FACTORS RELATED TO MOTORCYCLE ACCIDENTS AMONG MOTORCYCLE RIDERS IN SALAYA, PHUTTHAMONTHON DISTRICT, NAKHON PATHOM PROVINCE, THAILAND

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ABSTRACT

This study was a cross-sectional descriptive study aimed to determine factors related to motorcycle accidents among motorcycle riders in Salaya Municipality, Phutthamonthon district, Nakhon Pathom province, Thailand.

From January 4-31, 2005, 210 motorcycle riders in Salaya Municipality were randomly selected and interviewed with a structured questionnaire. Three sets of data were gathered. First was socio-demographic data on respondents' age, gender, marital status, educational level, occupation, income, purpose of driving, driving license and driving experience. The second set was about risk behaviors such as drinking alcohol, drug use, helmet use and driving speed. The third set was the physical factors.

The study revealed that young male riders aged between 18-29 years with low education background possession of the driving license, less than 5 years driving experience, and riding for work-related purposes were more likely to be involved in accidents. Among the risk behaviors, alcohol and high speed were associated with motorcycle accidents. Among the physical factors, road and vehicle conditions and people breaking the rules were associated with motorcycle accidents.

KEY WORDS: FACTORS RELATED/MOTORCYCLE ACCIDENTS

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CONTENTS

Page

CONTENTS (Cont.)

Page

LIST OF TABLES

TABLE Page

LIST OF FIGURES

FIGURE Page

LIST OF ABBREVATIONS

DALYs	:	Disability Adjusted Life Years
MOPH	:	Ministry of Public Health (Thailand)
RSOC	:	Road Safety Operational Center
WHO	:	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Rational and justification of the study

In 2004, World Health Day, organized by the World Health Organization, was for the first time devoted to Road Safety. Every year, according to the statistics, 1.2 million people are known to die in road accidents worldwide. Million of others sustain injuries, with many suffering permanent disabilities. No country is spared this toll in lives and suffering, which strikes the young particularly. Enormous human potential is being destroyed, with grave social and economic consequences. Road safety is thus a major public health issue throughout the world (1).

In Thailand road accidents are considered one of the top three public health problems in the country. Despite the Royal Thai Government's best efforts, in 2004 there are over 13,000 deaths and more than one million injuries each year as the result of road accidents, with several hundred thousand people becoming disabled. An overwhelming majority of the deaths and injuries involve motorcyclist and pedestrians. The Government regards this problem to be of great urgency and has accorded it high priority in the national agenda (1).

To deal with this crucial problem, the Government has establish a Road Safety Operation Center covering the different sectors of the country and comprising the government agencies concerned, non-governmental organizations and civil society. The centre has undertaken many injury prevention initiatives, including a "Don't Drink and Drive" campaign, and encouraging motorcycle drivers to wear safety helmets and to engage in safe driving practices (1).

"The problem of road traffic injuries is indeed a highly serious one, but it is also a problem that can be dealt with and prevented through concerted action among all the parties concerned. Through the leadership and strong commitment of the Government, we are confident that we will be successful in our efforts and we hope that others will be well (Thaksin Shinawatra, Prime Minister, Thailand) (1)."

Accidents, similar to diseases, do not occur at random, but certain population groups are at more risk due to the greater exposure to the hazard. Moreover, Thailand is known for its road traffic congestion, therefore motorcycles have become a popular mode of transportation in Bangkok due to their greater maneuverability and compact size. According to the statistics from the registration authority of Thailand, 1 million new motorcycles were registered in 1996 alone, and it is expected that there will be further increases of motorcycle in the near future (2). Table 1 shows the number and mortality rates from accident and injuries and the estimated damage from 1984 to 2001.

Table 1 Numbers and Rates of Accidental Deaths and Injuries and Estimated Damage, 1984 - 2001

Year	Number of population	Number of Accidents	Deaths		Injured		Property Damages (Baht)
			Numbers	Rate per 100,000 population	Numbers	Rate per 100,000 population	
1984	50,583,105	18,334	2,904	5.74	8,770	17.34	56,265,453
1985	51,795,651	18,955	2,788	5.38	8,901	17.18	60,645,504
1986	52,696,204	24,432	2,086	3.94	9,242	17.45	55,061,650
1987	53,873,172	25,639	3,991	7.41	12,947	24.03	129,539,616
1988	54,960,917	43,439	8,651	15.74	22,370	40.70	329,527,667
1989	55,888,393	43,557	8,967	16.04	23,083	41.30	439,028,000
1990	56,303,273	43,646	7,997	14.20	23,161	41.14	477,603,000
1991	56,961,030	49,625	8,608	15.11	24,995	43.88	639,616,000
1992	57,788,965	61,329	8,184	14.16	20,702	35.82	607,793,000
1993	58,336,072	84,892	9,496	16.28	25,330	43.42	1,021,464,000
1994	59,095,419	102,610	15,176	25.68	43,541	73.68	1,408,216,000
1995	59,277,900	94,362	16,727	28.22	50,718	85.56	1,631,117,000
1996	60,116,182	88,556	14,405	23.96	50,044	83.24	1,561,708,187
1997	60,816,227	82,386	13,836	22.75	48,711	80.09	1,571,786,469
1998	61,155,888	73,725	12,234	20.00	52,538	85.91	1,378,673,826
1999	61,577,827	67,800	12,040	19.55	47,770	77.58	1,345,985,811
2000	61,770,259	73,737	11,988	19.41	53,111	85.98	1,242,205,524
2001	62,093,855	77,616	11,652	18.76	53,960	86.90	1,240,801,187

Source: Information Center, Thailand Health Profile, 1999-2001.

Recent research (March-June 2003) at community Medicine Center, Faculty of Medicine, Ramathibodi Hospital, Mahidol University (3), recommended the investigation into behavioral determinants of road traffic accidents and road traffic safety issues. The study identified the known behavioral risk factors like driving under the influence of alcohol, substance abuse, speeding and failure to use helmets and seat belts. This study therefore, tries to look into the significance of the behavioral factors that are responsible for motorcycle accidents in Phutthamonthon District, Nakhon Pathom Province. By investigating the particular behavioral role for traffic safety, this study is expected to identify the gaps that render implementation of traffic safety laws ineffective in bringing down the present rate of injuries and deaths due to accidents. The behavior of drivers is very important to understand so as to incorporate possible fruitful interventions and to get maximum compliance from traffic safety laws. The baseline information gathered from this study can be used as the building

block for revised strategies and planning and to produce better intervention with suitable resource allocation.

As Nakhon Pathom becomes more crowded, using a motorcycle has become very popular, particularly because this province has many factories and markets. Factory workers are a group that prefers using motorcycles because the bus service involves long waits and often the workers are unable to reach their work place on time. Using a motorcycle is convenient and easily for passing along small streets. Phutthamonthon District of Nakhon Pathom has been developing quickly because it is close to Bangkok. In Phutthamonthon District there are many factories, schools, educational sites, markets, food stores, and shopping department stores. So residents go to work, school, market and other places by motorcycle since it is easy and does not mean spending a long time waiting for the bus. Salaya is one sub district of Phutthamonthon. It has a population of 15,168 people (4). Statistics from October 2003 and October 2004 two hospitals, Phutthamonthon Hospital and Salaya Hospital, show that accidents involving motorcycles, including passenger and driver, included 1,335 cases representing 70% of all accidents in Phutthamonthon District.

It is hoped that the inferences drawn from this study will enable generalizations to be made with respect to behavioral and attitudinal campaigns to augment the efforts already being done in order to cut down the number of accidents. The impact on health and the losses sustained the economy by of the country might be mitigated by addressing the major determinant of accidents.

1.2 Research question

1- What are the factors related to motorcycle accidents among motorcycle drivers in Salaya Municipality?

2- What are the risk behaviors of motorcycle drivers?

1.3 Research Objectives

1.3.1 General objective

The main objective is to identify the factors related to motorcycle accidents among motorcycle riders in Salaya Municipality, Phutthamonthon District.

1.3.2 Specific Objectives

Aimed to:

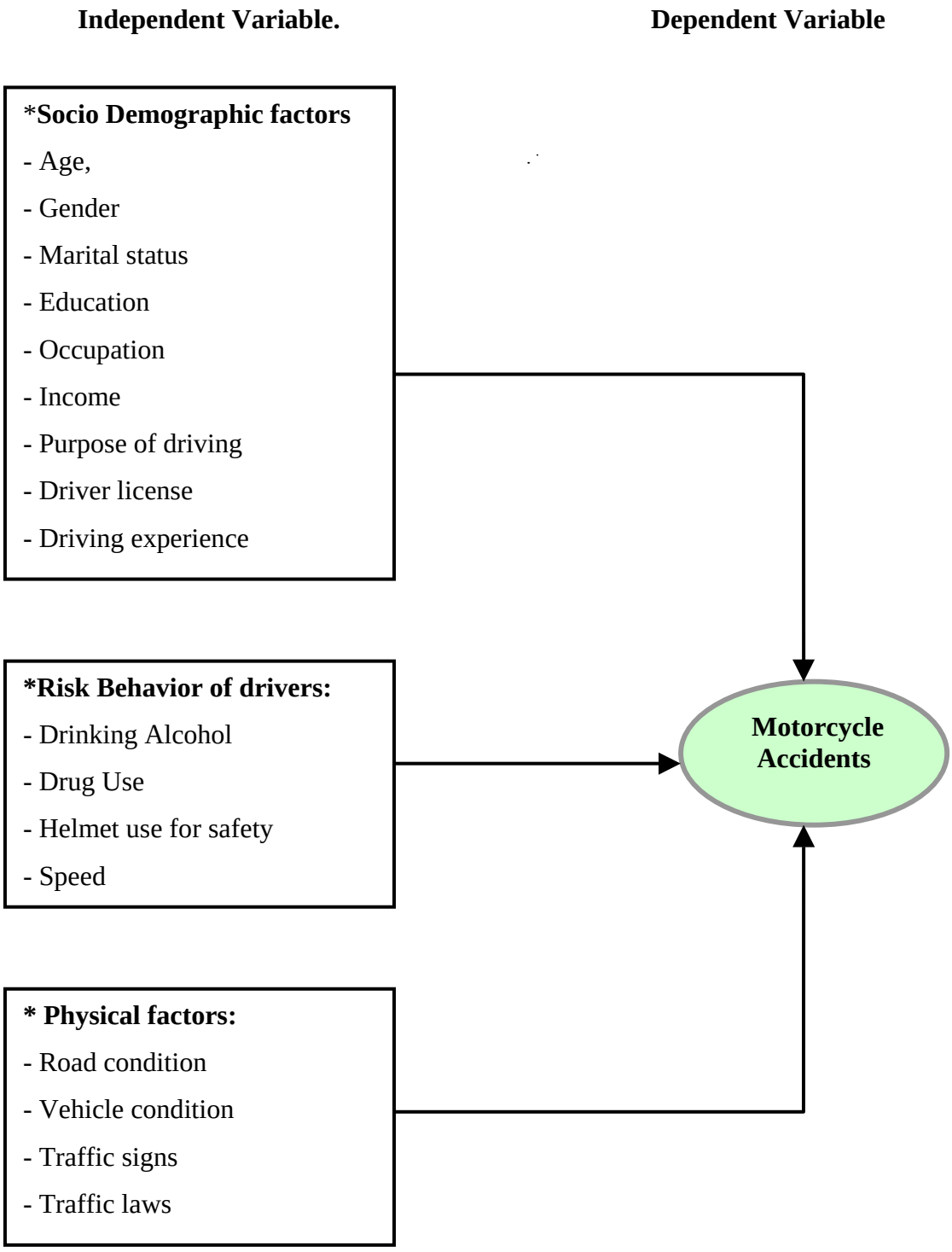
1. Describe socio-demographic factors among motorcycle drivers in terms of age, gender, marital status, education, occupation, income, purpose of driving, driver license and driving experience.

2. Describe the risk behavior of motorcycle drivers regarding: drinking alcohol, drug use, helmet use and speed average.

3. Describe the physical factors of motorcycle drivers in terms of road condition, vehicle condition, traffic signs and traffic laws.

4. Identify the relationship between socio-demographic factors, risk behavior, physical factors of motorcycle drivers and motorcycle accidents.

1.4 Conceptual framework



1.5 Operational Definitions

Factors related to motorcycle accidents: refers to action taken by motorcycle driver that cause accident while riding a motorcycle.

Motorcycle accident: refers to an accident caused by the drivers themselves, by another vehicle, or by a pedestrian.

Motorcycle riders: refers to the people who drive motorcycles or passengers.

- **Driver license**: is defined as a permit which a driver has to obtain according to the law which says that drivers are of good manners and know how to drive safety and will skill. It can be classified into two types, temporary and permanent.

- **Alcohol and drug use**: refers to the consumption of any form of alcohol or a substance that either stimulates or inhibits the central nervous system.

- **Driving experience**: means the duration of riding a motorcycle.

- **Vehicle condition**: refers to how often motorcycle get check up.

- **Traffic Sign**: refers to the traffic lights and signs which can be seen on the public road.

