POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

THE STUDY OF ROAD SAFETY AT KUALA KUBU BHARU, SELANGOR

NURAZIEAN BINTI MUHAMMAD ROZI

(08DKA20F1074)

JABATAN KEJURUTERAAN AWAM

1:2022/2023

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This report was submitted to the Civil Engineering Department as a partial fulfillment of the award requirements for the Diploma Civil Engineering

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1:2022/2023

AKUAN KEASLIAN DAN HAK MILIK

THE STUDY OF ROAD SAFETY AT KUALA KUBU BHARU, SELANGOR.

1. Saya, **NURAZIEAN BINTI MUHAMMAD ROZI (020421010900)** adalah pelajar **Diploma Kejuruteraan Awam, Politeknik Sultan Salahuddin Abdul Aziz Shah**, yang beralamat di **Persiaran Usahawan, Seksyen U1 40150 Shah Alam Selangor.**

2. Saya mengaku bahawa 'Projek tersebut di atas' dan harta intelek yang ada di dalamnya adalah hasil karya/reka cipta asli saya tanppa mengambil atau meniru mana-mana harta intelek daripada pihak-pihak lain.

3. Saya bersetuju melepaskan pemilikan harta intelek 'Projek tersebut' kepada 'Politeknik tersebut' bagi memenuhi keperluan untuk penganugerahan **Diploma Kujuruteraan Awam** kepada saya.

Diperbuat dan dengan sebenar benarnya diakui

oleh yang tersebut;

NURAZIEAN BINTI MUHAMMAD ROZI

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(NURAZIEAN BINTI MUHAMMAD ROZI)

Di hadapan saya,

RABEAH ADAWIYAH BINTI HASHIM
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……

sebagai Penyelia Projek pada tarikh: 9 DISEMBER 2022

(RABEAH ADAWIYAH BINTI HASHIM)

PENGHARGAAN

Alhamdulillah, bersyukur ke hadrat Illahi kerana dengan izin dan Berkat-Nya, dapatlah penulis menyiapkan laporan penyelidikan bagi memenuhi syarat Diploma Kejuruteraan Awam dalam tempoh masa yang ditetapkan. Selain itu, penulis juga bersyukur kerana segala masalah dan pelbagai kekangan yang timbul sepanjang kajian ini dijalankan telah berjaya diatasi. Semua permasalahan ini menjadikan penulis insan yang mengenal erti kesabaran dan manisnya sebuah kejayaan.

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ABSTRAK

Kajian ini bertujuan untuk menyiasat statistik kadar kemalangan bagi Jalan Kuala Lumpur ke Ipoh yang merupakan laluan utama menuju ke Tanjung Malim. Orang ramai mengurangkan tahap keselamatan mereka dan melaksanakan langkah keselamatan lalu lintas yang tidak mencukupi, yang merupakan trend yang membawa kepada kemalangan. Akibatnya, adalah penting untuk meningkatkan langkah keselamatan untuk mengurangkan kecederaan dan kemalangan jalan raya. Objektif kajian adalah untuk mengenal pasti beberapa perkara seperti faktor kemalangan jalan raya di Jalan Kuala Lumpur ke Ipoh, Kuala Kubu Bahru. Persepsi pengguna jalan raya, khususnya dalam beberapa aspek keselamatan jalan raya, seperti memandu laju dan agresif. Kaedah kajian yang ditetapkan untuk mencapai objektif di atas adalah dengan melaksanakan kajian kes yang mengaplikasikan pendekatan kuantitatif dan kualitatif. Data sekunder ialah maklumat kemalangan yang dikumpul dalam tempoh dua tahun dari 2020 hingga 2021 daripada dua organisasi, Jabatan Pengangkutan Jalan (JPJ) dan Ibupejabat Polis Diraja Malaysia Bukit Aman (IPD). Metodologi pengkaji menggunakan Audit Keselamatan Jalan Raya, Kajian Volume Lalu Lintas dan Soal Selidik semasa menjalankan analisis menggunakan pendekatan kualitatif bagi melihat jenis perancangan fizikal jalan raya dan ciri-ciri fizikal jalan raya yang wujud di kawasan kajian. Dapatan kajian menunjukkan kerosakan fizikal jalan raya adalah yang paling kerap dan meluas dan ketiadaan papan tanda bahu jalan telah menyebabkan kemalangan jalan raya. Walau bagaimanapun, tumpuan esei ini akan tertumpu kepada pelbagai elemen penting dalam keselamatan jalan raya, seperti membaiki jalan yang rosak, memasang lampu jalan dan papan tanda, kamera AES, perabot tepi jalan dan keperluan menyelenggara kenderaan untuk mengurangkan jumlah kemalangan jalan raya.

ABSTRACT

This study intends to investigate accident rate statistics for Jalan Kuala Lumpur to Ipoh which is the main route leading to Tanjung Malim. People are reducing their level of safety and implementing inadequate traffic safety measures, which is a trend that leads to accidents. As a result, it is important to enhance safety measures in order to lower injuries and traffic accidents. The objective of the study is to identify several things such as road accident factors on Jalan Kuala Lumpur to Ipoh, Kuala Kubu Bahru. The perception of road users, particularly in regard to several areas of road safety, such as speeding and aggressive driving. The research method set to achieve the above objectives is by performing a case study that applies a quantitative and qualitative approach. The secondary data is the accident information gathered during a two-year period from 2020 to 2021 from two organizations, the Jabatan Pengangkutan Jalan (JPJ) and Ibupejabat Polis Diraja Malaysia Bukit Aman (IPD). The researcher methodologies used Road Safety Audit, Traffic Volume Study and Questionnaires while carrying out analysis using a qualitative approach in order to see the kind of road physical planning and the physical characteristics of roads that exist in the study region. The findings study indicate that physical road damage is the most frequent and widespread and the absence of road shoulder signs has caused road accidents. However, the focus of this essay will be on a variety of crucial elements of road safety, such as mending broken roads, installing street lights and signs, cameras AES, roadside furniture and the necessity of maintaining vehicles to reduce the number of traffic accidents.

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q	Traffic Volume
n	The number of vehicles
t	Time interval

LIST OF ABBREVIATIONS

JPJ	Jabatan Pengakutan Jalan
JKR	Jabatan Kerja Raya
IPD Bukit Aman	Ibupejabat Daerah Bukit Aman
RSA	Road Safety Audit

CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

Road accidents constitute one of the major social problems in Malaysia. Accidents are relatively rare and unpredictable, sometimes it is direct observation and often impossible. In a developing country, the road accident has increased years by years. This could be due to an increasing in vehicle occupancy over time or to be more specific types of accident are much more common now than 10 years ago. Growth in urbanization and in the number of vehicles in many developing countries has led to the increase in traffic accidents on road networks which were never designed for the volumes and types of traffic which they are now required to carry.

Road safety has been considered one of the social responsibilities of the Malaysia Government. Since the country's independence, a number of bodies concerned with road safety have been formed with in government departments, private sector agencies and voluntary organizations. The concern for road safety was more visible, however, following a Karak Highway accident in 1990. The aftermath of the accident saw the government forming a Cabinet Committee on Road Safety, with the Prime Minister as the chairman. The committee set a target of reducing fatalities by 30% by the year. In 1991, a comprehensive National Road Safety Plan was formulated with special attention on safety research programmes, behavioural modification of road users, road engineering and vehicle safety, medical treatment and safety administration (Radin Umar Radin Sohadi, 1998).

Road in Malaysia can be classified according to its function or jurisdictions. By functions, road can be classified as primary, secondary or minor roads. By jurisdiction,

roads can be classified as Tolled Expressway and Highway, Federal, State, Municipal roads. Roads may also be able to be classified as rural and urban. Rural roads are roads outside the Municipality limit or if it is 5km apart from the Municipal limits. Otherwise, it is defined as urban roads that comprise of all roads within the Municipality gazette limits or a township having a population of 10,000 and above.

1.2 PROBLEM STATEMENT

Road Safety has long been considered one of the social responsibilities of the Malaysian Government. Since the country is independence, a number of bodies concerned with road safety have been formed within government department's private sector agencies and voluntary organisation. The committee set a target of reducing fatalities by 30% by the year 2000, (Federal Highway Administration). A comparison of Malaysia's figure with those of several developed and developing countries (Transport Research Laboratory, 1995) indicate that Malaysia is ranked about midway between the developed and developing countries. Although the accident fatality rate in Malaysia is still concern as the death rate per 10000 vehicles is well above for the rest of the developed countries. From Jalan Kuala Lumpur to Ipoh has been picked as the study area because those are main roads to Tanjung Malim. The safety level of this road is in used to be studied because of it has road traffic accident years by years. Data from Jabatan Pengangkutan Jalan (JPJ) has shown that from year 2020 until year 2021 the number of road traffic accident has increased on that section.

Road accidents can occur due to road user factors, vehicles and the environment. Sometimes accidents can happen due to one of those factors or a combination of those factors. The road user factor is a major contributor to the occurrence of road accidents. These factors include incompetence, negligence, carelessness and impatience while operating vehicles. Sabey and Staughton [1] quantified the contributing consumer factors to 95% of road accidents and user – related factors roads and the environment account for 25% of road accidents. Environments that are not suitable for users are such

as winding roads, damaged and potholed roads, design inadequacies and road geometry, absence, signboards, intersecting intersections and obscure street lights at crossroads at night.

This research was also carried out to determine the kinds of roadside obstructions that frequently result in traffic collisions. One aspect that may increase pedestrian and vehicular safety in a region, whether urban or rural, is road furniture. This makes the route more appealing and safer (Rasool, 2016). Among the types of road furniture that need to be given deep emphasis are signs, street lights, road humps, AES cameras, road pegs and delineator posts.

So, this study needs to be carried out to evaluate the road safety level of this road before any recommendation for improvement works can be proposed.

1.3 OBJECTIVE OF STUDY

According to Othman Mohamed (2001) in his book entitled "Thesis Writing in the Field of Applied Social Sciences" states the objective research is very important as a guide so that researchers are not fascinated by the direction of other issues that will obscure the brightness of the actual issue in the study conducted. In this study, the objective is to identify the following items:

i. To identify the factors of road accident on Jalan Kuala Lumpur to Ipoh, Kuala Kubu Bahru.

ii. To investigate the perception of the road user especially on various aspects of road safety.

1.4 SCOPE OF STUDY

The scope of study is on an accident severity and main causes of the accident on the route from Kilometre 50 to Kilometre 59, Jalan Kuala Lumpur to Ipoh, Kuala Kubu Bharu. Analyzing the study location will be made and all relevant information data will be collected. The location of the Study Research Area is shown in Figure 1.1.

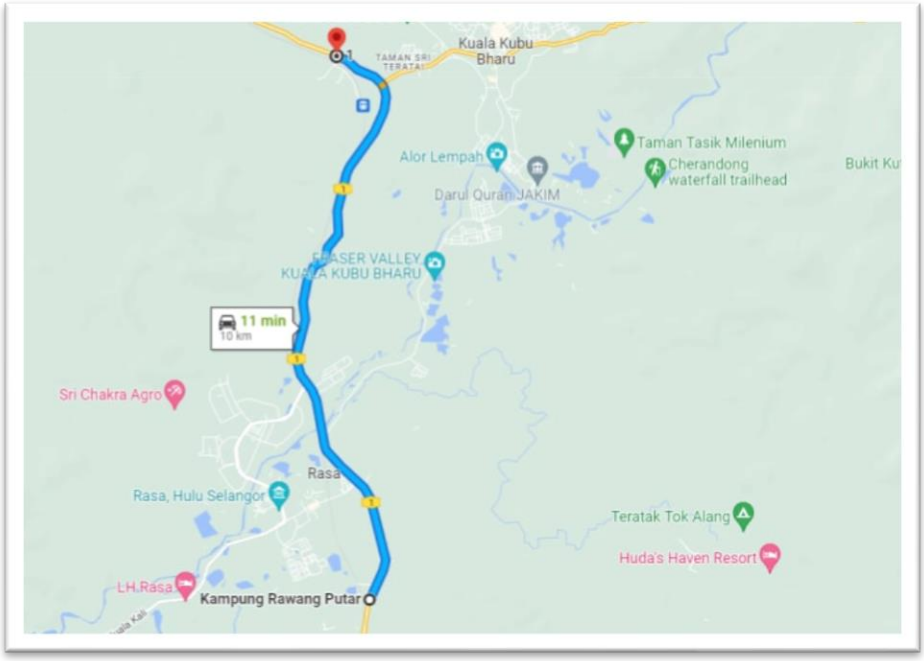

Figure 1.1: The location of the Study Research Area at Jalan Kuala Lumpur to Ipoh

The scope of study is to determine the degree of the link between road accident causes and road users' opinions toward them. The study examines the personality features of drivers who are at risk of being involved in a car accident, taking into account factors such as time pressure, enjoyment of difficulties, driving attitude and desire to obtain driving satisfaction. Additionally, factors such as vehicle and road conditions are looked at when determining the causes of traffic accidents. These criteria are aimed at lowering the number of car accidents on the road. It is intended that the findings of this

study will bring to light valuable statistics and information on the causes of traffic accidents and consumer perceptions.

