THE OCCURRENCE AND DETERMINANTS OF MOTOR VEHICLE INJURIES IN ADDIS ABABA, ETHIOPIA

A THESIS

PRESENTED TO THE

SCHOOL OF GRADUATE STUDIES OF

ADDIS ABABA UNIVERSITY

IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF PUBLIC HEALTH

BY

TADDELE DESSIE, Bsc, MD

MAY, 1989

ADDIS ABABA UNIVERSITY
School of Graduate Studies

The Occurrence and Determinants of Motor Vehicle Injuries in Addis Ababa

by

Dr. Tadele Dessie

Department of Community Health / Faculty of Medicine

Approved by the Examining Board:

Dr. Tadesse Alemu
Chairman, Department Graduate Committee

Dr. Charles Larson
Advisor

Dr. Ascher Segal
Examiner

Dr. Gary Peckeles
Examiner

Ato Gabre-Emanuel Teka
Examiner

TO MY FAMILY

ACKNOWLEDGMENTS

I wish to express my special thanks to Dr. Charles P. Larson, Director of the McGill-Ethiopia Community Health Project, whose continuous supervision and correction helped make this thesis possible.

My gratitude also goes to the International Development and Research Council of Canada (IDRC) for generously funding this study and to the McGill-Ethiopia Community Health Project team for their support and cooperation throughout the study.

My heart felt appreciation also goes to Dr. Getachew Tadesse, Vice-Minister, Ministry of Health of Ethiopia, who gave encouragement and administrative support to my work.

Finally, I forward my great thanks to the staff of the participating Addis Ababa hospitals, Ministry Of Health Planning and Programming Bureau, Road and Transport Authority,Addis Ababa Traffic Office, and Ethioian Insurance Corporation, who assisted me in every respect.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

This is a study of hospital treated motor vehicle injuries occurring in Addis Ababa, Ethiopia. Injuries are described in terms of their circumstance, type, and consequence. Drivers causing injury and their vehicles were compared with randomly selected control drivers in order to identify important driver and vehicle determinants of injury. The investigation was carried out between August 21, 1988 and November 12, 1988.

During the twelve week period of study, 1050 hospital treated injuries were identified, for an overall incidence density of 279.4 per 100,000 person years. The mortality rate was 17.6 per 100,000 population per year and these fatalities accounted for an estimated 11,154 years of potential life lost before age 65. The annual vehicle inflicted injury incidence density rate was 94.6 injuries per 1,000 cars registered.

The majority (90.6%) of the injured were pedestrians and 48.9% were between 11 and 30 years of age. The commonest body parts affected was multiple parts (43.6%), the extremities (26.5%) and the head (22.0%). The most frequent type of injuries were lacerations (42.1.%) and fractures (14.9%).

Driver characteristics placing an individual at increased risk of inflicting injury were male gender, under age 25 with less than 5 years driving experiences, and being privately employed with a taxi or small bus drivers licence. Elevated risks were also found for the following motor vehicle

characteristics; buses, taxis, private ownership, and less than 5 years on the road. Based upon a multiple regression analysis for the prediction of motor vehicle injuries, the most important predictions in order of their strength of association were found to be; motor vehicle age, drivers age, drivers gender and motor vehicle type.

This study has documented the high motor vehicle morbidity and mortality rates occurring, in particular, among the young male population of Addis Ababa. Several driver and vehicle determinants of this important public health problem have been identified,and recommendations have been given for the planning of future preventive programs, safegurding and educating the road user.

I. INTRODUCTION

In the past 100 years approximately 2 million persons have died and nearly 100 million have been injured from vehicular trauma (1). As people become increasingly dependent on motorized transport, motor vehicle injuries (MVIs) have become one of the single most frequent causes of death and a serious public health problem world wide (2,3,4,5). According to the World Health Organization 36% of all injuries involve motor vehicles and annually more than six million people are injured on the road (5).

MVI's are the highest ranking cause of death among people under the age of 40 years in developed countries (6,7,8). The impact of MVI's on morbidity and mortality in developing countries is far less well documented. A call for greater consideration of the impact of MVI's in developing countries has been made by the Economic Commission for Africa and the World Health organization. Recognizing the problem of lack of information about MVI's, the World Health Organization is now devoting greater attention to the prevention of road traffic injuries in developing countries . This stimulated a recent comparative review of traffic injuries in developed and developing (East and Southern African) countries. This investigation unexpectedly found that developing countries had higher injury rates than those reported from developed countries (9).

The incidence of MVI's in Addis Ababa has not been adequately documented. Nevertheless,based upon the health profiles carried out in its five districts, accidents causing physical injuries were found to be one of the leading causes of hospitalization (10), and according to the Ministry of Health MVIs is the 6th leading cause of hospital death in Addis Ababa (11).

A major problem with the documentation of MVI's is the incomplete recording of their occurrence . Traditionally police or hospital records have been relied upon . In Addis Ababa, nearly all serious MVI's are treated in hospital emergency rooms. Health Centers and other ambulatory facilities are not equipped with the proper manpower and physical resources to handle such emergencies. Prior to the initiation of this investigation it was documented by this study's principal investigator that about 30% of hospital treated MVI's in Addis Ababa had no police records, while nearly all police recorded MVI's had a hospital record (12). This finding provided important support to the feasibility of conducting a hospital based investigation of MVIs .

The purpose of this study was to determine the incidence of MVI's , to document the characteristics and outcome of MVI's, and to identify driver and vehicle characteristics placing them at increased risk for inflicting a MVIs. In the long run it is hoped that by focusing attention on the magnitude and importance of the problem that efforts to prevent MVI's will gain greater priority

II. STATE OF KNOWLEDGE

A. Occurrence of Motor Vehicle Injuries and Mortality

In Britain, in 1896, the first motor vehicle deaths were registered (13). Since then there has been a rising trend in the documented number of deaths, disability and human suffering caused by motor vehicles. Every year throughout the world, over 100,000 people are killed in road accidents and for every person killed 10-15 are seriously injured and 30-40 are slightly injured (6).

Although most African countries are in the early stages of motorization and the number of cars and roads is small relative to developed countries, the rate of MVI's is increasing at an alarming rate and is becoming an important cause of morbidity and mortality in many developing countries (9). In Nigeria, for example, the MVIs mortality rate increased from 13.2 in 1954 to 34.3 per 100,000 population in 1981 (14). In Eastern Africa in 1983 the number of deaths varied between 4 and 28 per 100,000 population (9).

In 1973, Fissha Teklewold published a retrospective study on injuries to children who were admitted from 1968-1971 to the Ethio-Swedish Pediatric Clinic of the Black Lion hospital in Addis Ababa. This study found accidents accounted for 5% (N=343) of all admissions, with car injuries accounting for 1.4% (15).

From data available from Addis Ababa police records for 1983 to 1987 MVIs rates were calculated and found to vary between

31.9 to 69.4 per 100,000 population. During this period , the rate of injury doubled while mortality remained relatively unchanged (Table 1).

B. Determinants of Motor Vehicle Injuries

Host Characteristics

The tragedy of MVI's is that they particularly involve the young and when death occurs the total productive years of life lost is enormous. Children are the most vulnerable victims of MVI's, presumably because children have not developed adequate self responsibility or control. In a study of 713 MVI's involving 749 children in the city of Vancouver, Canada boys were more commonly involved than girls and most injuries occurred in the 3 to 7 years age group (16). Although vehicular injuries are a prominent cause of death and injury for people of all ages, the incidence and proportional mortality are highest among the young (17,18,19). In a Nigerian study it was shown that 75.9% of the injured were below 30 years of age and 68.7% were males. Previous analyses have shown that the low incidence of female involvement is in part explained by the fact that females are less exposed to vehicles than males (20).

Agent

Driver Characteristics

Driving is a skill which requires training and experience. The driver who is in charge of the vehicle should be physically and mentally capable.

TABLE I

Motor vehicle injury and mortality rates (per 100,000) in Addis Ababa

Year	Population	Injuries		Deaths	
		N	rate	N	rate
1983/84	1,423,111	497	34.9	138	9.7
1984/85	1,471,497	742	50.4	142	9.7
1985/86	1,521,528	833	54.7	147	9.7
1986/87	1,573,266	1091	69.4	128	8.1

Many believe the major contributing factor in the majority of injuries is the behaviour of drivers. According to a Norwegian study, 90% of MVI's were classified as the fault of drivers. The common driving errors included lack of observation or inattentiveness, driving too fast and failure to carry out the necessary maneuvers. In this same study young and inexperienced drivers were found to be twelve times more likely to cause injury than older experienced drivers (9).

The most significant predictor driver characteristics that should be reported are the age and gender (youth and male) that greatly inflict injury. It has been noted that among motor vehicle drivers teenage and young adult men 16 to 29 years of age make the greatest use of motor vehicles (13,16). Immaturity and inexperience appear to underlie the high injury rate of these group. In a Nigerian study 36.2% (N=688) of cases were causes of injures due to negligence and inexperience (14).

In many developed and developing countries excess speed is the commonest of the recorded faults of drivers involved in accidents (20). Excessive speed was a factor in 30% of fatal MVIs (13). Another important contributor to MVIs rates is alcohol and drug consumption. There is evidence that alcohol is involved in approximately one-half of fatal driving injuries. Studies carried out in several countries since 1930 show that the excessive use of alcohol severity impairs driving skills, concentration, judgement,vision,and reflexes (21). In the United States. in 1987, an estimated 26,630 people were killed in alcohol related

motor vehicle traffic accidents (22).

Vehicle Characteristics

It is not known what proportion of MVI's in developing countries can be attributed to mechanical defects, older cars, poor maintenance or road construction. In the United Kingdom a study reported that a vehicle defect was responsible for only 2.5% (748) out of 299,767 casualties (13). It is known that the compulsory fitting of seat belts, burst proof locks, and head lamp wipers have resulted in safer vehicles (23). Another major advance is anti-skid brakes which reduce stopping distances by about 36 percent dry and 42 percent in wet weather. Studies show that the chance of fatal injury is reduced by 75% if the occupant is wearing a seat belt (23).

Environment

Road conditions are a major factor in the cause of MVI's. The design of roads, lighting, and surfacing of roads can all be shown to affect injury rates (6,23). An investigation carried out in the mid-western United States concluded that environment factors contributed to 12 to 19% of all MVI's (21). The importance of road design was demonstrated by Brown et al, who found that 74% of the fatalities and 64% of the severe injuries on a busy bridge entering Montreal occurred at a single curve near the end of the bridge (24).

Differences in the incidence of motor vehicle injuries at different times of the year, day of the week and hour of the day have been repeatedly documented (13,16,25). While the association of these factors with MVI's has been consistently found, it is also the case that social or culture influences significantly alter the identified patterns of association. For example, African studies have reported peak MVIs incidence rates in December (20), and October (25). In countries with well defined seasons there are corresponding well defined differences in the incidence of MVIs, with the highest rates in the summer months. It is generally accepted that MVIs occur more frequently in hours of daylight than darkness (26). The highest injury rates have been reported to be from 4 to 8 pm, and this is because more people are travelling then at other time (13). Climatic conditions are an additional factor affecting the occurrence of MVI's . Even though the greatest absolute number of injuries occur in clear weather, rain and fog greatly increase the relative risk of injury (13).

In many developing countries financial resources are limited, resulting in poorly constructed and maintained roads which are overloaded. In addition most are not bordered by sidewalks, which greatly increases the likelihood of host-agent exposure. In Addis Ababa it is estimated that less than 25% of roads are bordered by sidewalks (27).

This review has addressed host,agent and environment characteristics in relation to MVI's. Most of these relations

have been derived from studies in developed countries and may not be applicable to Ethiopia or other African countries. It is important to determine what the important local determinants are and their applicability to the prevention of MVI's. It will be of additional interest to document whether or not there are determinant similarities between developing and developed countries.

C. Impact

Although in most developed countries, the number of injuries due to MVIs has been decreasing due to technical progress, introduction of safety regulations and improved road infrastructure, motor vehicle injuries are still one of the leading causes of death and disability (1,3,22).

In addition to the tragedy of death or permanent disability the economic cost is high and there are many other social impacts. For example, in studies in the United States the cost of MVIs was 69.5 billion dollars in 1984. It is estimated that each motor vehicle death costs society more than 330,000 dollars in lost wages, medical costs, insurance expenses and other injury related costs (1).

The Ethiopian Insurance Corporation on the cost of MVIs in 1986 and 1987 indicated that motor vehicle accidents claims were the most common claim. It had a gross claim of 93.8 million Birr, 45.2 and 48.6 million Birr for the respective years (28).

In a study by the Ontario,Canada Ministry of Transport and Communication, 19% of people surviving a major traffic accident suffered from post-traumatic fear of driving, 15% from nervousness, 11% from insomnia and 10% from depression (29).

III. OBJECTIVES AND HYPOTHESIS

The objectives of the study are:

1. To describe hospital treated motor vehicle injuries in terms of their circumstances, type of injuries and consequences.
2. To determine the incidence density of hospital treated motor vehicle injuries and mortality rate.
3. To identify important driver nd vehicle determinants of motor vehicle injuries.

Hypothesis

This investigation was essentially hypotheses testing study. Important potential determinants included:

H1. Host: age, gender

MVI's are significantly ($p<.05$) more likely to occur in the young (<10 years of age) and among males.