- **Traffic rules:** refers to the rule which people have to follow while driving on the public roads..

1.6 Expected Outcomes

This study tried to survey the broad categories of factors related to motorcycle accidents and determinants of risk behavior that are the leading causes of accidents involve motorcycle. Among the ten leading causes of death, accidents and injuries

rank second after HIV/AIDS in 9 provinces and 4 districts in Bangkok (5). The study by Ellot MA, motorcyclists' behavior and accident states that this implies that the local attitudes and behaviors might hamper the past and current interventions and strategies at making the road safer and bring down the mortality and disability rates.

The results of this study would be a baseline for future studies that could generalized major behavioral and attitude campaigns to supplement the efforts to cut down the accidents and the impact on health and loss to the economy of the country.

1.7 Limitation and scope of this study

This study was conducted in Salaya Municipality, Phutthamonthon District, Nakhon Pathom Province, Thailand. The target population was randomly selected among motorcycle drivers of this area. Therefore, the subjects who were chosen to participate might have characteristics different from others. However the major assumption associated with this type of sampling was that the elements in the target population were not different on the basis of accessibility or availability. The results, however, might not be generalized to motorcycle drivers over all of Phutthamonthon District.

CHAPTER 2
LITERATURE REVIEW

This section is related to the factors:

2.1 General information on traffic accidents

2.2 Situation of road traffic accidents in Thailand

2.3 Location of study

2.4 Factors related to accidents

2.5 Traffic accidents reduction method

2.6 Theory related to the study

2.1 General information on traffic accidents

WHO data show that in 2002 nearly 1.2 million people worldwide died as a result of road traffic injuries. This represents an average of 3,242 persons dying each day around the world from road traffic injuries. In addition to these deaths, between 20 million and 50 million people globally are estimated to be injured or disabled each year (6,7,8).

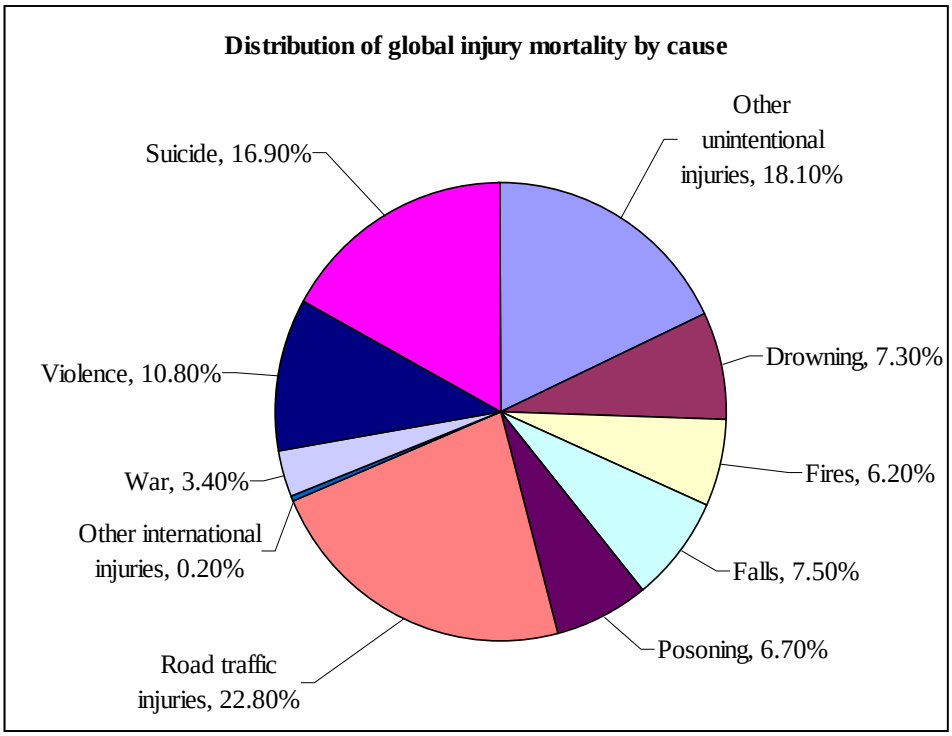
In the same year, the overall global road traffic injury mortality rate was 19.0 per 100,000 population (see table 1). Low-income and midle-income countries had a rate slighty greater than the global average, while that for high-income countries was considerably lower. 90% of road traffic accidents deaths were in low-income and middle-income countries. Only 10% of road traffic accidents deaths occurred in high-income countries (1).

Table 2 Estimated global road traffic injury-related deaths

	Number	Rate per 100 000 population	Population of total (%)
Low-income and middle-income countries	1,065,988	20.2	90
High-income countries	117,504	12.6	10
Total	1,183,492	19.0	100

Source: WHO Global Burden of Disease Project, 2002, Version 1

According to WHO data for 2002, road traffic injuries accounted for 2.1% of all global deaths and ranked as the 11th leading cause of death. Furthermore, these road traffic deaths accounted for 23% of all injury deaths worldwide (see figure 1) (1).



Source: WHO Global Burden of Disease Project, 2002, Version 1

Figure 1 Distribution of global injury mortality by cause

In 2002, road traffic injuries were the ninth leading cause of disability-adjusted life years lost, accounting for over 38 million disability-adjusted life years (DALYs) lost, or 2.6% of the global burden of disease. Low-income and middle-income countries account for 91.8% of the DALYs lost to road traffic injuries worldwide (1).

A WHO international conference on road traffic accidents in developing countries was convened in Mexico City in 1998. WHO has had a growing concern for the public health problem of road traffic accidents. The industrialized countries as stated in Taiwan using potential production years of life lost face the bigger problem of road traffic accidents (WHO). In Taiwan, 83% of registered vehicles were motorcycles, which may contribute to the high rate of accidents and property damage as road safety does not keep pace with motorization (9). Every day about 3,000 people die and 30,000 people are seriously injured on the world's roads (10). By 2020, road traffic crashes are projected to be the third leading cause of death and disability worldwide (11). Single vehicle motorcycle crashes account for about 45 percent of all motorcyclist fatalities. More than 38,000 motorcyclists have died in single vehicle motorcycle crashes between 1975 and 1999. The report claims to provide data for insight into possible causes for these fatalities. According to the report, from 1990 there were a total of 11,038 fatal single vehicle motorcycle crashes. During that same time period, there were an estimated 294,000 non-fatal single vehicle motorcycle crashes. Of these, an estimated 39,000 involved property damage only and 255,000 involved injuries. Motorcyclist fatalities in single vehicle motorcycle crashes decreased each year from 1990 to 1996, reaching a historic low of 937 in 1996 and again in 1997. In 1998, the fatalities increased to 1,042 (11.2 percent increase), in 1998 and 1999 they to increased 1,140 (9.4 percent increase). The overall increase in motorcyclist fatalities from 1997 to 1999 was 203 (21.7 percent) (12).

The problem of motor vehicle injuries in industrializing countries has been stated by the WHO and others, as in Taiwan, 83% of the registered vehicles were motorcycles, which may also contribute to the high motor vehicle injury rate. While

poor non industrialized countries have low motor vehicle injury rate associated with few vehicles, for those countroes those which are in the process of industrialization, many have the highest rates as road safety does not keep pace with motorization (13).

2.2 Situation of Road Traffic Accidents in Thailand

Thailand is not much different from Taiwan in terms of motorcycle accidents; the percentage of motorcycle accidents in Thailand is about 70% of all vehicle accidents. The continued popularity of motorcycles has not been met with effective regulatory control. This is perhaps an example where public education and traffic planning have lagged behind economic development. It would appear that, lessons learned from industrialized countries could be considered for application in newly industrializing countries (9).

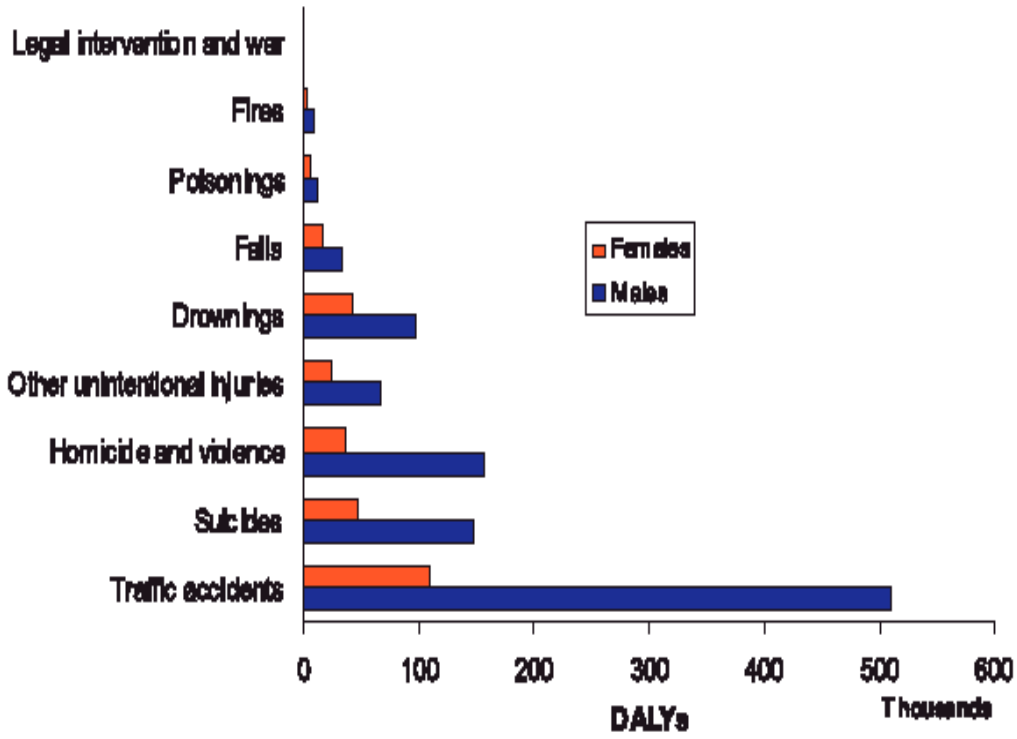
In Thailand, death from vehicular accidents is one of main cause of death compared with other causes, the same as in European countries. Review of existing data from 1947 to the present shows that traffic accidents are one of the most important causes of death, injuries and property damages. It has taken the lives of many young people, who are an important resources of the country. Data from the Ministry of Public Health showed that the trend is rising. Death from vehicular accidents ranked sixth in 1947, fourth in 1967 and second in 1987 as the leading cause of death (14).

Road traffic accident in Thailand are a major health problem. Reported annual economic losses to the country are in the order of over one hundred thousand million Baht. Cause of accidents are usually categorized as Road Users, Vehicles and Roads Environment desite the efforts taken to death. Thailand, in terms of physical and human development, could do well in payinf more attention to this matter (15).

In Thailand, injuries account for 18.5 and 7.5 per cent of the total injury burden in males and females, respectively. Traffic accidents account for half of the

injury burden in men, five times the rate of women. The second leading cause is homicide and violence in men and suicide for women. Three causes of injuries, traffic accidents, suicide, and homocide, are among the top leading causes of the total injury burden (figure 2).

The burden an women is much lower than for men for all causes of injury. The contribution from road traffic accidents in women is only one-fifth of those in men. (16).



Source Burden of disease and injuries in Thailand.

Figure 2 The burden of injuries by sex. Thailand 1999

2.3 Location of study

2.3.1 General information

Phutthamonthon is one of seven districts in Nakhon Pathom Province. It

became a sub-district in 1976. In 1996 it was established as a district with an area of 76,326 square kilometers or 47,705.625 rais. It is located in the area of Thachin River next to Bangkok and 33 kilometers away from the city center of Nakhon Pathom.

2.3.2 Boundaries

North	connects to Amphoe Banglen, Nakhon Pathom.
South	connects to Amphoe Samphan, Nakhon Pathom
West	connects to Amphoe Nakhonchaisri, Nakhon Pathom
East	connects to Amphoe Sainoi, Amphoe Bangyai and Amphoe Bangkruay, Nonthaburi Thewiwattana Suburb, Bangkok.

2.3.3 Administration

According to the administration established in 1914, it is divided in to 3 sub-districts. They are:

- Salaya Municipality	population	15,168	people
- Klongyoung	population	6,124	people
- Mahasawat	population	4,352	people

2.3.4 Transportation in Phutthamonthon

Phutthamonthon is one district of Nakhon Pathom province. This district is very crowded because there are a lot of factories and most of people ride motorcycles for transportation to work, to go to school or to shop at the market. The reason for riding motorcycle in the area of Salaya Municipality are:

- They can ride motorcycle along the narrow roads instead of walking.
- The can save money.
- It makes it more convinient to stop from place to place.

With respect to transport by cars, people will drive or ride as a passenger in a car for the reason that it is safer than riding a motorcycle.

The incidence of road accidents as reported by to hospitals Salaya Municipality showed that there were 1,656 accidents between in October 2003 and October 2004,

1,335 of these accidents were motorcycle accidents (Salaya Hospital and Phutthamonthon Hospital).

