POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

THE STUDY OF ROAD SAFETY IN KUALA BHARU, SELANGOR

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(08DKA20F1077)

JABATAN KEJURUTERAAN AWAM

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Laporan ini dikemukakan kepada Jabatan Kejuruteraan Awam sebagai memenuhi sebahagian syarat penganugerahan Diploma Kejurutera Awam

JABATAN KEJURUTERAAN AWAM

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

1. Saya, **SITI ROKIAH BINTI MOHD ZAWIZAH (020704-03-0346))** adalah pelajar **Diploma Kejuruteraan Awam, Politeknik Sultan Salahuddin Abdul Aziz Shah**, yang beralamat di **Persiaran Usahawan, Seksyen U1 40150 Shah Alam Selangor.**

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ABSTRAK

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.

Keywords : *Road safety, Road accidents, Road furniture.*

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LIST OF ABBREVIATIONS

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

CHAPTER 1

INTRODUCTION

1.1 Introduction

One of the most pressing societal issues in Malaysia is traffic accidents. Accidents are comparatively uncommon and unpredictable, and often, it is impossible to observe them directly. The number of traffic accidents has grown over time in a developing nation. This might be brought on by an increase in car occupancy over time, or, more specifically, by the fact that some sorts of accidents are substantially more frequent today than they were ten years ago. In many developing nations, the growth of urbanisation and the number of automobiles has resulted in a rise in traffic accidents on road networks that were never built to handle the volume and variety of traffic that they must now handle.

The Malaysian government has historically viewed road safety as one of its social duties. Since the nation's independence, a variety of groups dedicated to promoting road safety have been established within government institutions, nonprofits, and the business sector. However, after a Karak Highway tragedy in 1990, concern for traffic safety became increasingly apparent. After the collision, the government established the Cabinet Committee on Road Safety, whose chairman was the prime minister. The group set a goal to reduce mortality by 30% by the end of the year. A comprehensive National Road Safety Plan was created in 1991, paying particular emphasis to safety research programmes, traffic user behaviour change, road engineering and vehicle safety, medical care, and safety administration.

According to their purpose or governing bodies, Malaysian roads can be divided into categories. Roads can be categorised as primary, secondary, or minor roads based on their functions. Roads can be categorised as Tolled Expressway and

1

Highway, Federal, State, or Municipal roads according to jurisdiction. Roads may also be divided into rural and urban areas. Roads that are five kilometres or more from the municipal borders are considered rural roads. If not, it is defined as all roadways inside the Municipality gazette limits or in a township with a population of at least 10,000.
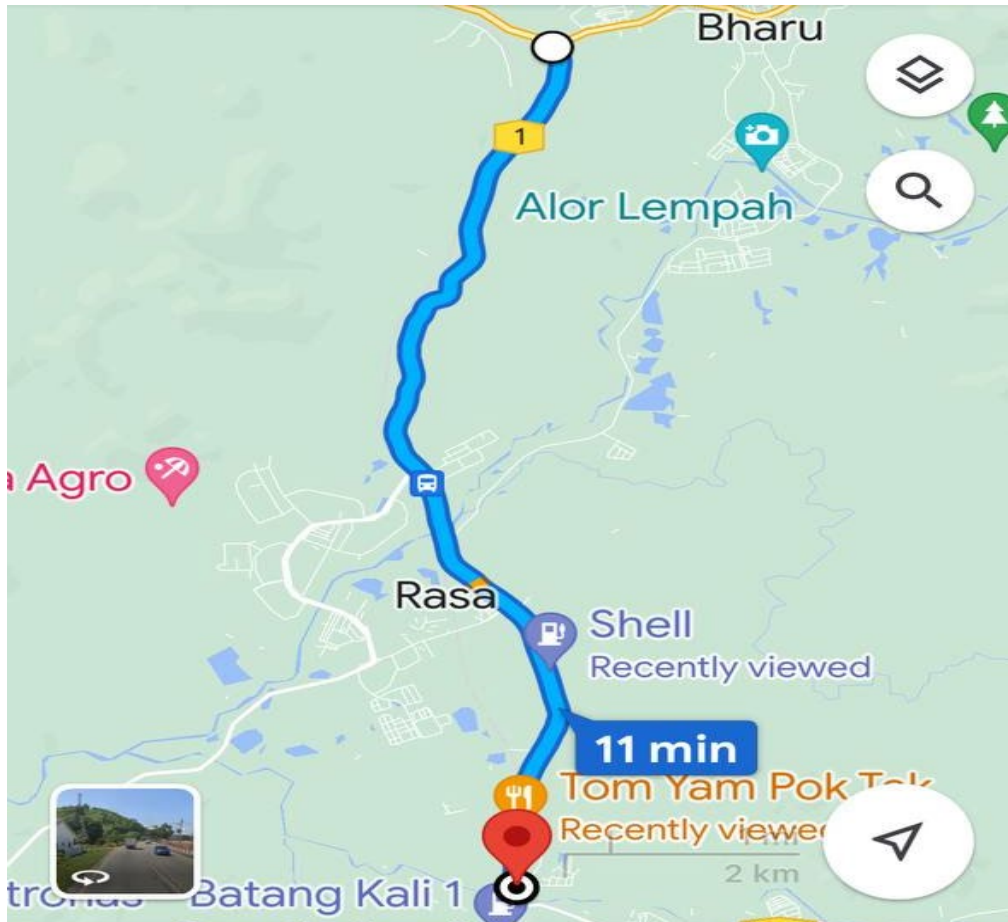

