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Exploring the Factors Influencing Road Accidents in Parit Raja: An in-Depth Research Investigation

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Abstract

Malaysia consistently grapples with a high frequency of traffic accidents that result in significant bodily harm, property damage, and loss of life. Despite the government's implementation of various measures to mitigate road accidents, they persist across the country. Notably, Johor has emerged as one of the top two regions with a high incidence of accidents in Malaysia. Alarmingly, over half of fatal accidents on rural roads involve federal infrastructure, and more than a quarter occur on state highways. This case study focuses on evaluating the road accident statistics in the town of Parit Raja, Johor. The aim of this study is to identify the specific causes behind the road accidents in this locality. The research employed SPSS software for data analysis to generate descriptive statistics related to the respondents' demographic characteristics and investigate the correlation among four factors influencing road accidents. The results of the ANOVA analysis revealed no significant differences (at $p = 0.05$) for a sample size of 50 regarding demographic factors such as Age Category, Gender Category, Marital Status, and Educational Background in their perception of factors influencing road accidents. Additionally, Pearson Correlations analysis indicated a robust statistical correlation ($r > 0.5$, $n = 50$, $p < 0.05$) among Human factors, Road Conditions, Weather Conditions, and Poor Car Maintenance. To address these findings, proposed intervention plans include maintaining damaged roads, installing Automated Enforcement Systems (AES), and implementing awareness programs promoting safe driving practices. These initiatives aim to significantly reduce road accident cases in Parit Raja.

1. Introduction

Malaysia grapples with a persistent and alarming frequency of road accidents, resulting in significant human casualties, physical injuries, and property damage. The issue is particularly pronounced in Johor, which ranked as the second-highest in the country with 49,559 road accidents in 2022, according to official statistics as illustrated in Fig. 1 [1]. Parit Raja, situated in Johor's Batu Pahat District, faces an elevated risk despite its small size, notably along Federal Route 50 (FT 050), labelled the "deadliest road" in Malaysia [2]. The complex problem of road accidents encompasses multiple factors, including human-related issues like distracted driving, speeding, driver fatigue, and violating traffic laws [3, 4]. Road conditions contribute through factors such as a lack of road signs, poorly maintained roads, and insufficient lighting [5-7]. Weather conditions, such as rain or fog, also play a role, along with poor car maintenance issues like tyre blowouts and brake failures [8-11]. Road accidents have profound impacts on drivers, causing physical injuries like fractures, spinal cord injuries, and traumatic brain

injuries, as well as psychological trauma such as PTSD, anxiety, and depression. Additionally, drivers face significant financial burdens, which can be exacerbated by legal repercussions like fines and license suspensions [12]. Families of those involved experience emotional, financial, and psychological strain, with costs ranging from medical bills to lost income and disrupted daily routines [13, 14]. Particularly for low-income households, the aftermath can lead to increased debt and worsened financial stability [15]. These issues, especially prevalent in developing nations, contribute to broader societal challenges and exacerbate socioeconomic inequality [13]. Recognizing road accidents as a critical socioeconomic issue, the study aims to identify contributing factors, assess existing control measures, and propose intervention plans to mitigate the escalating problem.