H2. Agent:

A. Driver: Driver characteristics significantly related to an increased risk for inflicting injury will include

1) male gender, 2) younger age, 3) less driving experience, and 4) employment status.

B. Vehicle: Vehicle characteristics significantly related to an increased risk for inflicting injury will include

1) vehicle type, 2) vehicle age, and 3) vehicle ownership.

H3. Environment

The nature of road and time of day are significantly related to the occurrence of motor vehicle injury.

IV. METHODS

A. Study Design

An incidence density case control study of hospital treated motor vehicle injuries among the Addis Ababa population between August 21, 1988 and November 12, 1988 (12 weeks) was carried out.

B. Study Domain

Addis Ababa is the capital city of Ethiopia, located in the centre of the country. It lies at an altitude between 2,000 and 2,700 meters above sea level and has a tropical highland climate. The estimated 1988 population of Addis Ababa is 1,628,751 and is scattered over an area of 216.6 square kilometers. There are 357 km of asphalt roads and 410 km of gravel or dirt roads in the city. There are 16 hospitals in the city, but only 10 hospitals handle MVIs.

Although the city is over 100 years old, rapid urban growth in the past 25 years has resulted in the combined contrast of modern buildings and paved avenues with low standard housing and gravel or dirt roads. According to the Road Transport Authority, the total number of vehicles registered in Addis Ababa that passed the required annual safety examination in 1988 were 48,101.

C. Population

1. Source population:

The source population includes any resident of Addis Ababa (potential host) and any registered driver residing in Addis Ababa (potential agent).

2. Study Population (refer to Figure 1):

a. Injured

Any individual treated for MVIs in one of the ten Addis Ababa hospitals.

b. Drivers inflicting injury (Cases):

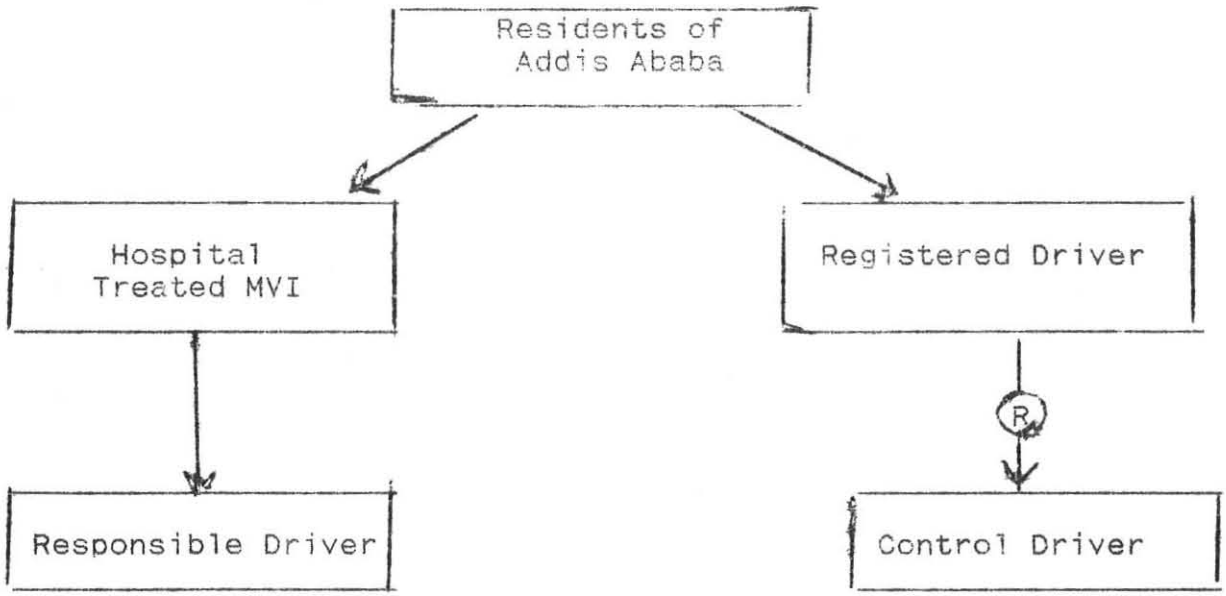
Drivers of vehicles inflicting a MVIs which was treated in one of the 10 city hospitals, and uninjured drivers inflicting MVIs.

c. Control Drivers (Controls):

One control driver was randomly selected from the licence bureau of Addis Ababa (resident) for each case driver. Selection was based upon a table of random numbers and simple random selection.

3. Sample Size Power Calculations:

Based on Addis Ababa police records the number of expected MVI's was approximately 1000 and vehicles 750. Given these numbers, the power of this study to detect a 10% difference in rates affecting, for example, agent's age and driving experience, with alpha set at .05, is greater than 0.95. (Taken from Table 8 of Biometrika Table for Statisticians; Vol.I. 2nd. edition 1958).



R = Randomization

FIGURE 1. Study population

D. Measurement

1.Outcome and Injured Characteristics

Motor Vehicle Injuries or Deaths

Within the defined geographical boundaries of Addis Ababa, a system was established to collect information related to any hospital visit for MVIs. All ten hospitals with a surgical emergency department treating MVI's were recruited and joined the study. Hospital registrars were engaged and trained to collect the required baseline information (see appendix A). This included recording of identifying information on each MVIs victim and giving them a study number. After emergency medical services were completed the patient was immediately interviewed if not admitted to the hospital, otherwise the record was kept aside until the health of the patient permitted an interview.

This interview included social and demographic information as well as a description of the injury and its outcome. Morbidity and mortality information were subsequently verified by a hospital physician. Every third day the medical records of motor vehicle injury patients were reviewed by a physician and their medical reports added to the questionnaires. For the unconscious and dead, information was obtained from relatives and traffic police.

2. Driver Characteristics

Data on case drivers and vehicles were obtained from police records and from a questionnaire (see appendix B). Control drivers were active drivers with no history of MVIs during the

study period. They were identified by first obtaining the list of annual vehicle safety examinations. From this list of vehicles a random starting point was picked and then every 100th vehicle selected and the driver of the vehicle identified
(see appendix C).

The following measurement definitions were applied:

Motor Vehicle: Any four wheel or more power driven vehicle used for carrying persons or goods by road.

Injured (victim): Any person who sustained one or more injuries as a result of a motor vehicle accident and was treated at a hospital.

Death: Any person killed outright at the sight or who died in hospital as a result of the motor vehicle injury.
(In Addis Ababa it is a requirement that all dead MVIs cases are brought to one of the treating hospitals).

Major Injury: An injury requiring hospitalization following a MVIs. Also considered major were all fractures, and patients sent home due to bed shortages.

Minor Injury: An injury not requiring hospitalization following MVI's.

E. Conduct of Study:

After the approval of the research protocol a letter was written from the Ministry of Health of Ethiopia to the Road and Transport Authority, the Addis Ababa Traffic Office, Ethiopian Insurance Corporation and the eligible treating hospitals in Addis Ababa explaining the purpose of the study and requesting their cooperation.

Orientation of the hospitals took two weeks. A three-week pretest was carried out and at the same time the data collectors were trained to complete the questionnaires in hospitals. Based upon pretesting, the questionnaires were modified and the study was initiated. Every 3rd day the hospitals were visited by the principal investigator who checked for the quality of the data collected and verified the number of injured. In addition, the medical findings were integrated into the study records.

F. Data Analysis:

To analyze the data the SPSS-PC+ statistical program was used for the descriptive, bivariate and multivariate analyses. Data entry, cleaning and editing were done using the SPSS Data Entry program.

Phase 1. Description of injuries: Calculations included frequency distributions of injured by age,sex,employment and nature of injury,time of injury, severity of injury, and body parts affected.

Phase 2. Occurrence rates: Incidence density rates, mortality rates, years of potential life lost rates per 100,000 population and vehicle incidence density rates per 1000 cars were calculated.

Phase 3. Bivariate analysis: Bivariate analyses for significant differences between cases and control drivers /vehicles for specific exposure histories were conducted. Potential determinant characteristics were assessed from the calculation of odds ratios, their confidence intervals , and chi-square or t- statistics.

Phase 4: Multivariate analysis: Multiple regression models for the prediction of inflicting injury were tested for driver characteristics, vehicle characteristics and a combination of both.

V. RESULTS

During the study period of August 21, 1988 to November 12, 1988 in Addis Ababa, 1,050 persons were injured and 66 died as a result of a MVIs (Figure 2)

A. Description of injuries

In Table 2 the number of body parts injuries sustained by victims is summarised; 56.4% had one injury, 36.0% two and 7.6% three or more. The body parts affected by the MVIs are shown in Table 3; 43.6% had multiple parts affected, 26.5% had injuries involving the extremities and 22.0% had only head injury.

The distribution of injuries by type and severity are summarized in Table 4. Lacerations were the most common type of injury, accounting for over one-third of the total. It was found that 81.8% of the injured were treated as outpatients and 11.9% were hospitalized and 6.3% died (refer to Figure 3). Of those dying, about half died at the scene, about one-third died within minutes of reaching hospitals and about one-tenth died in hospital.

Table 5 summarizes the age and sex distribution of motor vehicle injury deaths. Among males the highest rates are seen between the ages of 20 to 29, while among females in those 20 to 24 and 50 years of age and older.

The mean age of those injured was 25.7 +/- 17.6 years. Among the injured 32.4% were children under 15 years, 12.6% were between 15-19 years, 22.0% were between 20-29 years and 19.6% were 40 years of age and over (Figure 4). Concerning marital

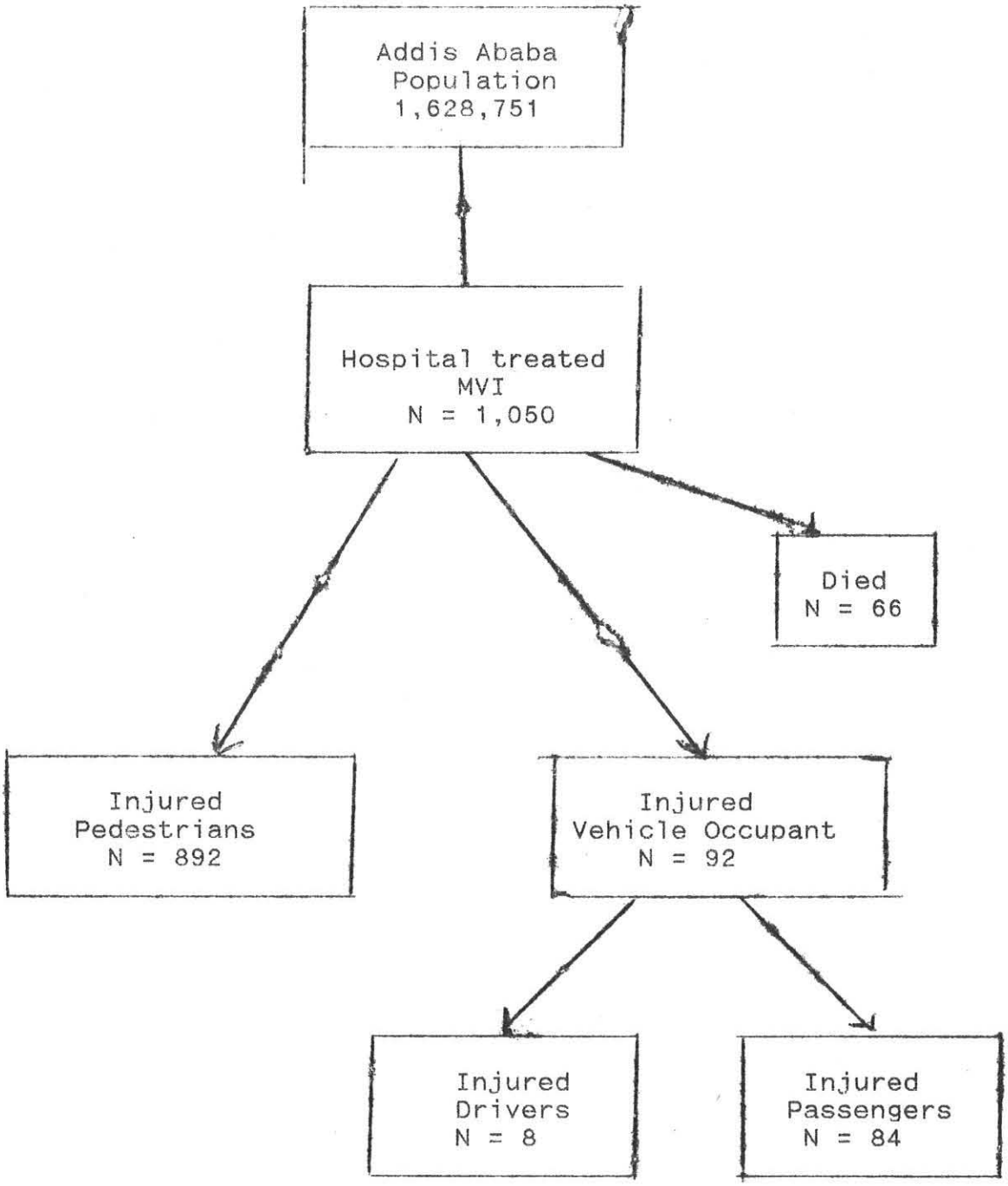


Figure 2. Study enrollment and outcome results of motor vehicle injuries during 12-week study period

