International Journal of Engineering & Technology, 7 (4.34) (2018) 112-117

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper



Road Traffic Accident in Malaysia: Trends, Selected Underlying, Determinants and Status Intervention

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Abstract

This paper includes review of the trends, selected underlying, determinants and status intervention. The 1.17 million of deaths occur each year worldwide due to road accidents 70 % of which occur in developing countries in the world. 65% of deaths involve pedestrian's causes, 35 % of which are children. Estimates suggest that 23–34 million people are injured worldwide every year in road crashes. Fatal accidents are among the major factors of death in the world apart from chronic diseases such as stroke, lung infections, respiratory difficulties and heart disease. The rise in fatal accidents in Malaysia is 70%. This study was conducted to study the rate of fatal accidents on roads in the state of Selangor and Perlis based on fatal accident data for a period of five years from 2013 to 2017. The data were analyzed using quantitative methods which took into account the research conducted by researchers last. Based on analyzed data, the state of Selangor recorded the highest accident rate while Perlis state recorded the lowest accident rate. Among other things being studied are factors affecting the rate of road accidents in both states. In conclusion, the traffic, the physical structure of the road and the road users' focus is a factor of road accidents more concentrated in a particular area.

Keywords: *Road Accident; determinants; intervention; fatal accident; developing countries.*

1. Introduction

Road transportation is a requirement seems it give a lot of benefit to a country and individual especially in access improving for workplace, economic resources, educational facilities and health center. Behind the importance of transportation to the community, it also gives negative effect which is road accident like fatal accidents. An injury caused by road accident is one of main killer in the world after a chronic disease such as heart disease, stroke, and lung infection and hard in breathing [1-3]. In addition, WHO [1] report of Global Burden of Disease Project in year 2004 told that this death accident reach to 1.27 million of death every year and it equivalent with the number of deaths effect by the combination of other factors. In Malaysia, total of death caused by accident is increasing every year from 1990 to 2011, while total of death caused by road accident was increased 70% [4, 5].

According to the report from Bukit Aman's Head of the Traffic Police shows that of daily death average caused by road accident in Malaysia is 19 people [6, 7]. It shows the high rate if compared to the total of Malaysia community which is 28 million people. This rate has to reduced seems the country is struggle to be a developed country approaching year 2020. In developing countries, road use is dominated by two-wheel vehicles [8] such as motorcycles. Motorcyclists are at the highest risk in traffic crashes, particularly for head injury [9]. In Malaysia, a national statistic on RTA by the Royal Malaysian Police showed that a very significant proportion of fatal accidents were caused by motorcyclists. Recorded the motor vehicle crashes are the leading cause of death in adolescents and young adults [10-13] and of the estimated 856 000 road deaths occurring annually worldwide, 74% are in developing countries [14]. The dramatic increases in the proportion and absolute number of traffic fatalities have been witnessed number of developing countries.

The road accident generally can be defined as undesirable incident to occur caused of lost driving control until happens of collision with an object, or causing vehicle crash either causing property damage, injury to driver, passenger and the other road users or otherwise [15, 16]. In Malaysia, definition of road accident for statistical purposes is as contained in Malaysia Road Accident Statistics Report 2012, where is the road accident is an incident that happen on the public road or private that caused either from negligence or lack of anybody or caused by environmental factors causing any collision that involve at least a moving vehicles where is damage or injury including death that faced by anybody, property, vehicle, structure or animal that involve the incident and complained to the police [17].

The road accident usually caused by combination of five factors which is behavior of driver, infrastructure of road quality, traffic volume and the environment [18-20]. The effort in resolve the problem of road accident more focused to aspect in road physical and vehicle shape. The goal is to provide better road and vehicle as a step to reduce the road accident rates. Despite that, the behavior and prestige of driver also should be given attention because it is the aspect which is important in handling the problem of road

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accident [21-24]. This article is to analyze the trend and pattern of the death due to road accident in Malaysia for a period in five years which is from 2013 until 2017.