Figure 1.1: The way Kuala Kubu Bharu from KM50 to KM 59

1.2 Problem Statement

The Malaysian government has long been seen as having a social responsibility to promote road safety. Since the nation gained independence, a variety of organisations focused on road safety have been established inside government departments, business sector organisations, and voluntary organisations. By the year 2000, the group aimed to reduce mortality by 30%. (Federal Highway Administration). Malaysia is positioned about in the middle of developed and developing countries, according to a comparison of its statistics with those of numerous other developed and developing nations (Transport Research Laboratory, 1995). Malaysia's accident fatality rate is still a cause for concern, however, as it is far higher per 10,000 vehicles than in the rest of the developed world. The route from Jalan Kuala Lumpur to Ipoh has been selected.

Road users, cars, and the environment can all play a role in causing traffic accidents. Accidents occasionally occur as a result of one of these causes or a combination of these causes. One of the main causes of traffic accidents is the behaviour of other road users. These elements include poor driving skills, carelessness, negligence, and impatience. Consumer variables account for 95% of road accidents, according to Sabey and Staughton [1], whereas user-related factors, such as the environment and the roads, contribute for 25% of road accidents. Winding roads, broken and potholed roads, inadequate design and road geometry, a lack of signboards, crossing intersections, and dim street lights at crossroads at night are examples of environments that are unsuitable for users.

The type of roadside barriers that frequently cause automobile collisions were also the subject of this study. Road furniture is one feature that might improve the safety of both pedestrians and vehicles in an area, whether it is urban or country. This improves the route's aesthetics and security (Rasool, 2016). Signs, street lights, road humps, AES cameras, road pegs, and delineator posts are a few examples of the several sorts of road furniture that require special attention.

Therefore, before any suggestions for improvement works can be made, this study must be conducted to assess the level of road safety on this particular stretch of road.

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 to what extent do road users' attitudes about them and the causes of accidents on the road relate? The study looks at the characteristics of drivers who are likely to be in a crash, taking into account things like time constraints, a desire for driving satisfaction, a desire to appreciate challenges, and driving attitudes. When figuring out what causes traffic accidents, other aspects like the car and the road are taken into consideration. Lowering the amount of automobile accidents on the road is the goal of these requirements. It is hoped that this study's findings would shed light on important data and information on consumer perceptions and the factors that contribute to traffic accidents.

This case study was conducted along the 10-kilometer Jalan Kuala Lumpur–Ipoh route. The Jalan Kuala Lumpur to Ipoh route offers a range of geographical features and traffic flow systems that reflect many different lives and cultures, including driving experience, driving style, road environment, and road conditions. This makes it possible to make comparisons and gain a better knowledge of the attitudes and elements affecting road safety in the study area. With this knowledge, comparisons may be made and a greater understanding of the attitudes and elements influencing road safety in the study area can be attained.

The purpose of this investigation is to pinpoint the root causes of accidents along Jalan Kuala Lumpur to Ipoh in Kuala Kubu Bahru. This study focuses on safety warnings for motorists when they are on the road. Accidents also result from a lack of traffic safety signage. The fundamental duty of drivers on the road is to prevent accidents, whether they involve humans or animals. The study's scope includes speaking with respondents from organisations like Jalan Pengangkutan Jalan (JPJ) via appointment, and the information will be analysed using the content analysis approach on a scheduled basis.