TABLE II

Number of injuries sustained

Number of Injuries	Injured	
	Number	%
1	555	56.4
2	354	36.0
3	58	5.9
4 or more	17	1.7

TABLE III

Body parts affected by the injury

Body Part	Number	Percentage
Multiple	429	43.6
Head	217	22.0
Lower extremities	201	20.4
Upper extremities	60	6.1
Trunk	34	3.5
Others	43	4.4

TABLE IV

Distribution of injuries by type and severity

Type of Injury	Serious Injury No.	(%)	Minor Injury No.	(%)
Concussion	127	(11.9)	12	(1.1)
Sprain	112	(10.5)	59	(5.5)
Laceration	394	(36.9)	56	(5.2)
Dislocation	10	(0.9)	1	(0.1)
Fracture	160	(14.9)	-	-
Amputation	3	(0.3)	-	-
Contusion	130	(12.2)	-	-
Others	5	(0.5)	-	-
Total	941	(88.0%)	128	(12.0%)

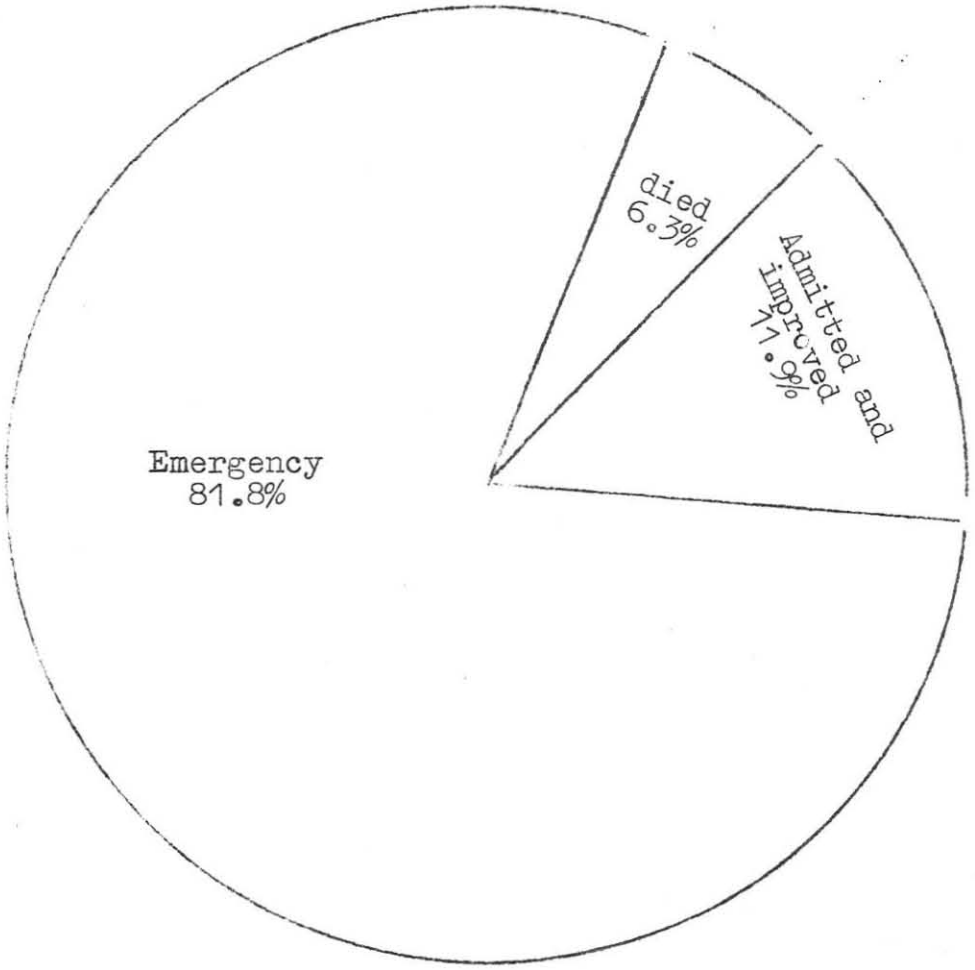


Figure 3: Outcome of Motor Vehicle Injuries

TABLE V

Age and sex disrtibution of motor vehical injury deaths

Age	Male		Female		Total	
	N	(%)	N	(%)	N	(%)
0 - 4	1	(1.9)	1	(7.1)	2	(3.0)
5 - 9	6	(11.5)	1	(7.1)	7	(10.6)
10 - 14	6	(11.5)	1	(7.1)	7	(10.6)
15 - 19	3	(5.8)	1	(7.1)	4	(6.1)
20 - 24	8	(15.4)	3	(21.4)	11	(16.7)
25 - 29	8	(15.4)	1	(7.1)	9	(13.6)
30 - 34	3	(5.8)	-	-	3	(4.6)
35 - 39	5	(9.6)	1	(7.1)	6	(9.1)
40 - 44	1	(1.9)	-	-	1	(1.5)
45 - 49	1	(1.9)	-	-	1	(1.5)
50	5	(9.6)	3	(21.4)	8	(12.1)
Unknown	5	(9.6)	2	(14.3)	7	(10.6)
Total	52	(100)	14	(100)	66	(100)

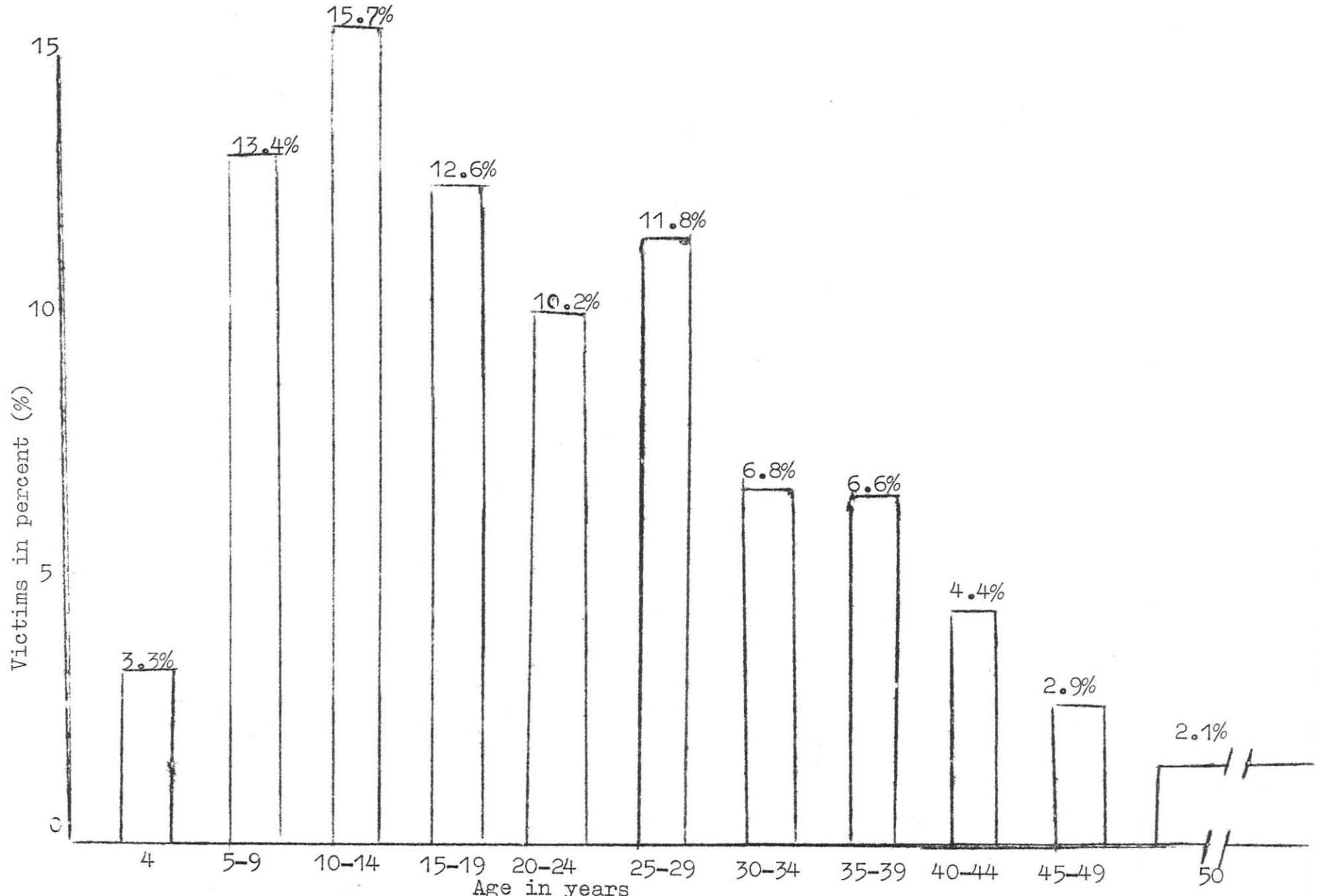


Figure 4: Age Distribution Curve of Victims

status, 72.1% of victims were single and 26.0% were married.

Among those injured 90.6% were pedestrians, 8.5% were passengers and 0.9% were drivers. Figure 5 compares the distribution of the Addis Ababa population and those injured by Ketena of residence.

In the study it was not possible to identify vehicle defects in relation to injuries. In Figure 6 it is seen that 41.1% of vehicles involved in a MVI were under 5 years old, 36.9% were between 6-10 years and 22% were greater than 10 years old. Of all 953 motor vehicles involved in a MVI only 16.7% were covered by motor vehicle insurance.

The study period covered the months of August to November, a time which includes both rainy and dry seasons of the year. The number of MVI's, however, were extremely stable at 13 - 15 persons injured per day. The location of accidents by Ketena is shown in Figure 7; 24.7% occurred in Ketena 3, 21.2% in Ketena 2, 20.8% in Ketena 4, 16.7% in Ketena 5 and 16.6% in Ketena 1. It was found that 77% of the injuries happened during the day, 99.3% occurred on paved roads, 86.6% of these in the road. The distribution of the injuries by day of the week is summarized in (Figure 8). Analysis of the time of accidents revealed that 49.7% were between 0601-1200 hours, while 31.3% were between 1201-1800 hours (Figure 9). A curfew is imposed between 12pm to 5pm.