This issue need be taken seriously by everyone especially the road users about the importance of road safety in Malaysia. Although the multiple bodies regarding on road safety has been formed within the government departments, private agencies and voluntary organizations and launches many road safety campaigns previously, the road accidents still happen every time and everywhere whether at the normal days or festival seasons. There are various aspects of causes that need to be looked out and investigated before we can find the solutions or steps to prevent or at least, reduce the numbers of road accidents in Malaysia at the future.

2. Methodology

2.1. Study Area

Figure 1 shows a map of the districts in the state of Malaysia. Selangor is one of the states in Malaysia which records the highest number of deaths due to road accidents. The shaded area is the most frequent area of traffic congestion in the state of Selangor. Among them are the Subang, Shah Alam and Klang districts. Shah Alam is the state capital of Selangor. Because of this, many residents live in the area.

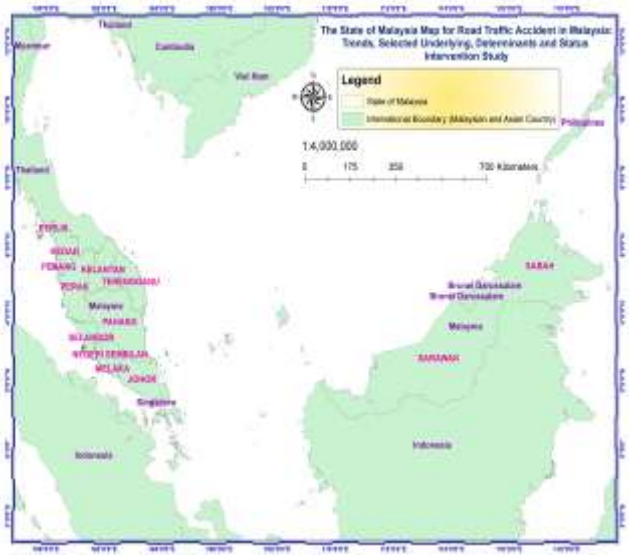


Fig. 1: The state of Malaysia map

This has resulted in no balance of increase in the number of vehicles with an increase in the total area of the road. Every day the number of vehicles increases, while increasing the width of the road can be said to be very slow. This imbalance makes the density of vehicles on the road higher. Therefore, there is traffic congestion. Another factor that is of no importance is the rapid increase of the population who inhabit the big city itself. The rapid increase in population of the city is due to migration from rural areas. The rapid increase in population requires more space for shelter. So, many areas that are supposed to be devoted to preparing roads are forced to use for residents.

2.2. Research Methodology

The research material used in this study was the death data from road accidents issued by the Road Safety Department Malaysia (JKR), Ministry of Transport Malaysia. The data taken are derived from the Road Accident Statistics Book. Through this data, there are number of accidents by type of vehicle, number of accidents, total deaths due to accidents, number of registered vehicles and new drivers in Malaysia, attitude data and safe in all states in Malaysia. The data used is the death rate of road accidents across the country in Malaysia from 2013 to 2017 for all states in Malaysia. From that data, we also make comparisons between the state's highest mortality and the least state of road death. According to the data, the state of Selangor recorded the highest number of deaths while the state of Perlis recorded the lowest mortality among all states in Malaysia. In addition, we took some references from the internet about the causes of accidents, ways to prevent accidents, and some information needed to complete this study. We also made reading on past studies of road accidents. Our purpose is to make reading into previous studies so that we can get information on how to do this research. The methods used in this study are quantitative methods, quantitative methods are methods that use quantitative information or data. Quantitative data can be measured, through the measurement process and requires of secondary data from government department. In this study, we only use data our reference because we did not provide questionnaires to respondents. We only describe the available data to be our study material.

In this study, we compared the number of deaths recorded due to road accidents between the two states, Selangor and Perlis. This two states chosen because Selangor has recorded the highest and Perlis has recorded the lowest number road accidents among all states in Malaysia. Quantitative methods are divided into two types: intervention studies and non-intervention studies.