1.5 Importance of Study

The purpose of this study is to raise awareness among all stakeholders concerned in creating a reliable and safe environment for both normal road users and users of the trunk route. When a traffic accident happens, people in our society often blame the drivers or other road users, even though the negligence of the driver may actually have been caused by other causes that diverted the driver's attention.

The Public Works Department (JKR) of the Ministry of Works Malaysia and the Local Authority may find this research to be helpful in reducing the issue in the road design and construction. This research will enable for an explicit study on the accident rates on the trunk road

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Engineering requires a strong emphasis on safety. Driving abilities, road characteristics, weather, and road conditions are just a few of the variables that affect traffic safety. The road collision is one of the most important contributing factors among all of them.

One mechanism In connected sectors, such as journals, articles, books, and newspaper research, investigations on road safety have been conducted and are based on accurate theories. The idea of road safety, including its development, is discussed in this chapter. The background material on this idea, as well as any implementation tactics employed for an existing roadway that focus on a particular feature of the road, are provided in this section.

Road safety, the environment, areas that are more likely to have accidents, people who are involved in accidents, and other aspects of roads are all discussed in the literature.

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.

Figure 2.4: The signboard show the accident prone area

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.

Figure 2.5: Accident Involmentn will can many injury and loss the life

2.6 Road Accident

In Malaysia, one of the leading causes of fatalities and injuries is traffic accidents. A total of 265,175 traffic accidents occurred in 2001, resulting in 5230 fatalities, 6942 serious injuries, and 30,684 minor injuries. It is surprising to learn that every year, more people die in car accidents in other developing nations than from war and illness combined. Over four million people are hurt and 400,000 people die on Asian roads alone each year. Nearly a million people are murdered, three million are seriously crippled for life, and thirty million are wounded in road traffic accidents each year, according to the WHO.

Figure 2.6: Severe accidents results in high mortality

2.7 Human Factor

Road traffic crasher (RTC) are responsible for the majority of morbidity and mortality and are responsible for more years of life lost than most human diseases. In this review, we have attempted to describe the behavioral factors that collectively represent causes of most of the remainder. Although significant differences are not always possible, classification of behavioral factors is necessary and feasible. Therefore, behavioral factors can be distinguished as;

i.   Driving while drowsy, tired, drunk, a distraction that is extremely dangerous to other drivers and their own lives.

ii.   Driving in dangerous conditions such as taking risks by driving fast vehicles, habitually ignoring traffic rules, reckless driving behavior, not using seat belts or helmets and careless driving with these conditions will be prone to accidents.

Figure 2.7 : Careless driving will endanger other drivers

2.8   Questionnaire

A questionnaire is a research tool made up of a list of questions used to elicit information from respondents. One may consider questionnaires to be a form of written interview. It is a rapid and effective approach to collect a lot of information from a big sample of individuals and can be done in person, over the phone, online, by computer, or by mail. Due of the researcher's absence when the questionnaires are filled out, data may be gathered very rapidly. When interviews are not feasible for huge populations, this is helpful. The issue with questionnaires is that respondents could mislead since it would be socially acceptable to do so. 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.

When compared to other techniques, questionnaires are a rapid and inexpensive way to measure the intents, preferences, and intentions of a sizable number of individuals. Between closed and open-ended inquiries, there is a crucial difference. To gather information, surveys frequently include both open-ended and closed-ended questions. Because of this, it is possible to get both quantitative and qualitative data, which is advantageous.

According on the type of questions asked, questionnaires can be categorised as either quantitative or qualitative methods. Particularly, answers collected through closed-ended questions with multiple choice answer alternatives are analysed using quantitative approaches, which may entail pie charts, bar charts, and percentages. Open-ended questionnaire responses are analysed using qualitative approaches, which don't employ math or statistics but instead focus on dialogues and critical analysis. Include 25–40 questions in questionnaires for a typical 15,000–20,000 word business dissertation; this should be adequate. In addition to being given in a logical order, questions must be phrased in a clear, plain manner.