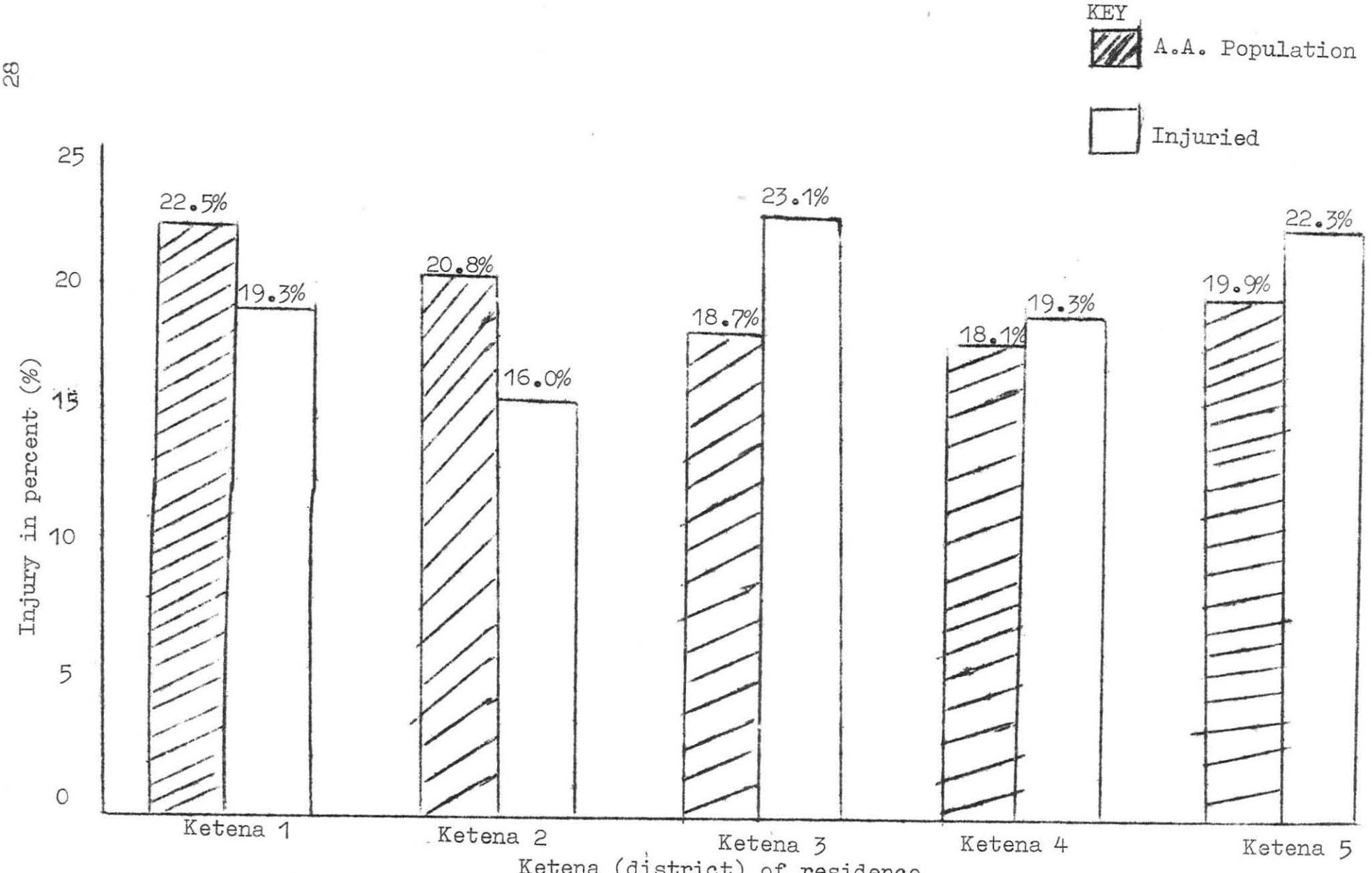


Figure 5: Distribution of Addis Ababa Population and Injuried by Ketena

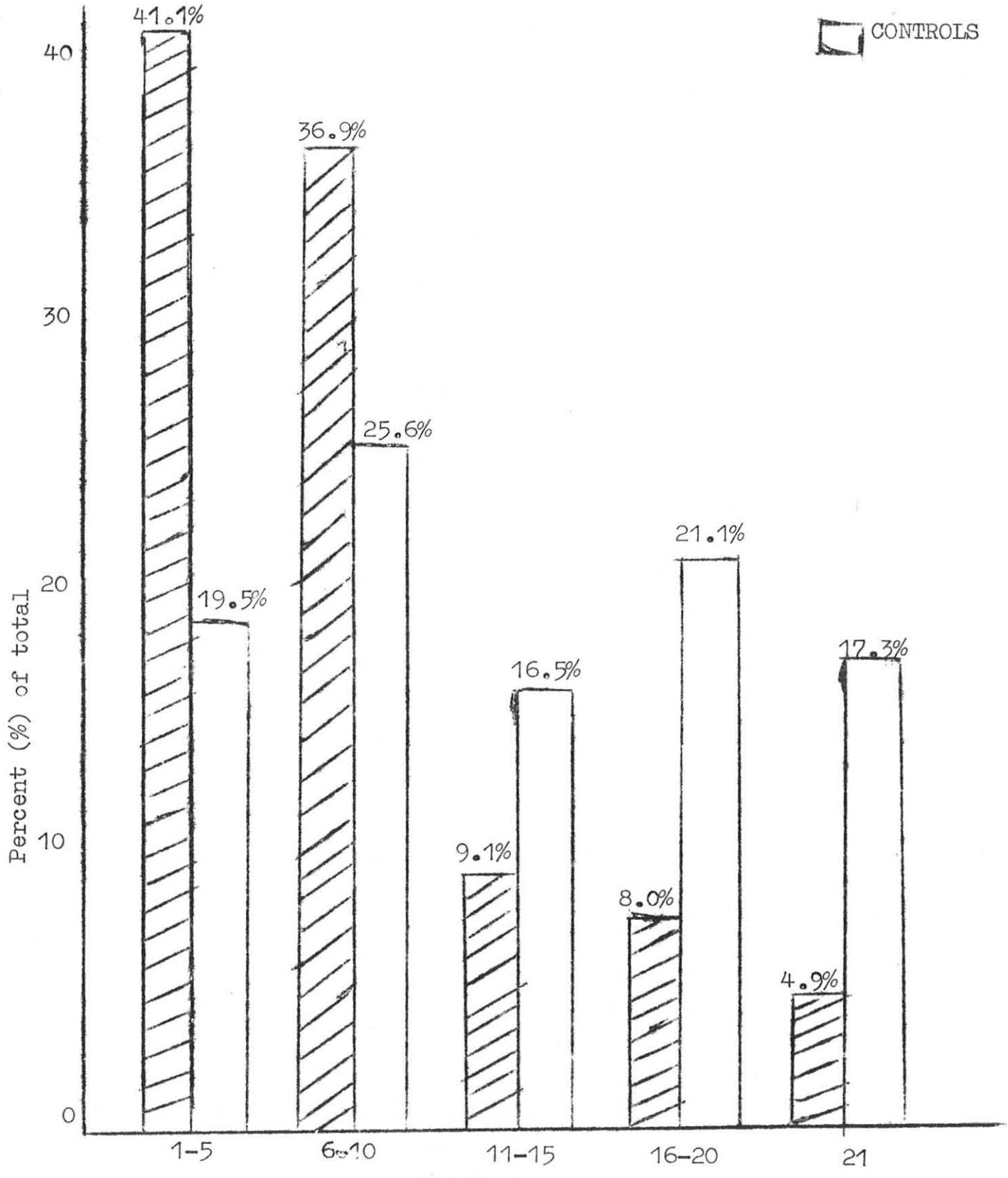


Figure 6: Motor Vehicle Age

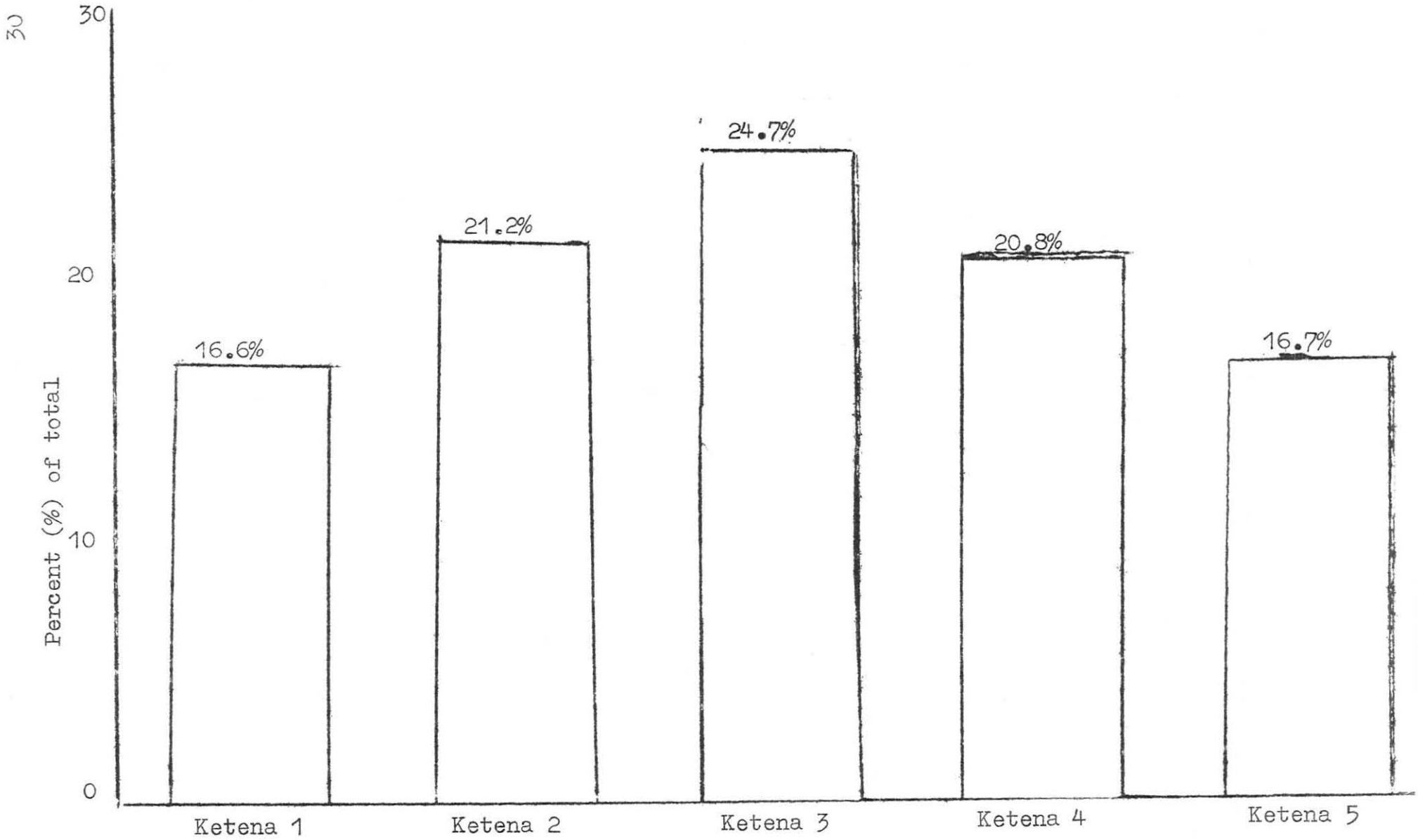


Figure 7: Location of Accident by Ketena

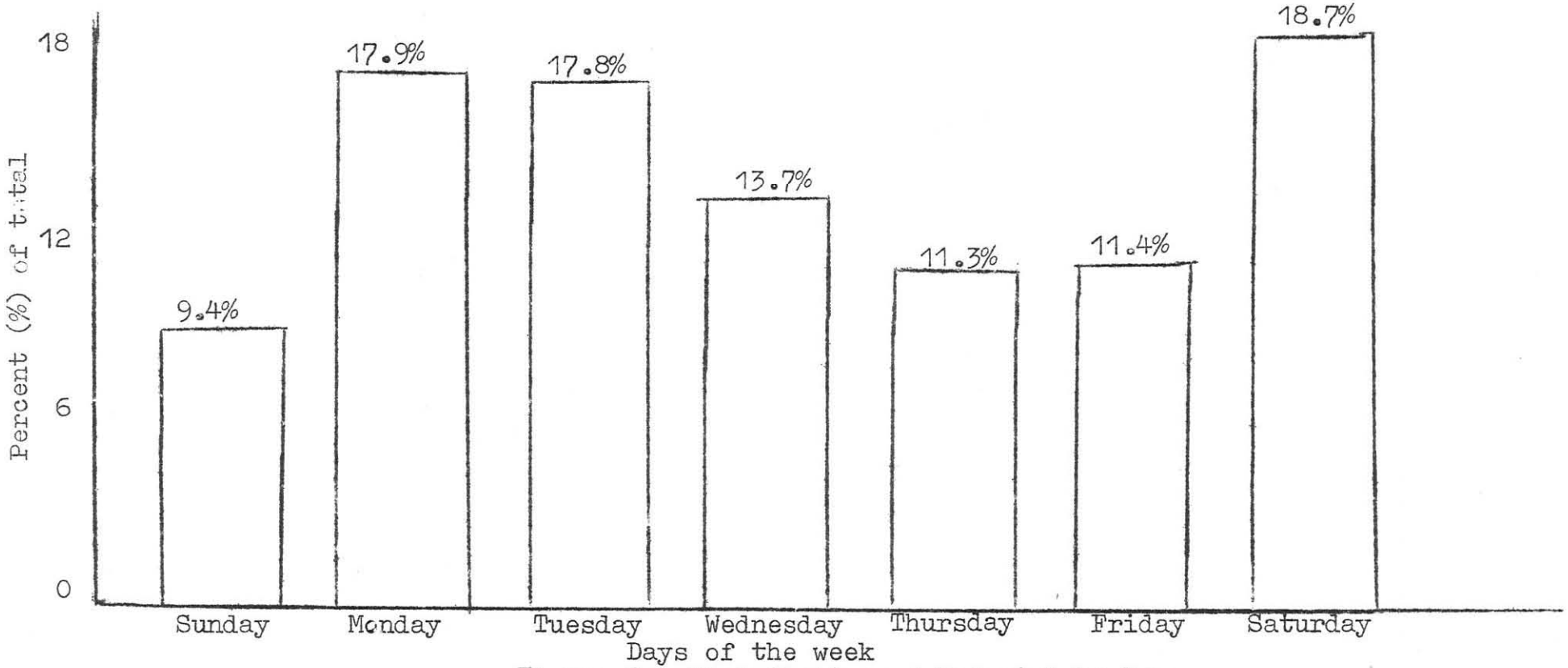


Figure 8: Distribution of Injuried by Day

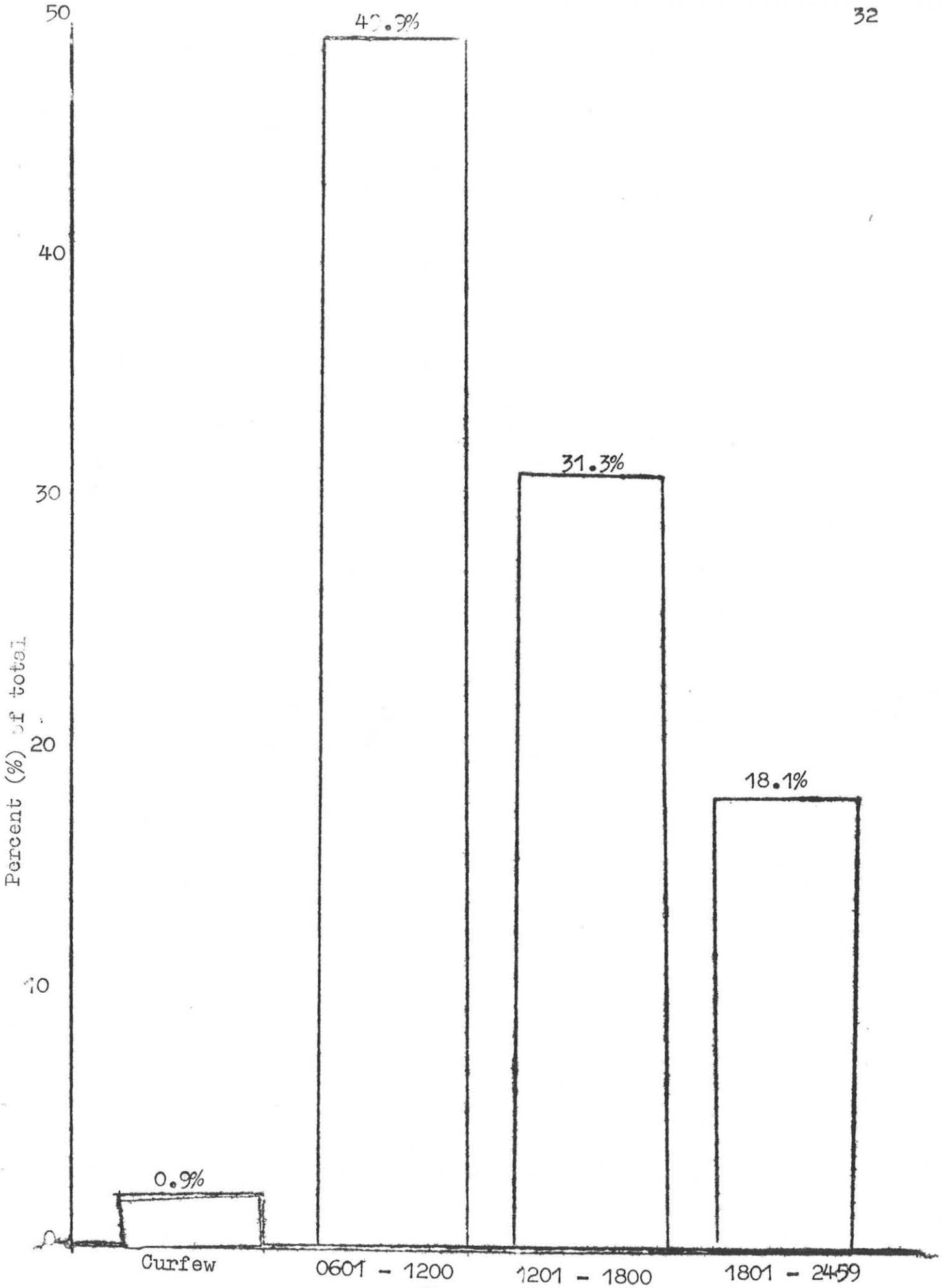


Figure 9: Hourly Distribution of Injuries

B. Occurrence

Extrapolating from the 12 week frequencies, the incidence density of hospital-treated vehicle injuries was estimated to be 279.4 per 100,000 person years and the case mortality rate to be 17.6 per 100,000 population. The projected annual hospital treated age specific motor vehicle injury rates ranged from 72.8 to 503 per 100,000 population. The lowest rate was found from birth to 4 years old and the highest between 25-29 years (Table 6).

The total years of potential life lost (YPLL) were calculated to be 11,154 years or 707 per 100,000 population per year. The years of potential life lost were considerably higher for males than females; 1150 vs 290 per 100,000 population. Most of the observed gender difference was attributable to the age group 20-29 years (Table 5). The sex specific mortality rates were four times higher for males than for females; 34.4 vs 8.7 per 100,000 population.

C. Determinants of Injury

1. Driver characteristics

A summary of driver characteristics significantly associated with the risk for inflicting injury is found in Table 7. From this table it can be seen that a significant increased risk factors for inflicting injury is associated with living in Ketena 1, being male, less than 25 years of age,

TABLE VI

Projected annual hospital treated, age specific motor vehical injury rates in Addis Ababa

Age (years)	Projected Annual No. of Injuries	Mid year Population*	Age Specific Injury rate/100,000