This case study was carried out on the route of Jalan Kuala Lumpur to Ipoh, with total length of 10km. The Jalan Kuala Lumpur to Ipoh route has a variety of geographical characteristics and traffic flow systems that reflect many lifestyles and cultures, including driving experience, driving style, road environment and road conditions. This allows for comparisons to be established and a better understanding of the attitudes and factors affecting road safety in the research area. With this information, comparisons may be conducted and a better knowledge of the attitudes and factors affecting road safety in the research area can be gained.

This scope aims to identify the causes of accidents in Jalan Kuala Lumpur to Ipoh, Kuala Kubu Bahru. This study focuses on safety signs to drivers while driving on the road. Lack of road safety signs is also a cause of accidents. Preventing road accidents while driving is the primary responsibility of road drivers to avoid accidents whether animal or human. The scope of the study involves interviewing respondents from agencies namely Jalan Pengangkutan Jalan (JPJ) through appointments that have been made and the data will be analysed using the method of content analysis on a scheduling basis.

1.5 IMPORTANCE OF STUDY

This study aims to create awareness to all parties involved in producing a safer and reliable environment of users of the trunk route in specific and all road users in general. In our society, people will tend to put blame on the drivers or road users when a traffic accident occurs, although in fact that driver's carelessness might be caused by other factors that interrupt driver's attention.

This research will allow for an explicit study on the accident rates on the trunk road which may be useful to the Jabatan Kerja Raya (JKR) of the Ministry of Works Malaysia and the Local Authority to mitigate the problem in the road design and construction.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

Safety is an essential component of engineering. The road safety involves many factors including driver skills, characteristics of roadway, road conditions and weather. Among all contributing elements, road accident is considered to be one of the most critical.

One mechanism road safety is a study that had been done based on the true theories and are used in related fields such as journals, articles, books and newspaper studies. This chapter presents the road safety concept, its origin, and expansion. This section provides the background information regarding this concept and strategies used or implementation for an existing roadway focusing on element of road.

Literature study about the road safety, environment factor, accident prone area, accident involvement, road accident and human factor all elements of roads is also reviewed.

2.2 ROAD SAFETY

Road safety is characterized by the absence of accidents, for example collisions between road users (Browm, 1994). The safety is traditionally measured by the number of collisions or rather its expected number at a given time. Traffic safety diagnosis has been traditionally undertaken using historical collision data. However, there are well recognized problems of availability and quality associated with collision data. Additionally, the use of collision records for safety analysis is a reactive approach a

significant number of collisions have to be recorded before action is taken (Browm, 1994).

Therefore, there has been considerable interest in research dealing with surrogate safety measures (Gettman and Head, 2003). The observation of traffic conflicts has been advocated as an alternative or complementary approach to analyse traffic safety from a broader perspective than collision statistics alone (Browm, 1994).

Traffic conflicts are intersections with very similar processes to collisions, but without collision. A conflict is defining as an observational situation in which two or more road users approach each other in space and time to such an extent that a collision is imminent is their movements remain unchanged. The concept of collision course is derived from this widely accepted definition of traffic conflicts. Based on Svensson (1998), defined that user can be on a collision course when, "speed and/or the direction of the road user changes". Deciding if two road users are on a collision course thus depends on extrapolation hypotheses.

2.3 ENVIRONMENT FACTOR

Environmental factors can be divided into weather and time when the accidents are prone to occur. In terms of weather, seven studies reported that accident usually occurs during rainy weather (Aron et al., 2015; Asefa et al.,2015; Black, Villarini, & Mote, 2017; Jaroszweski & McNamara, 2014; Mitchell, Driscoll, & Healey, 2004; Mondal et al., 2011; Saha, Schramm, Nolan, & Hess, 2016). Most of the researchers reported that rainy weather has significantly reduced the drivers' visibility and increased accident involvement (Jaroszweski & McNamara, 2014; Mondal et al., 2011; Saha et al., 2016). Moreover, three studies conducted in the US reported that driving during inclement weather (wet and cold) can more likely cause accident (Chen, Chen, & Ma, 2018; Das, Brimley, Lindheimer, & Zupancich, 2017; Legree, Heffner, Psotka, Martin, & Medsker, 2003). Nine studies reported that accident is also prone to occur during snowy, cloudy,

windy and foggy weathers (Chen & Zhang, 2016; Edwards, 1998; Eisenberg & Warner, 2005; Híjar, Carrillo, Flores, Anaya, & Lopez, 2000; Li, Yamamoto, & Zhang, 2018; Perrels, Votsis, Nurmi, & Pilli-Sihvola, 2015; Ponnaluri, 2016; Wang et al., 2011; Xi et al., 2014).

Similarly, accidents are prone to occur during these weathers due to the decline in drivers' visibility. Two studies conducted in Iran reported that accidents occur in the country because of dust storm, which not only drastically reduce drivers' visibility, but also cause respiratory problems including asthma (Lankarani et al., 2014; Tezangi, 2016. Apart from adverse and bad weather, accident is also highly occurring during good weather. Seven studies reported that most of the accidents occurred during fine weather (Haynes et al., 2008; Ismail et al., 2011; Lardelli-Claret et al., 2002; McGwin & Brown, 1999; Mohamed, Mohamed, & Al-Harthi, 2017; Radun & Radun, 2006; Tanishita & van Wee, 2017). Majority of the accidents occurred during fine and clear weather because the drivers were reported to drive at higher speed and being less caution compared to that during adverse or bad weather (Haynes et al., 2008; McGwin & Brown, 1999; Mohamed et al., 2017; Tanishita & van Wee, 2017). Young drivers have been reported to commit speeding violation when driving during fine weather because they are perceived to be risk takers despite their lack of driving skills, whereas older drivers are mainly involved in road accident during fine weather because of several driving errors while changing lane and the failure to foresee unseen objects on the road (McGwin & Brown, 1999). Moreover, drivers have been also reported to fall asleep when driving at fine and clear weather, which subsequently increased accident risk (Radun & Radun, 2006).

2.4 ACCIDENT PRONE AREA

Road accident proneness can be defined as some drivers have greater tendency to involve in road accidents as they are exposed to equal risk while driving on the road. Drivers are exposed to the same risk but carries different perception and behaviour while driving. For example, a driver might perceive road accident proneness from the perspective of near misses such as damage on sidemirror, front bumper , little scratch on the car whereas, other driver might define road accident proneness only from the road accidents perspective such as injury, ill health, loss or damage to the vehicle, fatality or any combination of all these.

Since a driver's behavioural factors have linkage towards a driver's involvement in road accidents, this study will integrate several driver's behavioural factors such as personality traits, anger, aggressive driving and risky driving in order to provide further understanding on the effects of these factors on drivers' road accident proneness.

2.5 ACCIDENT INVOLVEMENT

Road accident is defined as the collision or crash involving one or more vehicles that takes place in either highway or other public roads, thus causing light injury, permanent injury, vehicle breakdown or even death (Olusina & Ajanakum, 2017). Review on literature has shown that traffic crash involving young drivers within the age 17 to 25 years old was significantly higher than that of the mature and older drivers in western countries (Rowe et al., 2016). In Malaysia, the similar findings have also been emphasized by scholars as 46% of the fatal and non-fatal accidents are caused by the young drivers aged between 16 to 25 years old (Ramli et al., 2014). The young and novice drivers commit more traffic violations such as speeding, use of mobile phone while driving, tailgating, dangerous overtake, failure to follow traffic signage and drink – drive. These drivers perceived a higher level of risks when driving due to their lack of

driving skills and experience. Moreover, they also seem to be “unnecessarily” confident on the road, which caused them to break numerous traffic offences.

2.6 ROAD ACCIDENT

Road accident is one of the major causes of death and injuries in Malaysia. In the year 2001, the total number of road accidents was 265,175 with fatalities of 5230, seriously injured 6942, and slightly injured 30,684. It is a shocking fact that road accidents kill more people in other developing countries too, every year, than war and disease. In Asia alone, 400,000 people are killed on the roads annually and more than four million injured. According to WHO, every year, nearly one million people are killed, three million are severely disabled for life and thirty million are injured in road traffic accidents. The social and economic, economical cost of these accidents is also so high that it would be sufficient to buy the world total production of cereals each year. Furthermore, the number of accidents is in constant increase throughout the world. In 1990, death on road accidents remained in 9th rank and by 2020 road accidents will be the third leading cause of death worldwide.

2.7 HUMAN FACTOR

The most significant cause of road accidents is the attitude of the driver himself. This is because drivers are selfish, impatient when on the road and do not obey the rules of the road. For example, a motorist drives a car at high speed without complying with the permitted speed limit. Indirectly, drivers are not only risking their own lives but the lives of other road users.

2.8 QUESTIONNAIRE

A questionnaire is a research instrument consisting of a series of questions for the purpose of gathering information from respondents. Questionnaires can be thought of as a kind of written interview. It can be carried out face to face, by telephone, computer or post, quick and efficient way of obtaining large amounts of information from a large sample of people. Data can be collected relatively quickly because the researcher would not need to be present when the questionnaires were completed. This is useful for large populations when interviews would be impractical. However, a problem with questionnaire is that respondents may lie due to social desirability. Most people want to present a positive image of them and so may lie or bend the truth to look good; example pupils would exaggerate revision duration.

Questionnaires can be an effective means of measuring the behaviour, attitudes, preferences, opinions and, intentions of relatively large numbers of subjects more cheaply and quickly than other methods. An important distinction is between open-ended and closed questions. Often a questionnaire uses both open and closed questions to collect data. This is beneficial as it means both quantitative and qualitative data can be obtained.

Questionnaires can be classified as both quantitative and qualitative method depending on the nature of questions. Specifically, answers obtained through closed-ended questions with multiple choice answer options are analysed using quantitative methods and they may involve pie charts, bar-charts and percentages. Answers obtained to open-ended questionnaire questions are analysed using qualitative methods and they involve discussions and critical analyses without use of numbers and calculations. For a standard 15,000-20,000-word business dissertation, including 25-40 questions in questionnaires will usually suffice. Questions need be formulated in an unambiguous and straightforward manner and they should be presented in a logical order.

Advantages of questionnaires include increased speed of data collection, low or no cost requirements, and higher levels of objectivity compared to many alternative methods of primary data collection. However, questionnaires have certain disadvantages such as selection of random answer choices by respondents without properly reading the question. Moreover, there is usually no possibility for respondents to express their additional thoughts about the matter due to the absence of a relevant question.

i. **Computer Questionnaire.** Respondents are asked to answer the questionnaire which is sent by mail. The advantages of the computer questionnaires include their inexpensive price, time-efficiency, and respondents do not feel pressured, therefore can answer during the time, giving more accurate answers. However, the main shortcoming of the mail questionnaires is that sometimes respondents do not bother answering and cannot just ignore the questionnaire. ***(Appendix 2.1)***

ii. **Telephone Questionnaire.** Researcher may choose to call potential respondents with the aim of getting them to answer the questionnaire. The advantage of the telephone questionnaire is that, it can be completed during the short amount of time. The main disadvantage of the phone questionnaire is that it is expensive most of the time. Moreover, most people do not feel comfortable to answer many questions asked through the phone and it is difficult to get sample group to answer questionnaire over the phone. ***(Appendix 2.2)***

iii. **Mail Questionnaire.** This sort of questionnaires involves the researcher to send the questionnaire list to respondents through post, often attaching pre-paid envelope. Mail questionnaires have an advantage of providing more accurate answer, because respondents can answer the questionnaire in their spare time. The disadvantages associated with mail questionnaires include them being expensive, time consuming and sometimes they end up in the bin put by

respondents. Questionnaires can include the following types of questions. ***(Appendix 2.3)***

iv. **Open Question Questionnaire.** Open questions differ from other types of questions used in questionnaires in a way that open questions may produce unexpected results, which can make the research more original and valuable. However, it is difficult to analyse the results of the findings when the data is obtained through the questionnaire with open questions. ***(Appendix 2.4)***

v. **Multiple Choice Questions.** Respondents are offered a set of answers they have to choose from. The downsize of questionnaire with multiple choice questions is that, if there are too many answers to choose from, it makes the questionnaire, confusing and boring, and discourages the respondent to answer the questionnaire. ***(Appendix 2.5)***

vi. **Scaling Questions**. Also referred to as ranking questions, present an option for respondents to rank the available answers to the questions on the scale of given range of values (for example from 1 to 10). ***(Appendix 2.6)***

vii. **Dichotomous Questions**. This type of questions gives two options to respondents – yes or no, to choose from. It is the easiest form of questionnaire for the respondent in terms of responding it. ***(Appendix 2.7)***

The various choices of the way questionnaire are presented to the respondent are giving a lot of method to gain data from every aspect. It is not limited to one method since it is obtaining information without limit. Questionnaire is also the main collecting data and convenience way. The criteria of chosen questionnaire must be highly reliable and valid based on the scope. The basic guidelines and method of constructing a questionnaire must be followed in order to get a better data collecting.