The benefits of questionnaires include faster data gathering, cheap or no expense requirements, and more objectivity as compared to many other primary data collection alternatives. But surveys do have certain drawbacks, such the tendency for respondents to choose randomly from the available options without carefully reading the question. As a result of the lack of a pertinent inquiry, responders frequently are unable to offer any more opinions on the subject.

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 several options for how the questionnaire is presented to the responder offer a number of ways to collect data from all angles. Given that there is no cap on the amount of information it may gather, it is not restricted to one approach. The primary and most practical method for gathering data is the questionnaire. Based on the scope, the

selection criteria for the questionnaire must be very trustworthy and valid. To acquire better data collection, the fundamental rules and procedure for creating a questionnaire must be followed.

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.

There have been several improvements to the Google Forms service throughout time. In addition to menu search, question shuffle for randomised order, limiting responses to one per person, shorter URLs, custom themes, automatically generating answer suggestions when creating forms, and a "Upload file" option for users answering questions that ask them to share content or files from their computer or Google Drive, features offered by this form builder also include menu search.

When Google upgraded Forms in July 2017, numerous new capabilities were added. In October 2014, Google enabled add-ons for Google Forms, allowing surveys to be enhanced by outside developers. To determine what is entered in form fields and prompt the user to amend any incorrect information, "intelligent response validation" is capable of recognising text input. Users may request file uploads from people other than those who provided several choices in a table, depending on the file-sharing preferences they have established in Google Drive. Users may adjust the settings for all new forms, such as always collecting email addresses, by going to the settings page. Google Forms includes all of the sharing and collaboration tools 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.

In order to calibrate and validate the simulation model, field data on traffic flow characteristics are gathered. The validated simulation model is then used to produce

PCU values for various vehicle kinds, and these results show that the model is capable of accurately simulating the heterogeneous traffic flow on mid-block parts of intercity roadways under various road conditions.

3.2 SUMMARY

From the extensive review of the literatures, in order to decrease road accidents among drivers of cars, this study aims to investigate the relationship between driving personality characteristics, driving rage, and hazardous driving in addition to aggressive driving. It is advised that a motorist who demonstrates good driving habits will drive less aggressively, which will decrease their risk of getting into a car accident. For a deeper understanding, it is therefore necessary to explore this proposed framework. A study initiative being run by the first author in Malaysia will put the suggested framework to the test. The outcome of this specific study is anticipated to contribute to a deeper knowledge of factors that increase the likelihood of traffic accidents and help in the creation of efficient road safety interventions.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The goal of road safety is to spot dangers or safety flaws in traffic signs, roadside equipment, or accidents. The office review, the field review, and the final report are the three stages of the road safety evaluation process.

The office assessment generally consists of a thorough site description and a thorough investigation of the crash data. The field evaluation entails a road survey, carried out with the use of suggested manuals and given checklists, as well as the gathering and analysis of accident data. The outcomes of both the office review and the field review are included in the final report. The report should be brief and to the point, clearly identifying the issues and offering suggestions.
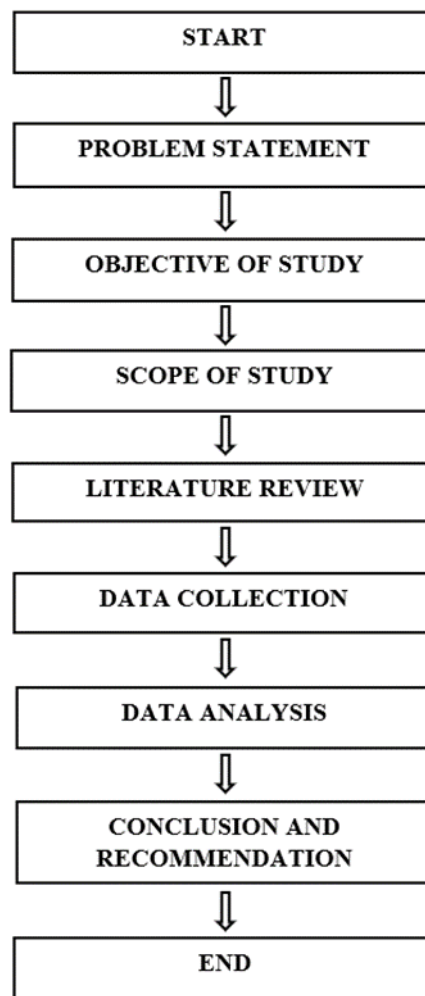
Road safety regulations are applicable to all types of current roads and to all phases of their construction. The method used in this article, however, is focused on small country roads found in urban and suburban settings.