0 - 4	147	201,965	72.8
5 - 9	607	242,684	250.1
10 - 14	711	249,199	285.3
15 - 19	568	203,594	279.0
20 - 24	459	128,671	356.7
25 - 29	533	105,869	503.5
30 - 34	308	128,671	239.4
35 - 39	299	105,869	282.4
40 - 44	199	65,150	305.4
45 - 49	130	48,863	266.1
> 50	589	148,216	397.4
Overall	4550	1,628,751*	279.4

*estimates based upon population data from National Central Statistics Office

TABLE VII

Driver characteristics significantly associated with the risk for inflicting injury

Driver Characterstics	Cases N	(%)	Controls N	(%)	Odds Ratio	95% CI (%)
Residence *						
Ketena 1	71	(19.0)	68	(13.1)	1.55	(1.06,2.27)
Ketena 2	87	(23.3)	141	(27.2)	0.81	(0.59,1.12)
Ketena 3	71	(19.0)	143	(27.6)	0.62	(0.44,0.85)
Ketena 4	63	(16.8)	73	(14.1)	1.23	(0.84,1.81)
Ketena 5	82	(21.9)	93	(18.0)	1.28	(0.91,1.81)
Gender **						
Male	446	(96.3)	479	(90.4)	2.79	(1.54,5.11)
Female	17	(3.7)	51	(9.6)	0.36	(0.20,0.65)
Age (Years) **						
<= 25	52	(12.6)	5	(1.0)	14.9	(5.66,42.6)
26 - 30	68	(16.3)	70	(13.2)	1.28	(0.88,1.86)
31 - 35	107	(25.6)	73	(13.8)	2.16	(1.53,3.04)
36 - 40	72	(18.2)	142	(26.8)	0.61	(0.44,0.84)
41 - 45	44	(10.6)	111	(21.0)	0.44	(0.30,0.66)
46 - 50	44	(10.6)	70	(13.2)	0.77	(0.51,1.18)
> 51	26	(6.2)	58	(11.0)	0.54	(0.32,0.90)
Employer **						
Government	176	(43.7)	223	(42.2)	1.06	(0.81,1.39)
International	32	(7.9)	97	(18.3)	0.38	(0.25,0.60)
Private	195	(48.4)	209	(39.5)	1.44	(1.10,1.88)
Driving Years **						
5	99	(29.7)	27	(5.9)	6.72	(4.18,10.9)
6 - 10	116	(34.9)	141	(30.9)	1.19	(0.87,1.63)
11 - 15	42	(12.6)	165	(36.2)	0.25	(0.17,0.38)
16 - 20	37	(11.1)	94	(20.6)	0.48	(0.31,0.74)
21	39	(11.7)	29	(6.4)	1.95	(1.15,3.33)
Driving Grade **						
Autombile	85	(23.6)	257	(48.5)	0.33	(0.24,0.44)
Taxi	173	(47.9)	143	(27.0)	2.49	(1.80,3.33)
Light Bus/Truck	70	(19.4)	73	(13.8)	1.51	(1.03,2.19)
Large Bus/Truck	33	(9.1)	57	(10.7)	0.83	(0.52,1.34)