2.4 Factors related to accidents

2.4.1 Education

Education plays a major part in determining the cue to action in a community. A case-control study conducted in rural Thailand on motorcycle drivers in 1995 (17), showed the result of an intervention program. A community-based program for motorcycle driver education was provided for motorcyclist in all villages of 3 randomly selected sub-districts in Mae Sot District, Tak Province, Thailand, between January and March 1995. Following the driver education program, the injury rates for 1995 and 1996 were significantly lower in the intervention group of those who received driver education than in the control population. The annual number and rate of fatal motorcycle injuries decreased after the intervention program although there was no significant demographic difference between the two populations. Motorcycle driver education has been documented in this study as being a promising positive factor in the effectiveness the other intervention programs to reduce the incidence and prevalence of the road traffic accidents. Thus this variable will be included and this study, but will try to look into the established association between only general education and road safety compliance.

2.4.2 Driver license

To obtain a driver license, one must show some ability and skill in motorcycle driving. A study conducted in Bangkok, published in 1997, showed injuries from road trafic accidents in Bangkok Metropolis. The study included 346 in-partient cases suffering injuries from road traffic accident in Bangkok Metropolis. Most of the partients drove a motorcycle, had their driving license for only a short period, and drove more than 5 hours a day (19). The short lived or absent license might have some behavior component towards the risk-taking attitude and causal behavior of those involved inmotorcycle accidents.

2.4.3 Driving experience

Years of riding experience is the time spent in driving a motorcyle. The more years of driving experience, the greater the knowledge and skill which may help to decrease the number of road accidents. This point is made in a study by Kumrai Tunchaisri entitled A Comparative Study of Factors Involving Motorcycle Accidents of Secondary School Students, which showed that the group of the students who rode for less then one year, were involved in 2.8 times more motorcycle accidents than the group who had ridden for one year or more (18). Furthermore, the study by Surachai Jrimkool showed that these drivers in the age group of 15-24 years old who rode for less than three years,were involved in 3.5 times more motorcycle accidents than the group who had ridden for seven years or more (19).

2.4.4 Alcohol consumption

According to study by Kidaphol Wadhanakul about factors related to motorcycle accidents among motorcycle taxi riders in Phayathai District, Bangkok considering health behavior factors, it was also showed that 245 out of 401 of riders consummed some alcoholic beverage before driving their motorcycle (20).

In Thailand, results from research in 2003 showed that driving under the influence of alcohol was found to be prevalent in certain male populations, as shown by the quote from this male laborer who working in the city “when I get drunk, I always drive a vehicle. If I don’t drive back to my home who is going to drive for me”. Symptom of drowsiness from consuming alcoholic beverages naturally reduces the effectiveness of driving. A worker narrating the experience of driving while intoxicated, consessed that one usually drove faster than normal while they stated that they were driving slower than they perceived. This creates high opportunity for accidents, along with the fact that the drunk driver would often refuse to wear a helmet while driving. Thoughts about safety become impaired due to the influence of the alcohol. Drinking alcohol is the village custom especially during meetings and parties. In addition, in order to relieve stress from daily working life, villagers will often go together as a group to a bar or a friend’s house and consume alcohol. After

they are finished drinking, they often will drive their motorcycle back to home without concern about using a helmet or driving while under the influence of alcohol (21).

2.4.5 Drug use

Legal requirements for police to carry out drug testing vary. Powers to carry out a blood or urine test exist in many countries to determine whether a driver is unfit to drive as a result of consuming drugs. The relationship between the use of drugs and involvement in road accidents is still largely unclear. Considerable research, though, is currently being undertaken to gain greater understanding of this subject. Enforcement strategies that deter people from driving while under the influence of drugs still have to be developed. Research is also being carried our in this area to find efficiant and cost-effective screening devices to help enforce laws on drug use and driving (22).

2.4.6 Helmet use

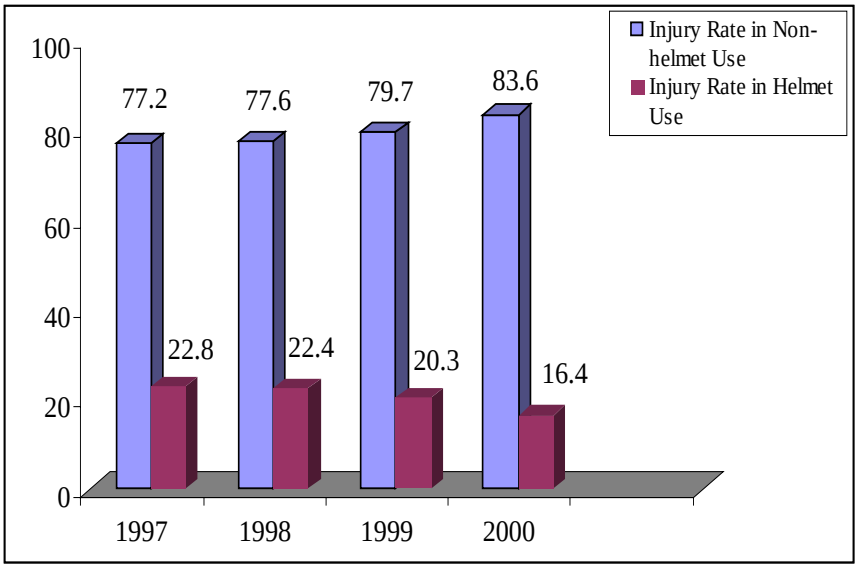
A study by Division of Epidemiology, MOPH about rate of injury of motorcycle riders, categorized by helmet use, 1997-2000 of road traffic accidents nationwide demonstrated that head injuries were the major cause of death in motorcycle accidents, despite the fact of a Royal Decree on anti-knock helmets which has been in effect in all provinces throughout the country since 1 January 1996. The Faculty of Public Health, Mahidol University, and the Medical Institute of Accidents and Disaster, MOPH, conducted a survey in 1997 on use of anti-knock helmets by motorcycle drivers and passenger in Bangkok and 20 other provinces with high accident death rate. The study discovered that the rate of helmet use was 38.1 percent among motorcycle drivers and only 10.4 percent among passengers. The rate of injury for those who drove a motorcycle without using a helmet was 80-90 percentage greater than for those using a helmet (figure 3 and 4) (23).

Besides the safety reason for using a helmet, protection from being stopped by police was an important issue for motorcycle drivers. Their experience with police

was a motivator for using a helmet, as people who drove without a helmet would pay a fine of 200 baht.

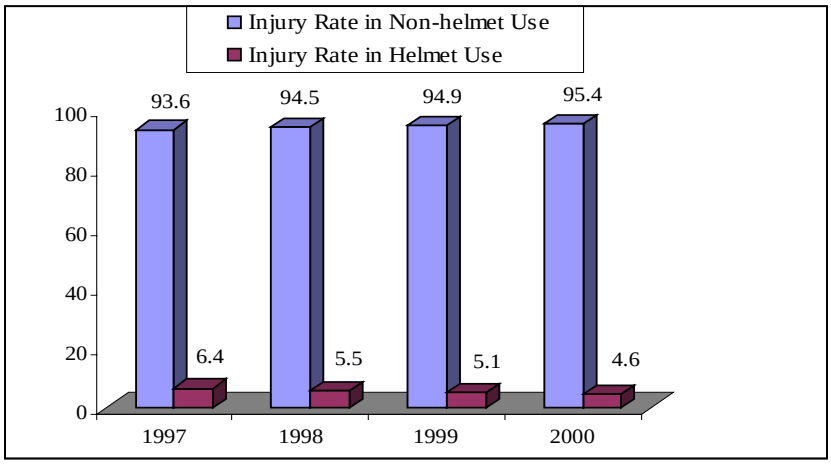
The Road Traffic Accident Prevention during 2004 Sangkran Festival By Road Safety Operation Center (RSPC), Department of Disaster Prevention Mitigation, Ministry of Thailan the proportion of motorcyclists who always or often wore helmets was significantly greater in the intervention sample (46.0%) than in the control sample (20.5%) (24). Result from this research showed that those motorcyclists who wore helmets tended to have fewer and less severe head and facial injuries than those would did not wearing helmets (25, 26, 27).

In Thailand, a retrospective study conducted recently in Pra Chom Klao Hospital, Phechaburi, showed analysis from 3,225 injuries to motorcycle drivers. Approximately 21 per cent of the accidents involved drivers who had been drinking alcohol and about half of the drivers were unlicensed. Only 4 per cent of the drivers were wearing helmets at the time of accident (28).



Source: Report on Injury Surveillance in Thailand, Division of Epidemiology, MOPH

Figure 3 Rate of Injury of Motorcycle Drivers, Categorized by Helmet Use, 1997-2000



Source: Report on Injury Surveillance in Thailand, Division of Epidemiology, MOPH

Figure 4 Rate of Injury of Motorcycle Passengers Categorized by Helmet Use, 1997 – 2000.

2.4.7 Driving speed

The study "Helmet Behavior: Social and Culture Aspects" interviewed motorcycle drivers who said "…when I became drowsy from drinking alcohol, I wanted to drive faster because it was fun. I thought that person behind wanted to race with me, and then I sped up and hit another car. Two of my friends were immediately death." Up to now, that person is now afraid of driving fast. He drives with limited speed, less than 100 km/hr, and keeps to the side when driving. He said he is still stuck with terror until today (22).

2.4.8 Road condition

From the study by Tassumi Yodpratumwan, (2002) about Suitability of Sports Model 150 cc and Family model 110 cc Motorcycle Taxi as a transportation in Amphoe Phutthamonthon Disrict showed that of road conditions in Salaya Municipality, it was found that 43.8% of the sampled group were very satisfyed, 31.3% were indifferent, 12.5% were unsatisfied, 6.3% were most satisfied and 6.3% was most unsatisfied. When comparing the mean at 3.31, it showed the sample group was in the middle satisfaction (29).

2.4.9 Vehicle condition

Lenght of driving experience and power of machines are two important contributing factors in accidents to young drivers. The resulting mortality rate of accidents may be affected by the structural design of the vehicles involved. Defects in such important factors as breaks, lights, tires and steering are common. Although it is not possible to measure precisely the contribution of vehiclar defect to road accidents, they likely play a considerable part in the causation of many accidents.

2.4.10 Motorcycle accidents

The study Road traffic Injuries in Thailand has tried to explore the risk behavior determinant of motorcycle accidents. Injuries and deaths from traffic accidents have become a major public health and economic problem in Thailand. Injuries, fatalities and economic loss due to traffic accidents have increased with the rising level of motor vehicle usage. This study Road traffic Injuries in Thailand (30) analyzes hospital-based data compiled by the Ministry of Public Health, data compiled by the National Police Office and data compiled by the traffic engineering divisions of Department of Highways, Ministry of Transport and Communications. Analysis reveals that 70% of the people injured or killed in traffic accidents are aged 15-39 and that men have a four to five time higher risks of death and injury due to traffic accidents than women.

An urban-rural difference in traffic injuries has been recorded in a study by Burden of disease and injuries in Thailand with a higher rural case-fatal rate. A number of risk behaviors of drivers have been identified, i.e., driving under the influence of alcohol, speeding, drug use and failure to use helmets (31).

2.5 Traffic accidents reduction method

A method to reduce traffic accidents are 3 E’s. They are education, enforcement and engineering (32).

2.5.1 Education

1. Direct education
    - Educating students in class.
    - Educating in driving schools.
    - Youth and general people education.
    - Educating people applying for a driver license and those receiving traffic police warnings.
2. Indirect education
    - Educating on mass media broadcasting on televisions, radios and newspaper.
    - Setting up traffic exhibition education and traffic auditory education.
    - Setting up driving arenas.

Continual campaigning and educating on every kind of mass media enhances public awareness, public precaution which can lead to a permanent decrease of traffic accidents (33).

2.5.2 Enforcement

- Regular arrests of people violating traffic regulations
- Concentrating on arrests of people violating traffic regulations in the time, places and actions that often times cause accidents.
- Seizing or canceling a driver license.
- Arresting for driving while under the influence of alcohol.
- Arresting for driving at high speed.
- Arresting for driving under the influence of drugs.
- Enforcement of Crash Helmet laws.

According to the study Chawalit Sukhawan and Kittham, 1981, strict enforcement will decrease accidents by more than 40% (34).

2.5.3 Engineering

- Improve road surfaces and widen roads adequately to accommodate the numbers of motorcycles.
- Carefully design roads, junction, and winding roads to decrease accidents.
- Construct bridges, widen bridges appropriate to the road, and construct overpasses and flyovers.
- Provide signal lights, paint lines on roads and provide signs and equipment for warning of danger along the roads.
- Provide lights sufficient on roads and in risky areas.
- Provide suggestion signs, warning signs, and signs prohibiting certain actions along the roads.
- Plant greenery along sidewalks to make drivers relax.
- Improve vehicle safety such as safety belts, crash helmets, safety mirror, bumpers and fenders, air bags and steering wheels that can be drop down.

2.6 Theory related to the study

The theoretical framework of the study the home and school background of young drivers involved in traffic accident is a model of interaction earlier used in educational settings (Kapborg and Fischbein, 1991). In a psychological perspective traffic accidents or their outcome can be considered to be the result of an interaction between individual characteristics and environmental factors (35).