2.9 GOOGLE FORM

Google Forms is a survey administration software included as part of the free, web-based. Google Docs Editors suite offered by Google. The service also includes Google Docs, Google Sheets, Google Slides, Google Drawings, Google Sites, and Google Keep. Google Forms is only available as a web application. The app allows users to create and edit surveys online while collaborating with other users in real-time. The collected information can be automatically entered into a spreadsheet.

The Google Forms service has undergone several updates over the years. Features include, but are not limited to, menu search, shuffle of questions for randomized order, limiting responses to once per person, shorter URLs, custom themes, automatically generating answer suggestions when creating forms, and an "Upload file" option for users answering questions that require them to share content or files from their computer or Google Drive.

In October 2014, Google introduced add-ons for Google Forms that enable third-party developers to add new features to surveys, while in July 2017, Google updated Forms to add several new features. "Intelligent response validation" is capable of detecting text input in form fields to identify what is written and ask the user to correct the information if wrongly input. Depending on file-sharing settings in Google Drive, users can request file uploads from individuals outside multi-option answers in a table. In Settings, users can make changes that affect all new forms, such as always collecting email addresses. Google Forms features all of the collaboration and sharing features found in Docs, Sheets, Slides, Drawings, and Sites.

3.0 ROAD SAFETY AUDIT

This section literature review different methodologies taken in research work done by different researchers. Some researchers (Sanjay Kumar Singh 2017), (Murat Gunduz 2018), (Rahul Goel 2018), (Hitesh Kumar 2017), (Shalini Kanuganti 2017) (Abdul Rahoof 2017) have investigated accident injury severity suggest measures. (Athanasios Galanis 2017), (Dinesh Mohan 2017), (Francis John Gichaga 2017), (Luca Persia 2016) have studied types of roads and asses the road safety management and schemes for road improvement. (Lorenzo Domenichini 2018) studied the urban road safety on vehicle speed reduction. Most of the studies are based on methods of assessment of road accidents. Their study includes accident data as main element of the research. Generally, Road safety Audit's methods improve the understanding of the safety performance of roads, they all require accident data. But there is a lack of data like Pothole data collection of roads. Road traffic accidents increases due to potholes on the road cause the traumatic spinal injuries, bones injuries, etc. After studying various review paper, we have found that the main aim of road safety audit is to assure that all new road schemes operate as safely as practicable. This means that safety should be considered whole cycle of design, construction and preopening of any project facility and also during operation and maintenance of the highway.

3.1 TRAFFIC VOLUME STUDY

The present study is essentially about the importance of traffic volume in traffic engineering of urban and suburban road links, in particular the literature on effect of traffic volume, speed-flow relationships, passenger car equivalents, peak hour factor, flow variations and traffic capacity and level of serviceability (LOS). But there are lot of studies which help to develop and modify the present study. Some of those are mentioned below in brief Arkatkar (2011) studied the effect of variation of traffic volume, road width, magnitude of upgrade and its length on PCU value; by using traffic-flow simulation model HETEROSIM.

Field data collected on traffic flow characteristics are used in calibration and validation of the simulation model. The validated simulation model is then used to derive PCU values for different types of vehicles and it indicate that the model is capable of replicating the heterogeneous traffic flow on mid-block sections of intercity roads, for different roadway conditions, to a satisfactory extent.

3.2 SUMMARY

From the extensive review of the literatures, this study intends to explore the influence of driver's personality traits, driving anger and risky driving along with aggressive driving on road accident proneness to reduce the road accident among car drivers. It is recommended that the driver which portrays good driving behaviours will exhibits low aggressive driving which then results to low road accident proneness.

Therefore, this proposed framework is needed to be examined for further understanding. The proposed framework will be tested in research program conducted by first author in Malaysia. The result of the particular research is expected to provide further understanding of road accident proneness and aid the development of effective intervention in road safety.

CHAPTER 3
METHODOLOGY

3.1 INTRODUCTION

The aim of road safety is to identify hazards or safety deficiencies either on road traffic signs, road furniture and road accident. The road safety review process is divided in three phases, the office review, the field review, and the final report.

The office review primarily consists of a comprehensive site description and a complete crash data analysis. The field review includes a road survey, conducted with the aid of recommended manuals and provided checklists and accident data collection and analysis. The final report summarizes the results of both the office and the field review. The report should be concise and succinct, with clear identifications of problems and recommendations.

Road safety are applicable to all types of existing roadways and at every stage of their development. However, the procedure followed in this document focuses on local roads situated in urban and suburban areas.

Road safety should be undertaken by a team of people such as Malaysia Public Works Department, Police Station and others who have experience and up – to – date expertise in road safety engineering and crash investigation and prevention, linked to an understanding of road management. When necessary other fields such as road user behaviour, enforcement and maintenance should be represented on the team (Austroads, 2002).

3.2 METHODOLOGY OF STUDY

The several methods have been used based on the objectives and scope on the studies to achieve this study. During the research, there is flow chart that happens. The flow charts describe about researcher's progress in order to running the research. It is consisting nine steps. The flow chart of methodology is shown in Figure 3.1.

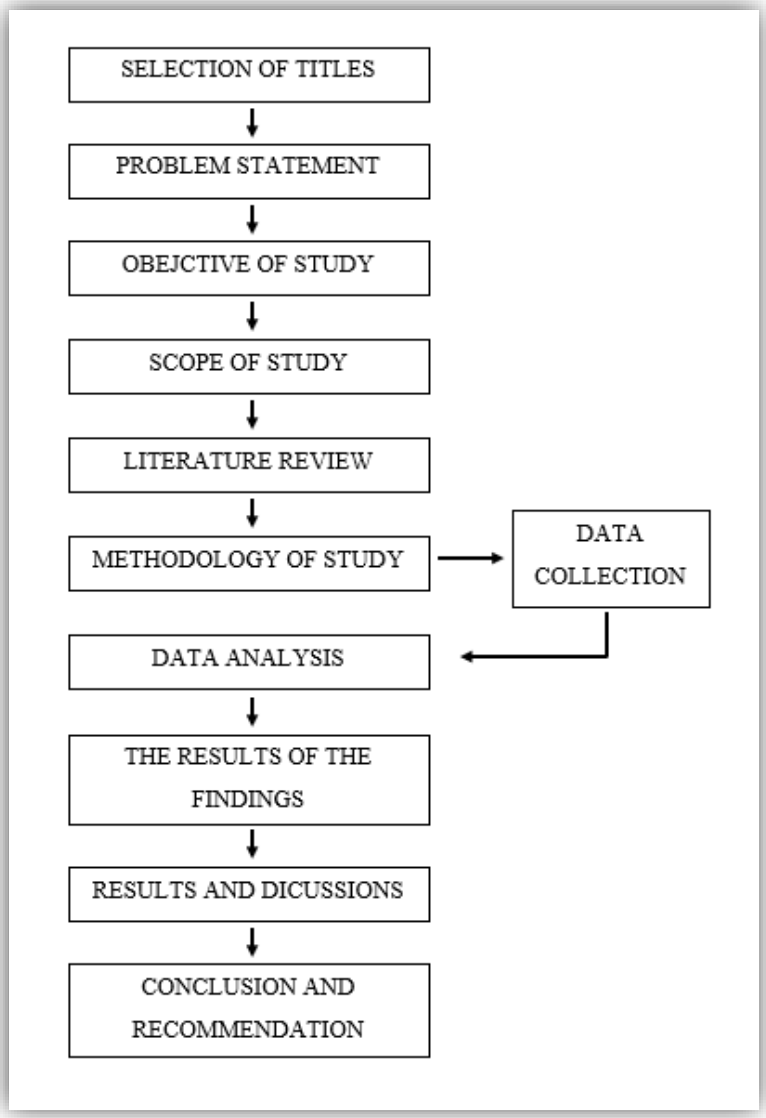

Figure 3.1: Flow Chart in Methodology of Study

3.2.1 Data Collection

There is the data that will be collected for this study. First, the data is about accidents that have occurred in the study area. The data is known as secondary data that can be collected from the Jabatan Pengangkutan Jalan (JPJ) and Ibupejabat Daerah Bukit Aman (IPD Bukit Aman). This data needs to be collected to find out the main factors that cause accidents to occur on the highway.

Secondly, the data is about road pavement damage. In this data will show the permanent road and also road maintenance that has been done. The use of the data is to see the condition of the road on the highway whether it needs to be upgraded.

Third, the data is about traffic volume study. In this data will show the manually calculating way with direct counting and to record the available sheet data provided that is useful in recording classified vehicles.

Lastly, the data is about road users by showing questionnaires and interviews about the level of road safety to them.

3.2.2 Data Analysis

The methodologies employed to analyse the data were both qualitative and descriptive statistics. Thus, the organized data were interpreted using descriptive methods in the form of tables, charts and graph using statistical quality control tools to the trends and the situations of the road accidents on the road on the research ways. To identify hazardous locations along road from Jalan Kuala Lumpur to Ipoh accident density and accident rate are to be judged. The result from the questionnaires will be calculated using Google Form.

The next data analysis will be analyse based on the data that had been collected from PDRM that is data about the road pavement damage. These two data will be analysed by related the data connections. The data will be analysed to see whether the road pavement damage is the main factor that case the accident happen in that highway.

If the data of the accident shown that there are many accidents happen because of the road pavement damage so the road physical condition will be the main factor that can cause the accident in the highway. But if the data shown that the accident that had happen in that highway was not cause by the roads pavement damage there will be another cause for the accident that had happen.

The analysis of data for this study will use software of Google Form to analysis the data from questionnaire. Google Form is software specially made to calculate data from many aspects. The analysis can be made after the data is finish calculating.

Content analysis was used to analyse the data which was gathered from personal interviews. The type of research whereby data gathered is categorized in themes and subthemes, so as to be able to be comparable. A main advantage of content analysis is that it helps in data collected being reduced and simplified, while at the same time producing results that may then measure using quantitative techniques. Moreover, content analysis gives the ability to researchers to structure the qualitative data collected in a way that satisfies the accomplishment of research objectives. However, human error is highly involved in content analysis, since there is the risk for researchers to misinterpret the data gathered, thereby generating false and unreliable conclusions.

3.3 SUMMARY

In conclusion, the safeties for the driver are very important especially in the highway because many people are using that road. Nowadays, the road lighting requirements are ignored. Based on the article, many people already made report about the road lighting. So, the responsible party are needs to take action so the driver will be safer using the highway. And hopefully the action that will be doing will decrease the statistic of accident that had happened on that highway.

CHAPTER 4
RESEARCH FINDINGS AND DISCUSSION

4.1 INTRODUCTION

This chapter will describe the results of the data collection that has been implemented. This data was obtained from the distribution of questionnaires and interviews with drivers who drive along the Jalan Kuala Lumpur to Ipoh, Kuala Kubu Bharu. The data obtained will be analysed to meet the objectives of the study.

The first data that has been collected is accident data known as secondary data obtained from the Jabatan Pengangkutan Jalan (JPJ). Accident data is collected for 2 years (2020 - 2021).

Finally, the questionnaire was prepared in Malay and divided into 4 parts. Part A contains 3 questions to examine the respondent's background. After that, 7 questions in Part B ask if the driver's attitude caused the accident. Next, Section C has 6 questions asking about road conditions. Part D also has 6 questions asking about the condition of the vehicle that caused the road accident.

The same analysis also means by analysing the raw data obtained by providing it in an easily understandable form and then making conclusions and recommendations from it. From the description, only the final conclusions and results can be understood by other users who want to know and obtain information from the scientific studies that have been in the questionnaire.

The data obtained from the questionnaire responses are analysed and presented in this chapter. The decisions taken are all based on the interpretation of the data processing results obtained from the survey responses. A total of 80 respondents have

given feedback from the questionnaire that has been distributed. This means that 100% of respondents cooperated in answering the questionnaire. The data is also analysed according to the average to further facilitate the study

4.2 SECONDARY DATA (JABATAN PENGANGKUTAN JALAN - JPJ)

Table 4.1: Accident Data Year 2020 to 2021

Year	Fatal Accident	Major Accident	Minor Accident	Collision Only	Total Accident
2020	0	0	0	30	30
2021	1	1	0	48	50

The accident data are collected from two agency which is Jabatan Pengangkutan Jalan (JPJ) and IPD Bukit Aman. The range for the data collected are for 2 years. In year 2020 there are no fatal accident occurred and 1 fatal accident cases happen in year 2021. As it can be shown that the fatal accidents are increasing year by year. And also, from the total of the accident that had been recorded in year 2020 had 30 cases and in year 2021 there are 50 accident that happen.

4.3 THE ROAD SAFETY AUDIT

Road Safety Audit (RSA) is defined as a systemic process for checking the road safety implications of highway improvement and new schemes. The sole objective of the process is to minimise future road accidents occurrence and severity once the scheme has been built and the road comes into use. Having identified potential road safety problems. Then makes recommendations for improvement. Road Safety Audit (RSA) fulfil a vital role in checking that roads have been designed and build to the highest safety standards.