* p <.01 , ** p <.001

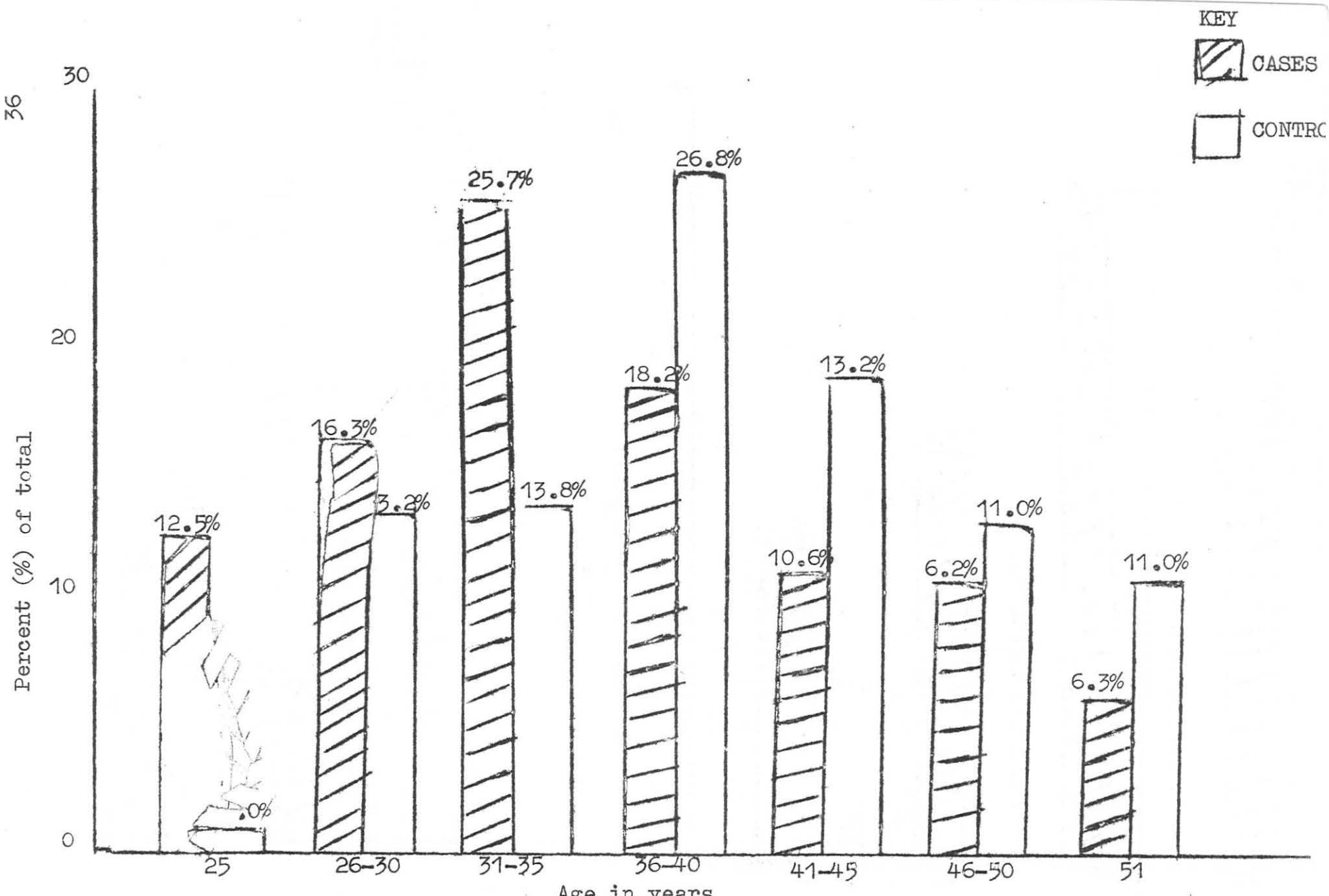


Figure 10: Drivers Age Distribution

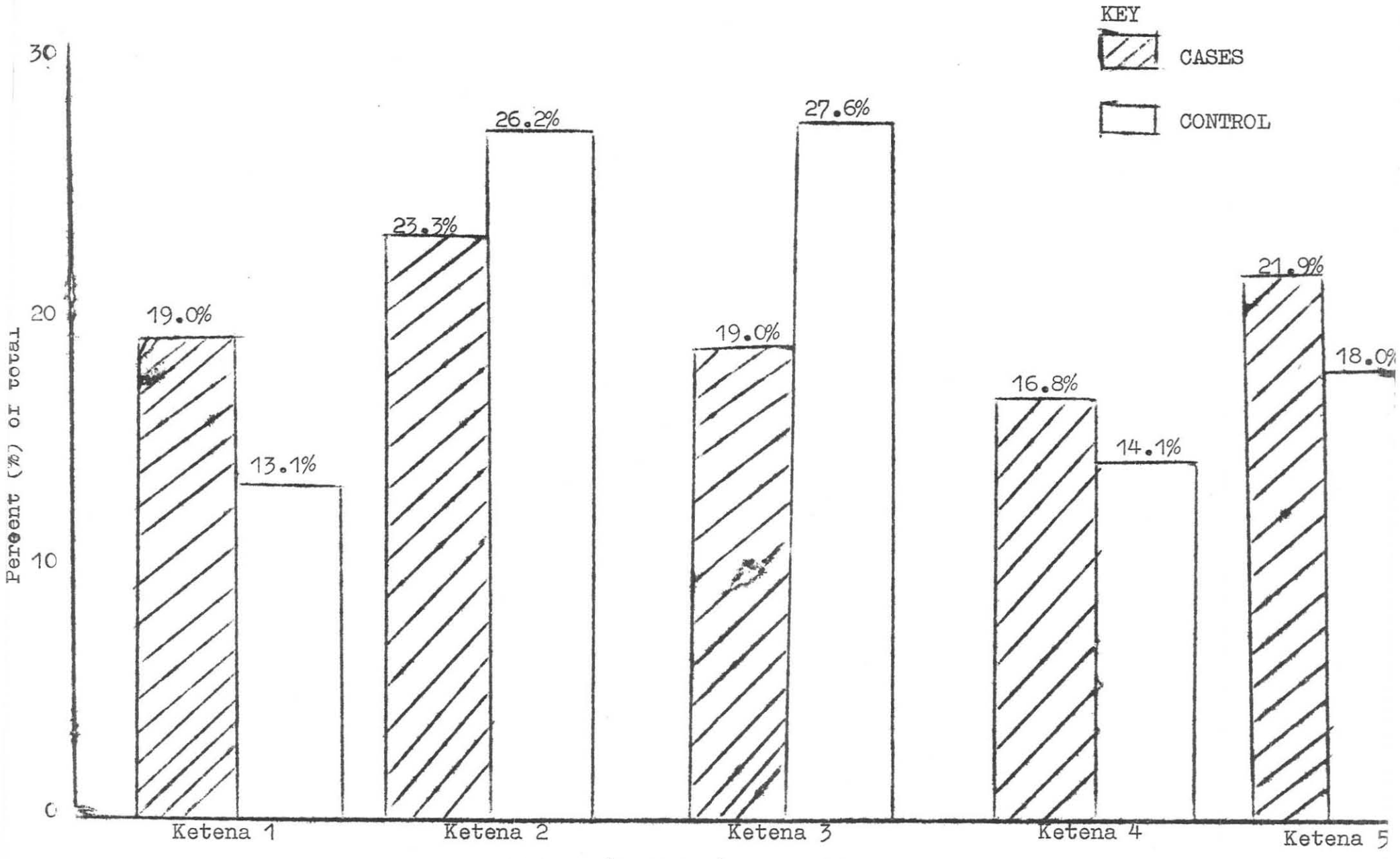


Figure 11: Drivers Residence by Ketena

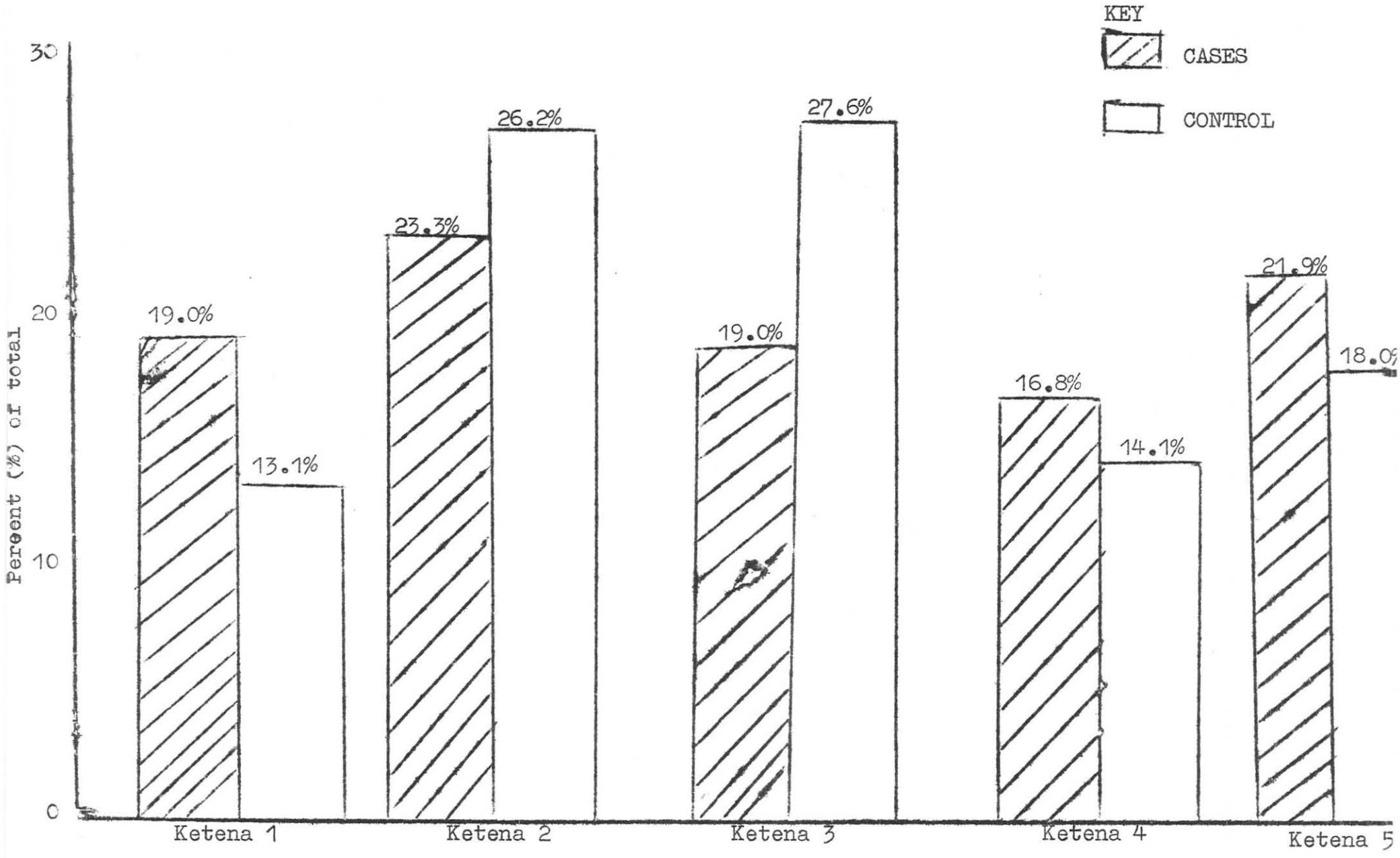


Figure 11: Drivers Residence by Ketena

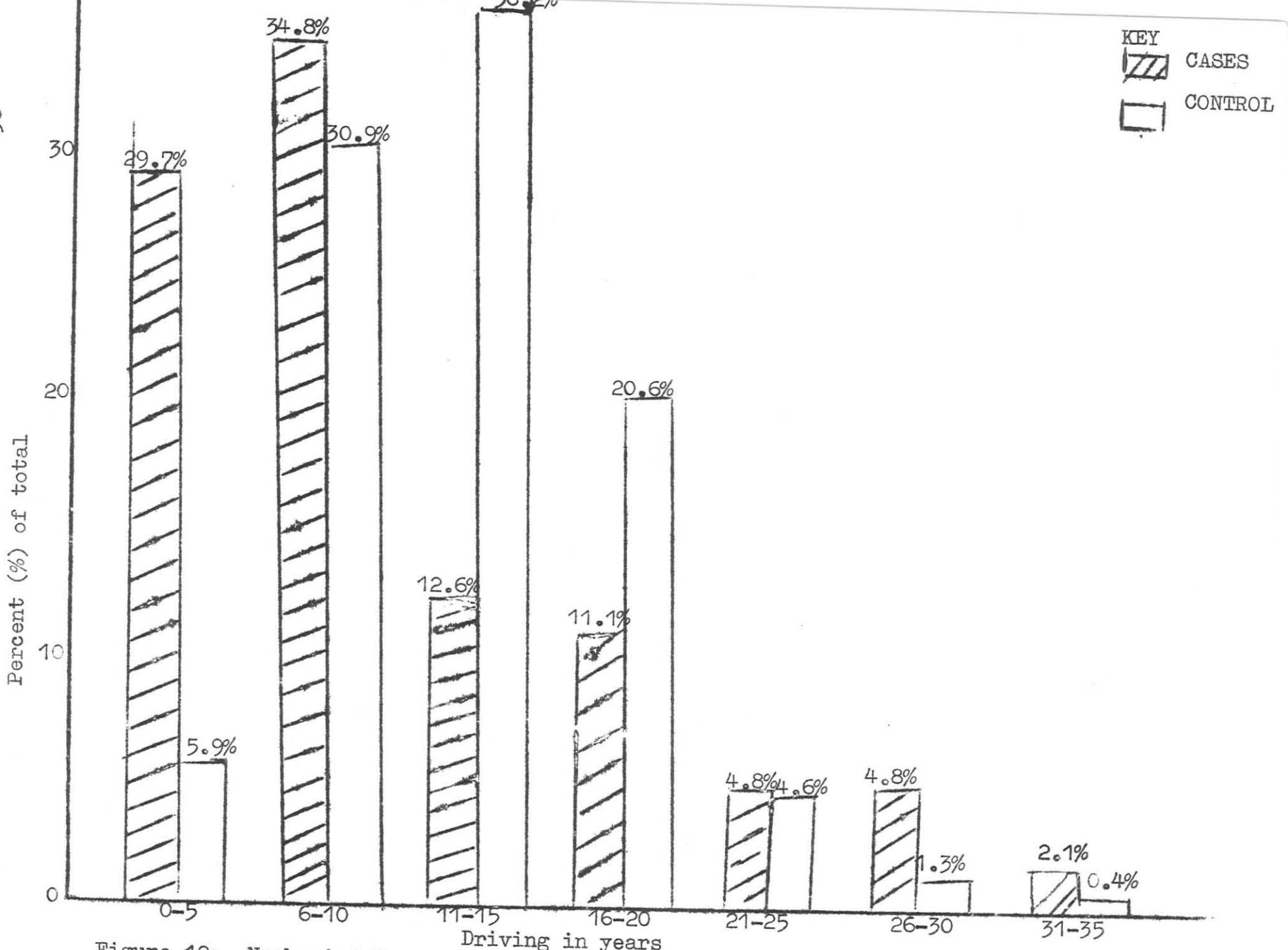


Figure 12: Number of Years of Driving Experience in Case and Control Drivers

privately employed, less than 5 years driving experiences, and driving with a 3rd grade license. The age, residence and years of driving experience distributions for case and control drivers are presented graphically in Figures 10, 11, and 12. Significant age ($p<.001$), residence ($p<.01$), and experience ($p<.001$) differences were found.

2. Vehicle characteristics

Vehicle characteristics significantly associated with the risk of inflicting injury are summarized in table 8. Increased risks were found for government owned cars, taxis and buses, and vehicles less than 5 years age. The type of vehicle driven and vehicle ownership among case and control drivers are summarized in figures 13 and 14.

Those driver and vehicle characteristics significantly associated with the occurrence of injury were included in three multiple regression models: Model 1 driver characteristics, Model 2 vehicle characteristics, Model 3 combined driver and vehicle characteristics. The results are summarized in Tables 9, 10, and 11.

TABLE VIII

Vehicle characteristics significantly associated with the risk of inflicting injury

Vehicle Characteristics	Cases N	Cases %	Controls N	Controls %	Odds Ratio	95% CI
Vehicle Ownership **						
Government	183	(37.2)	144	(27.2)	1.59	(1.21,2.09)
International	45	(9.2)	82	(15.4)	0.55	(0.37,0.82)
Private	264	(53.6)	304	(57.4)	0.86	(0.67,1.11)
Vehicle Type **						
Automobile	219	(48.6)	370	(69.8)	0.41	(0.31,0.53)
Taxi	87	(19.3)	30	(5.7)	3.98	(2.52,6.31)
Bus	94	(20.8)	18	(3.4)	7.49	(4.33,13.1)
Truck	51	(11.3)	112	(21.1)	0.48	(0.33,0.70)
Vehicle Age **						
<= 5	108	(41.1)	99	(19.5)	2.88	(2.04,4.06)
6 - 10	97	(36.9)	130	(25.6)	1.70	(1.22,2.37)
11 - 15	24	(9.1)	84	(16.5)	0.51	(0.30,0.84)
16 - 20	21	(8.0)	107	(21.1)	0.33	(0.19,0.55)
>= 21	13	(4.9)	88	(17.3)	0.25	(0.13,0.47)