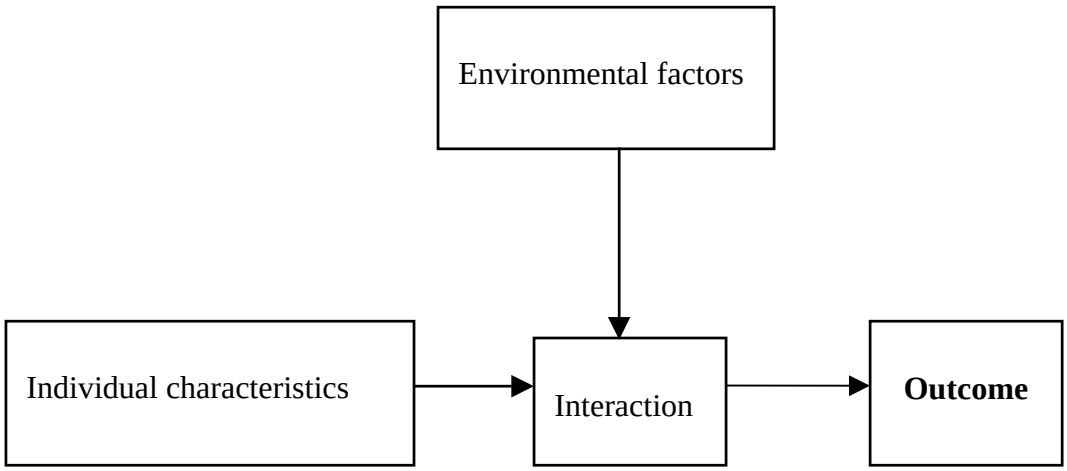


Figure 5 Model of interaction between individual and environmental factors. The model is modified after Kapborg and Fischbein (1991).

In this study, this theory was modified to 4 categories, motorcycle accidents (out come) are the result of physical factors (environmental factors), risk behavior (internal factors) and socio-demographic factors (individual characteristics) (see figure 6).

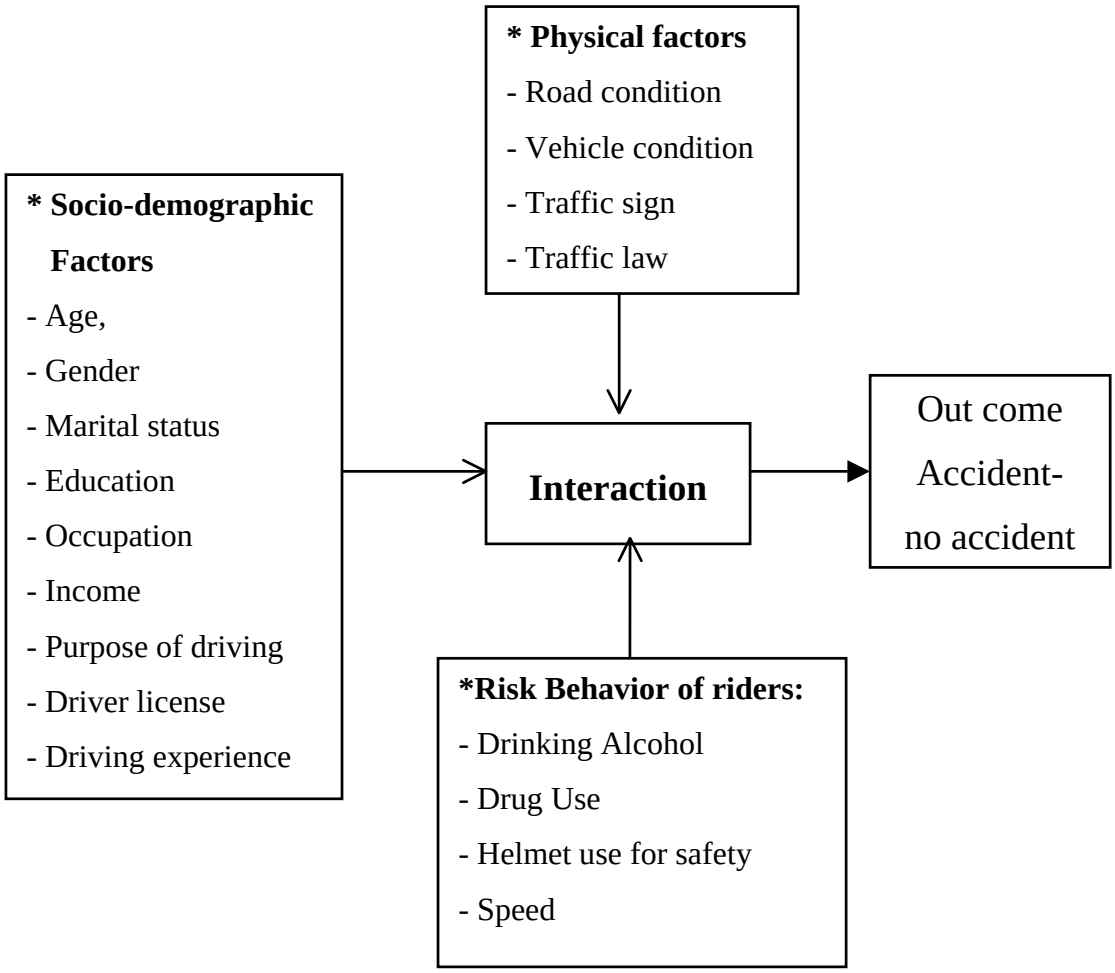


Figure 6 Modified model of interaction (2005).

From the Figure 6, motorcycle accidents are the outcome of variables of physical factors (Environmental factors), Socio-demographic factors (individual characteristics factors) and risk behavior of riders (internal factors.

Traffic laws, traffic sign vehicle condition and road condition are examples of physical factors. Age, gender, marital status, education, occupation, income, purpose of driving, driver license and driving experience are examples of socio-demographic factors. Drinking alcohol, drug use, helmet use and driving speed are examples risk behavior of riders.

What the model hypothesizes is that a traffic accident is the result of an interaction among the socio-demographic factors, risk behavior and physical factors of the individual driver. The focus of this study identifies the relationship between socio-demographic factors, risk behavior, physical factors of motorcycle riders and motorcycle accidents.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Research design

This study was designed as a cross–sectional descriptive study, aimed at describing the socio-demographic factors, risk behavior and physical factors relating to motorcycle accidents of motorcycle riders. The data collection was done by structured questionnaires. The study population was systematically selected among motorcycle riders. 230 respondents were interviewed and after data cleaning and sorting, 210 were selected to be included for data analysis making the sample size 210.

3.2 Study population

The target population of this study were people who rode motorcycles, both motorcycle drivers and passenger, in Salaya Municipality, Phutthamonthon District, Nakhon Pathom province.

3.3 Sample size

At the time of the study, in Salaya Municipality of Phutthamonthon District, the researchers collected information from 210 motorcycle riders in three places. Systematic sampling technique was use in this research as follow (table 3):

Table 3 Sampled group of motorcycle riders in Salaya Municipality

No	Selected of area:	No. of motorcycle riders
1	Salaya market	70
2	Salaya community	70
3	School/ University	70
	Total number	210

3.4 Research instrument

The research instrument was a structured questionnaire, which was designed with 48 questions. The questionnaire had four major categories of questions, which was based on a conceptual framework study.

Part I: Socio demographic factors included respondent's background such as age, gender, marital status, education, occupation, income, purpose of driving, driver license and driving experience.

Part II: Risk behavior factors included respondent's alcohol consumption, drug use, helmet use for safety and average speed.

Part III: Physical factors included respondent's opinion of road condition, vehicle condition, traffic sign and traffic laws.

Part IV: Accident, which included information about why the accident occurred.

The structure questionnaire was prepared in English and then translated into Thai. The questionnaires were tested upon thirty five motorcycle riders in the area of Salaya Municipality, Salaya market, Salaya community and around Mahidol University, as a pre-test. The questionnaires were checked and three questions were deleted, four questions were revised and some questions rearranged.

3.5 Data collection

After the pre-test was completed, the advisor and co-advisors checked the questionnaires. The researcher trained two Thai research assistances to serve as interviewers in the field. Before starting data collection, the two Thai interviewers were given orientation.

Data collection was undertaken at the three places of the target sites as stated, by face to face interviews. To ensure reliability, the researcher monitored the whole process regularly.

The duration of the data collection process was one week. The data was collected during the morning and evening because there were many people at these places during those times.

3.6 Data processing and analysis

After completing data collection, each questionnaire was screened and some answers needed to be translated to English to run the analysis such as regrouping of some categories. Than, the process of coding and data analysis was done by the statistical package Minitab.

3.6.1 Descriptive statistics

For the data which included socio-demographic factors, risk behavior and physical factors, this study used frequency distribution, percentage mean standard deviation, maximum and minimum to explain the study variables.

3.6.2 Inferential statistics

After frequency distribution, an analysis was done along with Chi-square test and Fisher's exact test that assessed the relationship between independent and dependent variable. The critical significance of these statistical level worked at α = 0.05.

CHAPTER 4
RESULTS

This research was conducted to describe the factors and relationship among motorcycle riders involved in accidents. The study area selected was Salaya Municipality, Phutthamonthon District of Nakhon Pathom province. A pre-test with a sample of 35 motorcycle riders was done in a area close to Salaya around the community market and in front of Mahidol University in January 2005.

The study size was 210 motorcycle riders sampled from three areas, in front of Mahidol University, Salaya market and Salaya community.

The purpose of this study was to determine the personal characteristics, risk behavior of riders and physical factors among the motorcycle riders related to motorcycle accidents in Salaya Municipality, Phutthamonthon District. And finally, suggest how to reduce motorcycle accidents in this area.

The study results are presented in four parts according to the conceptual framework including:

1. Socio-demographic factors.
2. Risk behavior of riders.
3. Physical factors.
4. Association between the dependent variable (motorcycle accidents), and independent variables (socio-demographic, risk behavior of riders and physical factors).

Since this is a cross-sectional descriptive study, most of the results have been summarized into frequent and percentage tables. The relationship between independent variable contributing factors to dependent variables among the target

population has been statistically analyzed by Chi-quire test, with the level of significance set at $\alpha = 0.05$.

4.1 Descriptive explanation

4.1.1 Socio-demographic factors

The socio-demographic characteristics included gender, age, marital status, education, occupation, income, purpose of driving; driver license and driving experience.

Table 4 Frequency distribution of socio-demographic factors.

Personal characteristics		Number **(N= 210)**	Percent **(%)**
Gender			
	Male	152	72.4
	Female	58	27.6
Age (years)			
	18 or below	26	12.3
	18 – 29	102	48.3
	30 – 45	67	32.2
	46 – 72	15	7.2
Mean = 28.3, SD = 10.9, Min = 10, Max = 72			
Marital Status			
	Single	118	56.2
	Married/ Widow/ divorced	92	43.8
Education level			
	Primary school	61	29.0
	Secondary school	79	37.6
	Vocational	38	18.1
	Bachelor	30	14.3
	Higher than bachelor	2	1.0

Table 4 Frequency distribution of socio-demographic factors (Cont.).

Personal characteristics		Number (N= 210)	Percent (%)
Occupation			
	Student	51	24.3
	Government employee	32	15.2
	Private employee/ Labour	73	34.8
	Self entrepreneur	44	21.0
	Other such as factory worker, farmer	10	4.7
Income per Month			
	Less than 5,000	107	51.0
	5,001 – 10,000	82	39.0
	More than 10,000	21	10.0
Mean = 6,709	SD = 7,592 Min = 750 Max = 100,000		
Purpose of driving			
	Occupation	36	17.1
	Transportation	174	82.9
Driver license			
	Yes	122	58.1
	No	88	41.9
Driving experience (years)			
	5 years or below	97	46.2
	6 – 10 years	64	30.5
	More than 10 years	49	23.3
Mean = 8.220	SD = 6.220 Min = 0 Max = 30		

Table 4 shows that most of motorcycle rider's were male (72.4%) with female just over one-fourth (27.6%). The ages of the motorcycle riders were grouped into fours categories. Nearly one-half (48.3%) of the motorcycle riders, irrespective of

their gender, were in the age group of 18-29 years. The age group of 30-45 years was the second most represented, having about over almost one third (32.2%) of the respondents. The age group of less than 18 years was the third highest group (12.3%) and the rest were in the age group 46-72 years with a small percentage of respondents (7.2%). The median age was 26 years with the standard deviation of 10.93 and the minimum age for the respondents of 10 years to a maximum of 72 years.

For the marital status of the respondents, more than one-half (56.2%) were single. Those who were married or divorced, nearly one-half (43.8%).

Education level of the respondents was grouped mainly in the secondary and primary school level. The respondents in the vocational level and bachelor level were a much lower percentage. Those with secondary school education level were over one-third (37.6%) of riders, followed by primary school level (29.0%) and vocational level (18.1%) and then bachelor degree level (14.3%).

Regarding occupation of motorcycle riders, over one-third (34.8%) of the respondents were private employee/labours, students were nearly one-fourth (24.3%), self entrepreneur (21.0%), government employee (15.2%) and other such as factory worker, farmer, house wife (4.7%).