There are 6 major road infrastructure elements which are audited as follow:

Table 4.2: Type of Road Safety Audit

TYPE OF ROAD	PICTURE	OBSERVATION
Pavement Marking		- Road marking plays an important role in transmitting road information and requirements to road user. Several aspects must be considered when auditing like colours and dimension. - The colour on the yellow square become faded.

TYPE OF ROAD	PICTURE	OBSERVATION
Road Barriers		- Generally, road barriers are specified in three categories, which are permanents barriers, semi-permanent barriers, and flexible barriers. The road barrier should be designed with its optimum height based on its oproper functioning. - No road barriers along the way.

TYPE OF ROAD	PICTURE	OBSERVATION
Traffic Signal		- Traffic Signal is a device used to facilitate the movement of road vahicles and pedestrian traffic. Several criteria to be considered in traffic signal design to ensure oeration effiency are signal phasing, signal faces, appropriate signal installation and signal hardware.
		- The traffic light not function and broken.

TYPE OF ROAD	PICTURE	OBSERVATION
		- The traffic light not function and broken.
Street Lighting		- The purpose of the street light installation is to enchance the safety of road users at night. Several audit aspects for the street lights are light pole location, rate of lighting and design of the lighting system.

TYPE OF ROAD	PICTURE	OBSERVATION
		- No street lights all the way.
Road Damage	 (Road Patch)	- Geometry of road shall include access control, horizontol and vertical alignment, visibility, cross-section and intersection. The design standart of the road geometry shall be following the requirements of traffic based on of traffic based on specific standards recommended by JKR.

TYPE OF ROAD	PICTURE	OBSERVATION
Traffic Sign		- The existence of traffic signs intended to ensure road safety and to inform road operation to every road user. There are 3 categories of traffic signs, consists of guide signs, warning signs, and regulatory signs. General design considerations on traffic signs are colours, lettering and borders, symbols, post and mounting and material used.

4.4 THE TRAFFIC VOLUME STUDY

I) Location: Traffic Light Kuala Kubu Bharu

Date: 15/10/2022 (Saturday)

Phase: Peak Hours

Table 4.3: Total of Traffic Volume Study

Time	Car	Heavy vehicle	Bus	Motorcycle	Bicycle	Total Vehicle
11:00 – 12:00	1816	132	23	177	18	**2166**
17:00 – 18:00	1301	78	14	207	0	**1600**
18:00 – 19:00	1296	54	5	201	1	**1557**
TOTAL	**4413**	**264**	**42**	**585**	**19**	**5323**
PERCENTAGE %	**82.9**	**4.95**	**0.79**	**11.0**	**0.36**	**100**

II) Location: Traffic Light Kuala Kubu Bharu

Date: 11/11/2022 (Friday)

Phase: Peak Hours

Table 4.4: Total of Traffic Volume Study

Time	Car	Heavy vehicle	Bus	Motorcycle	Bicycle	Total Vehicle
10:00 – 11:00	3501	215	39	348	5	**4108**
13:00 – 14:00	2550	137	16	291	0	**2994**
17:00 – 18:00	2783	111	10	352	1	**3257**
TOTAL	**8834**	**463**	**65**	**991**	**6**	**10359**
PERCENTAGE %	**85.3**	**4.47**	**0.6**	**9.57**	**0.06**	**100**

Table 4.3 and table 4.4 has shown the percentage of traffic volume studies. Data analysis shows the number of cars of 4413 and a percentage rate of 82.9% on Saturday, it increased on Friday by 8832 and a percentage rate of 85.3%. In addition, on Saturday the number of heavy vehicles was 264 and the percentage rate was 4.95%, it further decreased by 463 and the percentage rate was 4.47%. Next, the number of buses on Saturday is 42 and the percentage rate is 0.79%, it is also increasing on Friday by 65 and the percentage rate is 0.6%. In addition, on Saturday the number of motorcycles was 585 and the percentage rate was 11.0%, it increased by 991 and the percentage rate was 9.57% on Friday. Finally, the number of bicycles on Saturday was 19 and the percentage rate was 0.36%, it further decreased by 6 and the percentage rate was 0.06% on Friday.

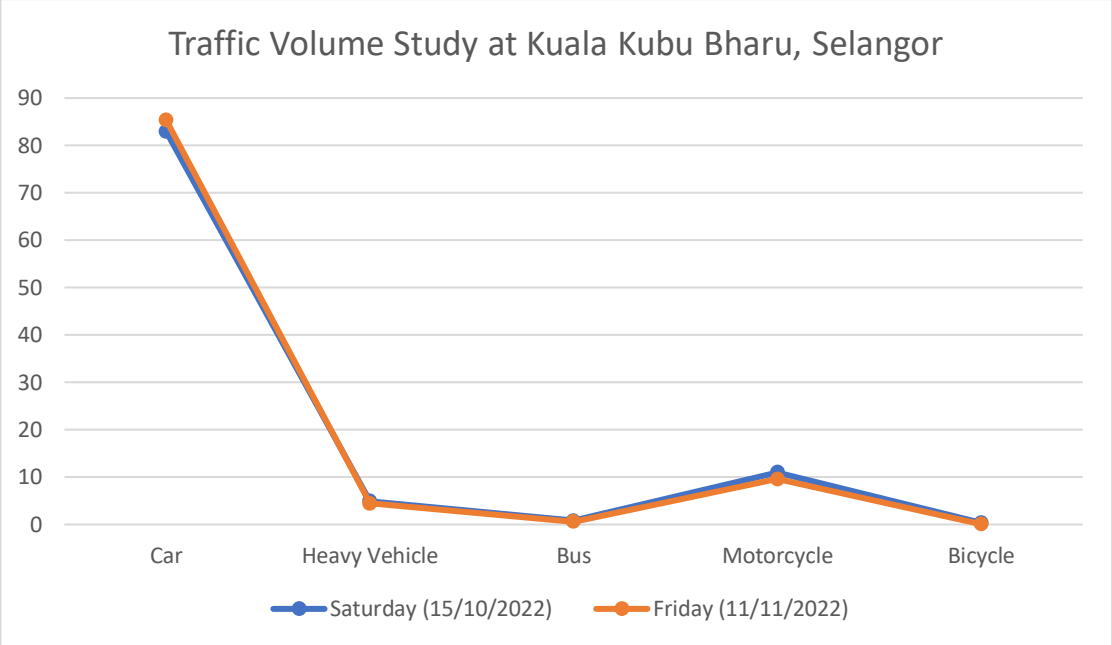
Traffic Volume Study at Kuala Kubu Bharu, Selangor
90
80
70
60
50
40
30
20
10
0
Car
Heavy Vehicle
Bus
Motorcycle
Bicycle
Saturday (15/10/2022)
Friday (11/11/2022)

Table 4.5: Conversion factors to P.C.U

(Source Arahan Teknik (Jalan) 8/86)

Type of vehicle	**Equivalent Value in P.C. U's**
	Traffic Signal
Passenger Car	1.00
Heavy Vehicles	1.75
Buses	2.25
Motorcycle	0.33
Bicycle	0.20

Traffic Volume (q)

- The number of vehicles (***n***) passing some designated roadway point in a given time interval (***t***)

$$q = \frac{n}{t}$$

- The count can be directional or all directions
- Units are typically **veh/hour, veh/day, veh/year**

Solution:

Saturday (Peak Hours):

= (0.829x1.00 + 0.0495x1.75 + 0.079x2.25 + 0.11x0.33 + 0.036x0.20) x 222

= 1.14 x 222

= 253 pcu/h

Friday (Peak Hours):

= (0.853x1.00 + 0.0447x1.75 + 0.06x2.25 + 0.0957x0.33 + 0.0006x0.20) x 432

= 1.10 x 432

= 475 pcu/h

~ This shows that the weekdays peak hour traffic is busiest compare to the weekend traffic.

4.5 QUESTIONNAIRE

A total of 80 questionnaires were distributed to obtain information to achieve the objectives of the study. Selection of study respondents based on drivers who pass along the Jalan Kuala Lumpur to Ipoh.

4.5.1 Section A: Background Of Respondent

Table 4.6: Total of Respondent

	Background	Respondents	Percentage (%)
Gender:			
	Male	42	52.5%
	Female	38	47.5%
Age:			
	18-25	29	36.3%
	26-40	25	31.3%
	41-55	15	18.8%
	56 and above	11	13.7%
Race:			
	Malay	48	60%
	Chinese	14	17.5%
	Indian	13	16.2%
	Others	5	6.3%

Of the 80 respondents, only 38 were female respondents compared to 42 other male respondents. This shows that more men drive than women. This means that the probability of male drivers being involved in an accident is higher than that of females. Table 4.5.1 Shows the number of study respondents by gender. The table 4.6 shows that most respondents in this study are between 18 to 25 years old, that is 29 respondents (36.3%), (31.3%) percent are aged between 26 to 40 years that is 25 respondents, (18.8%) percent are 41 years old to 55 years old which is a total of 15 respondents, and (13.7%) percent 11 respondents for those aged 56 years and above. The table 4.6 shows

that the majority of respondents in this study is made up of Malays, namely a total of 48 people (60%) percent. While those of Chinese descent are as many as 14 people or (17.5%) percent of the total respondents, followed by Indians as many as 13 people (16.2%) and others as many as 5 people or (6.3%) percent.

4.5.2 Section B: Driver's Attitude

Table 4.7: Total of Driver's Attitude

Statement	Frequency	Percentage (%)
The driver cut the road in a dangerous way		
• Strongly agree	63	41.3%
• Agree	16	20%
• Disagree	1	1.3%
• Strongly disagree	0	0%
The driver follows too closely with other vehicles		
• Strongly agree	55	68.8%
• Agree	23	28.7%
• Disagree	2	2.5%
• Strongly disagree	0	0%
The drivers changing lanes without giving signs of traffic lights		
• Strongly agree	58	72.5%
• Agree	22	27.5%
• Disagree	0	0%
• Strongly Disagree	0	0%
The driver is driving while intoxicated		
• Strongly agree	68	85%
• Agree	12	15%
• Disagree	0	0%
• Strongly disagree	0	0%
The driver violating the traffic lights		
• Strongly agree	63	78.8%
• Agree	16	20%
• Disagree	1	1.3%
• Strongly disagree	0	0%

The drivers using cell phones while driving		
• Strongly agree	59	73.8%
• Agree	20	25%
• Disagree	1	1.3%
• Strongly disagree	0	0%

The table above show about the statement of drivers cutting in a dangerous way is the cause of road accidents. The majority of 16 respondents, 20% agreed with the statement. Next, a total of 63 people or 78.8% strongly agreed with the statement. On the other hand, 1 people, namely 1.3% did not agree with the statement given. While there is no person that is 0% strongly disagree with the statement.

The table above show that the driver's statement that following too closely with other vehicles is the cause of road accidents. A majority of 23 people or 28.7% agreed with the statement because they thought drivers following too closely with other vehicles was one of the causes of road accidents. Next, a total of 55 people or 68.8% strongly agreed with the statement. On the other hand, 2 people, 2.5% did not agree with the statement given. While there is no person that is 0% strongly disagree with the statement.

The table above show the statement of drivers changing lanes without giving signs traffic lights is the cause of road accidents. The majority of respondents as many as 58 people that is 72.5% strongly agree with the statement. Next for the respondents who agree with the statement is 22 people that is 27.5%. On the other hand, person that is 0% do not agree with the statement given. While there is 0 person that is 0% strongly disagree with the statement.

The table above show the statement of a driver driving while intoxicated is the cause of road accidents. More than 85% of respondents, namely 68 people strongly agree with the statement. Next, for the respondents who agreed with the statement, there were 12

people, which is 15%. On the other hand, no person, 0% disagreed and strongly disagreed, 0 person, 0%, with the statement given, they thought that it was not the main cause of road accidents.

The table above show that the driver's statement that violating traffic lights is the cause of road accidents. The majority of 63 respondents or 78.8% strongly agree with the statement. Next, for the respondents who agreed with the statement, there were 16 people, which is 20%. On the other hand, 1 people or 1.3% did not agree with the statement given. While there is 0 person that is 0% strongly disagree with the statement.

The table above show the statement of drivers using mobile phones while driving is the cause of road accidents. The majority of the 59 respondents, 73.8% strongly agreed with the statement because they felt that using a mobile phone while driving was one of the causes of road accidents. Next, for the respondents who agreed with the statement, there were 20 people, which is 25%. In fact, 0% of respondents disagreed with the statement and almost 0% strongly disagreed with the statement given.