For intervention studies, appropriate research design is an experimental study, while non-intervention studies design is a study of tolerance and study of the study. For the research design experiment (intervention study), it explains either the intervention affecting the result of one group than the other group. While for the correlation analysis design, it predicts the relevance or relationship between the variable, and for the review research design, it explains the trends of a population.

The statistical analysis methods applied for the trends of road traffic accident in Malaysia and classification to determine and identify the variability of road accident trends characteristics using Environmetric Method (Hierarchical Agglomerative Clustering Analysis (HACA)) [25-27]. HACA used in this study to investigate the grouping of the distribution of distribution of road accident in Malaysia and determine the clustering group of generated based on similar characteristics. All data analysis was carried out using XLStat2014 and SPC XL licensed soft-ware for Microsoft Excel [28-30].

3. Results and Discussion

3.1. Discussion

The highest number of death cases recorded in the state of Selangor was 1019, 1068, 1028, 1140 and 627 on 2013, 2014, 2015, 2016 and 2017. While the lowest case of death fatalities in the state is 72, 61, 65, 67, and 37 in 2013, 2014, 2015, 2016 and 2017 respectively. Under the state of Johor shows a decrease in the number of cases of fatal accidents, which is significantly higher than 1135 cases in 2016 dropped to 596 cases in 2017. The increase in the number of cases of fatal accidents is particularly significant in the Selangor area of 1019 cases in 2013 increased to 1140 cases in 2016 but decreased to 627 cases in 2017. Based on Table 1, most cases of road accident cases in Malaysia have risen from 2013 to 2016, but declined in 2017. Overall, the total number of cases decreased from 6915 cases in 2013 to 6706 in 2015, but again rising significantly in 2016 of 7152 cases. Nevertheless, it is controlled by a number of steps taken, the number of cases decreased to 3913 in 2017. Malacca and Federal Territories have the same number of road accident deaths from 2013 to 2017. The amount recorded is only in the case of 100-300 cases only. In Sabah, the number of deaths due to road accidents is quite flat in 2013 and 2014 of 420 cases, but decreased by 2015 to 2017. The state of Johor recorded the highest number of deaths due to road accidents in 2013 and 2015 1128 and 1040 cases. Selangor recorded the highest number of deaths due to road accidents in 2014, 2016 and 2017 of 1068, 1028 and 627 cases (Table 1).

The percentage of each type of vehicle involved in accidents in Malaysia is summarized in Table 2. These percentages did not display specific trends over the study period. Therefore, the average percentages over the 10 years period have been provided in Table 1. The buses have the highest accident involvement rate (17 percent), followed by taxis (11 percent), lorries (7 percent) and passenger cars (6 percent), while motorcycles represent the smallest percentage (less than 1.5 percent). The high percentage of taxis involved in accidents can be attributed to the nature of the operation of this type of vehicle than the passenger cars and motorcycles, which increases their chances of a traffic accident. In addition, the lack of driver training may be an important factor. The very small percentage for motorcycles is expected, as the motorcycle. The lower percentage of private vehicles and lorries involved in accidents indicates that these drivers are reasonably skilled.

Table 1: Total death of events access to state roads by state year 2013-2017

State/ Year	2013	2014	2015	2016	2017
Perlis	72	61	65	67	37
Kedah	517	525	530	572	327
Pulau Pinang	381	378	360	411	240
Perak	770	750	726	789	429
Selangor	1019	1068	1028	1140	627
Wilayah Persekutuan	243	238	256	232	132
Negeri Sembilan	396	379	355	414	214
Melaka	258	236	256	247	120
Johor	1128	1018	1040	1135	596
Pahang	592	539	532	539	293
Kelantan	378	354	426	453	260
Terengganu	320	276	307	342	191
Sabah	420	420	392	379	211
Sarawak	421	432	433	432	236
Total	6915	6674	6706	7152	3913

