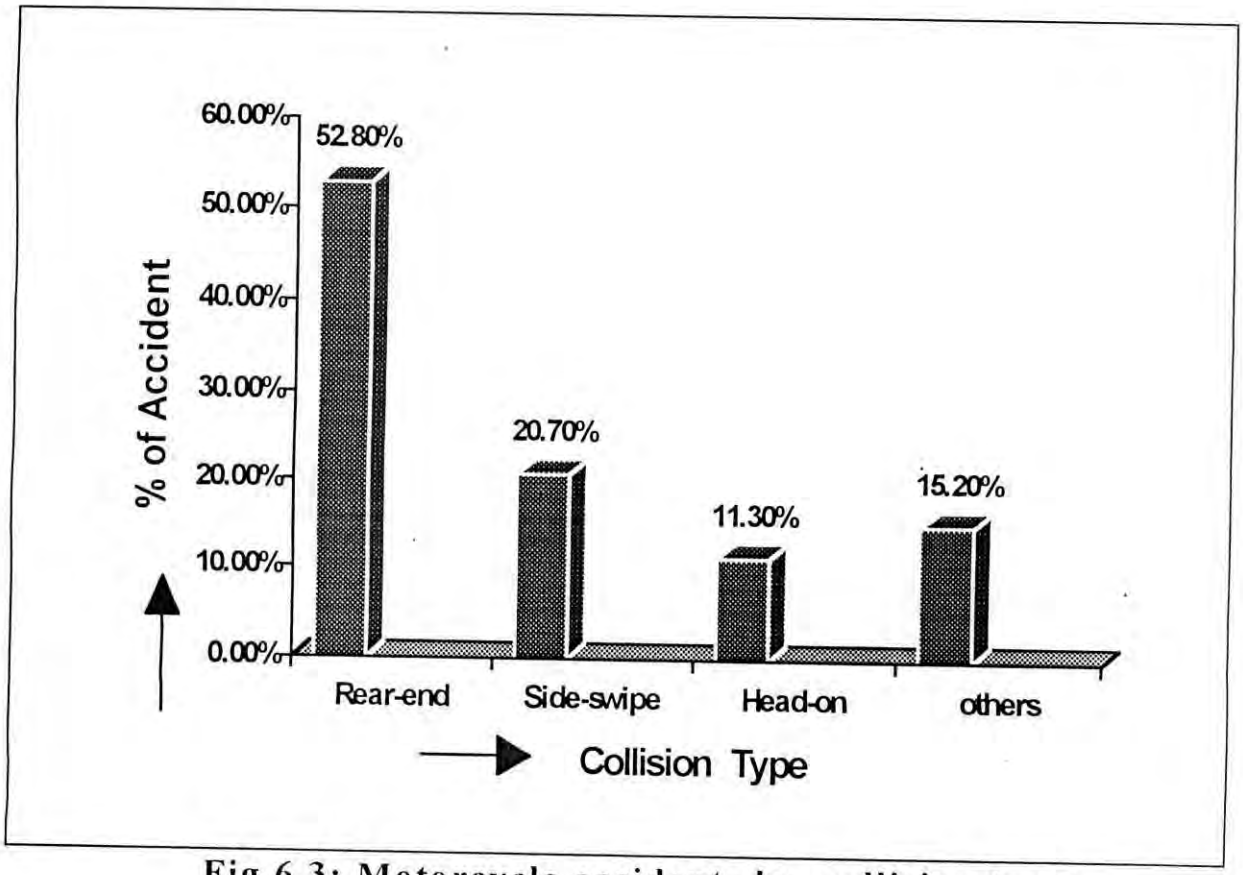

Fig 6.3: Motorcycle accidents by collision types

Motorcycle accident severity: Motorcycle accidents can be classified according to fatalities and injuries. About 64 percent of motorcycle accidents were resulted in seriously injuries, 24 percent simple injury and 14 percent killed. The emergency medical service should be improved in reducing the injury problem of motorcyclists. Classification of motorcycle accidents by severity levels is shown in Fig 6.4.