4.5.3 Section C: Road Condition

Table 4.8: Total of Road Condition

Statement	Frequency	Percentage (%)
Slippery road conditions during rain		
• Strongly agree	40	50%
• Agree	39	48.8%
• Disagree	1	1.3%
• Strongly disagree	0	0%
The absence of street lights along the road		
• Strongly agree	41	51.2%
• Agree	38	47.5%
• Disagree	1	1.3%
• Strongly disagree	0	0%
Potholed and uneven road conditions		
• Strongly agree	46	57.5%
• Agree	34	42.5%
• Disagree	0	0%
• Strongly Disagree	0	0%
Road infrastructure is in unsatisfactory		
• Strongly agree	43	53.8%
• Agree	37	46.3%
• Disagree	0	0%
• Strongly disagree	0	0%
Planting trees and oil palm by the roadside cause road accidents		
• Strongly agree	3	3.7%
• Agree	10	12.5%
• Disagree	45	56.3%
• Strongly disagree	22	27.5%

The table above show the distribution of frequency and percentage of respondents according to the statement that slippery road conditions during rain are the cause of road accidents. A majority of 48.8% or 39 people agreed with the statement. Next, for the respondents who strongly agree with the statement is 40 people which is 50%. While for disagreeing with the statement given is 1.3% which is 1 people only and only 0 people strongly disagree which is 0%.

The table above show about the statement that the absence of street lights along the road is the cause of road accidents. A majority of 38 people or 47.5% agreed with the statement. Next, for respondents or drivers who strongly agree with the statement is a total of 41 people out of 80 respondents which is 51.2%. While for the status do not agree with the statement is a total of 1 people which is 1.3% and a total of 0 people which is 0% for the status strongly disagree with the statement.

The table above show about the statement that potholes and uneven roads are the cause of road accidents. A majority of 46 people or 57.5% strongly agreed with the statement. Next, for respondents or drivers who agreed with the statement, there were 34 people out of 80 respondents, which is 42.5%. While for the status of disagree with the statement is as many as 0 person which is 0% and those who strongly disagree is 0%.

The table above show the statement that road infrastructure that is in unsatisfactory condition is the cause of road accidents. A majority of 43 people or 53.8% agreed with the statement. Next, for respondents or drivers who strongly agree with the statement is a total of 37 people out of 80 respondents which is 46.3%. While for the status of disagree with the statement is a total of 0 people which is 0% and those who strongly disagree is 0%.

The table above show the distribution of frequency and percentage of respondents according to the statement planting trees and oil palm by the roadside cause road accidents. A majority of 56.3% or 45 people disagreed with the statement. Next, for the

respondents who strongly agree with the statement is 3 people which is 3.7%. While for agreed with the statement given is 12.5% which is 10 people only and only 22 people strongly disagree which is 27.5%.

4.5.4 Section D: Vehicle Condition

Table 4.9: Table of Vehicle Condition

Statement	Frequency	Percentage (%)
Heavy vehicle cause road damage		
• Strongly agree	54	67.5%%
• Agree	23	28.7%
• Disagree	2	2.5%
• Strongly disagree	1	1.3%
Poorly maintained vehicles		
• Strongly agree	49	61.3%
• Agree	28	35%
• Disagree	1	1.3%
• Strongly disagree	2	2.5%
Brake lights not working properly		
• Strongly agree	53	65.4%
• Agree	26	32.1%
• Disagree	1	1.2%
• Strongly Disagree	1	1.2%
Foot or hand brakes not working properly		
• Strongly agree	58	72.5%
• Agree	20	25%
• Disagree	0	0%
• Strongly disagree	2	2.5%
Wipers do not work properly when rain		
• Strongly agree	34	42%
• Agree	44	55%
• Disagree	1	1.2%
• Strongly disagree	1	1.2%

The table above show that the statement that heavy vehicle cause of road damage. The majority of 23 respondents or 28.7% agreed with the statement. Next, for the respondents who strongly agreed with the statement, there were 54 people, which is 67.5%. On the other hand, 2 people or 2.5% did not agree with the statement given. While there is 1 person that is 1.3% strongly disagreed with the statement.

The table above show the distribution of frequency and percentage of respondents according to the statement that poorly maintained vehicles can cause of road accidents. A majority of 35% or 28 people agreed with the statement. Next, for the respondents who strongly agree with the statement is 49 people which is 61.3%. While for disagreeing with the statement given is 1.3% which is 1 people only and only 2 people strongly disagreed which is 2.5%.

The table above show that the statement that the brake lights not working properly causing a road accident. The majority of 26 respondents or 32.1% agreed with the statement. Next, for the respondents who strongly agreed with the statement, there were 53 people, which is 65.4%. On the other hand, 1 people or 1.2% did not agree with the statement given. While there is 1 person that is 1.2% strongly disagreed with the statement.

The table above show the statement of foot or hand brakes not working properly due to a road accident. The majority of the 20 respondents, 25% agreed with the statement because they felt that brakes are main causes of road accidents. Next, for the respondents who strongly agreed with the statement, there were 58 people, which is 72.5%. In fact, 0% of respondents disagreed with the statement and almost 2.5% strongly disagreed with the statement given.

The table above show that the statement that wipers do not work properly when it is raining can cause road accidents. The majority of 44 respondents or 55% agreed with the statement. Next, for the respondents who strongly agreed with the statement, there

were 34 people, which is 42%. On the other hand, 1 people or 1.2% did not agree with the statement given. While there is 1 person that is 1.2% strongly disagreed with the statement.

4.6 SUMMARY

In conclusion, traffic volume studies are used to identify the types of vehicles that make up the traffic flow system and to track movement trends. We were able to accurately determine the number of cars per hour, traffic flow, and vehicle makeup. Data on traffic flow is typically gathered to learn more about the movement of vehicles at certain locations along the road, such as yearly traffic, daily traffic average, annual average daily traffic, and hourly traffic. The next step is to determine the crash rate and display the volume trend using yearly traffic. Average daily traffic and annual average daily traffic are estimated to gauge demand and plan capital upgrades, whereas hourly traffic is used to identify peak periods, gauge capacity issues, and set up traffic controls

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

In road safety is given the fact that roadway and development factors are known as the most effective parameters contributing to road traffic accidents on roads, applying these evaluate in safety analysis could be instrumental in reducing the accident frequency rate and preventing the growth fatality and injury rate on rural roads. Therefore, this study evaluated the road safety level on accident frequency in order to develop a rural road safety risk index. Relying on the obtained data and the results of the analysis, the main findings of the study and the evaluation of the rural accident risk index among roadway is identified, as well as clustering and risk analyses as follows.

In addition, for objectives 2 is this report attempts to contribute to the body of knowledge on road safety. It is hoped that it will inspire and facilitate increased cooperation, innovation and commitment to preventing road traffic crashes around the world. Road traffic crashes are predictable and there- fore preventable. In order to combat the problem, though, there needs to be close coordination and collaboration, using a holistic and integrated approach, across many sectors and many disciplines.

Moreover, while there are many interventions that can save lives and limbs, political will and commitment are essential and without them little can be achieved. The time to act is now. Road users everywhere deserve better and safer road travel. Nowadays, the road lighting requirement are ignored. Based on the article, many people already made report about the road lighting. So, the responsible party are needs to take action so the driver will be safer using the highway.

In a nutshell, Road Safety management seeks to maintain and improve the existing safety of a road network by reducing crashes and providing a safe road environment for its users to enable its continued use in an effective and safe manner. It concerns the implementation of road safety policies, management and organisation in the authorities responsible for the reduction of road crashes and fatalities.

5.2 RECOMMENDATION

This study is one of a method to evaluate the level of road safety, specifically in Kuala Kubu Bharu route. It may influence everyone in the site to keep the road traffic surrounding safe, preventing any fatality happens during road traffic. Every single steps of safety must be taken seriously.

Jabatan Kerja Raya (JKR) may add some budget to provide road furniture. road furniture is important because the risk of road accidents can be reduced, road users must have a good level of safety especially for the elderly. Plus, the condition of the road furniture must be in good condition to avoid any damage to the road.

In recommendation based on studies, questionnaires and observations conducted, several suggestions from respondents can be put forward to reduce the number of accidents along the way on Jalan Kuala Lumpur to Ipoh, Kuala Kubu Bharu.

5.2.1 Damaged roads need to be repaired.

The condition of the road along the route which is damaged whether the road is potholes due to heavy vehicles, uneven paving, or the road has cracks must be maintained and repaired and re-paved as this condition contributes to road accidents. For uneven road conditions, it is necessary to cut or reclaim to make the road condition in accordance with the design.

5.2.2 Increase the number of street lights.

As a result of the observation method, for Jalan Kuala Lumpur to Ipoh from KM50 to KM59, we found that the route lacks street lights installed. This can also contribute to the occurrence of accidents because users who pass through the road at night only rely on vehicle lights only. Those in charge need to be more sensitive to the condition of the road and take the initiative to increase the number of street lights along the route.

5.2.3 Installation of signage.

The installation of signage should be clear so that drivers can read long distances. Installation of warning signs in areas at high risk of being involved in accidents can reduce the number of road accidents.

5.2.4 Camera mounting (AES)

AES cameras should be installed along the route to prevent drivers from driving too fast. There are many benefits of installing this AES camera, one of which is to reduce the rate of road accidents when drivers drive according to the set limits. This is also the result of the government's efforts to control the rate of road accidents which is increasing every year.

5.2.5 The vehicles needs to be maintained

When you want to start a long journey, it is necessary to ensure that the vehicle is in good condition and does not suffer any damage. It is also necessary to take into account the distance travel so that we ensure the condition of the vehicle is suitable for long journeys or vice versa. In addition, the condition of the vehicle such as brakes, engine and all components are in good condition and functioning properly.

5.2.6 Road furniture needs to be added

They are highly important on urban roads and intersections as they promote road safety and bring out smooth and harmonious flow of traffic along guided paths of travel. This can also contribute to the occurrence of accidents because users who pass through the road can beware to use the road such as has delineators and traffic barrier by roadside. Those in charge need to be more sensitive to the condition of the road and take the initiative to increase the number of road furniture along the route.

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APPENDIX

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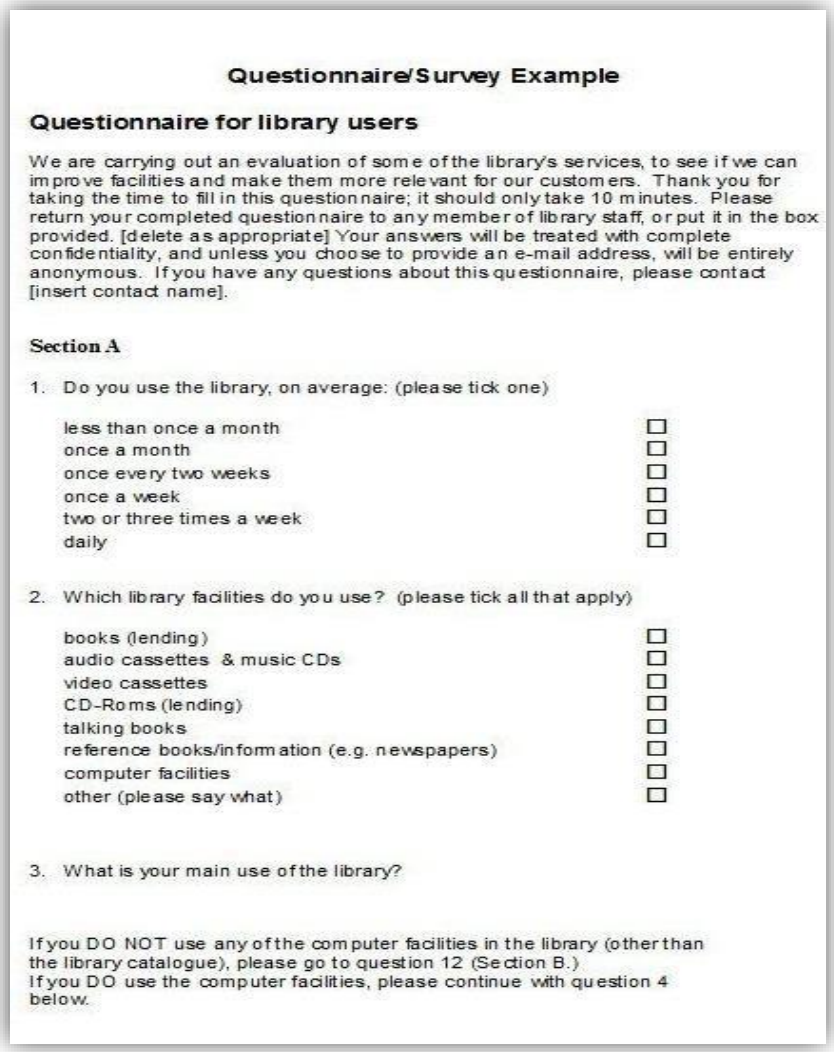
	Jabatan Pengangkutan Jalan (JPJ)
	Ibupejabat Daerah Bukit Aman

APPENDIX A: EXAMPLE OF QUESTIONNAIRE



Questionnaire/Survey Example

Questionnaire for library users

We are carrying out an evaluation of some of the library's services, to see if we can improve facilities and make them more relevant for our customers. Thank you for taking the time to fill in this questionnaire; it should only take 10 minutes. Please return your completed questionnaire to any member of library staff, or put it in the box provided. [delete as appropriate] Your answers will be treated with complete confidentiality, and unless you choose to provide an e-mail address, will be entirely anonymous. If you have any questions about this questionnaire, please contact [insert contact name].