A group of individuals with experience and current knowledge in engineering for road safety, crash investigation and prevention, and linked with an understanding of road management, such as Malaysia Public Works Department, Police Station, and others, should take on the responsibility of ensuring that roads are safe. When appropriate, the team should include representatives from other disciplines, such as road user behaviour, enforcement, and maintenance (Austroads, 2002).

3.2 Methodology of Study

For this study, a variety of methodologies were employed depending on the goals and parameters of the investigation. A flow chart is used during the research process. The flowcharts outline the researcher's progress as they carry out the research. There are nine steps in it. Figure 3.1 displays a flowchart of the process.

Figure 3.1: Flow Chart in Methodology of Study

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┌─────────────────────────────┐
│           START             │
└─────────────────────────────┘
              ⇓
┌─────────────────────────────┐
│      PROBLEM STATEMENT       │
└─────────────────────────────┘
              ⇓
┌─────────────────────────────┐
│      OBJECTIVE OF STUDY      │
└─────────────────────────────┘
              ⇓
┌─────────────────────────────┐
│        SCOPE OF STUDY        │
└─────────────────────────────┘
              ⇓
┌─────────────────────────────┐
│      LITERATURE REVIEW       │
└─────────────────────────────┘
              ⇓
┌─────────────────────────────┐
│       DATA COLLECTION        │
└─────────────────────────────┘
              ⇓
┌─────────────────────────────┐
│        DATA ANALYSIS         │
└─────────────────────────────┘
              ⇓
┌─────────────────────────────┐
│      CONCLUSION AND          │
│      RECOMMENDATION          │
└─────────────────────────────┘
              ⇓
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│            END               │
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```

3.2.1 Data Collection

Data will be gathered for this study, of course. The data starts with information on mishaps that have happened in the research region. The information, which may be obtained from the Bukit Aman Head Office and the Public Transport Department (JPJ), is referred to as secondary data (IPD Bukit Aman). This information must be gathered in order to identify the key components that contribute to highway accidents.

Second, the data relates to damage to the road's pavement. This information will display the ongoing upkeep of the roads as well as the permanent ones. The information is used to determine if upgrading the highway's road conditions is necessary.

Third, the data relates to a study of traffic volume. The manual method of calculation with direct counting and the recording of the given sheet data that is helpful in recording categorised cars are shown in this data.

Lastly, information on road users is obtained by asking them in interviews and surveys how safe the roads are.

3.2.2 Data Analysis

Both qualitative and descriptive statistics were used as the approaches for data analysis. As a result, the structured data were interpreted using descriptive techniques in the form of tables, charts, and graphs using statistical quality control tools to the trends and the circumstances of the road accidents on the road on the research approaches. Accident density and accident rate are to be assessed in order to identify dangerous places along the route from Jalan Kuala Lumpur to Ipoh. Google Form will be used to calculate the survey results.

The data from PDRM, which pertain to the damage to the road pavement, will be used as the basis for the study of the following data. By relating the data links, these two data will be analysed. The information will be examined to determine if the major cause of the accident on that roadway was damage to the road pavement.

If accident data indicates that many collisions occur as a result of damaged road pavement, then the physical state of the road will be the primary factor that can result in an accident on the highway. However, if the statistics indicated that the accident that had occurred on that route was not caused by the deterioration of the road's surface, then there would have been another reason for the incident.

Google Form software will be used for the data analysis for this project in order to examine the survey data. A software programme designed specifically to compute data from various angles is Google Form. Following the completion of the data calculation, the analysis may be performed.

The information collected from in-person interviews was analysed using content analysis. a study design where the data collected is divided into themes and subthemes to allow for comparison. The fact that content analysis aids in the reduction and simplification of data while also providing findings that can later be quantified is one of its key benefits. The capacity to organise qualitative data in a way that meets the achievement of study objectives is another benefit of content analysis for researchers. However, since there is a chance that researchers would misunderstand the data collected and come to erroneous and inaccurate conclusions, human error plays a significant role in content analysis.

3.3 SUMMARY

In conclusion, it should be noted how crucial it is for drivers to remain cautious, especially on highways where numerous vehicles are present. The rules governing road illumination are no longer followed. Numerous reports concerning the road lights have

already been made based on the article. In order for the motorist to use the roadway safely, the responsible party must take action. And maybe the planned intervention will help to lower the number of accidents on that roadway.