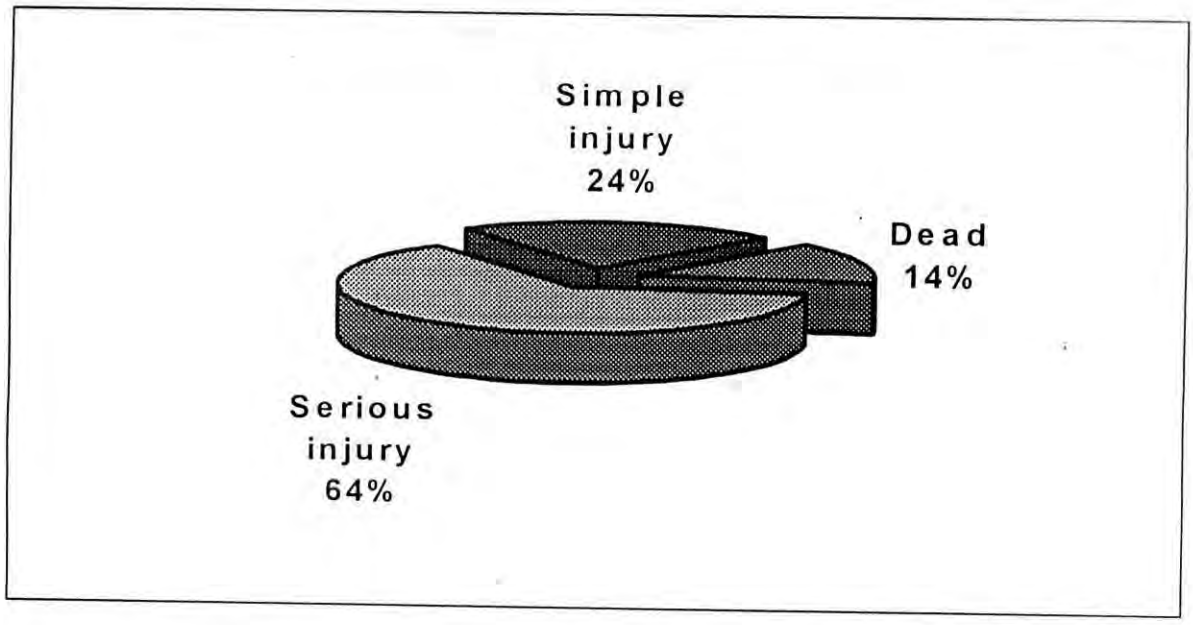

Fig 6.4: Classification of motorcycle accidents by severity

6.8 COMPARISON OF MOTORCYCLE ACCIDENT CHARACTERISTIC

A comparison of motorcycle accident characteristics in the study area in Dhaka city with those in Kaula Lumpur, Singapore and Suita are presented in the following Table 6.3-Table 6.6. The most striking difference could be in vehicles involved in accidents.

TABLE -6.3

Motorcycle accidents by time of day

	Kuala Lumpur %	Singapore %	Suita %	Dhaka %
00:01-06:00	4.9	14.2	4.0	0.0
06:01-12:00	31.1	21.6	39.4	26.5
12:01-18:00	34.1	32.6	36.2	41.4
18:01-24:00	29.9	31.6	20.4	32.1
Total	100 %	100 %	100 %	100 %

Source: NHMRC Road Accident Research Unit, The university of Adelaide

TABLE -6.4

Motorcycle accident by day of week

	Kuala Lumpur %	Singapore %	Suita %	Dhaka %
Sunday	12.8	19.3	14.1	17.0
Monday	15.9	12.2	16.8	17.0
Tuesday	14.8	14.7	15.6	13.2
Wednesday	13.4	12.2	14.3	11.3
Thursday	14.9	14.2	14.7	20.7
Friday	15.3	14.2	13.2	11.3
Saturday	12.9	13.2	11.3	9.5
Total	100 %	100 %	100 %	100 %