Section A

1. Do you use the library, on average: (please tick one)

less than once a month	☐
once a month	☐
once every two weeks	☐
once a week	☐
two or three times a week	☐
daily	☐

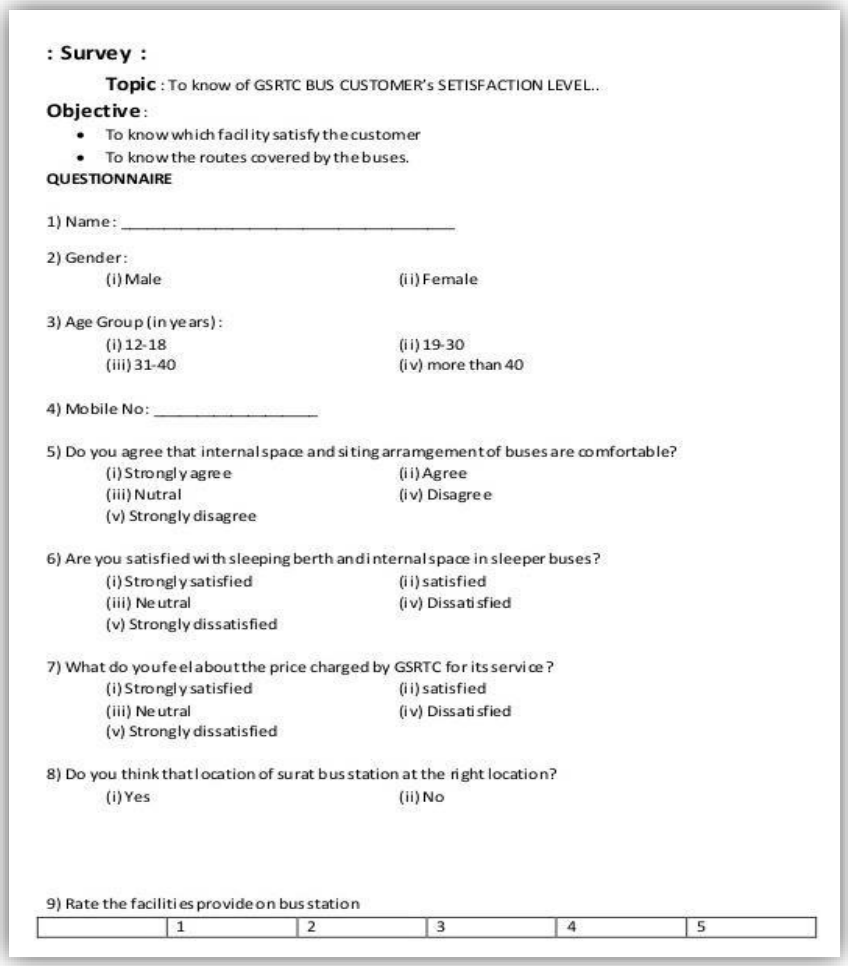
2. Which library facilities do you use? (please tick all that apply)

books (lending)	☐
audio cassettes & music CDs	☐
video cassettes	☐
CD-Roms (lending)	☐
talking books	☐
reference books/information (e.g. newspapers)	☐
computer facilities	☐
other (please say what)	☐

3. What is your main use of the library?

If you DO NOT use any of the computer facilities in the library (other than the library catalogue), please go to question 12 (Section B.)
If you DO use the computer facilities, please continue with question 4 below.

Appendix 2.1: Example of Computer Questionnaire



: Survey :

Topic : To know of GSRTC BUS CUSTOMER's SETISFACTION LEVEL..

Objective:

- To know which facility satisfy the customer
- To know the routes covered by the buses.

QUESTIONNAIRE

1) Name: _____

2) Gender:
(i) Male (ii) Female

3) Age Group (in years):
(i) 12-18 (ii) 19-30
(iii) 31-40 (iv) more than 40

4) Mobile No: _____

5) Do you agree that internal space and siting arramgement of buses are comfortable?
(i) Strongly agree (ii) Agree
(iii) Nutral (iv) Disagree
(v) Strongly disagree

6) Are you satisfied with sleeping berth and internal space in sleeper buses?
(i) Strongly satisfied (ii) satisfied
(iii) Neutral (iv) Dissatisfied
(v) Strongly dissatisfied

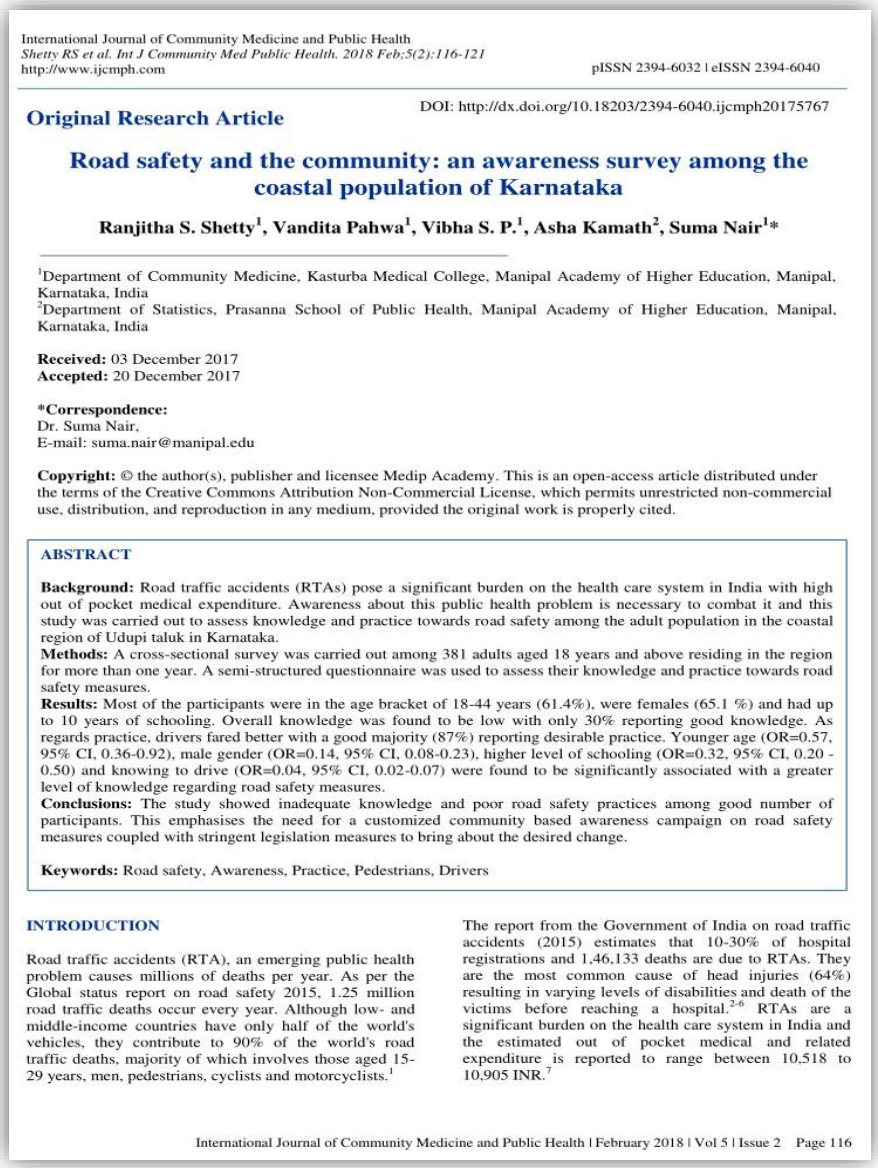
7) What do you feel about the price charged by GSRTC for its service?
(i) Strongly satisfied (ii) satisfied
(iii) Neutral (iv) Dissatisfied
(v) Strongly dissatisfied

8) Do you think that location of surat bus station at the right location?
(i) Yes (ii) No

9) Rate the facilities provide on bus station

	1	2	3	4	5

Appendix 2.2: Example of Telephone Questionnaire



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Original Research Article

Road safety and the community: an awareness survey among the coastal population of Karnataka

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Accepted: 20 December 2017

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ABSTRACT

Background: Road traffic accidents (RTAs) pose a significant burden on the health care system in India with high out of pocket medical expenditure. Awareness about this public health problem is necessary to combat it and this study was carried out to assess knowledge and practice towards road safety among the adult population in the coastal region of Udupi taluk in Karnataka.
Methods: A cross-sectional survey was carried out among 381 adults aged 18 years and above residing in the region for more than one year. A semi-structured questionnaire was used to assess their knowledge and practice towards road safety measures.
Results: Most of the participants were in the age bracket of 18-44 years (61.4%), were females (65.1 %) and had up to 10 years of schooling. Overall knowledge was found to be low with only 30% reporting good knowledge. As regards practice, drivers fared better with a good majority (87%) reporting desirable practice. Younger age (OR=0.57, 95% CI, 0.36-0.92), male gender (OR=0.14, 95% CI, 0.08-0.23), higher level of schooling (OR=0.32, 95% CI, 0.20 - 0.50) and knowing to drive (OR=0.04, 95% CI, 0.02-0.07) were found to be significantly associated with a greater level of knowledge regarding road safety measures.
Conclusions: The study showed inadequate knowledge and poor road safety practices among good number of participants. This emphasises the need for a customized community based awareness campaign on road safety measures coupled with stringent legislation measures to bring about the desired change.

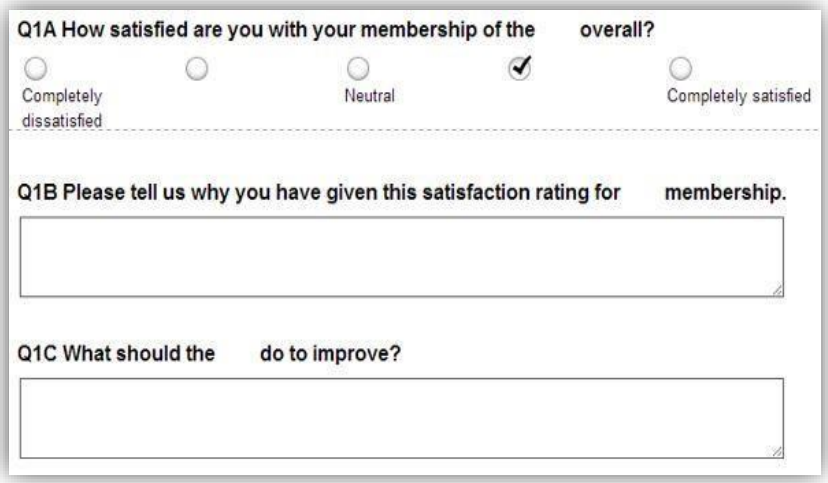
Keywords: Road safety, Awareness, Practice, Pedestrians, Drivers

INTRODUCTION

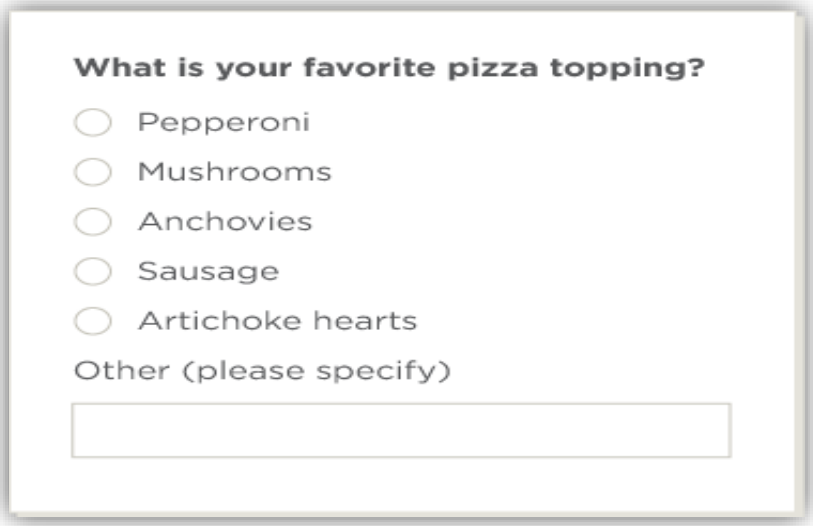
Road traffic accidents (RTA), an emerging public health problem causes millions of deaths per year. As per the Global status report on road safety 2015, 1.25 million road traffic deaths occur every year. Although low- and middle-income countries have only half of the world's vehicles, they contribute to 90% of the world's road traffic deaths, majority of which involves those aged 15-29 years, men, pedestrians, cyclists and motorcyclists.[1]

The report from the Government of India on road traffic accidents (2015) estimates that 10-30% of hospital registrations and 1,46,133 deaths are due to RTAs. They are the most common cause of head injuries (64%) resulting in varying levels of disabilities and death of the victims before reaching a hospital.[2-6] RTAs are a significant burden on the health care system in India and the estimated out of pocket medical and related expenditure is reported to range between 10,518 to 10,905 INR.[7]

Appendix 2.3: Example of Mail Questionnaire



Appendix 2.4: Example of Open Questionnaire



Appendix 2.5: Example of Multiple Choices

	Circle the correct numeric response to each question						
#	Question	Survey Scale: 1=Strongly Disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly Agree					
1	I have easy access to the supplies and equipment I need to do my work on this unit.		1	2	3	4	5
2	The support services to this unit respond in a timely way.		1	2	3	4	5
3	I can discuss challenging issues with care team members on this unit.		1	2	3	4	5
4	My ideas really seem to count on this unit.		1	2	3	4	5
5	I speak up if I have a patient safety concern.		1	2	3	4	5
6	Care team members on this unit feel free to question the decisions or actions of those with more authority.		1	2	3	4	5
7	Important patient care information is exchanged during shift changes.		1	2	3	4	5
8	If I have an idea about how to make things better on this unit, the manager and other staff are willing to try it.		1	2	3	4	5
9	Care professionals communicate complete patient information during hand-offs.		1	2	3	4	5

Appendix 2.6: Example of Scaling Questionnaire

Do you believe that the death penalty is ever justified?