Table 4 shows that income of the respondents fluctuated around in the low income category (51.0%) follow by the middle income category (39.0%) and the rest (10.0%) were in the higher income category The median income was 5,000 Baht with a standard deviation of 7,592.458 Baht and the minimum income for the respondents around 750 Baht to a maximum of 100,000 Baht.

Regarding purpose of driving of motorcycle in this area, the large majority (82.9%) was for transportation and the rest (17.1%) for their occupation.

For driver license, just over half of respondents (58.1%) had a driver license, but nearly one-half (41.9%) had no license. The reason for having no license were: did not go to make one (80.0%), age less than 18 years (16.5%), and just riding in the village (3.5%). The reason for obtaining a license was because they were afraid of being arrested by the police (85.7%), for safety (8.6%) and a small percentage of respondents wanted to use the license as use an ID card (1.9%), no answer (3.3%) and not important (0.5%) “See appendix B 1”

Table 4 shows that nearly one-half (46.2%) of the respondents had motorcycle driving experience of 5 years or less, followed by (30.5%) of drivers who had experience from 6-10 years, and the last group, nearly one-fourth (23.3%), were those who had driving experience of more than 10 years. The median number of years of driving experience was 6 years with the standard deviation of 6.22 and the minimum riding experience for the respondents less than 1 year to a maximum of 30 years.

4.1.2 Risk Behavior of riders

Table 5 Frequency distribution of risk behavior rider’s factors

Risk Behavior of riders	**Number (N= 210)**	**Percent (%)**
Alcohol		
***Drinking alcohol before ride motorcycle**		
Often	20	9.5
Sometimes	66	31.5
Never	124	59.0
***Have you ever driver a motorcycle when you were intoxicated**		
Often	18	8.6
Sometimes	53	25.2
Never	139	66.2
Drug Use		
*Some kind of medicine before riding		
Ever	33	15.7
Never	177	84.3

Table 5 Frequency distribution of risk behavior rider's factors (cont.).

Risk Behavior of riders		Number (N= 210)	Percent (%)
*Some kind of drug abuse before riding			
	Ever	6	2.9
	Never	204	97.1
Helmet Use			
	Every time	116	55.2
	Often	16	7.6
	Some time	63	30.1
	Never	15	7.1
Speed of riding (kms/hour)			
	50 Km/hr or below	40	19.1
	51 – 80 Km/hr	141	67.1
	More than 80 Km/hr	29	13.8
Mean = 70.02	SD = 22.52	Min = 20	Max = 200
Engine power CC			
	100 cc or below	65	31
	101 – 125 cc	125	59.5
	More than 125 cc	20	9.5
Mean = 116.78	SD = 17.778	Min = 80	Max = 250

Table 5 shows that a few drivers (9.5%) admitted to having consumed alcohol before driving their motorcycle and nearly one third (31.5%) sometime drink alcohol before driving but more than one half (59.0%) stated that they never consumed alcohol before driving their motorcycle.

For the case of medicine use, a few respondents (15.7%) admitted that they had ever used medicine before driving but a large majority (84.3%) of the motorcycle riders never used any kind of medicine before driving their motorcycle. Regarding use

of other drugs, only a small number of respondents (2.9%) admitted to having used drugs before driving their motorcycle.

With respect to helmet use, more than half (55.2%) said they used a helmet every time while riding a motorcycle, nearly one third (30.1%) said they used a helmet sometimes with a lesser percentage who said they often used a helmet (7.6%) and never used a helmet (7.1%). The stated reason for helmet use was for safety, over one third (38.6%), or to follow the rules, almost two third (61.4%). Among the 210 respondents, a large majority (91.4%) thought helmet use was very necessary, necessary (7.6%) and a small percentage thought that helmet use was not necessary (1.0%) “See appendix B 2”.

With regards to driving speed, slightly over two thirds (67.1%) of the respondents stated that they drive at a speeds between 51–80 km/hour, with the second group of the respondents (19.1%) driving at a speed of 20–50 km/hour and only (13.8%) of respondents that were driving at a speed more than 80 km/hour.

For the size of the motorcycle, more than one half (59.5%) used a motorcycle with engine power between 101 to 125 cc, nearly one third (31.0%) had motorcycle power less than or equal to 100 cc, and a few (9.5%) had a motorcycle with power more than 125 cc.

4.1.3 Physical factors

Table 6 shows the factors relating to physical factors, such as road condition, vehicle condition and traffic signs.

Table 6 Frequency distribution of physical factors

Road condition		**Number (N= 210)**	**Percent (%)**
Road condition			
	Rough and dusty	148	70.5
	Splashy and dusty	41	19.5
	Clean and safe	21	10.0
Condition of road effect to accident			
	Yes	176	83.8
	No	25	11.9
	Not sure	9	4.3
Traffic sign in Salaya enough			
	Yes	57	27.1
	No	153	72.9
Signs can reduce motorcycle accidents			
	Yes	107	51.0
	Sometime	89	42.4
	No	14	6.7
Check up vehicle per year			
	Once a year	72	34.3
	Twice a year	72	34.3
	More than three times a year	32	15.2
	Other, specify	34	16.2
**** Other check up motorcycle (n= 34)***			
	Every month	*26*	*76.5*
	Never check up	*8*	*23.5*

Table 6 Frequency distribution of physical factors (Cont.)

Road condition		**Number (N= 210)**	**Percent (%)**
Duration of maintenance of motorcycle			
	Routine maintenance	112	53.3
	Out of order	78	37.2
	Other, specify	20	9.5
Break the rules			
	Often	13	6.2
	Seldom	104	49.5
	Never	93	44.3
Dangerous if Break the rules			
	Yes	**203**	**96.7**
**** Reason (n = 195)***	*Carelessness*	*60*	*29.9*
	Riding the red light and pass each other	*18*	*9.0*
	Accident can be occurred	*115*	*57.2*
	Loss the balance vehicle	*2*	*1.0*
	No	**7**	**3.3**
**** Reason (n = 6)***	*Never think about it's dangerous*	*6*	*2.9*

Table 6 shows that the road condition that they mostly used while driving a motorcycle (70.5%) were rough and dusty roads, while nearly one five of the respondents (19.5%) said they used splashy and dusty roads, with just a few (10.0%) that said they used clean and safe roads. About whether the condition of road had an effect on accidents, the large majority (83.8%) answered yes, a few (11.9%) answered no and a small percentage of respondents (4.3%) were not sure.

With respect to traffic signs in Salaya a large number of the respondents answered that there were not enough signs and that the signs were not clear (72.9%) but over one-fourth (27.1%) said there were enough traffic signs. About half (51.0%) thought traffic signs were related with motorcycle accidents and that signs can reduce

accidents, but nearly one half (42.4%) said that only sometimes traffic sign can reduce motorcycle accident and small percentage (6.7%) were not sure.

Regarding regular vehicle check ups, the same percentage, just over one-third (34.3%), said they did it one time per year and two times per year, a smaller number of respondents and said they got their vehicle checked up more than three time per year (15.2%) or specified some other check up frequency (16.2%). Of the other frequencies specified they said that they got a check up every month (76.5%) or never got a check up (23.5%). More than half of the respondents (53.3%) got routine maintenance of their motorcycle, but more than one-third (37.2%) only got maintenance when their motorcycle was out of order and a few (9.5%) had some other type of maintenance.

Nearly one-half (49.5%) of the motorcycle drivers stated that they seldom break the rules, over more than two fifths (44.3%) never break the rules but a small percentage (6.2%) stated that they often break the rules. Regarding the question about whether it is dangerous if they break the rules, the great majority (96.7%) answered yes and the reasons it can be dangerous is carelessness (29.9%), accident can occur (57.2%), passing a red light and pass other vehicles (9.0%) and loss of balance of the vehicle (1.0%). A small number (3.3%) answered that they did not think it is dangerous to break the rules when driving a motorcycle.

4.1.4 Characteristics of motorcycle accident

Table 7 Percentage of motorcycle accidents, in association with riders personal risk factors (N=210)

Variable	Motorcycle accidents	
	Number (N= 210)	**Percent (%)**
Accidents		
No	83	39.5
Yes	**127**	**60.5**
Number of accidents (times) (n = 127)		
1	55	43.3
2	31	24.4
3	20	15.7
4	5	3.9
5	13	10.2
6	1	0.8
7	1	0.8
10	1	0.8
Mean = 2.24 SD = 1.57	Min = 1	Max = 10
Accidents you were (n = 127)		
Driver	108	85.0
Passenger	19	15.0
Place of accidents (n = 127)		
In Salaya	71	55.9
Out Salaya	56	44.1
Time of accidents (n = 127)		
Early morning	27	21.3
Evening	56	44.1
Night	41	32.2
Others	3	2.4
Cause of accidents (n = 127)		
Carelessness	53	41.7
Road condition	24	18.9
Intoxicated	21	16.5
Vehicle condition	4	3.2
Weather condition	3	2.4
Other	22	17.3

Table 7 Percentage of motorcycle accidents, in association with riders personal risk factors (N= 127) (cont**.).**

Variable	Motorcycle accidents	
	Number (N= 127)	**Percent (%)**
Party in the Accidents		
Was hit	46	36.2
Hit by the other	43	33.9
Other	38	29.9
accidents involved with		
Car	46	36.2
Motorcycle	20	15.7
Pedestrian	13	10.3
Bicycle	3	2.4
Other	45	35.4
Other reason (n = 45)		
By self (Fall down)	*24*	*53.3*
Dog	*13*	*28.9*
Road condition (corvy, bumpy)	*7*	*15.6*
Bus	*1*	*2.2*

Table 7 presents the characteristics of motorcycle accidents. This table shows that 83 respondents (39.0%) never had an accident but 127 respondents (60.5%) had accidents. Regarding the 127 respondents who have had an accident, nearly one half (43.3%) have had one accident, nearly one fourth (24.4%) have had two accidents, a few had accidents 3 times (15.7%) and 5 times (10.2%) and a very small percentage had accidents 4 times (3.9%) and more than 5 times (0.8%). The large majority all of the respondents who had accidents were the drivers (85.0%) with the rest as passengers (15.0%).

Over one half (55.9%) of the accidents occurred in Salaya Municipality and the rest (44.1%) outside of Salaya Municipality. Regarding the time of day for the accident, nearly one half (44.1%) took place in the evening, followed by nearly one third (32.2%) at night and nearly one fourth (21.3%) early in the morning and a very small percentage (2.4%) at other times.

Table 7 shows that the cause of the accidents were carelessness (41.7%), road condition (18.9%), driving while under the influence of alcohol (16.5%), other causes (17.3%), a small percentage (3.2%) were due to vehicle condition and lastly weather conditions (2.4%).

Table 7 shows that among the 127 respondents who had accidents, (36.2%) were hit by others, followed by (33.9%) who had accidents by hitting the other party, and (29.9%) responding some other incident such as “motorcycle, bicycle and people”. These accidents involved: with a car 46 cases (36.2%), other 45 cases (35.4%), motorcycle 20 cases (15.7%), people 13 cases (10.3%) and with a bicycle 3 cases (2.4%).

4.2 Association between dependent and independent variables

The inferential explanation of the results mainly has a basis on the relationship of the independent variable to the dependent variable. During this part of the chapter, it will be seen that most interesting results of the this study were:

4.2.1 Association between motorcycle accidents and socio-demographic factors.

4.2.2 Association between motorcycle accidents and risk behavior of riders.

4.2.3 Association between motorcycle accidents and physical factors.

4.2.1 Association between motorcycle accidents and socio-demographic factors.

Table 8 Percentage of motorcycle accidents, in association with socio-demographic factors (N = 210)

Socio-demographic	Motorcycle accidents				Total	x^2 (df)	P value
	No		Yes				
	n=83	%	n=127	%	N=210		
Age group (years)						5.004	0.171
< 18	12	46.2	14	53.8	26	(3)	
18 - 29	41	40.2	61	59.8	102		
30 - 45	21	31.3	46	68.7	67		
46 - 72	9	60.0	6	40.0	15		
Gender						8.209	0.004 *
Male	51	33.6	101	66.4	152	(1)	
Female	32	55.2	26	44.8	58		
Marital status						0.150	0.698
Single	48	40.7	70	59.3	118	(1)	
Married	35	38.0	57	62.0	92		
Number of children(n = 202)						1.359	0.507
No children	9	30	21	70	30	(2)	
1 - 2 children	14	41.2	20	58.8	34		
3 - 4 children	57	41.3	81	58.7	138		
Driver license						6.955	0.008*
Yes	39	32.0	83	68.0	122	(1)	
No	44	50.0	44	50.0	88		
Driving experience						6.022	0.049 *
5 years or below	46	47.4	51	52.6	97	(2)	
6 - 10 years	18	28.1	46	71.9	64		
> 10 years	19	38.8	30	61.2	49		

* Significant at p-value < 0.05.

Table 8 Percentage of motorcycle accidents, in association with Socio-demographic factors (N = 210) (Cont.)