Source: NHMRC Road Accident Research Unit, The university of Adelaide

TABLE -6.5

Motorcycle accidents by types of accidents

	Kualalumpur %	Singapore %	Suita %	Dhaka %
Motorcycle alone	39.1	33.5	2.1	0.0
Motorcycle-animal	0.9	3.1	0.2	0.0
M/cycle - pedestrian	4.0	1.0	8.3	13.3
Motorcycle-bicycle	1.2	0.0	9.7	1.9
M/cycle-motorcycle	12.3	3.7	11.2	0.0
M/cycle-car, Jeep	35.4	44.0	49.2	18.7
Motorcycle-truck	1.9	7.9	18.1	13.3
M/cycle-bus, mirobus	5.0	5.2	0.3	26.4
M/cycle-auto-rickshaw, others	0.2	1.6	0.9	26.4
Total	100 %	100 %	100 %	100 %

Source: NHMRC Road Accident Research Unit, The university of Adelaide

TABLE - 6.6

Motorcycle accidents by road locations

	Kuala Lumpur %	Singapore %	Suita %	Dhaka %
Intersection	29.6	34.4	60.7	25.0
Mid-block	56.8	47.8	--	64.0
Other	13.6	17.8	39.3	11.0
Total	100 %	100 %	100 %	100 %

Source: NHMRC Road Accident Research Unit, The university of Adelaide

CHAPTER-7

CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

The aim of this study was to assess motorcycle traffic volume characteristics and their travel behaviour. The travel behaviour was assessed with regard to trip time, purpose, trip length and trip patterns. This study also aimed to determine the average occupancy of motorcycles as well as male, female and children riders characteristics. At the outset field surveys were carried out on the selected major roads of Dhaka city to obtain the above elements of data. These data were then processed for detailed analysis.

It was found that motorcycle volume accounted for about 4 percent of total traffic volume. The hourly traffic volume of motorcycle showed considerable variation between the different hours of the day and between locations. The highest proportion of motorcycle traffic was found on Mirpur road, accounting for near 7 percent during 10:00 am-11:00 am. This was followed by 5 percent on New Airport road. In terms of numbers, the maximum hourly volume of motorcycles was found be 377 on New Airport road, which was followed by Tongi-Diversion road (182 motorcycles/hour).

Overall a total no 5814 motorcycles were observed. The distribution of these motorcycles was 68 percent with single rider, 31 percent with two riders and 1 percent with three or more riders. Average occupancy was thus 1.3 riders per motorcycle in the study area of Dhaka city. The difference in the occupancy per motorcycle depends on both the survey time and selected localities. A substantial number of motorcycles with 2 or 3 riders were found during the morning and evening peak hours in the study area. The results of field survey showed that overall 57 percent of all riders used helmets and this percentage for motorcycle driver was about 90 percent. The percentage of pillion riders who used helmets varied between 3 percent and 5 percent. About ninety-nine percent of motorcycle drivers were male. Average distribution of pillion riders was male 79 percent, female 11 percent and children 10 percent.

Roadside interview of motorcyclists (drivers) was carried out for the study of motorcycle user characteristics. A questionnaire was designed to get information about motorcycle users' on sex, profession, age, trip purpose, occupancy of motorcycle, use of safety helmet and reason for using motorcycle. It was found interview survey that male drivers were 100 percent .The page group 30-39 was the highest, accounting for 45 percent of total motorcyclists (driver). The highest occupation group of motorcyclist was service, accounting for 50 percent of total drivers. About 35 percent of motorcycle trips were generated for business purpose. Average distance traveled per day per motor cycle rider

was 32.6 km. It was found that main reason for using motorcycle (90% of motorcyclists) was to reduce travel cost.

It is notable that 15 percent of motorcycle accidents occurred involving passenger cars. About 35 percent of motorcycle accidents in the study area of Dhaka were involved with buses, minibuses and trucks. Autorickshaws, micro-buses, rickshaws and tempos were responsible for remaining accidents. About 64 percent of motorcycle accidents occurred at straight roads, 25 percent at junctions and the remaining 11 percent were at unknown locations. According to present analysis 68 percent of total motorcycle accidents occurred at day time and 32 percent at night time. About 53 percent of total accidents were rear-end collisions and 21 percent were side-swipes accidents. Passenger cars were responsible for most of the rear-end collision types of motorcycle accidents.

The results that were obtained from this study are expected to help developing future policies and safety programs to reduce the causality and mortality rates among motorcyclists as well the operation of motorcycle traffic in the Dhaka metropolitan area.