____Yes

____No

Please enter your gender:

☐ Male ☐ Female

Appendix 2.7: Example of Dichotomous Questionnaire

APPENDIX B: QUESTIONNAIRE

GUIDE TO RESPONDENTS

1. There are 4 sections to this questionnaire:

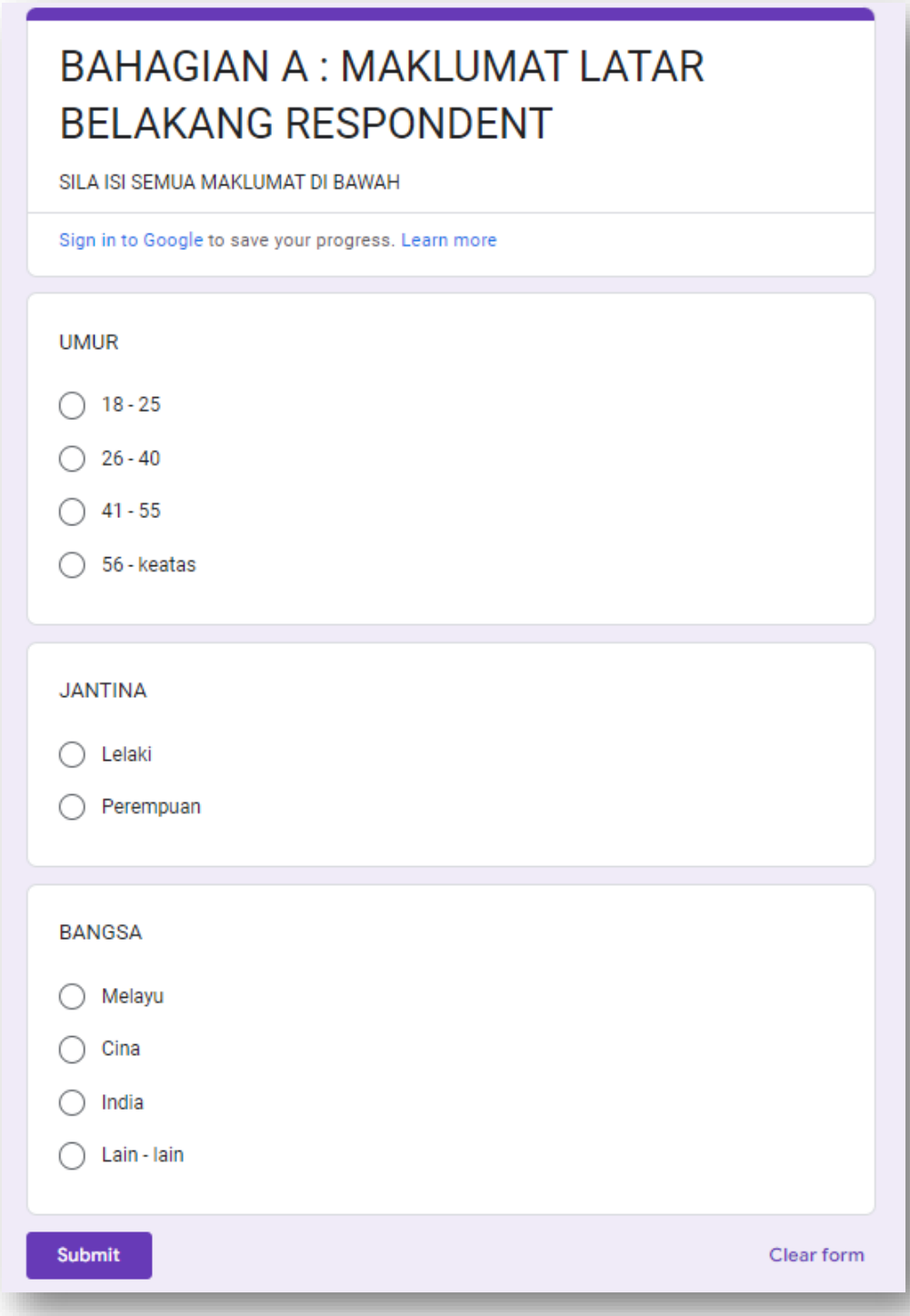
- Part A – Questions regarding the respondent's background.
- Part B – Questions regarding the driver's attitude.
- Part C – Questions regarding road conditions.
- Part D – Questions regarding the condition of the vehicle.

2. Fill in the answer field that has been prepared. You are required to answer honestly and sincerely.

3. All information is obtained only for this study only.

4. All your personal information is confidential.

SECTION A



BAHAGIAN A : MAKLUMAT LATAR BELAKANG RESPONDENT

SILA ISI SEMUA MAKLUMAT DI BAWAH

Sign in to Google to save your progress. Learn more

UMUR

- 18 - 25
- 26 - 40
- 41 - 55
- 56 - keatas

JANTINA

- Lelaki
- Perempuan

BANGSA

- Melayu
- Cina
- India
- Lain - lain

Submit

Clear form

SECTION B

BAHAGIAN B : SIKAP MEMANDU

SILA ISI SEMUA MAKLUMAT DI BAWAH

Sign in to Google to save your progress. Learn more

ADAKAH PEMANDU MEMOTONG DENGAN CARA YANG BERBAHAYA BERPUNCA KEMALANGAN JALAN RAYA ?

- ◯ Sangat tidak setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

ADAKAH PEMANDU MENUKAR LORONG TANPA MEMBERI LAMPU ISYARAT BERPUNCA KEMALANGAN JALAN RAYA ?

- ◯ Sangat tidak setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

ADAKAH PEMANDU MELANGGAR LAMPU ISYARAT MERAH BERPUNCA KEMALANGAN JALAN RAYA ?

- ◯ Sangat tidak setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

ADAKAH PEMANDU MENGIKUT TERLALU RAPAT DENGAN KENDERAAN LAIN BERPUNCA KEMALANGAN JALAN RAYA ?

- ◯ Sangat tidak setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

ADAKAH PEMANDU MEMANDU DALAM KEADAAN YANG MABUK BERPUNCA KEMALANGAN JALAN RAYA ?

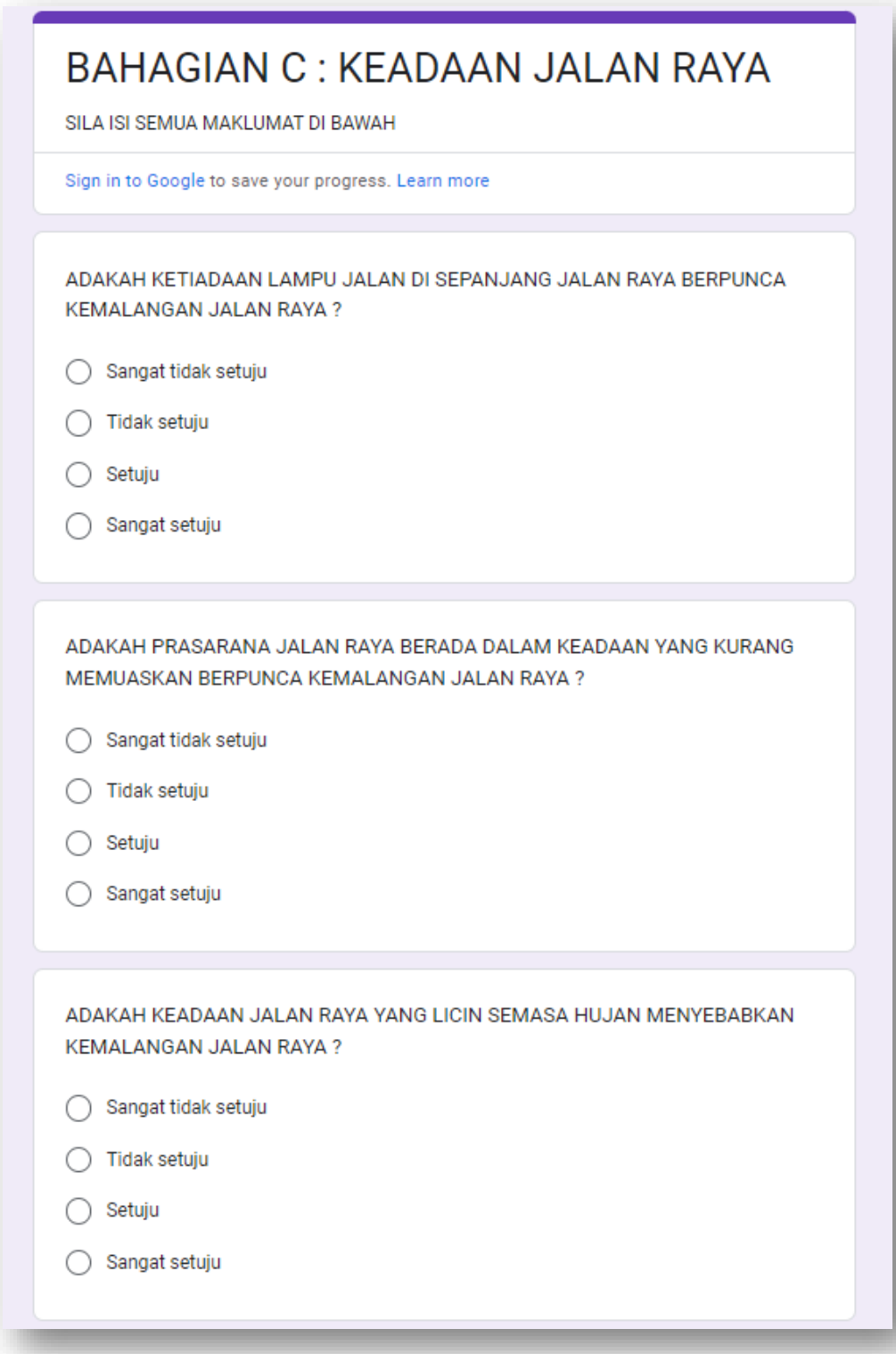
- ◯ Sangat tidak setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

ADAKAH PEMANDU MENGGUNAKAN TELEFON BIMBIIT SEMASA MEMANDU BERPUNCA KEMALANGAN JALAN RAYA ?

- ◯ Sangat tidak setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

Submit Clear form

SECTION C



BAHAGIAN C : KEADAAN JALAN RAYA

SILA ISI SEMUA MAKLUMAT DI BAWAH

Sign in to Google to save your progress. Learn more

ADAKAH KETIADAAN LAMPU JALAN DI SEPANJANG JALAN RAYA BERPUNCA KEMALANGAN JALAN RAYA ?