Table 2: Percentage of each vehicle type involved in accidents

Year	Private Vehicle	Private Motorcycles	Lorries/ Van	Buses	Taxis
2004	6.44	1.51	8.42	22.12	10.94
2005	5.85	1.39	7.62	15.06	10.49
2006	5.93	1.40	7.80	16.19	11.01
2007	5.77	1.41	7.92	16.52	12.12
2008	5.01	1.22	4.91	29.57	8.90
2009	5.58	1.28	7.06	14.17	11.00
2010	5.68	1.28	7.20	13.95	11.83
2011	5.65	1.30	7.14	13.94	12.47
2012	6.37	1.23	6.84	16.28	11.83
2013	6.11	1.11	6.48	16.28	11.83
Average	5.84	1.31	7.14	17.23	11.32

Based on Figure 2 shows the difference in the number of deaths due to traffic accidents recorded in the highest and lowest number in Malaysia. The highest number of road accidents recorded in Selangor was 4882 cases from 2013 to 2017, while the number of deaths due to road accidents was lowest in Perlis state, a total of 302 cases from 2013 to 2017. There are several causes that caused Selangor to record the highest number of deaths due to road accidents compared to Perlis. Among them is, the lack of monitoring from the authorities can also cause road accidents. Authorities such as the police should monitor in places identified with frequent accidents. Authorities must take legal action against street offenders. Examples of places to be monitored are hilly roads, at twin lines and traffic light areas. Continued monitoring will make road users more prudent while on the road at the same time can avoid accidents.

In addition, the uneven condition of the road surface structure is poor. The poor roads in the Malaysia make the vehicle drivers to pay more their full attention when passing through the road. Besides that, the driver of the vehicle also needs to be more careful when passing through the road at night situation. Among the poor roads is that there are many sharp turns, uneven roads and holes. Therefore, the driver of the vehicle must slow down the car while passing through a dangerous road. This also has a great impact on road drivers because uneven roads such as perforated, slippery and rocky roads can cause road drivers to crash into the crash. The weather factors which also one of the causes that will make the drivers involve in the road accidents. In Malaysia, there are more causes from rainy weather such as wet and slippery roads. The road accidents occurred especially on the highways because as the driver did not have time to crack when the vehicle in front suddenly brakes slowed down.

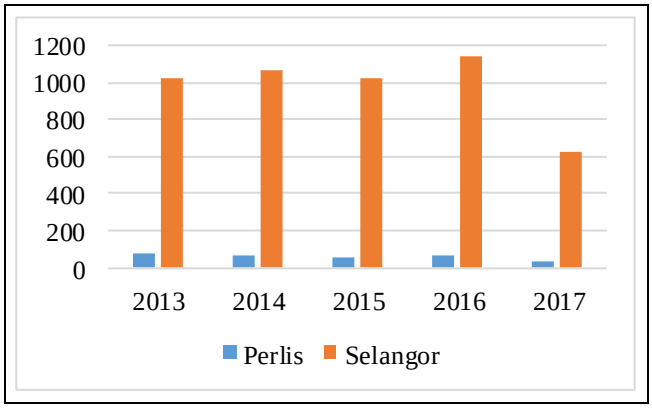


Fig. 2: The road accident distribution at Selangor and Perlis, Malaysia from 2013 to 2017