7.2 RECOMMENDATIONS

7.2.1 Recommendations for Motorcycle Safety

1. Small vehicles like motorcycles, bicycles and other slow moving small vehicles should be painted only in combination of conspicuous colors like white, orange, yellow, and greater use of reflective strips should be encouraged. These could make smaller vehicles more noticeable, specially at night.
2. Speed limits are needed to be enforced particularly for public buses and trucks which are operated within the city limits.
3. Helmet use should be made compulsory for all motorcycle riders.
4. A lower minimum age limit of 25 years should be established for bus and truck drivers. This would ensure that they have had some driving experience with smaller vehicles (which have a lower probability of being involved in fatal crashes) before driving the heavy vehicles which have higher probability on fatal crash involvement.
5. Road design should be discouraged with high speeds in the city. This may be done by introducing safe and well design speed-limiting devices in the road design process.
6. Pedestrian crossings on the straight roads should be provided in association with appropriate methods of slowing down vehicular traffic on either sides.
7. Truck movement in the city may be restricted during off-peak hours.

8. Motorcycle with engine capacity greater than 150 c.c. should be discouraged, as higher-powered motorcycle riders tend to sustain more serious injuries and are often overspeeding.
9. Helmets have to be designed which are not too uncomfortable in warm climates. In addition, it should provide greater protection in blunt impacts to the sides of the head.
10. Bus and truck head light designs should aim at detection of pedestrians and motorcycle riders at greater distances.
11. There is a need for more effective training procedures for motorcyclists because there is a high risk of serious injury to novice riders compared with those who are more experienced.
12. Novice motorcyclists have a relatively high risk of accident involvement. It is recommended that motorcyclist operating on a learner's permit or in the first year of riding, should not be permitted to be accompanied by pillion riders.

7.2.2 Recommendations for Future Study

The field survey data used in this study are based on some selected counting stations. There are no continuous counting stations in our country. In this research work manual counting was done. Data from continuous counting stations are required to study properly the distribution of traffic flow and fluctuations in the flows. Further studies on traffic volume characteristics should be done having continuous counting stations at representative locations of road way system. It is expected that this type of

study will give better results due to the increase of number of counting stations.

Field surveys were carried out on the selected major roads of Dhaka city. These survey locations were Tongi-Diversion Road, Mirpur Road and New Airport Road. To represent the actual development of motorized vehicles in Dhaka, it is necessary to survey all other major roads in Dhaka city.

Motorcycle trip and the rider characteristics were assessed based on a relatively small sample size. It is recommended that a more comprehensive such study should be carried out by taking statistically significant sample size.

The accident data were used in this study did not contain sufficient information about details of accidents as well as user characteristics such as driver's age, sex, education etc. Accident data which included only Tejgoan and Mirpur Thana were used in this study. Further study should be conducted by using greater amount of accident data covering the whole metropolitan area.

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APPENDIX-A

TABLE-A4.1

Hourly volume of different type of motorized vehicles on Tongi-Diversion Road

(Data were colleted in different three days)

	6A.M-7A.M	7A.M-8A.M	8A.M-9A.M	9A.M-10A.M	10A.M-11A.M	11A.M-12A.M	12A.M-1P.M	1P.M-2P.M	2P.M 3P.M	3P.M 4P.M	4P.M 5P.M	5P.M-6P.M
Motorcycle	27	64	92	110	138	182	182	163	178	174	134	114
Bus/ Mini-bus	120	267	245	185	171	201	180	180	205	198	172	154
Autorickshaw /tempo/mishuk	412	845	1949	2658	2995	2855	2500	2180	3420	2650	2420	2130
Truck	20	52	44	127	200	210	200	164	265	252	185	148
Micro-bus,Jeep Pickup	159	578	578	659	504	484	522	455	515	477	375	388
Taxi/Car	175	482	628	650	567	1052	800	960	1070	930	710	625
Total	924	2288	3536	4389	4575	4984	4384	4102	5649	4681	3995	3483

TABLE-A4.2

Hourly volumes of motorcycles with respect to different numbers of riders on Tongi-Diversion Road