CHAPTER 4

RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

The outcomes of the data gathering that has been carried out are discussed in this chapter. This information was gathered through the distribution of surveys and interviews with drivers that travel along the Jalan Kuala Lumpur to Ipoh in Kuala Kubu Bharu. To accomplish the goals of the study, the data collected will be analysed.

Accident data, also known as secondary data, provided by the Road Transport Department constitutes the initial set of information gathered. For two years, accident information is gathered (2020 - 2021).

Finally, a 4-part questionnaire prepared in Malay was created. Three questions are included in Part A to probe the respondent's history. The next seven questions in Part B inquire as to whether the driver's attitude contributed to the collision. The next six questions in Section C are regarding the state of the roads. Six questions in Part D also pertain to the vehicle's condition that was the cause of the accident.

The same analysis also refers to analysing the received raw data and presenting it in a readily understood format before drawing conclusions and making suggestions from it. Other users who wish to know and learn more about the scientific research that have been included in the questionnaire can only understand the final findings and results from the description.

This chapter analyses and presents the information gleaned from the questionnaire replies. The choices made are entirely dependent on how the data processing findings

from the survey replies were interpreted. From the disseminated survey, 80 respondents in total provided input. This indicates that all respondents answered the survey cooperatively. To aid in the study, the data is also average-analyzed.

4.2 Secondary Data (JABATAN PENGANGKUTAN JALAN- JPJ)

Table 4.2: 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 4.3: Type of Road Safety Audit

Type of road	Pictures	Observation
Pavement Marking	Figure 4.3.1: The yellow square is faded	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	Pictures	Observation
Pavement marking	Figure 4.3.2 : The zebra crossing is faded	- The colour on the zebra crossing faded.
Road Barriers	Figure 4.3.3 : No road barier on the road	- 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	Pictures	Observation
Road barrier	 Figure 4.3.4 : No road barrier on the road	- No road barriers along the way.
Traffic Signal	 Figure 4.3.5 : The Traffic Light is broken	- 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.

Type of road	Pictures	Observation
Traffic signal	 Figure 4.3.6 : The Traffic Light not function	- The traffic light not function and broken.
Traffic signal	 Figure 4.3.7 : Traffic Light is broken	- The traffic light not function and broken.

Type of road	Pictures	Observation
Street Lighting	Figure 4.3.8 : No street Light on the road	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.
Street Lighting	Figure 4.3.8 : Don't have street lighting on the road	No street lights all the way.
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

	Figure 4.3.9 : Do't have traffic sign on the road	design considerations on traffic signs are colours, lettering and borders, symbols, post and mounting and material used.
Road Damage	Figure 4.3.10 : 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 specific standard JKR

4.4 The Traffic Volume Study

I) Location: Traffic Light Kuala Kubu Bharu

Date: 15/10/2022 (Saturday)