** p <.001

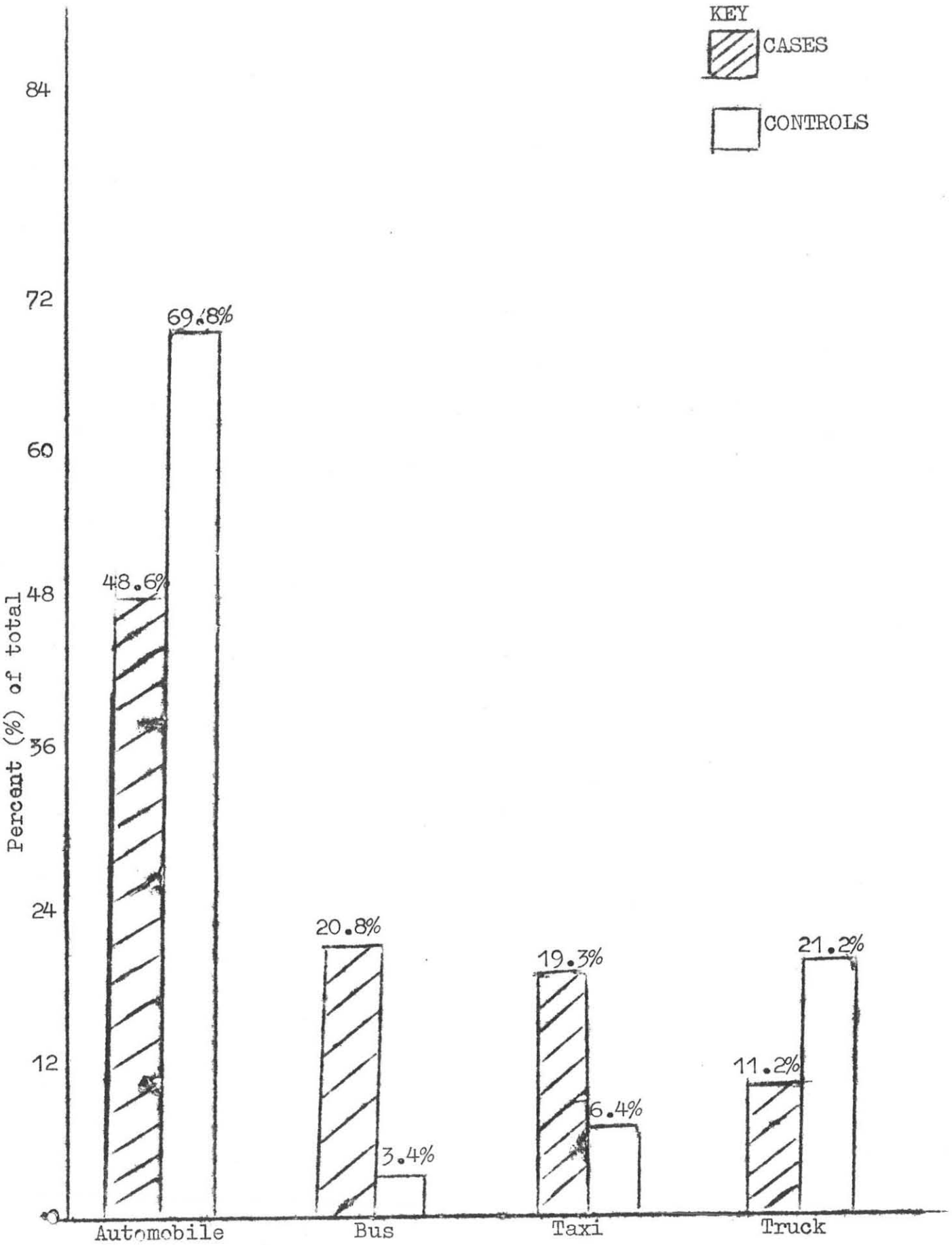


Figure 13: Type of Motor Vehicle Driven

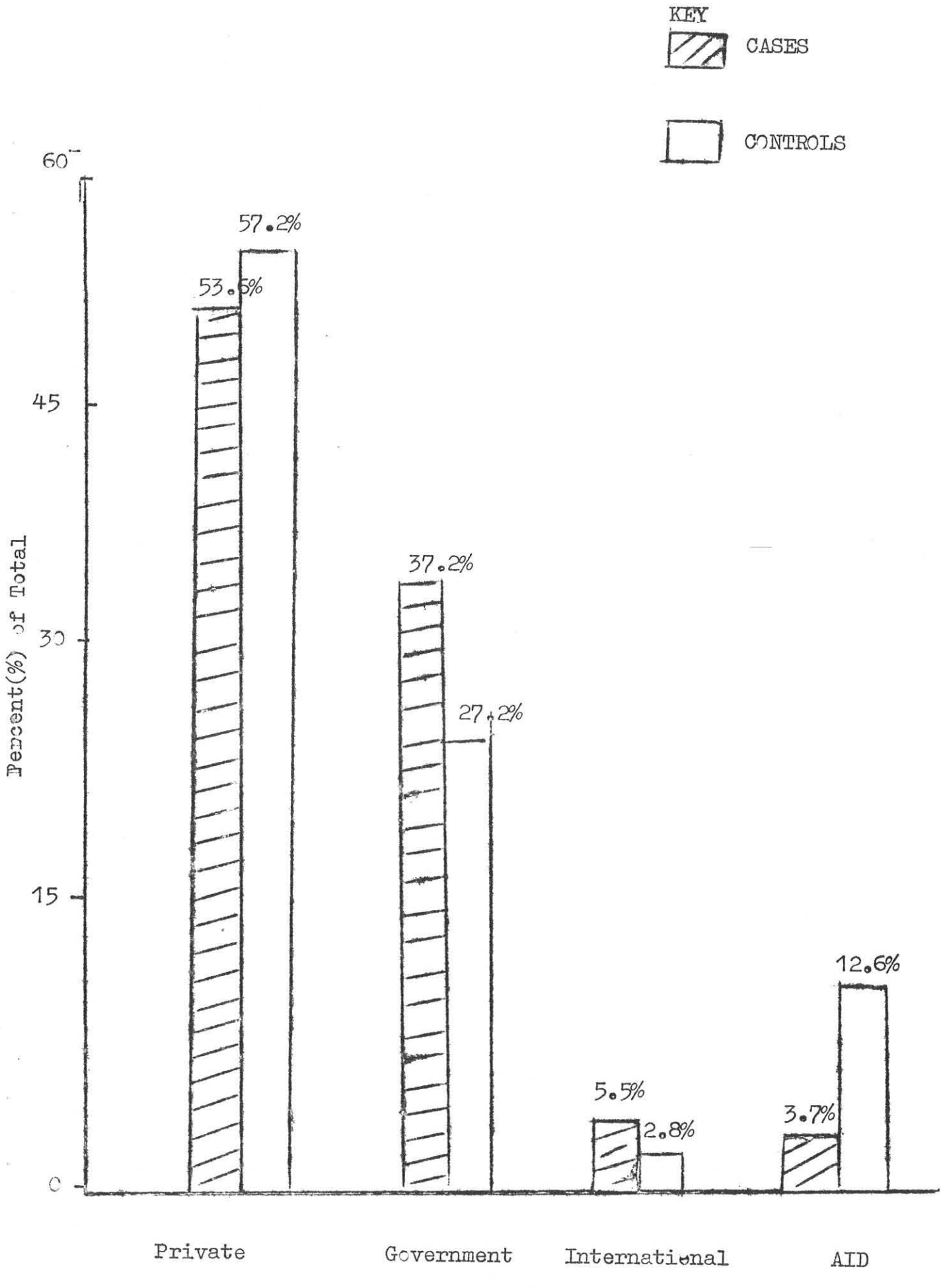

KEY
CASES
CONTROLS
60
45
30
15
0
Percent(%) of Total
57.2%
53.6%
37.2%
27.2%
5.5%
2.8%
3.7%
12.6%
Private
Government
International
AID

TABLE IX

Result of multiple regression for the prediction of inflicting a motor vehicle injury in relation to driver characteristics

Variable	B	SE B	Beta	T	Sig T
Drivers age	-.074	.010	-.251	-7.49	<.0001
Drivers license grade	.057	.016	.114	3.40	<.0007
Drivers gender	-.237	.070	.113	-3.36	<.0008
Drivers employment	.051	.018	.090	2.86	<.0043
(Constant)	.619	.113		5.48	<.0000

Note: residence not included in the model

TABLE X

Result of multiple regression for the prediction of inflicting a motor vehicle injury in relation to vehicle characteristics

Variable	B	SE B	Beta	T	Sig T
Motor vehicle age	-.105	.012	.305	-8.860	<.0000
Motor vehicle type	-.033	.014	.083	-2.42	<.0157
(Constant)	.716	.054		13.3	<.0000

Note:Vehicle ownership not included in the model

TABLE XI

Result of multiple regression for the prediction of inflicting a motor vehicle injury in relation to combined driver and vehicle characteristics

Variable	B	SE B	Beta	T	Sig T
Motor vehicle age	-.084	.01231	-.244	-6.80	<.0000
Drivers age	-.048	.010	-.169	-4.75	<.0000
Drivers gender	-.190	.073	-.092	-2.60	<.0096
Motor vehicle type	-.035	.014	-.088	-2.50	<.0125
(Constant)	1.05	.096		-10.9	<.0000

VI. DISCUSSION

This investigation was successful in documenting the occurrence of hospital treated MVI's and in identifying several important determinants of driver and vehicle characteristics for inflicting injury in Addis Ababa. This discussion will first consider the occurrence and determinant findings. This will be followed by a discussion of specific methodologic issues and the generalizeablity of this investigation.

The MVIs rate found in this investigation was very high at two to three times the rates reported in other developing countries (9,14) and four to five times higher than rates reported in developed countries (6,7,8). Why was such a high rate found?

In Addis Ababa the number of vehicles per capita is far fewer than most developing countries, at one car per 34 people. This would tend to lessen the opportunity for host-agent contact and thus reduce MVIs rates. A similar influence is exerted by the Sunday driving restrictions and the midnight to 5 am curfew. In addition the study period was mostly rainy and cold which tends to keep pedestrians off the streets relative to the warm and dry periods of the year. The wet roads would tend to make driving more difficult and increase stopping distances, factors tending to increase the chance of injury.

A large proportion of injuries occurred among pedestrians, in particular children under 15 years of age. Most were hit by

oncoming vehicles while in a street. This pattern is different from developed countries, where a larger proportion of injured are vehicle occupants (16,21). An important factor forcing people into the streets is the absence of sidewalks. This may, in part, explain the high injury rates in Addis Ababa, which is overcrowded and filled with citizens in its streets. Another factor which would tend to increase MVIs rates is pedestrian behaviour. In Addis Ababa many people do not know or follow basic road safety, thus crossing in the middle of streets and often within traffic.

Many studies have made it apparent that MVIs are most prevalent among specific groups of persons who can be described by age and sex (16,17,18,21). Similarly in this study, young males were two to three times more likely to sustain a MVIs or death. This may be explained by the fact that males are in the streets far more than females. As well, risk behaviour or unsafe road practices are more common in males (9).

The body parts affected by MVIs are similar to those reported in other studies, with multiple parts affected, the extremities and head injuries being the commonest (16,30).

The frequency of MVIs varied by the day of the week and hour of the day. Saturdays, Mondays, and Tuesdays were high incidence days. There are two possible explanations for this finding: one focuses on the behavior of drivers and the other focuses on the behavior of pedestrians. Because of gasoline rationing, most drivers obtain enough fuel to drive their vehicles on Saturday,

Monday, and Tuesday, Thus MVIs may occur on these days simply because more vehicles are being driven. The behavior of pedestrians may better explain why between 6:00 am and 12:00 noon there are more MVIs. These are the hours when students and workers travel to their work site. In fact, around noon, two sessions of students are on the streets: one on their way home, and the other on their way to school. While the influence of these factors has been reported elsewhere, the patterns vary considerably from one country or urban centre to the next (13,16,20,25).

This study also looked at those who inflicted MVIs in terms of driver and vehicle characteristics. As with this investigation, many studies have shown that young male and inexperienced drivers are most likely to inflict MVI's (20,25,26,31). However, in addition, the present study found that newer cars, taxis and buses were most likely to be involved. Newer cars may be capable of faster speeds than older cars, and their drivers are perhaps less cautious. Taxis and buses may be more involved because their drivers are not as capable as they should be, because they are driving long hours, or because they are pushing themselves to make more money. These explanations are post hoc and speculative and thus require more investigation.

There are several methodological advantages of the present study over previously conducted ones. Many of the earlier MVI investigations have been based upon retrospective data obtained from the Traffic Police and hospital records (20,26,31). In

contrast, in this investigation data on hospital treated MVIs were collected prospectively. Also, in addition to collecting data from hospital records, a questionnaire was designed to obtain socio-demographic data from the injured. A further advantage was that drivers and their vehicles involved in MVIs were compared with randomly selected controls, in order to identify determinants of MVIs.

There are some limitations of the study. One concerns the limited number of locations where injured people were recruited. Although hospitals are the major centers for treatment and the majority of injured people will be found at such locations, the very few with minor injuries who do not need hospital management will be missed by a hospital based study. If such people were included, some of the vehicle factors may have changed in importance (e.g. newer vehicles, buses).

Some hospital data were missing because one of the private hospitals in the city which initially volunteered to join the study later refused to record the information and show the medical records of the MVIs patients in their hospital. Corresponding information was obtained for these cases only from police records.

It was hoped that the weather would vary somewhat over the course of the study, covering both the rainy season and the drier season after. However, the rainy season lasted longer than expected, so that the whole study took place during the rainy season. The results are therefore most valid when generalized to

the rainy season in Addis Ababa. It is not clear from the study whether the incidence of MVIs at other seasons of the year will be higher or lower.

The importance of extrapolation was emphasized at the 1981 WHO conference on Motor Vehicle Injuries in Developing Countries. Experts felt that although the statistical rates and economic situation may differ from country to country, the nature of MVIs and certain conditions are basically similar throughout the world (5). The validity of the present results when applied to other cities depends on the specific determining factors. The host and driver factors are likely to affect MVIs in the same manner in other developing countries. However, vehicle and environment factors may be specific to Ethiopia or even to Addis Ababa. The differing importance of these factors might thus create considerably different incidence rates. Finally, it should be pointed out that determinants were limited to the study of driver characteristics. This study was not designed to examine pedestrian determinant characteristics.

VII. CONCLUSION AND RECOMMENDATIONS

On the basis of a 12-week study of MVIs in Addis Ababa, the incidence density was calculated to be 279.4 per 100,000 person years. This was considered to be very high particularly given the relatively small number of vehicles in the city. An analysis of the significant determining factors indicates that many of these injuries could be prevented. First the seriousness of the situation must be recognized and then policies developed.

In order to present the situation accurately, the city of Addis Ababa requires a more systematic reporting system. At the present time, not all accidents involving injuries are reported by the police. For example, police records were lacking for 40% of the hospital cases in the present sample.

Recommendations are organized according to the three constituents of motor vehicle injury: the host, the agent and the environment.

1. The Host

Education and training programs should be expanded for the public using the mass media. Because injuries are sustained mostly by children under the age of 15, proper pedestrian behavior should be taught in schools, perhaps by policemen who are respected by children.

2. The Agent

The only feasible recommendation here is to standardize the examination drivers take in order to obtain a licence. Although

lack of experience is a risk factor, it is difficult to enforce a minimum time of driving experience, even if training licenses were required for a minimum period of time (say 2 years) before the official examination could be taken. Drivers who are responsible for accidents should receive demerit points and have their licenses suspended for a period of time when they reach a set number of points.

3. The Environment

Starting time at work could be staggered for some of the larger industries and companies to reduce traffic at certain times such as when children are going to school. In particular, if companies who operate buses for their employees began work at 7:30 am, traffic after this time would be less.