	6A.M-7A.M	7A.M-8A.M	8A.M-9A.M	9A.M-10A.M	10A.M-11A.M	11A.M-12A.M	12A.M-1P.M	1P.M-2P.M	2P.M-3P.M	3P.M-4P.M	4P.M-5P.M	5P.M-6P.M	TOTAL
Motorcycle with one rider	20	49	75	92	100	110	120	116	118	119	88	78	1085
Motorcycle with two riders	7	15	17	18	38	71	60	45	60	53	44	35	463
Motorcycle with three riders	0	0	0	0	0	1	2	2	0	2	2	1	10
Total	27	64	92	110	138	182	182	163	178	174	134	114	1558

TABLE-A4.3

Hourly volume of different type of motorized vehicles on New Airport Road

(Data were colleted in different three days)

	6A.M-7A.M	7A.M-8A.M	8A.M-9A.M	9A.M-10A.M	10A.M-11A.M	11A.M-12A.M	12A.M-1P.M	1P.M-2P.M	2P.M-3P.M	3P.M-4P.M	4P.M-5P.M	5P.M-6P.M
Motorcycle	72	120	258	337	347	290	284	265	303	301	292	261
Bus/Minibus	117	180	155	75	105	70	72	80	143	135	130	120
Autorickshaw/ tempo/ mishuk	825	1500	3015	4215	4308	4051	4115	3503	3220	3300	4320	3802
Truck	24	30	30	80	155	140	108	89	111	105	135	121
Microbus	74	140	320	294	280	336	248	235	255	215	200	160
Zeep/pickup	68	170	210	146	292	184	192	185	180	280	308	231
Taxi/Car	452	850	1970	1320	2440	2040	1680	1635	1590	1415	1440	1224
Total	1632	2990	5958	6467	7927	7111	6699	5992	5802	5751	6825	5919

TABLE - A4.4

Hourly volumes of motorcycles with respect to different numbers of riders on New Airport Road

	6A.M 7A.M	7A.M-8A.M	8A.M-9A.M	9A.M-10A.M	10A.M-11A.M	11A.M-12A.M	12A.M-1P.M	1P.M-2P.M	2P.M-3P.M	3P.M-4P.M	4P.M-5P.M	5P.M-6P.M	TOTAL
Motorcycle with one riders	53	96	191	254	254	200	190	167	168	191	188	172	2124
Motorcycle with two riders	14	24	64	83	90	86	90	96	131	105	102	87	972
Motorcycle with three riders	0	0	3	0	3	4	4	2	4	5	2	2	29
Total	67	120	258	337	347	290	284	265	303	301	292	261	3125

TABLE-A4.5

Hourly volume of different type of motorized vehicles on Mirpur Road

(Data were colleted in different three days)

	6A.M-7A.M	7A.M-8A.M	8A.M-9A.M	9A.M-10A.M	10A.M-11A.M	11A.M-12A.M	12A.M-1P.M	1P.M-2P.M	2P.M-3P.M	3P.M-4P.M	4P.M-5P.M	5P.M-6P.M
Motor cycle	32	82	124	112	134	96	71	137	105	102	114	64
Bus/ Minibus	225	325	280	242	200	196	240	220	240	310	240	296
Autorickshaw/ tempo/ mishuk	863	1100	1200	1159	1153	970	1100	1270	1571	1806	1835	1848
Truck	90	133	100	289	240	255	265	310	290	255	265	172
Micro-bus	22	31	27	21	22	15	14	25	24	23	24	32
Taxi/Car/ Zeep	170	280	260	200	224	130	100	280	220	230	280	305
Total	1402	1951	1991	2023	1973	1662	1790	2242	2450	2726	2758	2717

TABLE-A4.6

Hourly volumes of motorcycles with respect to different numbers of riders on Mirpur Road

	6A.M-7A.M	7A.M-8A.M	8A.M-9A.M	9A.M-10A.M	10A.M-11A.M	11A.M-12A.M	12A.M-1P.M	1P.M-2P.M	2P.M-3P.M	3P.M-4P.M	4P.M-5P.M	5P.M-6P.M	TOTAL
Motorcycle with one rider	18	46	79	75	99	62	46	96	65	72	71	48	777
Motorcycle with two riders	12	32	42	37	34	33	22	38	38	29	40	15	372
Motorcycle with three riders	2	4	3	0	1	1	3	3	2	1	3	1	24
Total	32	82	124	112	134	96	71	137	105	102	114	64	1173