Socio-demographic	Motorcycle accidents				Total	x^2 (df)	P value
	No		Yes				
	n=83	%	n=127	%	N=210		
Education						8.958 (4)	0.062
Primary school	21	34.4	40	65.6	61		
Secondary school	33	41.8	46	58.2	79		
Vocational	10	26.3	28	73.7	38		
Bachelor	18	60.0	12	40.0	30		
Higher bachelor	1	50.0	1	50.0	2		
Occupation						6.274 (4)	0.180
Student	24	47.1	27	52.9	51		
Government employee	16	50.0	16	50.0	32		
Private employee	23	31.5	50	68.5	73		
Self entrepreneur	18	40.9	26	59.1	44		
Other	2	20.0	8	80.0	10		
Purpose of driving motorcycle						7.329 (1)	0.007*
Occupation	7	19.4	29	80.6	36		
Transportation	76	43.7	98	56.3	174		

* Significant at p-value < 0.05.

Table 8 shows that with respect to the age group of those who ride motorcycles in Salaya. For the group of motorcycle riders age 18-29 years which constitution the largest group of respondents 102 motorcycle riders, (40.2%) never had an accident and (59.8%) among this age group of respondents previously had an accident. The second largest group of respondents, those in the age group 30-45 years, (31.3%) had no accidents and (68.7%) had accidents. The third largest group of respondents those less than 18 years, (46.2%) never had an accident and (53.8%) had an accident. The last group 46-72 years, there were just a small number of

respondents. The result showed that with respect to age, there was not a significant association with motorcycle accident at p-value (p=0.171).

Regarding gender 152 (72.4%) of the riders were male and only 58 (27.6%) were female. The results have statistical analysis association significant with p-value, (P= 0.004). Among the 152 male riders slightly over two-thirds (66.4%) had accidents. Just over one half (55.2%) of the female riders never had an accident and (44.8%) of female rides had accidents. As might be expected this shows that the rate of accidents among male riders is more than for females riders.

Table 8 shows with respect to marital status of the respondents, among the single riders more than one half (59.3%) had accidents and (40.7%) had no accidents. The second group, those who were married, almost two-thirds (62.0%) had accidents and just over one third (38.0%) had no accidents. Among respondents who had 1-2 children, more than one half (58.8%) had accidents, but a higher percent of motorcycle riders who had 3-4 children (58.7%), had accidents. Thus with respect to marital status and number of children, the statistical analysis shows no association with motorcycle accidents at p-value, (P > 0.05).

With respect to driver license as shown in Table 8, among the 122 motorcycle riders that had a license, nearly one third (32%) never had an accident and slightly over two-thirds (68%) had an accident. Regarding the second group of 88 respondents who did not have a license, half of the respondents (50.0%) never had an accident and the same percentage had accidents. While statistical testing using Chi-square it was shown that having a license was significantly association to motorcycle accidents occurrence at p-value, (P=0.008) this association is suspect since it is possible that respondents obtained their license by means other that testing of their driving skill.

In Table 8 the driving experience of the riders for the purpose of the inferential statistical was grouped by those having 5 years of experience or below, 6 to 10 years and more than 10 years of experience. Among those with 5 years of experience or below, nearly one half (47.4%) had no accidents and more than half (52.6%) had

accidents. In the group with 6 to 10 years of experience, over one fourth (28.1%) had no accidents but nearly three fourths (71.9%) experienced an accident. In the last group, those with more than 10 years of experience, over one third (38.8%) had no accidents and well over half (61.2%) had accidents. The results show significant statistical association related to motorcycle accident occurrence at p-value, (P= 0.049).

The education level and occupation of motorcycle riders stand for non-significance on Chi-square as we look at the table p-value, (P= 0.062) education and p-value (P= 0.180) of occupation. There is no association between education and occupation with motorcycle accidents, because the incidents of accidents were equally distributed among all respondents.

Among occupation, just less than one half (47.1%) of the students never had an accident and a bit more than half (52.9%) had accidents. In the second group, government employees, the incidents of never having an accident and having had an accident were the some percentage (50%). The third group, private employees, nearly one third (31.5%) never had an accident and slightly over two-thirds (68.5%) had accidents. The fourth group, self entrepreneur, (40.9%) never had an accident and (59.1%) had accidents. The last group, house wife or farmer, there was just a very small number as compare with other groups above.

Regarding the purpose of driving, of the majority that drove for transportation, less than one half (43.7%) of the riders had no accidents and a bit more than one half (56.3%) had accidents. For the second group who drove for their occupation, (19.4%) never had accidents and the large majority (80.6%) had accidents. In this resulting statistical analysis, there was a significant association between the purpose of riding motorcycle and occurrence of motorcycle accident at p-value (P= 0.007).

4.2.2 Association between motorcycle accidents and risk behavior of riders

Table 9 Percentage of motorcycle accidents, in association with risk behavior of riders.

Risk behavior factors	Motorcycle accidents				Total	x^2 (df)	P value
	No		Yes				
	n=83	%	n=127	%	N=210		
Alcohol							
- Drove after drinking alcohol						19.062	0.001*
Often	3	15.0	17	85.0	20	(2)	
Some time	16	24.2	50	75.8	66		
Never	64	51.6	60	48.4	124		
Drug use							
- some kind of medicine						5.493	0.019
Ever	7	21.2	26	78.8	33	(1)	
Never	76	42.9	101	57.1	177		
- abuse some kind of drug						-	0.083a
Often	0	0.0	6	100	6	(1)	
Never	83	40.7	121	59.3	204		
Helmet use						3.602	0.308
Every time	43	37.1	73	62.9	116	(3)	
Often	9	56.3	7	43.7	16		
Seldom	23	36.5	40	63.5	63		
Never	8	53.3	7	46.7	15		
Speed level (Km/hr)						19.785	0.001 *
50 or below	27	67.5	13	32.5	40	(2)	
51 – 80	51	36.2	90	63.8	141		
More than 80	5	17.2	24	82.8	29		

* Significant at p-value < 0.05

a Fisher's Exact Test

Table 9 shows that among the risk behavior of motorcycle riders in Salaya, those riders who never drink alcohol before they drive, just over half (51.6%) have no accidents and almost one half percent (48.4%) had accidents. In cases of those who drink and drive sometimes, the majority (75.8%) had accidents and just one fourth (24.2%) never had accidents. Of those who often drive after they drink alcohol, the large majority (85.0%) had accidents and only 3 cases (15.0%) where they drive after drinking alcohol did them never have an accident. Using Chi-square to test the association dependent variable and independent variables, and test proved significant relationship between this factor and motorcycle accidents at p-value (P= 0.001).

Regarding use of some kind of medicine, Table 9 shows that among motorcycle riders who used medicine before driving, no accidents occurred in (21.2%) cases but the majority (78.8%) had accidents. But among motorcycle riders that never used medicine before drives, almost one half (42.9%) had an accident and more than one half percent (57.1%) had an accident after using medicine and driving their motorcycle. The result showed in table 9 a statistical significant at p-value, (P=0.019).

For abuse of some kind of drug, (40.7%) of those never used drug before driving had an accident but (59.3%) of those who never use drugs had a motorcycle accident. In only 6 cases, respondents said they is very small number used drugs when driving a motorcycle and all got into an accident. The results in Table 9 show that there is not a statistical significant between drug use and motorcycle accident at p-value, (P=0.083, Fisher’s Exact Test). This appears to show that among motorcycle riders in Salaya Municipality, they know very well that drug use and driving a motorcycle and can cause accidents.

Table 9 shows that among the 116 respondents who said they used a helmet every time, more than one thirds (37.1%) never had an accident but almost two third (62.9%) of those that used a helmet every time had an accident. Regarding the group of respondents who said they often used a helmet, more than one half percent (56.3%)

never had an accident and nearly one half (43.7%) had an accident. The third group, those who said they seldom used a helmet, more than one third (36.5%) never had an accident, and almost two thirds (63.5%) had an accident. The last group, those who said they never used a helmet; there were just a small number of respondents but interesting, more than half of these respondents said they never had an accident.

Regarding the speed of driving their motorcycle, for those who said they traveled at 50 kilometers per hour or below, slightly over two-thirds percent (67.5%) never had an accident and almost one third (32.5%) had an accident. The group, who said they traveled at speeds between 51-80 kilometers per hour, more than one third (36.2%) never had an accident and almost two-third (63.8%) had an accident. The last group, those who said they traveled at speeds more than 80 kilometers per hour, (17.2%) never had an accident and the majority (82.8%) had an accident . There was significant association between driving speed motorcycle and occurrence of motorcycle accident at p-value, ($p= 0.001$).

4.2.3 Association between motorcycle accidents and physical factors

Table 10 Percentage of motorcycle accidents, in association with physical factors.

Physical factors	Motorcycle accidents				Total	x^2 (df)	P value
	No		Yes				
	n=83	%	n=127	%	N=210		
Road condition that you use						8.340	0.015 *
Rough and dusty	57	38.5	91	61.5	148	(2)	
Splashy and dusty	12	29.3	29	70.7	41		
Clean and safe	14	66.7	7	33.3	21		
Vehicle condition maintenance (year)						13.030	0.005*
One time	37	51.4	35	48.6	72	(3)	
Two times	28	38.9	44	61.1	72		
More than three	13	40.6	19	59.4	32		
Other	5	14.7	29	85.3	34		
The traffic sign can reduce motorcycle accident						1.055	0.590
Yes	45	42.1	62	57.9	107	(2)	
Sometime	34	38.2	55	61.8	89		
No	4	28.6	10	71.4	14		
Break the rules						19.516	0.001*
Often	2	15.4	11	84.6	13	(2)	
Seldom	29	27.9	75	72.1	104		
Never	52	55.9	41	44.1	93		

* Significant at p-value < 0.05.

Respondents were asked to identify road condition as either rough or dusty, splashy and dusty and clean and safe. Table 10 show that in the cases were respondents said road conditions were rough and dusty, (38.5%) never had an accident and (61.5%) had an accident. In those cases where road conditions were splashy and dusty, nearly one thirds percent (29.3%) never had an accident and (70.7%) had an accident. In those cases where road conditions were clean and safe, almost two-thirds percent (66.7%) never had an accident and one third (33.3%) had an

accident. The p-value is beyond the significance level of 0.05, standing at p-value, (p= 0.015) that mean the results show significant relationship between road condition and motorcycle accidents.

Table 10 shows that for those who had vehicle check ups once a year, over one half (51.4%) never had an accident and nearly one half (48.6%) had an accident. For those who had check ups two times per year, one third (38.9%) never had an accident and almost two thirds (61.1%) had an accident. The third group of respondents who had check ups more than three times per year, more than one third (40.6%) never had an accident and more than one half (59.4%) had an accident. The last group who had a check up every month, a very small percentage only (5%) never had an accident and large majority (85.3%) had an accident. While the result from this study showed that statistical significant association between vehicle condition and motorcycle accident at p-value (P= 0.005), this association does not appear to make logical sense and should be studied further.

Regarding whether signs can reduce motorcycle accidents, of those who answered yes, nearly one half (42.1%) never had an accident and more than one half (57.9%) had an accident. For those who answered that sometimes traffic sign can reduce accidents, more than one third (38.2%) never had an accident and almost two thirds (61.8%) had an accident. For those who answered that traffic signs cannot reduce an accident, there were just a few respondents. The result showed that statistical not significant with p-value (P= 0.590)

Table 10 shows that among riders who often break the rules, (15.4%) never had an accident and large majority (84.6%) had an accident. For those who responded that they seldom break the rules, just over one fourth (27.9%) had no accidents and (72.1%) had an accident. The last group who answered they never break the rules, over one half (55.9%) never had an accident and nearly one half (44.1%) had an accident. This result association with p-value (P= 0.001).

CHAPTER 5
DISCUSSION

5.1 Discussion

This study was designed to find out the cause of the occurrence of accidents by motorcycle riders as a result of multiple factors those might interplay among each other. This inter relationship consists of socio-demographic, risk behavior of riders and physical factors. A cross sectional study was conducted in order to identify the relationship between the motorcycle accidents and the characteristic described above. Traffic accidents are of immense importance, as road traffic accidents constitute the second leading cause of injuries and mortality in Thailand, as described in earlier chapters.

The factors included in this study of those who ride motorcycle in Salaya Municipality, Phutthamonthon District and the occurrence of motorcycle accidents were socio-demographic factors such as age, gender, marital status, education, occupation, income, purpose of driving, driver license and driving experience. The second group of factors under study was risk behavior of riders such as, consumption of alcohol, drug use, helmet use and normal driving speed of motorcycle. The physical factors considered road condition, vehicle condition, traffic signs and compliance with traffic laws.

The discussion as followed is from the finding of the study related to the factors affecting the motorcycle accidents among 127 motorcycle riders.

5.2 Socio-demographic factors related to motorcycle accidents

5.2.1 Age

Nonetheless, for certain groups, those in age groups 18-29 years and 30-45 years showed a higher percentage of accidents than the other two groups. Revealed that 70% of the people injured or killed in traffic accidents are men aged 15-39 who have a four to five time higher risks of death and injury due to the traffic accidents than women. This study Suriyawongpaisal P, Kanchanasut S, Road Traffic injuries in Thailand (2003) (31) analyzes hospital-based data compiled by the Ministry of Public Health, data compiled by the National Police Office and data compiled by the traffic engineering divisions of Department of Highways, Ministry of Transport and Communications in Thailand.