Phase: Peak Hours

Table 4.4.1: 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 4.4.2: 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 4.4.1 and table 4.4.2 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.
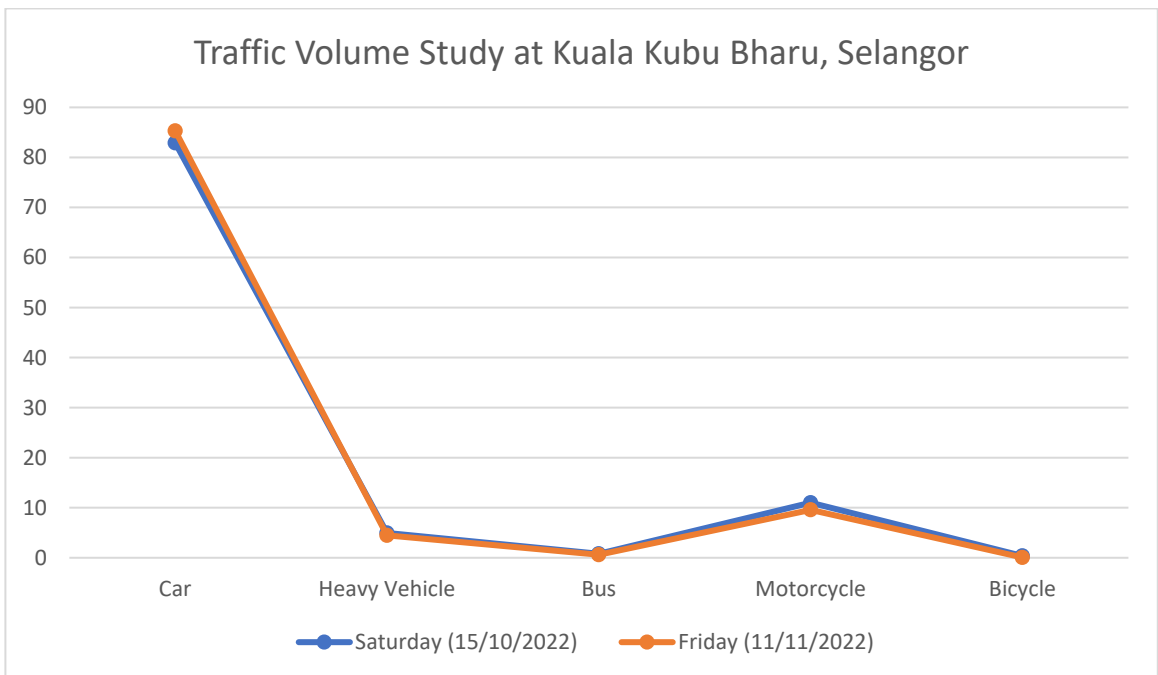
Figure 4.4.3: The graph show the total vechicle 2 days of Friday and Saturday

Table 4.4.4: 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 4.5.1: 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 4.5.1 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 4.5.1 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 4.5.2: 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 4.5.3: 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

43

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 4.5.4: 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, road safety audit are one of the proactive strategies that have been proven effective to improve road safety, RSA is used to identify the level of road safety and existing junctions. Along the way, we checked 4 times to see the condition of the road such as on the road and on the shoulder of the road. This data is collected to find out more about road conditions whether they are the cause of road accidents.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Applying these evaluations in safety analysis could be crucial in lowering the accident frequency rate and preventing the growth in the number of fatalities and injuries on rural roads, given that roadway and development factors are known as the most effective parameters contributing to road traffic accidents on roads. In order to create a rural road safety risk index, this study investigated the relationship between the frequency of accidents and the quality of road safety. The key findings of the study and the assessment of the rural accident risk index among roadways are identified, along with clustering and risk assessments, based on the data that was acquired and the conclusions of the analysis.

Additionally, this study makes an effort to add to the body of information on road safety in order to support objective 2. It is intended that this would encourage and enable improved collaboration, creativity, and dedication to reducing traffic accidents all across the world. Road traffic accidents can be prevented because they are predictable. But to address the issue, there must be strong coordination and collaboration across several sectors and disciplines, along with a comprehensive and integrated strategy.

Furthermore, despite the fact that there are several interventions that can save lives and limbs, political will and dedication are crucial, and nothing can be accomplished without them. Acting is best done right away. Every road user deserves improved and safer driving conditions. The obligation for road illumination is no longer followed. Numerous individuals have already reported on the road lights based on the post. Therefore, the responsible party must take steps to make driving on the roadway safer.

In a nutshell, road safety management aims to maintain and enhance the current level of safety of a road network by lowering collision rates and supplying a secure driving environment for its users to support the network's continuous safe and efficient usage.

It relates to the administration, planning, and organisation of the authorities in charge of reducing traffic accidents and fatalities.

5.2 Recommendation

The Kuala Kubu Bharu route is the focus of this study, one of several methods for assessing the degree of road safety. Everyone present may be influenced to maintain a safe environment around the road traffic, avoiding any fatalities that may occur on the road. It is important to take carefully each and every safety precaution.

In order to supply road furnishings, Jabatan Kerja Raya (JKR) may increase its budget. As a result of the possibility of lowering the danger of traffic accidents, road users must feel secure, especially the elderly. Additionally, for the sake of keeping the road from being damaged, the roadside furniture needs to be in good shape.

Several recommendations from respondents may be made based on research, surveys, and observations made in order to lessen the amount of accidents that occur on the Jalan Kuala Lumpur to Ipoh, Kuala Kubu Bharu route.

i. Damaged roads need to be repaired.

The state of the road along the route that is damaged, whether the road has cracks, potholes caused by heavy cars, or uneven paving, must be maintained, repaired, and repaved since this condition increases the risk of traffic accidents. It is important to cut or reclaim for uneven road conditions in order to make the road condition consistent with the plan.

ii. Increase the number of street lights.