DISTRIBUTION OF DIFFENENT TYPE OF VEHICLES ON SELECTED ROADS

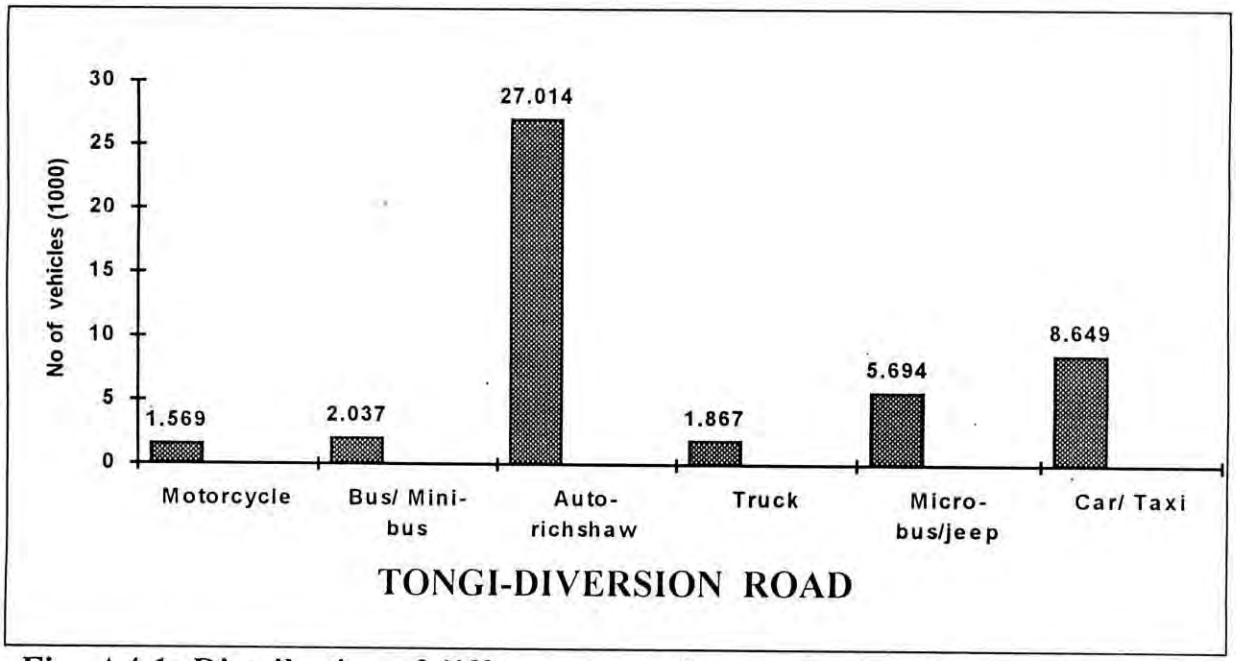

Fig -A4.1: Distribution of different type of motorized vehicles on Tongi-Diversion Road