Other aspects of the environment, such as the presence of sidewalks, crossing zones, stop signs, speed limit signs, and pedestrian traffic lights were not examined in the present study. Further research into these variables is necessary in order to make confident recommendations about improving the environment.

VIII. REFERENCES

1. Sleet DA. Motor vehicle trauma and safety belt use in the content of public health proprieties. J Trauma 1987; 27: 695 - 702.
2. Bakar SP, Whitefild and O'neill B. Geographic variations in mortality from motor vehicle crashes. N Eng J Med 1987; 316: 1384 - 1387.
3. Barancisk JI, Chatteijee BF, YC,etal. Motor vehicle trauma in northeastern Ohio. I. Am J Epidemiol 1986; 128: 846 -861.
4. Newman RJ, Jones IS. A prospective study of 413 consecutive car occupation with chest injuries. J Truma 1984; 24: 129 - 135.
5. WHO. Road traffic accidents in developing countries. World Health Organization, 1984.
6. WHO Chronicle. The epidemiology of road accidents. World Helath Organization, 1966; 20: 393 - 406.
7. Arya OP and Bosa CB. Injury experience in a defined population (university employees) in Uganda - an epidemiological survey and prevention. East Afr M J 1972; 49: 417 - 427.
8. Simpson HM and Moyhew DR. Youth and traffic accident causes and preventive. Can Fam Physicians 1987, 33: 429 - 435.
9. Economic Commission for Africa. First African road safety congress,Nairobi, Kenya, 1984.

10. Tadelle Dessie. Health profile and action plan for Fenfene Awraja, Addis Aababa. 1988.

11. Ministry of Health. Comprehensive Health Service Directory 1986-1987, Addis Ababa, 1988.

12. Ministry of Health. Stastic Bureau, Unpublished reports.

13. Norman LG. Road traffic accidents. World Health Organization, 1962.

14. Ezenwa AO. Trends and characteristics of road traffic accidents in Nigeria. JRSH 1986, 1: 27 - 29.

15. Fisseha Teklewold. Accidents in childhood. Ethiop Med J 1973, 11: 41 - 46.

16. Read JH, Bradley EJ, Mqreson JD, LD, etal. The epidemiology and prevention of traffic accidents involving child pedestrians. Can Med Ass J 1963; 89: 687 - 701.

17. Barbara RB and Barbara M. Demographic analysis of childhood pedestrian injuries. Pediatrics 1985; 76: 375 - 381.

18. Dolan WD. Automobile related injuries. JAMA 1983; 63: 232 - 254.

19. Kohler L, and Hackson H. Traffic and children's health, The Nordic School of Public Health, Sweden, 1987.

20. Jenadu MK. Epidemiology of motor vehicle accidents in a developed country - a case of Oyo state of Nigeria. JRSH 1984; 4: 153 - 156.

21. Council Report. Automobile related injuries. JAMA 1983; 249: 3216 - 3222.

22. Premature mortality due to alcohol related motor vehicle traffic fatalities - United States, 1987. MMWR 1988; 37: 753 - 755.

23. Hanlon RH. Motor ways and health, JRSH 1980; 4: 144 - 148.

24. Brown BP, Salim LR, Lecours S, and Battista RN. Motor vehicle related injury on the bridges between Montreal and South shore of the St. Lawrence river, 1978 - 1982 .Am J Public Health 1985; 75: 871 - 874.

25. Aganga AO, Umoh JU and Abeche SA. Epidemiology of road traffic accidents in Zaria, Nigeria. JRSH 1983; 4: 123 - 126.

26 Bennes GM, El-Sayyed. Epidemiology of motor vehicle accidents in Jeddah. JRSH 1985; 6:200 - 201.

27. Addis Ababa Urban Dwellers Association Statistic Office. Unpublished report.

28. Ethiopian Insurance Corporation. Meden. Addis Ababa,1988.

29. Backs H. The motor vehicle accidents in family practices. Can Fam Physicians 1988; 34: 589 - 591.

30. Hall RR, and Fisher AJ. Some factors affecting the trauma of pedestrians involved in road accidents. Med J Aust 1972; 2: 313 - 317.

31. Bakar S.P., Robertson L.S., O'Neill B. Fatal pediatrics collusion. Am J Public Health 1974; 64: 318 - 325.

Appendex A

MVI Study Hospital Form

Serial No._____ Hospital card No._____

Date_____

A. Victim classification

Driver_____ Passenger_____ Pedestrian_____

Victim name_____

Address_____ Kef._____ Keb._____ H.No._____ Tel._____

Gender_____ Age_____ Employer_____

Education_____ Marital status_____

Accident time_____ Hospital reaching time_____

Location of injury_____ Kef._____ Keb. _____

Side walk_____ Road side_____

B. Condition of victim

Affected body part _____

Number of injuries_____

Nature of most serious injury_____

Nature of less serious injury_____

X-ray_____ Infusion_____ Blood transfusion_____

Surgery_____ Hospitalization_____ Date of discharge_____

Outcome_____ Expenses_____

C. Driver

Name_____

Address_____ Kef._____ Keb. _____ H.No.____ Tel._____

Vehicle code number_____

Appendix B

MVI Study Traffic Policy Form

Serial No._____

A. Victim

Name_____ Age_____ Gender _____

Address _____ Kef._____ Kebele_____H. No.____Tel._____

Employer_____ Education_____

Marital status _____ Treated Hospital_____

Card No._____

B. Driver (Cases)

Name_____ Age_____ Gender _____

Address_____ Kef._____ Kebele_____ H.No.___ Tel._____

Employer_____ Education_____

Marital status_____

C. Driving licence grade _____ Vehicle licence No._____

Owner of vehicle_____ Vehicle age_____

Vehicle type_____ Driving years_____

D. Accident time: Hour_____ Day_____ Month_____

Accident place_____ Number of vehicle involved_____

Number of Injured:

Driver_____ Passenger_____ Pedestrian_____

E. Road surface_____ Road type_____

Road intersection_____ Time of the day_____

Traffic light_____ Weather_____

F. Alcohol_____

Hit and run_____

Appendix C

MVI Study

Driving Licence Bureau Form

Serial No._____

Driver (Control)

A. Name_____ Age_____Gender_____

Address_____ Kef._____ Keb._____ H.No._____ Tel._____

Employer_____ Education_____

Marital status_____

B. Driving licence grade_____

Vehicle code number_____

Vehicle ownership_____

Vehicle age_____

Vehicle type_____

Driving years_____

የመኪና አደጋ መጠየቅ ቅጽ

ቀን _____ ወር _____ የካርዱ ቁጥር _____

1. አደጋ የደረሰበት ስም ከነአባቱ፣ _____
2. አድራሻ ከ _____ ቀ _____ የቤት ቁ. _____ የስልክ ቁጥር _____
3. ጾታ _____ 4. ዕድሜ _____ 5. ሥራ _____
6. የትምህርት ደረጃ _____ 7. የጋብቻ ሁኔታ _____
8. አደጋ የደረሰበት ሰዓት _____ 9. ሐ/ቤት የደረሰበት ሰዓት _____
10. አደጋ የደረሰበት ቦታ _____ 11. የመንግድ ሁኔታ _____
12. የእግረኛ መንገድ አለው _____ 13. መደበኛ የመንዳት ትምህርት ወስደ ዋለ _____
14. ከአደጋው በፊት ለስንት ሰዓት ሥራ ላይ ነበረ _____ መንዳት ላይ ነበረ _____
15. ከአደጋው ጊዜ ሀ/ መኪና ይነዱ ነበር _____ ለ/ በእግር ይጊዙ ነበር ___
ሐ/ በመኪና ውስጥ ነበረ _____ መ/ በሌላ _____
16. አደጋ የደረሰበት ልጁ ከሆነ ሀ/ ከአደጋው ቦታ ስንት ይርቃል _____
ለ/ ልጁ ትምህርት ቤት ይሄዳል _____
ሐ/ አደጋው ሲደርስ ትልቅ ዘመዱ አብሮት ነበር ___
17. ሽማግሌ/ባለቴት/ከሆኑ ሀ/ ከማን ጋር ይኖራሉ _____
ለ/ ከአደጋው በፊት የአካል ጉዳለት ነበራቸው
18. የበሽተኛ ሁኔታ ሐ/ቤት ሲደርሱ ሀ/ራሱን ያውቃል _____
ለ/ ትንሽ ራሱን ስቷል _____
ሐ/ራሱን ጨርሶ አያውቅም ___
19. ከአደጋ በፊት ጠጥ ተዋል _____
20. የመንገዳገድና የምላስ መወላተፍ ሁኔታ ነበረን _____
21. የተጐዳ የአካል ክፍል ሀ/ በመድማት ላይ ነው ___ ለ/ ቀላል ቁስል ___
ሐ/ ከባድ ቁስል _____ መ/ ቀላል ስብራት _____
ሠ/ ከባድ ስብራት _____
22. የራጁ ምርመራ _____ 23. ኢንፋክሽን _____ 24. ደም ወስደ ዋለ ____
25. ቀይ ጥገና _____ ቀላል _____ ከባድ _____
26. የአደጋ ዉጤት ቀላል _____ አካለ ጐደሉ _____ ሞት _____
27. አደጋ ያደረሰው መኪና የስትና አለው _____ ቀጥሩ _____ ዓይነት ___
28. በሽተኛው ከሐኪም ቤት የወጣበት ጊዜ _____
29. የሕክምና ወጭ፣
ሀ/ አደጋውን በተመለከተ _____
ለ/ አደጋው ጋር ግንኙነት በሌለው ሕመም _____
30. የተጐዳው ፣
ሾፌር መንገደኛ እግረኛ
31. በመኪና ውስጥ የተቀመጡት
32. ከአሁን በፊት አደጋ በደረሰ ከፊት _____ ከኋላ _____

የአደጋ ጥናት

1. አደጋ የደረሰበት

ስም _____ ዕድሜ _____ ጸታ _____

አድራሻ _____ ከ _____ ቀ _____ የቤት ቁ. _____

ሥራ _____ የት/ደረጃ _____ የጋብቻ ሁኔታ _____

የታከመበት ሆስፒታል ስም _____ የካርድ ቁጥር _____

2. አደጋውን ያደረሰው ሰው /አሽከርካሪ/

ስም _____ ዕድሜ _____ ጸታ _____

አድራሻ _____ ከ _____ ቀ _____ የቤት ቁ. _____

የስልክ ቁጥር _____

ሥራ _____ የት/ደረጃ _____ የጋብቻ ሁኔታ _____

3. ሀ/ የመንጃ ፈቃድ ደረጃ 1ኛ ___ 2ኛ ___ 3ኛ ___ 4ኛ___ 5ኛ___

ለ/ የሠ/ ቁጥር _____ ሐ/ የተሸከርካሪው ንብረት _____

መ/ የተሸከርካሪው አገልግሎት ዘመን _____ ዓመት ዓይነት _____

ሠ/ የማሽከርከር ለምድ _____ ዓመት

4. ሀ/ አደጋ የደረሰበት ጊዜ ሰዓት _____ ቀን _____ ወር _____

ለ/ አደጋ የተፈጸመበት ቦታ ከ _____ ቀን _____ አካባቢ _____

ሐ/ የተፈጸመው አደጋ ዓይነት _____

መ/ አደጋው ያስከተለው ጉዳት _____

ሠ/ በአደጋው የተጐዱ ተሸከርካሪዎች ብዛት _____ ሰዎች ብዛት _____

ረ/ በእግር ጫማ ላይ እንደነበሩ _____ በመኪና ውስጥ እንደነበሩ ___

5. የመንገዱ ሁኔታ

ሀ/ የመንገዱ አከፋፈል _____ ለ/ የመንገዱ አቀማመጥ _____

ሐ/ የመንገዱ መጋጠሚያ _____ መ/ የመንገዱ ንጣፍ _____

ሠ/ የብር ሃን ሁኔታ _____ ረ/ የአየር ሁኔታ _____

6. የጥፋተ ዓይነት _____

_____

_____

1. አደጋ ያሳደረሰው ሰው/አሽከርካሪ/

ስም _____ ዕድሜ _____ ጾታ _____

አድራሻ _____ ከ _____ ቀ _____ የቤት ቁ. _____

የትም/ደረጃ _____ የጋብቻ ሁኔታ _____

2. ሀ. የመንጃ ፈቃድ ደረጃ 1ኛ _____ 2ኛ _____ 3ኛ ___ 4ኛ__ 5ኛ __

ለ. የተሽከርካሪው አገልግሎት ዘመን _____ ዓይነት _____

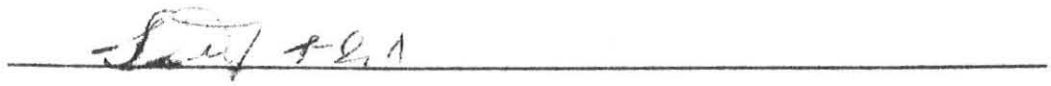
ሐ. የማሽከርከር ልምድ _____ ዓመት ::

መ. የሠ/ቁ _____ ሠ/ የተሽከርካሪ ንብረት _____

DECLARATION

I, the undersigned, declare that this thesis is my work and that all sources of material used for this thesis have been duly acknowledged.

Name Taddele Dessie, Bsc,M.D.

Signature 

Place Addis Ababa, Ethiopia

Date of Submission May, 1989