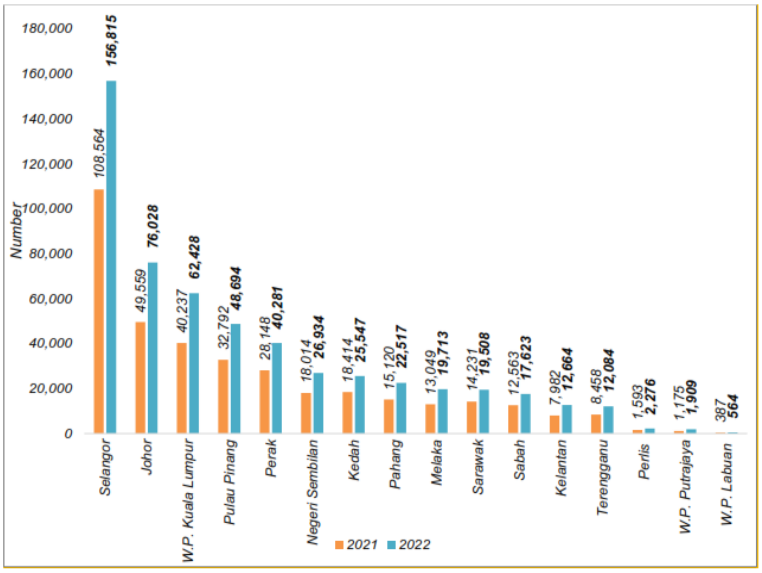


Fig. 1 *Number of Road Accidents by State, 2021-2022 [1]*

2. Methods

2.1 Research Design

The researchers utilise both qualitative and quantitative methods to achieve the objectives. The qualitative approach involves the analysis of non-numerical data to understand social realities, beliefs, and attitudes. This method is suitable for exploring behaviour and perceptions in smaller sample sizes, yielding unquantifiable information. On the other hand, the quantitative method measures variables numerically, employing statistical models to analyse relationships without the need for informant participation. The research flowchart, displayed in Figure 2, follows a structured progression from the problem statement to literature reviews, questionnaire design, and distribution. A pilot study assesses reliability, leading to widespread survey distribution. Data collected is analysed using SPSS, with results interpreted in the results and discussion section. The final step involves proposing intervention plans to fulfil Research Objective 3. Adherence to the research flowchart ensures a systematic and comprehensive research process.

2.2 Operational Framework

The research emphasises the importance of collecting information from various sources, including books, journals, articles, the Internet, interviews, questionnaires, surveys, and case studies. However, the literature review is identified as the most effective method for accessing information relevant to the current study by examining previous research or studies. The data collected from respondents will support the problem statement and aid in understanding the causes of traffic accidents in the research area. Utilising survey questionnaires and interviews, the research aims to uncover the reasons behind the failure or inadequacy of recovery activities and assess the alignment of existing driver-driving practices with the literature review or other implementations explored in the study. These methods serve as the primary sources of information for the research, with the ultimate goal of proposing an intervention strategy to reduce road accidents.

Research Progress in Mechanical and Manufacturing Engineering Vol. 5 No. 1 (2024) p. 469-477

2.3 Questionnaire

The questionnaire is strategically concise and pre-planned, tailored to collect precise information addressing specific research needs. Clarity and precision in language are crucial to ensure respondent understanding, avoiding complexity, generalisations, and double-barreled questions. The questionnaire comprises two sections: Section A collects background data such as age, gender, marital status and educational background, while Section B focuses on identifying factors contributing to road accidents, including human, road condition, weather-related, and inadequate car maintenance factors. Additionally, respondents are encouraged to provide suggestions for Parit Raja roads. The questionnaire involves a mix of multiple-choice and Likert scale questions, ensuring respondent confidentiality and exclusive use for research purposes.

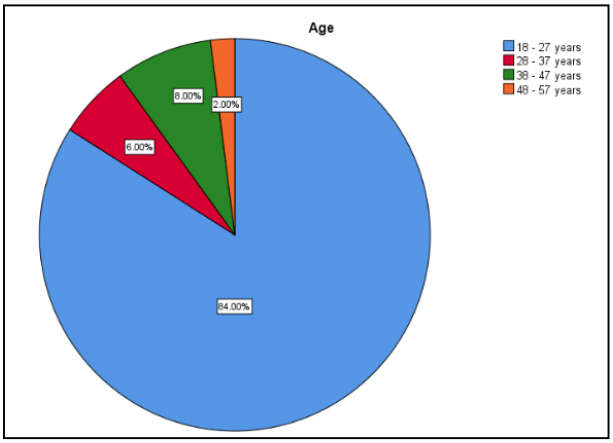
2.4 Data Analysis

Data analysis is a crucial component of any research project, involving the interpretation of collected data through analytical and logical thinking to identify patterns, correlations, or trends. The process includes cleaning data, analysing data, and reporting results. The SPSS software will be utilised in this study to evaluate raw survey data. SPSS, developed in 1968, is widely used in the social sciences for statistical analysis, monitoring, and assessment. It serves as a powerful tool for organising, managing, and visualising data, offering features for descriptive and bivariate statistics, numerical result forecasts, group identification forecasts, data translation, charting, and direct marketing. SPSS covers a range of statistical tests and multivariate analyses, making it a comprehensive tool for researchers.