Using the observational approach, we discovered that there are no erected street lights along Jalan Kuala Lumpur to Ipoh between KM50 and KM59. Because users who cross the road at night only rely on car lights, this may potentially increase the likelihood of accidents. The people in charge should pay closer attention to how the road is doing and take the effort to provide extra street lights to the area.

iii. Installation of signage.

Signage should be clearly installed to allow for long-distance reading by cars. Road accidents can be decreased by installing warning signs in locations that are more likely to be engaged in collisions.

iv. Camera mounting (AES)

To deter excessive speeding, AES cameras should be placed along the road. When drivers follow the established restrictions, placing an AES camera has numerous advantages, one of which is a decrease in the frequency of traffic accidents. This is the outcome of government attempts to reduce the number of traffic accidents, which is rising year.

v. The vehicles needs to be maintained

It is important to check that the car is in excellent shape and has not sustained any damage before beginning a lengthy drive. To guarantee that the car is in good enough condition for lengthy excursions or vice versa, it is also vital to consider the distance to be travelled. Furthermore, all of the vehicle's components, including the brakes, engine, and other systems, are in good shape and work correctly.

vi. Road furniture needs to be added

They play a vital role in ensuring traffic flows smoothly and harmoniously along designated routes on urban roadways and crossings. Accidents may result from this since drivers may be cautious while using a route that has delineators and a traffic barrier by the side. The people in charge must pay more attention to the state of the road and take the initiative to place more roadside amenities along the route.

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APPENDIX

EXAMPLE OF QUESTIONNAIRES

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 arrangement 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

Original Research Article

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

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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

What is your favorite pizza topping?

○ Pepperoni
○ Mushrooms
○ Anchovies
○ Sausage
○ Artichoke hearts

Other (please specify)

[   ]

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

GUIDE TO RESPONDENTS

1. There are 4 sections to this questionnaire:

    i.   Part A – Questions regarding the respondent's background.

    ii.   Part B – Questions regarding the driver's attitude.

    iii.   Part C – Questions regarding road conditions.

    iv.   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.

Bahagian A

Arahan: Sila **isi** semua maklumat dibawah.

Bahagian B

Arahan: Sila **isi** semua maklumat di

bawah.

Section 3 of 5

BAGIAN B :
SIKAP PEMANDU

SILA ISI SEMUA MAKLUMAT DI BAWAH

ADAKAH PEMANDU MEMOTONG DENGAN CARA YANG BERBAHAYA 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 MENUKAR LORONG TANPA MEMBERI LAMPU ISYARAT 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 MELANGGAR LAMPU ISYARAT MERAH BERPUNCA KEMALANGAN JALAN RAYA ?

◯ Sangat tidak setuju

◯ Tidak setuju

◯ Setuju

◯ Sangat setuju

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

◯ Sangat tidak setuju

◯ Tidak setuju

◯ Setuju

◯ Sangat setuju

Bahagian C

Arahan: Sila **isi** semua maklumat di bawah

BAHAGIAN C : KEADAAN JALAN RAYA

SILA ISI SEMUA MAKLUMAT DI BAWAH

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

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

ADAKAH KETIADAAN LAMPU JALAN DI SEPANJANG JALAN RAYA BERPUNCA 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 PRASARANA JALAN RAYA BERADA DALAM KEADAAN YANG KURANG MEMUASKAN BERPUNCA KEMALANGAN JALAN RAYA ?

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

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

- ◯ Tidak sangat setuju
- ◯ Tidak setuju
- ◯ Setuju
- ◯ Sangat setuju

Bahagian D

Arahan: Sila **isi** semua maklumat di bawah.

Section 5 of 5

BAHAGIAN D : KEADAAN KENDERAAN

SILA ISI SEMUA MAKLUMAT DI BAWAH

ADAKAH KENDERAAN BERAT MENYEBABKAN KEROSAKAN JALAN RAYA ?

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

ADAKAH KENDERAAN YANG TIDAK DISELENGGARA DENGAN BAIK BERPUNCA KEMALANGAN 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 BREK KAKI ATAU TANGAN TIDAK BERFUNGSI DENGAN BAIK BERPUNCA 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

TERIMA KASIH DI ATAS KERJASAMA ANDA