The analysis of road fatal accidents between the states of Selangor and Perlis shows a very significant difference. With the help of GIS software, it is able to display not only the distribution but also the intensity and spatial pattern as a whole. The number of fatalities within the five years (2013-2017) in Selangor recorded a very high number which is 4882 number of death while the number of fatal accidents occur in Perlis was the lowest which is 302. The main cause of this significant difference is that the population density in the state. Selangor is the state with the highest population density of 5.46 million while Perlis has a total population of 0.23 million. Selangor is one of the developing states, and is also a country with many cities in Malaysia, this is due to the rapid development of modernization in the area of Lembang Klang, Selangor progress has led to more excellent infrastructure such as highways and public transport. Thus, there are more job opportunities offered in the state of Selangor. Hence, the main source of population density in Selangor is due to the focus of the employment sector. On the other hand, Perlis is the smallest state in Malaysia located north of the peninsula of Malaysia. The state of Perlis with an area of 795 km^2 is a state in which its economy is dominated by agriculture, especially rice, sugar and fruits. With its economy based on agriculture, plantation and forestry, Perlis has no rapid development and is not a focus location for the Malaysian community to work more closely with its geographical location that lies far north of Malaysia. So the density of the urban population is much less than the state of Selangor and its traffic situation is much better than Selangor. Because of that, this state does not have many roads and highways. The community in Perlis also do not have to face heavy traffic congestion as often happens in the state of Selangor.

According to the employment sector guide, the Malaysian government has set a working day to be five days a week starting from Monday to Friday and the entry time of employment must start at 8am to 6pm. It is customary for the people of Selangor to weather traffic congestion each morning to go to work and go home from work. Hence, the Selangor government has created more road networks to reduce traffic congestion and residents are also advised to leave the house early to avoid traffic congestion. Although the existence of more roads will help to minimize traffic congestion, the density of the road network has also become one of the higher causes of road accident cases that have killed lives. Furthermore, the conditions and types of roads themselves are either highways or main roads as road users tend to drive faster and exceed the designated limits because the roads are straighter

and have more than one lane. Most of the cases of road accidents occurred in the highway and the main roads. All the people of Selangor who are tired of working wants go home quickly so that they will be able to relax. To reach the destination quickly, most of them will drive at a faster rate in the highway area especially when the structure of the road is large and straight. This causes the risk of accidents quite high due to driving too fast can cause the guided vehicle to lose control and to collapse the other vehicles around. For an example of a crash in the Duke Highway in 2015, the accident occurred as two drivers of Myvi, who were driving in a dangerous manner, lost control over a Pajero that resulted the death of a family on the highway. Hence, driving speed is not only a danger to yourself but also danger to the safety of road users. Similarly happened in Perlis, fatal accidents occurring in this state have different divisions according to the certain areas. The distribution and intensity of the road's death threats indicate that the areas of Kangar, Padang Besar and Arau are areas of frequent road accidents that kill lives. This is because the area has a large road and is a focal point for the community and tourists in that state. The busy roads become one of the factor why the accidents happened especially during the holiday season. Road accidents typically occur in urban areas as opposed to village areas as these areas have many main roads busy with fast-moving vehicles.

In addition, road accidents that cause life expectancy are also common in distorted area and uneven road conditions. For each intersection on the main road, the vehicle moves fast and sometimes a careless and impatient driver often tries to enter at each intersection without seeing any other vehicle on the main road and the consequences of the infringement can occur. Especially at a busy intersection, it is difficult for drivers to enter the junction due to the lack of compromise of many vehicles and other drivers. Furthermore, motorbike riders, where smaller vehicles like these are often easy for riders to intervene at each intersection. Riders like this also have a high risk of accidents because of its small structure causing other vehicles to not notice and did not have time to avoid hitting it. In addition, the structure of the road can also be the cause of accidents causing more lives for motorists. Holes and uneven roads cause vehicle tires unable to grip the surface of the road and cause the vehicle to easily lose control. Sometimes there are some drivers who try to avoid this passage by entering the other driver's way in a sudden and causing other drivers cannot avoid the collision. This uneven road is abundant in the interior areas of Selangor that have lodged a report for resettlement. The delay of the authorities to repair the surface of the road may cause more cases of accidents. other than that, there are other factors that cause road users to cause fatal accidents, which are inefficient and incorrect driving considerations before taking action while on the road, driving with velocity exceeding the allowed speed, liking or squeezing other vehicles, speeding up the whim on the wrong path, not giving a turn signal, less focus when driving, not preparing before going on the road, not checking the vehicle, impatience and ignoring the road and weather conditions.