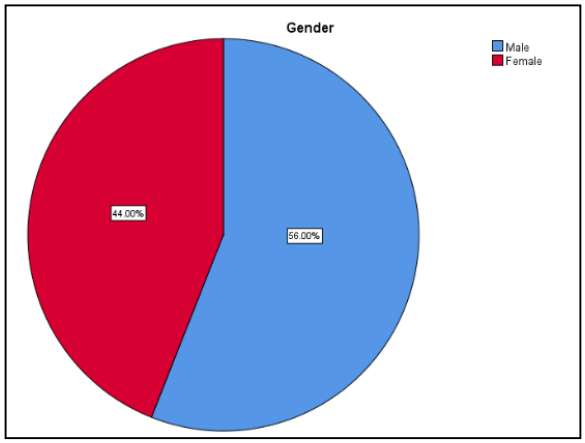
3. Result and Discussion

3.1 Respondent Data

A total of 50 survey questionnaires were collected from road users in Parit Raja to assess their awareness of factors influencing road accidents. The respondents included both residents and non-residents working in the area. The reliability of the data was evaluated using Cronbach's alpha, with a score of 0.815 obtained from the reliability test for the 20 survey questionnaires analysed. A Cronbach's alpha score of 0.70 or above is deemed good, 0.80 or above is considered better, and 0.90 or above is regarded as excellent [16]. Figure 3 illustrates the age distribution of respondents in four groups, with the 18–27 years age group having the highest representation at 84%, the 48–57 years age group the smallest at 2%, the 28–37 years age group at 6%, and the 39–47 years age group at 8%. In terms of gender, male respondents constitute 56%, while females represent 44%. Regarding marital status, 84% are single, and 16% are married. Educational backgrounds vary, with 72% holding degrees, 6% completing high school, 12% obtaining a diploma, 2% having a master's degree, and 8% possessing a PhD. The predominant demographic is single males aged 18 to 27 with a degree.



(a)



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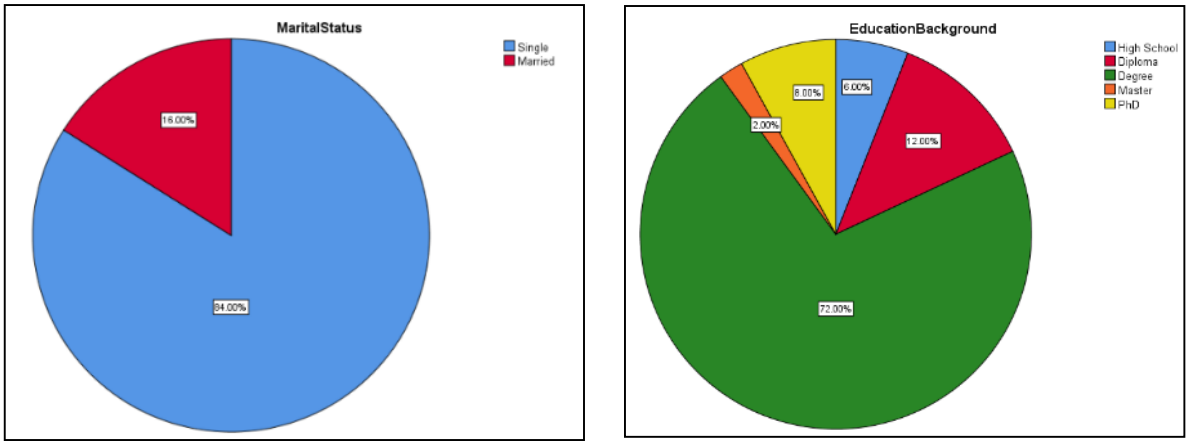

(c) **(d)**

Fig. 3 *Respondent data based on (a) Age categories; (b) Gender categories; (c) Marital status; (d) Educational background*

3.2 One-way ANOVA Test Result

Table 1 reveals a significant outcome with an F-value of 4.269 and a p-value of 0.000 for age categories. As the significance value is less than 0.05, the null hypothesis is unaccepted, indicating a notable difference among respondents' age groups concerning factors influencing road accidents.

Table 1 *ANOVA for Age Categories of Respondents*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	19.947	26	0.767	4.269	0.000
Within Groups	4.133	23	0.180		
Total	24.080	49			

In Table 2, the F-value for gender categories is 1.650, and the significance value is 0.114. As the significance value exceeds 0.05, the null hypothesis is accepted, suggesting that there is no significant difference between respondents' genders concerning factors influencing road accidents.