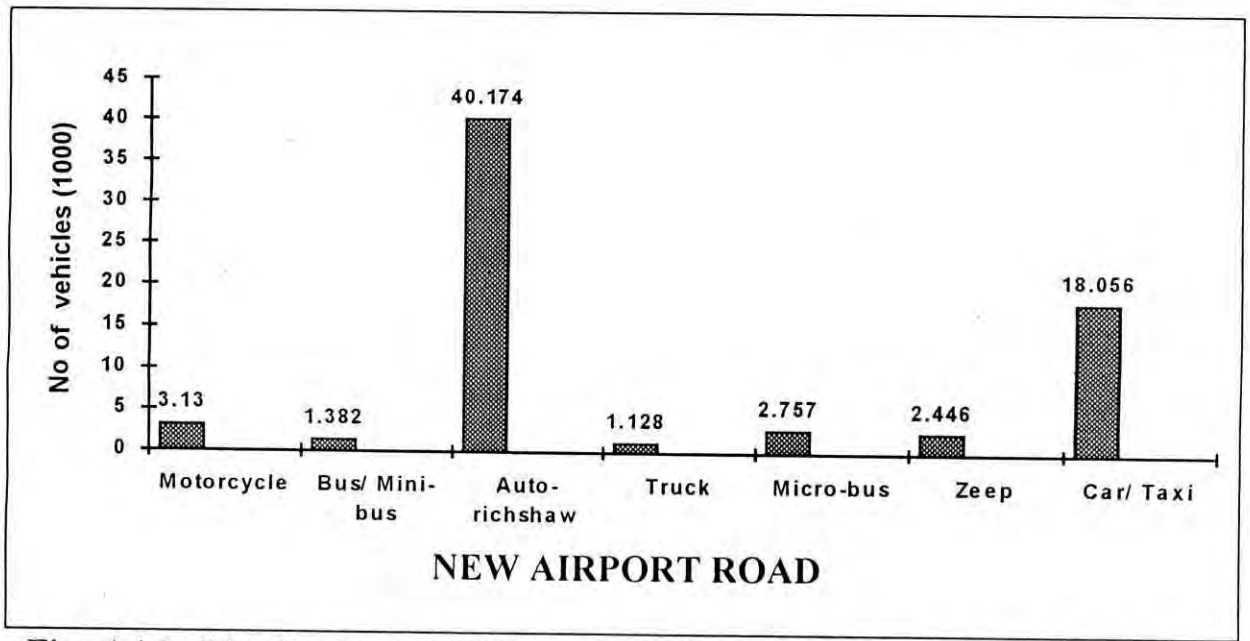

Fig -A4.2: Distribution of different type of motorized vehicles on Tongi-Diversion Road

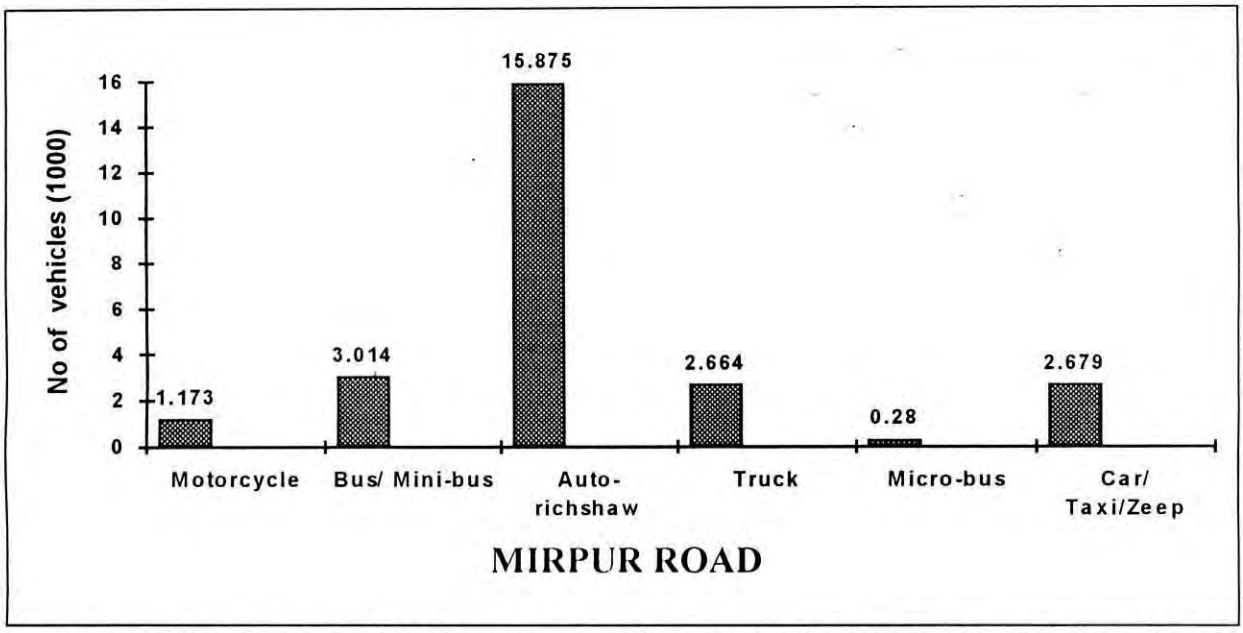

Fig -A4.3: Distribution of different type of motorized vehicles on Mirpur Road