Hence, the community should identify proactive measures in ensuring that road accidents do not continue to increase. The main step in reducing the crash rate is to alert road drivers about road safety features. For example, road safety advertisements should be broadcast in the mass media and social media as a reminder to the public to drive carefully, to ensure the car is serviced before use and value the lives of others. Furthermore, the authorities should also be responsible for repairing road conditions. The undisturbed roads are definitely dangerous for drivers and motorcyclists. Not only that, the dark road conditions without the light of the lamp can also endanger the lives of the road users especially at night. For example, guided car on the highway will immediately avoid the perforated roads without seeing the side view mirror. This condition causes accidents if other vehicles are too close. This should be avoided in reducing the rate of road accidents. Authorities should also play their part in reducing the rate of road accidents in our country. The Road Transport Department (JPJ), the Royal Malaysian Police (PDRM), the Malaysian Land Services Commission (SPAD) and other relevant organizations need to work together to reduce the road accidents. Roadblocks and patrols are periodically able to reduce the risk of accidents. However, the monitoring needs to be continuous and not seasoned because accidents can occur at any time.

3.2. Statistical Analysis

The box plot provides basic information about a distribution and is a powerful exploratory data analysis tool. It can also be used to visualize the median differences and to track the trends of distribution of road accident in Malaysia. For example, a distribution with a positive skew would have a longer whisker in the positive direction than in the negative direction. A larger mean than median would also indicate a positive skew. From figure of box plot below (Figure 3) showed the longer whisker in the positive direction during 2013 until 2016 respectively. Box plots are good at portraying extreme values and are especially good at showing differences between distributions. There is one more mark to include in box plots (although sometimes it is omitted). We indicate the mean score for a group by inserting a plus sign. The box and whisker plot (Figure 3) shows that the distribution during 2013 until 2016 were statistical significant with $p < 0.005$. From 2013 until 2016 recorded the highest number of deaths compared on 2017 among all states in Malaysia. It should be noted that the accident reports include the total number of accidents and fatalities on all road classifications in Malaysia. The majority of the previous Malaysian traffic studies focused on accidents or fatalities caused by motorcycles.