Table 2 *ANOVA for Gender Categories of Respondents*

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	8.020	26	0.308	1.650	0.114
Within Groups	4.300	23	0.187		
Total	12.320	49			

In Table 3, the F-value for marital status in age categories is 0.752, and the significance value is 0.760. As the significance value is greater than 0.05, the null hypothesis is accepted, indicating no significant difference in respondents' marital status concerning factors influencing road accidents.

Table 3 *ANOVA for Marital Status of Respondents*

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	3.087	26	0.119	0.752	0.760
Within Groups	3.633	23	0.158		
Total	6.720	49			

Meanwhile, in Table 4, the F-value for education background is 0.645, and the significance value is 0.860. Since the significance value is above 0.05, the null hypothesis is accepted, indicating no significant difference in respondents' education backgrounds concerning factors influencing road accidents.

Table 4 *ANOVA for Education Background of Respondents*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14.687	26	0.565	0.645	0.860
Within Groups	20.133	23	0.875		
Total	34.820	49			

3.3 Correlation and Interferential Analysis of Variable

In the context of an Analysis of Variance (ANOVA) to ascertain a correlation between two variables, Pearson's Correlation plays a crucial role. This method becomes essential when assessing the strength of association between independent and dependent variables. The Pearson's Correlation value spans from 0.00 (indicating no correlation) to 1.00 (reflecting perfect correlation), with correlations surpassing 0.80 being deemed high. This information is presented in the SPSS system, as illustrated in Table 5.

Table 5 *Correlations Strength [17]*

Correlation	Negative	Positive
None	-0.09 to 0.0	0.0 to 0.09
Small	-0.3 to -0.1	0.1 to 0.3
Medium	-0.5 to -0.3	0.3 to 0.5
Strong	-1.0 to -0.5	0.5 to 1.0

3.3.1 Analysis on Human Factor

Table 6 displays a Pearson Correlation value of 0.445, indicating no clear connection between the Human factor and the Factors Influencing Road Accidents. However, with a p-value of 0.001, which is lower than the significance level of 0.05, the null hypothesis is rejected. This suggests a statistically significant correlation between the Human factor and the Factors Influencing Road Accidents.

Table 6 *Pearson Correlation between Human Factors and Factor Influencing Road Accidents*

		Human	Factor Influencing Road Accidents
Human	Pearson Correlation	1	0.445
	Significance (2-tailed)		0.001
	N	50	50
Factor Influencing Road Accidents	Correlation	0.445	1
	Significance (2-tailed)	0.001	
	N	50	50

3.3.2 Analysis on Road Condition Factor

In Table 7, the Pearson Correlation value of 0.818 suggests no evident relationship between the Road Condition factor and Factors Influencing Road Accidents. However, the p-value of 0.000, below the significance level of 0.05, rejects the null hypothesis. Hence, there is a statistically significant correlation between the Road Condition factor and Factors Influencing Road Accidents.

Table 7 *Pearson Correlation between Road Condition Factors and Factor Influencing Road Accidents*

		Road Condition	Factor Influencing Road Accidents
Road Condition	Pearson Correlation	1	0.818
	Significance (2-tailed)		0.000
	N	50	50
Factor Influencing Road Accidents	Correlation	0.818	1
	Significance (2-tailed)	0.000	
	N	50	50

3.3.3 Analysis on Weather Conditions Factor

As per Table 8, the Pearson Correlation value stands at 0.774, indicating no correlation between the Weather Condition factor and the Factors Influencing Road Accidents. Nonetheless, the p-value of 0.000 is exceptionally small, falling below the significance level of 0.05. Consequently, the null hypothesis is unaccepted, signifying a statistically significant correlation between the Weather Condition factor and the Factors Influencing Road Accidents.