5.2.2 Gender

The majority of motorcycle riders that had accidents were male, 101 (66.4%). It is evident that from the past studies of traffic accidents, men account, four times the rate of women (figure 2). In this study this factor was also significant at a p-value, (P= 0.004) and (x^2 = 8.209). Men ride motorcycles more frequently than female so naturally they are likely to have accidents more frequently than females. In this study there were only 26 cases of female (44.8%) that had accidents among the 127 riders who sustained accidents. In the study of the burden of injuries by sex in Thailand in 1999, the results showed that the injuries sustained by women are only one-fifth of those sustained by men (18).

5.2.3 Marital status

This study reveals no statistical significant association, yet show the number of among single respondents higher, 70 cases (59.3%) than the married group with 57 cases (62.0%). This result showed that maybe the number of motorcycle accidents for single riders was due to the fact that they cared less due to the fact of having no family.

5.2.4 Educational level and occupation

This study found that (65.6%) who primary school level education had accidents. The incidence of secondary school education was not much higher than primary school at 46 (58.2%) which suggests that if they were educated, the accident rate will be less. For the rest, vocational, others (bachelor and high bachelor) , the education level did not show a significant associations with motorcycle accidents at p-value, (P= 0.062). However, the data appears to indicate that the higher the education level attained, the less probability of an accident occurring. As for occupation (68.5%) of private employees had accidents. This may be related to their working long hours and that they go to work using a motorcycle which leads to accidents. This result is considered important and baseline for the major recommendations made in next chapter.

5.2.5 Income

Regarding income, for those in the lowest income group the, (60.7%) were involved in accidents, this was similar to the middle income group where (63.4%), were involved in accidents. The findings reflect that the higher income group sustained less motorcycle accidents as compared with low and middle income groups. However, the result showed that statistical not significant at p-value, (P= 0.416). The low and middle income group had more accidents perhaps because this group usually rode motorcycles to go to work daily (see appendix B 3).

5.2.6 Purpose of driving

Most of motorcycle riders in Salaya, (82.9%), used motorcycles for transportation and among this group (56.3%) had accidents while (43.7%) never had an accident while using a motorcycle for transportation. For the association between purpose of driving and motorcycle accident was found that there were a significant level at p-value, (P= 0.007).

5.2.7 Driver license

Among the 127 motorcycle accidents most, 83 cases had a driver license. This

represented (68.0%) of all those who had licenses. There were 44 cases of accidents where the driver did not have a license, which represented (50.0%) of all those who did not have a license. This result was significant association with motorcycle accidents at p-value (P= 0.005). A study conducted in Bangkok, published in 1997, showed injuries from road traffic accidents in Bangkok. The study included 346 in-patient cases suffering injuries from road traffic accident in Bangkok. Most of the patients drove a motorcycle, had their license for only a short period, and drove more than 5 hours a day (20). The short lived or absent license might have some behavior component towards the risk-taking attitude and causal behavior of accidents.

5.2.8 Driving experience

While this study and not show a strong association between driving experience and motorcycle accidents, it is the observation of the researcher that young and inexperienced riders usually drive very fast without thinking about the consequences. This point is made in a study by Kumrai Tunchaisri, entitled A Comparative Study of Factors Involving Motorcycle Accidents of Secondary School Students which showed that the group of the students who rode for less then one year, were involved in 2.8 times more motorcycle accidents than the group who had ridden for one year or more (20). Furthermore, the study by Surachai Jrimkool showed that the driver age group of 15-24 years old who rode for less than three years, were involved in 3.5 times more motorcycle accidents than the group who had ridden for seven years or more (21).

5.3 Risk behavior of riders

5.3.1 Drinking alcohol

In this study although only a small percentage of riders (9.0%) said that they drank alcohol before riding a motorcycle a large percentage (85%) had accidents, of the (31.5%) who said that sometimes drank before driving a motorcycle (75.8%) had accident and the higher percentage. More than half (59.0%), said they never drank alcohol before they drove and this group only had (48.4%) accident rate. This result was significant with motorcycle accident at the p-value, (P= 0.001). This appears to

show that for the riders in Salaya they know an accident might occur when drinking alcohol and before driving a motorcycle.

5.3.2 Drug use

With respect to use of some kind of medicine or other drugs by motorcycle riders , the incidence of those who said they used medicines or drugs is very small when compare with those who said they never use them. There were 26 cases of medicine use, representing (78.8%) of those who used medicines and had an accident and 6 cases of drug abuse. The majority, 101 cases representing (57.1%) of those who had an accident, who said they never use some kind of medicine and in 121 cases representing (59.3%) of those who had an accident, who said they never abused any drugs before riding a motorcycle. This indicates that riders seldom use medicine or drug when driving. This study showed that in cases where they did use some kind of medicine, a significant association with motorcycle accident at p-value, (P = 0.019) and in cases where they said they had used some kind of drugs, there was not a significant association with motorcycle accident at p-value, (P = 0.083). This would indicate that motorcycle riders in this area understand that accidents will occurred when they use drug and drive a motorcycle.

5.3.3 Helmet use for safety

Regarding the use of safety helmets by the motorcycle riders, it was not significant related at the p-value (P= 0.308) to the occurrence of motorcycle accidents. But it is interesting to note that there was an inverse relationship with accident and those who used a helmet every time, 73 cases representing (62.7%) of those who always wore a helmet, had an accident. Those who seldom used a helmet while ride motorcycle, 40 cases representing (63.5%) of those who seldom wore a helmet had an accident and the rest was a small percentage. Regarding those motorcycle riders who had an accident, only 81 riders said the reason was for safety and others said the reason was that they were afraid of police arrest and to comply with the law and not necessarily for safety from accidents. In this study many riders appeared to police misunderstand the reason for helmet use because they appeared to be more afraid of arrest or merely

to follow the rules and not for safety (see appendix B 4).

5.3.4 Speed of driving

From the results of driving speed of riders had who had accidents, there were 90 cases representing (63.8%) of those who drove more than 50-80 kilometers per hour, who had accidents. For those who drove more than 80 kilometers per hour, there were 24 cases representing (82.8%) of those who drove more than 80 kilometers per hour that had accidents. This shows that riders in both of these groups sustained more accidents. So it can be concluded that driving at fast speed is directly related to the occurrence of motorcycle accident, because in fast driving, drivers could not control the vehicle and accidents can occur. In the result showed that statically significance association at the p-value (P= 0.001).

5.4 Physical factors

5.4.1 Road condition

Regarding road condition, it was found that among motorcycle riders that had accident, 91 respondents representing (61.5%) of those who responded that they drove on rough and dusty roads, had accidents. This was followed 29 cases representing (70.7%) of those who responded that they drove on splashy and dusty road, that had accidents with the others responding they drove on clean and safe road being a very small percentage. In this case the statistical significant association with motorcycle accident was p-value (P= 0.015) (see appendix B5).

About the traffic in Salaya the highest number said traffic was always jammed, of these, (62.0%) had accidents, the other respondents who traffic was only jammed at rash hour or not jammed was a small percentage with reference to those respondents who said traffic conditions effect traffic accidents, answer yes 101 cases percentage (60.5%) of those who had accidents, answer yes. Regarding those that responded that following traffic signs can reduce motorcycle accident, there were 62 cases representing (57.9%) of those who had accidents, who responded this way. 55

cases representing (61.8%) of those who had accidents, responded that sometimes traffic signs lead to accidents and 10 cases representing (71.4%)of those who had accidents, responded that signs cannot reduce accidents. All of these variable were not significant association with motorcycle accident at the p-value, (P=0.217), (P= 0.944), (P= 0.590) (see appendix B5).

More than half of riders, 97 respondents representing (62.2%) of those who had accidents, responded that the traffic lights were not enough and only 30 (55.6%) responded that there were enough lights in Salaya area. 76 respondents representing (60.3%) of those who had accidents said the lights can reduce motorcycle accident because they could not see the signs from a distance, second group 45 respondents representing (58.4%) of those who had accidents said the light sometimes can reduce accidents. With respect to both of these variables about weather the lights are enough or whether they can reduce accidents the results are statistical not significant association with motorcycle accident at p-value, (P= 0.391) and (P= 0.368) (see appendix B5).

5.4.2 Vehicle condition

For the riders that checked up their vehicles twice a year, there were 44 cases representing (61.1%) of those who had twice yearly check up that had accidents, follow by 35 cases representing (48.6%) of those who had check ups once a year who had accidents. For those who had check ups more than three times a year, there were 19 cases representing (59.4%) of those who had three yearly check ups who had accidents and the for others such as those who had check up every month or out of order, there were 29 cases representing (85.3%) of these cases who had accidents. While the result showed that statistical association significant between check up motorcycle and motorcycle accident at p-value (P= 0.005) this association does not appear to make logical. Sense and should be studied further.

5.4.3 Traffic law

Regarding compliance with the traffic laws of those that often break the law,

there were 11 cases respondents (84.6%) of those who had accidents, 75 cases respondents (72.1%) of those who had accidents who said they seldom break the laws and 41 cases respondents (44.1%) of those who had accidents, who said they never break the rules. The statistical significantly was at p-value, (P= 0.001). About the rules that drivers always said they break, 63 cases respondents (65.7%) of those who had accidents, who said they go in the opposite direction to traffic, 30 cases respondents (75%) of those who had accidents, who said they raced, which in this case was significance at p-value, (p = 0.002). Reasons for carelessness more than one-fourth (29.9%), accident can be occurred over one-half (57.2%), riding the red light and pass other a few (9.0%), loss the balance vehicle very small percentage (1.0%),

5.5 Characteristics of motorcycle accidents

Table 7 shows the characteristic of accidents such as: times of accidents, in cases of accident was the respondents a drivers or sitting behind, place of accidents, time of accidents, cause of accident and involved factors.

Table 7 shows that the number of motorcycle riders who got accident one time was 55 cases (43.3%), two times was 31 cases (24.4%), three times was 20 cases (15.7%), four times was 5 cases (3.9%), five times was 13 cases (10.2%) and the rest more than five time was 3 cases (2.4%). This study shows that among the 127 respondents that had accidents one and two times was a higher percentage than other groups this might mean that after they had an accident they changed behavior, because we see that the incident among those that had accidents more than three times was small percentage of motorcycle riders in Salaya Municipality. Looking at the place of accident, Table 7 shows a similar percentage of riders who had accidents in Salaya and out Salaya Municipality of Phutthamonthon District. Another factors of interest related to motorcycle accidents was time, in the evening (44.1%), (32.2%) occurred at the night time, followed by (21.3%) in the early morning and the last some other time. About the cause of accident we found that the largest percentage was due to carelessness (41.7%), then road condition (18.9%), from consuming alcohol

(16.5%) and other such factors as vehicle condition, weather condition and other cause.

A major drawback of this study was inconsistency of some information because of language barrier and lack of ability to communicate in-depth with interviewee. But the results from this research should provide information about motorcycle accidents that can be suggested to the community, district and province.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This study was a cross sectional survey to describe the factors related to motorcycle accidents among motorcycle riders in Salaya Municipality, Phutthamonthon District, Nakhon Pathom Province, Thailand.

The purpose of this study was to determine the personal characteristic of motorcycle riders about risk behavior; physical factors that caused motorcycle accidents and identify the relationship between socio-demographic, risk behavior, physical factors of motorcycle rider and motorcycle accidents.

The tragedy of the motorcycle accident is that they involved all the age groups such as young rider's age less than 18 years, 18-29 years, and 30-45 years. More than half of the people in these groups had an accident. The results showed that males had accidents much more than females. It is an essential step in the road traffic accident prevention to obtain reliable information about the probable causation factors. This study showed that some of rider's ages less than 18 years did not yet have a driver license but they still drove a motorcycle. In these cases there should be better law enforcement such as strict arrests of people violating traffic regulation, concentrating on arrests of people violating traffic regulation in the time and places that often have accidents. Education level would appear to have some role and people with higher education trend to practice a much higher level of traffic safety. Those at low education levels many need more training and attention to improve the over all traffic accident incidents.

This study found that drivers who had driving experience less than or equal 5

years had accidents no more than the two group that have experience 6-10 years and more than 10 years. Thus contrary to other studies experience appeared to have little effect on the accident rate.

Regarding the risk behavior factors, (59.0%) of the motorcycle riders said they never used alcohol before driving, (31.5%) of riders said they drank sometimes and only (9.5%) said they drink often when they drive a motorcycle. In case of the use of some kind of medicine and drug abuse while ride a motorcycle, (84.3%) respondents said that never use some kind of medicine and (97.1%) never abused drugs, (14.7%) said that used medicine or drugs sometimes. So that means that most of the riders know very well not to drink, consume medicine or drugs before driving a motorcycle (1).