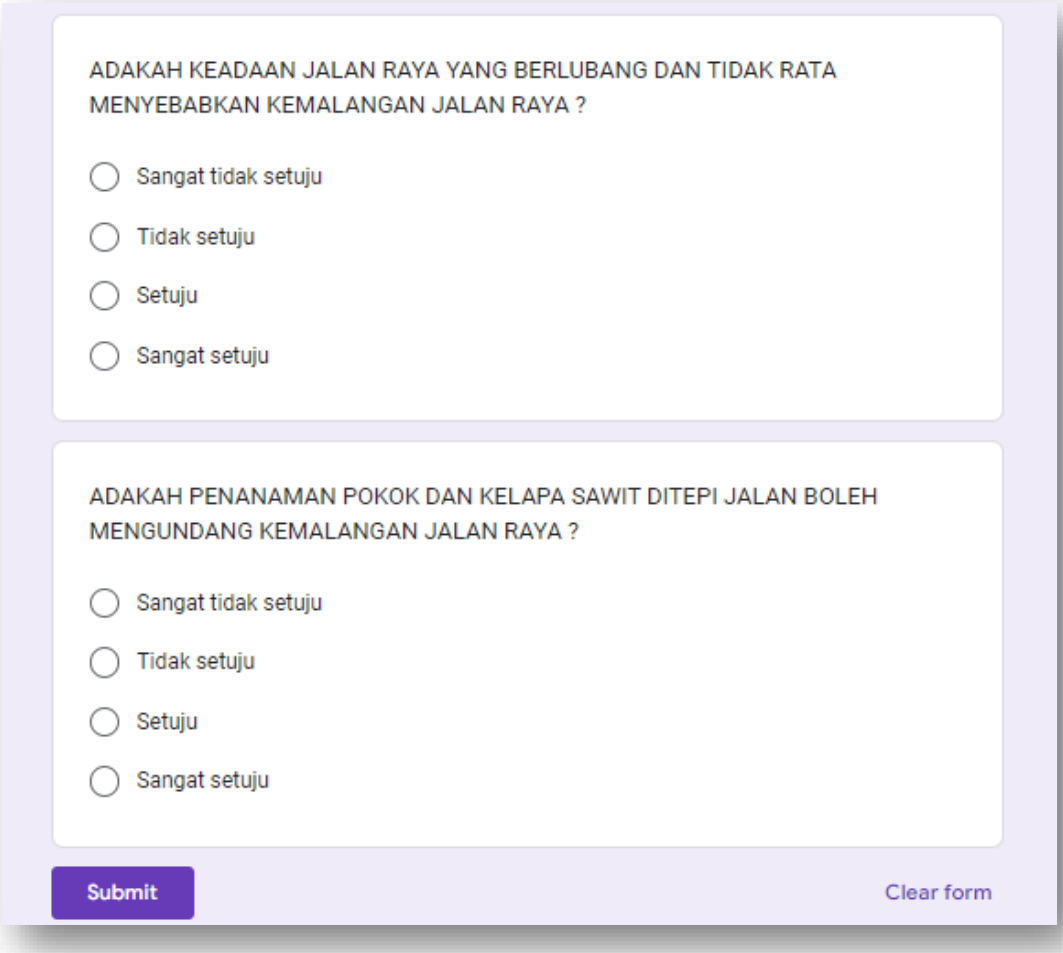
- Sangat tidak setuju
- Tidak setuju
- Setuju
- Sangat setuju

ADAKAH PRASARANA JALAN RAYA BERADA DALAM KEADAAN YANG KURANG MEMUASKAN BERPUNCA KEMALANGAN JALAN RAYA ?

- Sangat tidak setuju
- Tidak setuju
- Setuju
- Sangat setuju

ADAKAH KEADAAN JALAN RAYA YANG LICIN SEMASA HUJAN MENYEBABKAN KEMALANGAN JALAN RAYA ?

- Sangat tidak setuju
- Tidak setuju
- Setuju
- Sangat setuju


ADAKAH KEADAAN JALAN RAYA YANG BERLUBANG DAN TIDAK RATA MENYEBABKAN KEMALANGAN JALAN RAYA ?

- ◯ Sangat tidak setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

ADAKAH PENANAMAN POKOK DAN KELAPA SAWIT DITEPI JALAN BOLEH MENGUNDANG KEMALANGAN JALAN RAYA ?

- ◯ Sangat tidak setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

Submit

Clear form

SECTION D

BAHAGIAN D : KEADAAN KENDERAAN

SILA ISI SEMUA MAKMLUMAT DI BAWAH

Sign in to Google to save your progress. Learn more

ADAKAH KENDERAAN YANG TIDAK DISELENGGARA DENGAN BAIK BERPUNCA KEMALANGAN JALAN RAYA ?

- ◯ Sangat tidak setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

ADAKAH BREK KAKI ATAU TANGAN TIDAK BERFUNGSI DENGAN BAIK BERPUNCA KEMALANGAN JALAN RAYA ?

- ◯ Sangat tidak setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

ADAKAH KENDERAAN BERAT MENYEBABKAN KEROSAKAN JALAN RAYA?

- ◯ Sangat tidak setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

ADAKAH LAMPU BREK TIDAK BERFUNGSI DENGAN BAIK MENYEBABKAN KEMALANGAN JALAN RAYA ?

- ◯ Sangat tidak setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

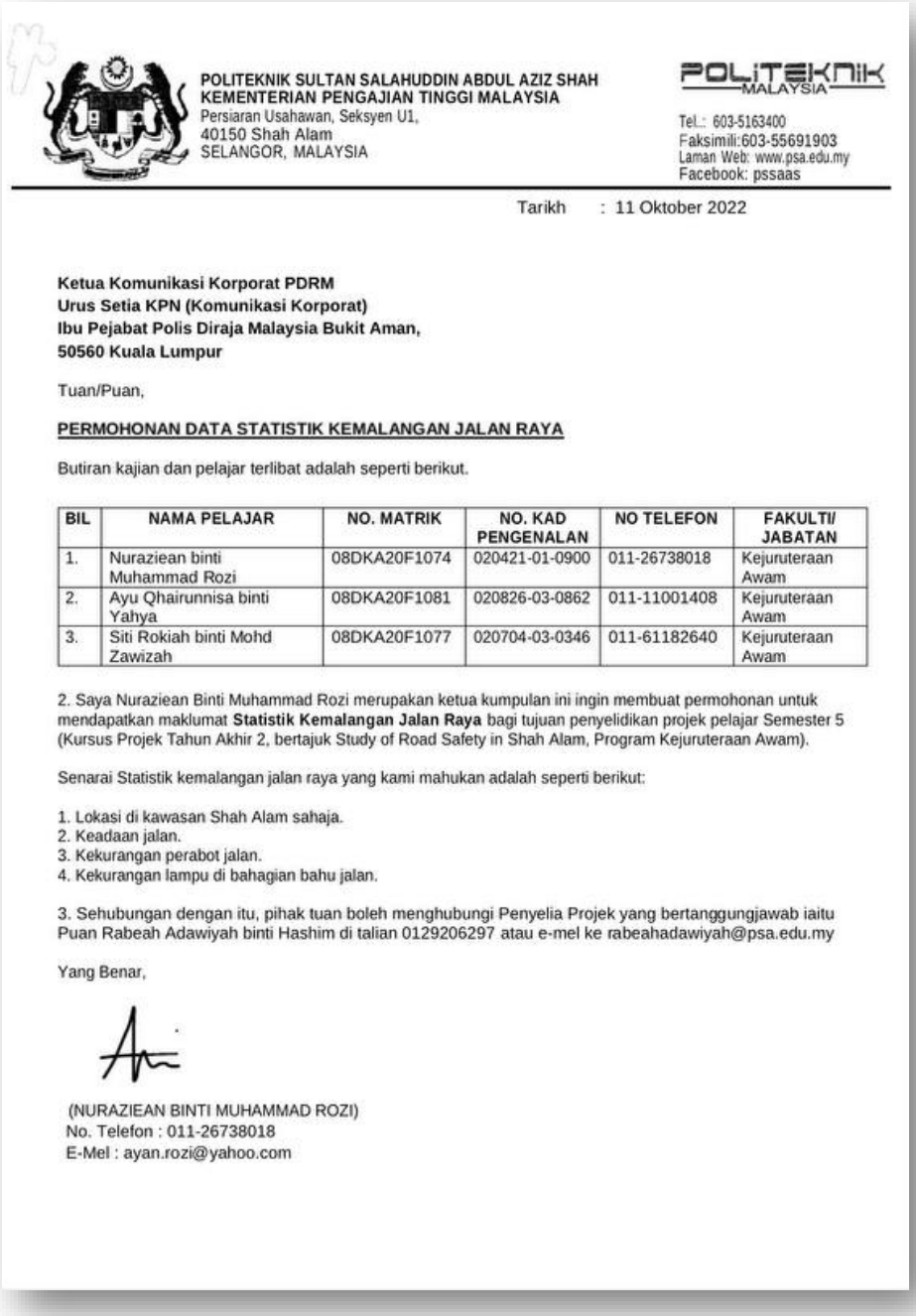
ADAKAH WIPER TIDAK BERFUNGSI DENGAN BAIK KETIKA HUJAN BERPUNCA KEMALANGAN JALAN RAYA ?

- ◯ Sangat tidak setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

Submit Clear form

APPENDIX C: PERMISSION LETTER OF RESEARCH

(Jabatan Pengangkutan Jalan)



POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH
KEMENTERIAN PENGAJIAN TINGGI MALAYSIA
Persiaran Usahawan, Seksyen U1,
40150 Shah Alam
SELANGOR, MALAYSIA

POLITEKNIK MALAYSIA

Tel.: 603-5163400
Faksimili:603-55691903
Laman Web: www.psa.edu.my
Facebook: pssaas

Tarikh : 11 Oktober 2022

Ketua Komunikasi Korporat PDRM
Urus Setia KPN (Komunikasi Korporat)
Ibu Pejabat Polis Diraja Malaysia Bukit Aman,
50560 Kuala Lumpur

Tuan/Puan,

PERMOHONAN DATA STATISTIK KEMALANGAN JALAN RAYA

Butiran kajian dan pelajar terlibat adalah seperti berikut.

BIL	NAMA PELAJAR	NO. MATRIK	NO. KAD PENGENALAN	NO TELEFON	FAKULTI/ JABATAN
1.	Nuraziean binti Muhammad Rozi	08DKA20F1074	020421-01-0900	011-26738018	Kejuruteraan Awam
2.	Ayu Qhairunnisa binti Yahya	08DKA20F1081	020826-03-0862	011-11001408	Kejuruteraan Awam
3.	Siti Rokiah binti Mohd Zawizah	08DKA20F1077	020704-03-0346	011-61182640	Kejuruteraan Awam

2. Saya Nuraziean Binti Muhammad Rozi merupakan ketua kumpulan ini ingin membuat permohonan untuk mendapatkan maklumat **Statistik Kemalangan Jalan Raya** bagi tujuan penyelidikan projek pelajar Semester 5 (Kursus Projek Tahun Akhir 2, bertajuk Study of Road Safety in Shah Alam, Program Kejuruteraan Awam).

Senarai Statistik kemalangan jalan raya yang kami mahukan adalah seperti berikut:

1. Lokasi di kawasan Shah Alam sahaja.
2. Keadaan jalan.
3. Kekurangan perabot jalan.
4. Kekurangan lampu di bahagian bahu jalan.

3. Sehubungan dengan itu, pihak tuan boleh menghubungi Penyelia Projek yang bertanggungjawab iaitu Puan Rabeah Adawiyah binti Hashim di talian 0129206297 atau e-mel ke rabeahadawiyah@psa.edu.my

Yang Benar,

(NURAZIEAN BINTI MUHAMMAD ROZI)
No. Telefon : 011-26738018
E-Mel : ayan.rozi@yahoo.com

(Ibupejabat Daerah Bukit Aman)

POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH
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Facebook: pssaas

Ruj. Kami : PSA.700-1/7/1(73)
Tarikh : 3 Oktober 2022

Kepada sesiapa yang berkenaan,

Tuan,

KEBENARAN MENGUMPUL MAKLUMAT KAJIAN BAGI PELAJAR JABATAN KEJURUTERAAN AWAM POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

Dengan segala hormatnya, perkara di atas adalah dirujuk.

2. Adalah dimaklumkan bahawa pelajar jabatan ini perlu mengumpulkan maklumat kajian untuk memenuhi keperluan kursus yang sedang diikuti yang merupakan salah satu syarat penganugerahan diploma.

3. Butiran kajian dan pelajar terlibat adalah seperti di lampiran.

4. Sehubungan dengan itu, kerjasama dari pihak tuan amatlah diharapkan untuk membenarkan pelajar tersebut mendapatkan maklumat kajian yang berkaitan. Sekiranya terdapat sebarang pertanyaan, tuan bolehlah menghubungi pegawai seperti di lampiran.

5. Segala kerjasama dari pihak tuan amatlah dihargai dan didahului dengan ucapan ribuan terima kasih.

Sekian.

"**BERKHIDMAT UNTUK NEGARA**"

Saya yang menjalankan amanah,

(DR. HJ MOHD ZAHARI BIN ISMAIL)
Pengarah,
Politeknik Sultan Salahuddin Abdul Aziz Shah.

LAMPIRAN

Ibu Pejabat,
Jabatan Pengangkutan Jalan Malaysia,
Kementerian Pengangkutan Malaysia,
Aras 5, No. 56, Jalan Tun Hussein, Presint 4,
Pusat Pentadbiran Kerajaan Persekutuan,
62100 Putrajaya.

Butiran kajian dan pelajar terlibat adalah seperti berikut.

Kursus & Kod Kursus : DCC50194 Final Year Project 2
Tajuk kajian: The Study of Road Safety in Shah Alam, Selangor

BIL	NAMA PELAJAR	NO PENDAFTARAN	NO TELEFON
1.	Nuraziean binti Muhammad Rozi	08DKA20F1074	011 - 17715105
2.	Siti Rokiah binti Mohd Zawizah	08DKA20F1077	011 - 61182640
3.	Ayu Qhairunnisa binti Yahya	08DKA20F1081	011 - 11001408

Sekiranya terdapat sebarang pertanyaan, tuan bolehlah menghubungi penyelia projek iaitu Puan Rabeah Adawiyah binti Hashim di talian 012 - 9206297