Table 8 *Pearson Correlation between Weather Condition Factors and Factor Influencing Road Accidents*

		Weather Condition	Factor Influencing Road Accidents
Weather Condition	Pearson Correlation	1	0.774
	Significance (2-tailed)		0.000
	N	50	50
Factor Influencing Road Accidents	Correlation	0.774	1
	Significance (2-tailed)	0.000	
	N	50	50

3.3.4 Analysis on Poor Car Maintenance

Table 9 indicates a Pearson Correlation value of 0.825, suggesting no association between the Poor Car Maintenance factor and the Factors Influencing Road Accidents. Nevertheless, the p-value of 0.000, falling below the significance level of 0.05, leads to the null hypothesis being unaccepted. Thus, a statistically significant correlation is observed between the Poor Car Maintenance factor and the Factors Influencing Road Accidents.

Table 9 *Pearson Correlation between Poor Car Maintenance Factors and Factor Influencing Road Accidents*

		Poor Car Maintenance Condition	Factor Influencing Road Accidents
Poor Car Maintenance	Pearson Correlation	1	0.825
	Significance (2-tailed)		0.000
	N	50	50
Factor Influencing Road Accidents	Correlation	0.825	1
	Significance (2-tailed)	0.000	

N	50	50

3.4 New Intervention Plan Proposed

3.4.1 Enhance Road Damage Reporting and Maintenance

Maintaining damaged roads is essential for safety and cost-effectiveness, preventing minor issues from escalating. Well-kept roads reduce vehicle wear and tear, minimizing repair costs for owners. Individuals can contribute by identifying and documenting poor road conditions, using the MyJalan KKR app in Malaysia to report issues to the Ministry of Works. Providing comprehensive information and following up on the status of the report helps ensure timely road maintenance and informs authorities about specific problem areas [18].

3.4.2 Propose Installation of AES at Strategic Locations

The Automated Enforcement Systems (AES) in Malaysia, introduced as part of the Road Safety Plan 2006-2010, involves collaboration among various road safety entities, focusing on the 4E framework (Engineering, Enforcement, Education, and Environment). The goal is to adapt the enforcement system to address the growing challenges posed by increased vehicles and drivers while instigating sustainable changes in Malaysian drivers' attitudes. This comprehensive system incorporates a tracking system with road sensors and imaging capabilities for automatic recording of traffic offenses through photos and videos. The AES employs a structured procedure for managing traffic offenses, automatically detecting violations, transmitting data to the control center, identifying drivers or vehicle owners, and generating summonses [19]. A study supports the hypothesis that the AES system significantly contributes to reducing road accidents, as demonstrated by correlation and regression analyses [20]. Suggesting the implementation of AES at traffic lights in Parit Raja aims to further enhance road safety by reducing accidents at these intersections.

3.4.3 Increase the Frequency of Road Safety Education

In response to increasing traffic congestion, Malaysia has implemented a comprehensive Road Safety Plan (2014-2020) that includes a dedicated Road Safety Education (RSE) program integrated into school curriculums. This program aims to develop children's knowledge, skills, attitudes, and values, empowering them to navigate roads safely. Recognizing the heightened involvement of children in road accidents, the RSE program plays a crucial role in fostering awareness. It focuses not only on knowledge and skills but also on instilling values for safe road use. The program's expansion from primary to secondary schools underscores its significance, particularly targeting the youth as vulnerable individuals in road accidents. By increasing school road safety awareness, the initiative aims to reduce risk factors contributing to youth road traffic injuries, including issues like not wearing helmets, speeding, neglecting seatbelt use, drunk driving, and distracted driving [21].

4. Conclusion

In conclusion, this study successfully achieved its first objective by identifying factors contributing to road accidents and their effects on drivers, families, and society. These factors include human-related issues like speeding and running red lights, road-related problems such as poor maintenance, weather-related challenges like rain and fog, and issues related to poor car maintenance, including worn-out tires. The impacts of road accidents on drivers encompass physical, psychological, and financial consequences, while families also endure emotional and financial hardships. At the societal level, road accidents result in economic and environmental burdens, affecting productivity and contributing to socioeconomic inequality. The second objective involved analyzing existing road accident control measures, revealing that Malaysia employs strict enforcement of traffic laws, efficient speed management, and successful public awareness campaigns, as outlined in the Malaysia Road Safety Plan. The third objective achieved the proposal of new intervention plans, including optimizing road infrastructure procedures, installing Automated Enforcement Systems (AES) aligned with the 4E framework, and implementing impactful road safety awareness programs, all aimed at reducing road accidents and promoting a culture of safety awareness at Parit Raja.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of the paper.

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