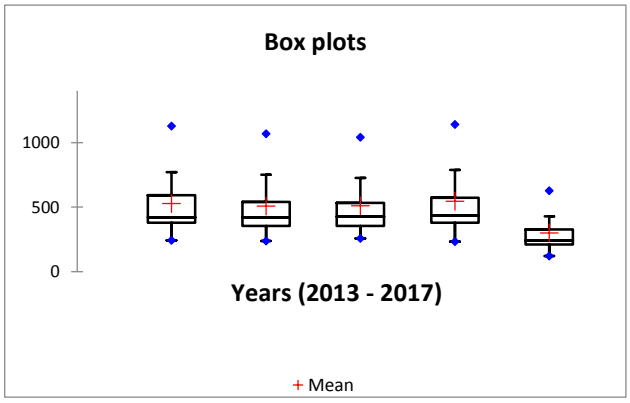
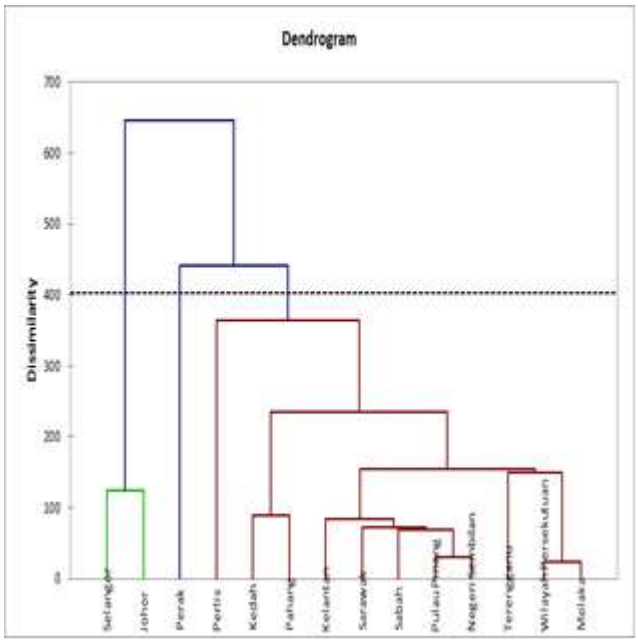
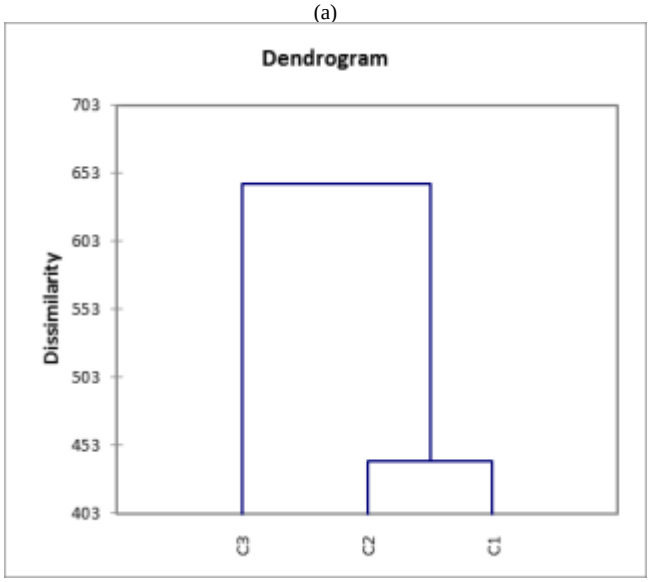


Fig. 3: The box and whisker plot of 6 years of distribution of road accident in Malaysia

The CA dendogram (Figure 4 (a) (b)) shows three different spatially patterns of the distribution of road accident in Malaysia using Environmetric Method (Hierarchical Agglomerative Clustering Analysis (HACA)). Cluster 1 consists of 11states (Perlis, Kedah, Pulau Pinang, Wilayah Persekutuan, Negeri Sembilan, Melaka, Pahang, Kelantan, Terengganu, Sabah and Sarawak. Cluster 2 consists only one state which is Perak and Cluster 3 consists of two states (Selangor and Johor). The three spatial road accident distribution patterns were determined due to the different level of the road accident numbers are higher numbers, moderate numbers and lower numbers as shown in Figure 4 (a) (b).



(a)



(b)

Fig. 4 (a) (b): Dendogram showing different clusters of states based on road accident distribution

4. Conclusion

Road accidents involving fatal accidents in Perlis state showed a decline from 2013 to 2017 while the Selangor state graph showed increases and decreases by year. The intensity of the deadly accident tends to vary by road and year. Perlis state recorded the highest fatal accidents for 2013, while the state of Selangor recorded the highest number in 2014. The case of the deadliest fatal accidents was in 2017 for both states based on an analysis of the highest places of accidents shows Shah Alam recorded the highest number of accidents. This is because the Shah Alam is a place of focus where there are many factories and universities. The residents in Shah Alam are more compact than anywhere else. This road accident problem should be taken seriously and needs to be reviewed and controlled, so that the rate of road accidents can be reduced from time to time. Factors that cause road accidents also need to be taken into account in upgrading the physical condition of the road.

Acknowledgement

The authors acknowledge to UniSZA for Scholarship under research grants: UniSZA/2017/SRGS/17 – R0019-R017 and FRGS/1/2017/WAB05/ UNISZA/01/1 (RR222). Special thanks are also dedicated to Faculty of Applied Social Sciences (FSSG) and Department of Statistics Malaysia give permission to use the research facilities, provided the secondary data and supporting in this research.

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