But about helmet use among of riders, more than half of respondents said they used a helmet every time while riding a motorcycle and the rest used a helmet only sometime or never used a helmet. Reasons given by riders for helmet wearing were primary for protect from police arrest and secondly for safety from injury in the event of an accident. In this case they lacked knowledge about how helmets can prevent injury in the case of an accident. It showed that they still need more education on this matter.

High risk occurred among those driving at 51-80 km/hour and more than 80 km/hour. In fact the traffic law should enforcement those driving at high-speeds.

Regarding the involvement of physical factors, it was found that road condition such as: rough and dusty roads, some streets with dim lights during the night time tended more towards the occurrence of motorcycle accidents around the Salaya area.

Regarding the traffic law, the majority stated that they break the rules often, with a less percentage that seldom break or never break the rules. About the rules that

the drivers always break: going in the opposite direction and racing were the most cited.

6.2 Recommendation

With respect to road traffic accident prevention, an objective evaluation of control measures based on valid information is crucial since many existing measures are merely administrative and lacked evidence of proper implementation and effectiveness.

This study was undertaken to investigate the factors related to motorcycle accidents, and to look for solutions for prevention of accidents in Salaya Municipality, Phutthamonthon District, Nakhon Pathom province in Thailand.

The recommendations that can be made based on this study are increased public education, through mass media, regarding traffic rules and regulation with the emphasis through special clinics on the younger riders, age less than 18 years and especially riders without a license.

The police have stepped up operations to check for excess alcohol use among drivers, to control speeding and to check on wearing helmets. The traffic police should fully and consistently enforce traffic laws to control the behavior of riders.

Education campaigns should emphasize the importance of observing speed, wearing helmets, obtaining a license, not drinking and driving, and in support of police enforcement campaigns. Special campaigns take place during the big holiday weeks, when large numbers of people take to the roads. Within primary and secondary school at all levels, the national plan provides for educational modules on road safety.

The government agency responsible for the maintenance of the roads should be more vigilant and responsible to ensure the roads are free from sand, and are not

rough and dusty or splashy and dusty, that might render the roads risky to the road user.

The traffic bureau in this province must also devise a plan to lessen traffic jams or create specific routes and add lights in some area that do not have enough lights at the night times for motorcycle riders, if feasible.

After studying the factors related to motorcycle accidents among motorcycle in Salaya Municipal, the researcher reviewed the result from the study and concluded that they can be used as a way to reduce and solve motorcycle accidents problem in this district. This study can also be useful for all agencies of National Police Office and other agencies, especially to help improve traffic law, rules and regulation and campaign of the good behavior of motorcycle riders.

From the study, it is recommended the following measures should be carried out to reduce motorcycle accidents.

- Increased traffic law enforcement with respect to alcohol use and the wearing of helmets.
- Short course training all of riders aged 18 years and younger.
- School curricular for traffic rules in the primary school level.
- Laws on driving and speed laws should be rigorously enforced for motorcycle riders who drive fast, and the advantages of no more racing.
- There should be more campaign and public relation about safety on the road.

A poster which has a connotation with accidents should be readily available in strategic places like supermarket and department stores, movie houses, hospitals, health centers, schools and gasoline stations.

Demonstration of greater interest and a more vigilant attitude with regards to the treatment of this neglected problem by public officials could stimulate

communities to participate actively in developing and implementing educational programs and control measures to prevent traffic accidents.

6.3 Recommendations for future study

In follow upstudies, it is recommended to study the possible role of age, education, driving speed, driver license and traffic laws with a larger population sample. The public health personnel, whose primary concern is health promotion and disease prevention, should be actively involved in traffic accident prevention through research, since this is an area where benefits of prevention are enormous. It is recommended that such a study could confirm the intervention strategy and evaluate its impact based on the recommendations on this study.

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APPENDIX

APPENDIX A

QUESTIONNAIRE

FACTORS RELATED TO MOTORCYCLE ACCIDENTS AMONG THE MOTORCYCLE RIDERS IN SALAYA, PHUTTHAMONTHON DISTRICT, NAKHON PATHOM PROVINCE BANGKOK, THAILAND.

D9ate of registration……./……/……. Registration No……./……../……..

I. **SOCIO-DEMOGRAPHIC PART:**
INTRODUCTION: Please mark in the blank space for each questions according to your response.

1. Age……years old

2. Gender
   1.[ ] Male
   2.[ ] Female

3. Marital status
   1.[ ] Single
   2.[ ] Married with ……kid (s)
   3.[ ] widow/divorced
   4.[ ] Other……

4. Education level
   1.[ ] Primary school
   2.[ ] Secondary school
   3.[ ] Vocational
   4.[ ] Bachelor
   5.[ ] Higher Bachelor
   6.[ ] Other……

5.What is your occupation?

1.[ ] Student

2.[ ] Factory worker

3.[ ] Farmer

4.[ ] Government employee

5.[ ] Private employee

6.[ ] Self entrepreneur

7.[ ] others (specify)……

6. Staying area

1.[ ] In Salaya

2.[ ] Out Salaya

3.[ ] Out Putthamonthon

7. How much money you earn every month? ……Baht

8. You have ride motorcycle for……years.

9. How many CC of your motorcycle you always use?.....CC

10. How many times you use motorcycle within a day?.....times

11. How long do you use motorcycle within a day? ..……...hour(s)

12. How far do you use motorcycle within a day? ..…….....km(s)

13. What is the speed you always use?.....km/hour

14. What is the purpose of riding motorcycle?

1.[ ] Occupation

2.[ ] School related

3.[ ] Transportation

4.[ ] Others, specify……..

15. Do you have riding license?

1.[ ] Yes

2.[ ] No What is the reason……

16. What do you think about the riding license?

1.[ ] Important……

2.[ ] Not important……..

II RISK BEHAVIOR OF RIDERS: Please mark in the blank space for each question.

17. Hove you ever rode when you drink alcohol?

1.[ ] Often 2.[ ] Some times 3.[ ] Never

18. Have you ever rode motorcycle when you drunk?

1.[ ] Often 2.[ ] Some times 3.[ ] Never

19. Have you ever rode motorcycle after you had some medicine?

1.[ ] Often 2.[ ] Some times 3.[ ] Never

20. Have you ever rode motorcycle after you had some drug?

1.[ ] Often 2.[ ] Some times 3.[ ] Never

21. How often do you use helmet?

1.[ ] Every time

2.[ ] Often

3.[ ] Seldom

4.[ ] Never

22. What is the reason for using helmet?

1.[ ] Safety

2.[ ] Rule

3.[ ] Others……

23. What do you think about helmet use?

1.[ ] Very necessary

2.[ ] Necessary

3.[ ] Not necessary

24. Is it good to follow the rules?

1.[ ] Yes, why……..

2.[ ] No, why not..…….

25. How often you break the rules?

1.[ ] Often 2.[ ] Seldom 3.[ ] Never

26. Is it dangerous when breaking the rules?

1.[ ] Yes, why……

2.[ ] No, why not……

27. Which rules from these items you used to break.

1.[ ] Opposite direction 3

2.[ ] Racing

3.[ ] Riding through the red light

4.[ ] Other (specify)……

III PHYSICAL PART: Please mark in the blank space for each question.

28. How long have your motorcycle been used? …….years.

29. How often do you check up your motorcycle?

1.[ ] Once a year

2.[ ] More than three times a year

3.[ ] Twice a year

4.[ ] Other, specify…….

30. When will you have it repaired?

1.[ ] Out of order

2.[ ] Routine check up

3.[ ] Other, specify……

31. The condition of road that you use

1.[ ] Rough and dusty

2.[ ] Splash and dusty

3.[ ] Clean and safe

4.[ ] Other, specify…….

32. Does the condition of road effect to the accident?

1.[ ] Yes 2.[ ] No 3.[ ] Not sure

33. How is the traffic in Salaya?

1.[ ] Not jam

2.[ ] Jam during rush hours

3.[ ] Always jam

4.[ ] Other, specify…….

34. Does the traffic condition effect to the motorcycle accident?

1.[ ] Yes 2.[ ] No 3.[ ] Not sure

35. Is the traffic signs in Salaya enough?

1.[ ] Yes 2.[ ] No

36. Can those signs be seen clearly?

1.[ ] Yes 2.[ ] No

37. Can those signs be reduced the number of motorcycle accidents?

1.[ ] Yes 2.[ ] Sometimes 3.[ ] No

38. Is the traffic lights in Salaya enough?

1.[ ] Yes 2.[ ] No

39. Can it be seen from long distance?

1.[ ] Yes 2.[ ] No

40. Can it be reduced the motorcycle accidents?

1.[ ] Yes 2.[ ] Sometimes 3.[ ] No

41. Is the light enough during night time?

1.[ ] Yes

2.[ ] No, specify…….

IV. **Accident:** Please mark in the blank space for each question.

42. Have you ever got an accident?

1.[ ] No, ***(Finish. Thank you for kind cooperation).***

2.[ ] Yes, How often……**(** ***Answer the next question***)

43. In that latest accident, you were

1.[ ] Rider

2.[ ] Passenger

3.[ ] Other, specify……..

44. Where?

1.[ ] In Salaya

2.[ ] Out of Salaya

45. Time of accident.

1.[ ] Early morning

2.[ ] late

3.[ ] Noon

4.[ ] Evening

5.[ ] Night

6.[ ] Very late

7.[ ] Other, specify……

46. Who/what are involved?

1.[ ] People

2.[ ] Bicycle

3.[ ] Motorcycle

4.[ ] Car

5.[ ] Other, specify……

47. What is the cause?

1.[ ] Drinking alcohol

2.[ ] Some kind of medicine

3.[ ] Road condition

4.[ ] Carelessness

5.[ ] Weather condition

6.[ ] Vehicle condition

7.[ ] Other, specify……

48. Who are you in the accident?

1.[ ] Crash into the other

2.[ ] Was crashed by the other

3.[ ] Other, specify……

APPENDIX B

MISCELLANEOUS TABLES

Table B 1. Frequency distribution of socio-demographic factors

Personal characteristics	**Number (N= 210)**	**Percent (%)**
Driving license		
Yes	122	58.1
No	88	41.9
***Reason about riding license (Because) (n = 210)**		
1- Afraid from the police arrest	*180*	*85.7*
2- Safety	*18*	*8.6*
3- Use ID card	*4*	*1.9*
4- Not necessary	*1*	*0.5*
5- No answer	*7*	*3.3*

Table B 2. Frequency distribution risk behavior factors

Risk Behavior of riders	**Number (N= 210)**	**Percent (%)**
Helmet Use		
Every time	116	55.2
Often	16	7.6
Some time	63	30.1
Never	15	7.1
***Reason for using helmet (n= 210)**		
Safety	*81*	*38.6*
Rule	*129*	*61.4*
Think about helmet use		
Very necessary	192	91.4
Necessary	16	7.6
Not necessary	2	1.0

Table B 3. Percentage of motorcycle accident in association with socio-demographic factors.

Socio-demographic	Motorcycle accidents				Total	x^2 (df)	P value
	No		Yes				
	n=83	%	n=127	%	N=210		
Income (Baht)						1.752 (2)	0.416
5000 or below	42	39.3	65	60.7	107		
5001–10.000	30	36.6	52	63.4	82		
> 10.000	11	52.4	10	47.6	21		

* Significant at p-value < 0.05

Appendix B 4: Percentage of motorcycle accidents, in association with risk behavior of riders (N = 210)

Risk behavior factors	Motorcycle accidents				Total	x^2 (df)	P value
	No		Yes				
	n=83	%	n=127	%	N=210		
Helmet use						3.602 (3)	0.308
Every time	43	37.1	73	62.9	116		
Often	9	56.3	7	43.7	16		
Seldom	23	36.5	40	63.5	63		
Never	8	53.3	7	46.7	15		
Reason for using helmet						1.355 (1)	0.244
Safety	34	34.6	53	65.4	81		
Rule	55	42.6	74	57.4	129		

* Significant at p-value < 0.05

Appendix B 5: Percentage of motorcycle accidents, in association with Physical factors (N = 210)

Physical factors	Motorcycle accidents				Total	x^2 (df)	P value
	No		Yes				
	n=83	%	n=127	%	N=210		
Traffic in Salaya						4.447 (3)	0.217
Jammed during rush hours	9	64.3	5	35.7	14		
Always jammed	63	38.0	103	62.0	166		
Not jammed	11	37.9	18	62.1	29		
Other	0	0	1	100	1		
The traffic condition effect the traffic accident						0.115 (2)	0.944
Yes	66	39.5	101	60.5	167		
No	13	38.2	21	61.8	34		
Not sure	4	44.4	5	55.6	9		
The sign can reduce motorcycle accident						1.055 (2)	0.590
Yes	45	42.1	62	57.9	107		
Sometime	34	38.2	55	61.8	89		
No	4	28.6	10	71.4	14		
Traffic lights in Salaya clearly						0.736 (1)	0.368
Yes	24	44.4	30	55.6	54		
No	59	37.8	97	62.2	156		
The traffic light can reduce motorcycle accident						2.000 (2)	0.368
Yes	50	39.7	76	60.3	126		
Some time	32	41.6	45	58.4	77		
No	1	14.3	6	85.7	7		

* Significant at p-value < 0.05

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