PEAT

Safety Performance Analysis for Traffic Management During Activation and Deactivation Lane Closure at Highway New Klang Valley Expressway (Nkve)

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Abstract: Highway maintenance keeps drivers safe and comfortable. To maintain essential highway routes, MHA has produced "Traffic Management Plan Guidelines" for lane closures and traffic control plans on all Malaysian routes. Objective of this study is to analyse the accidents, to identify the hazards, present before, during and after activation and deactivation of lane closure during work at Highway New Klang Valley Expressway (NKVE) and to recommend an improvement on the traffic management plan activity for site Highway New Klang Valley Expressway (NKVE). Quantitative research methods were used to achieve the objective of this study. Descriptive analysis was used to analyse information on activation and deactivation lane closure. The statistical analysis was conducted on the overall hazard base on descriptive analysis. Based on the data obtained injuries that often happen to workers are injuries to the right leg with a high medical certificate throughout the 5 years from 2017 to 2021 and the hazard found is hit by a car. The highest frequency of accidents is in 2019 for all types of graphs such as time factors, medical certificates, unsafe conditions and subcontractors that affect this graft. Determine the accident data company's most critical traffic accidents against personnel.
Keywords: Traffic Management, Lane Closure, New Klang Valley Expressway (NKVE), Workers Accidents & Injuries

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1. Introduction

According to the Malaysian Highway Authority (MHA) website, 31 concession companies operate Malaysia's 65,877 miles of highways in March 2021. The roadway links important commercial districts to industrial, transit, and logistical districts. It connects major seaports and airports and helps the rapid growth of numerous significant municipalities and industries by improving accessibility.

Next, highway maintenance is crucial for ensuring the safety and convenience of road users as they travel from one location to another [1]. In addition, routine maintenance periods, such as for pavement conditions, road shoulder conditions, slope conditions, and other assets along the route, should be carried out accordingly [2]. MHA has established uniform guidelines for lane closures on highways as well as standard techniques for traffic control schemes on all Malaysian highways, namely "Traffic Management Plan Guidelines," in order to perform maintenance on important highway routes [3]. Road users may not be able to distinguish between different construction sites and their hazards. Thus, all jobs, whether long-term or short-term, require a Traffic Management Plan and safety measures. The number of road users who died in 2012 increased by 0.6% from the previous year [4]. There were 6,917 fatalities. In addition, 441,950 cases of reported damage-only cases were documented, setting a record year [4]. It is a concerning situation since road safety is also seen as a sign of how a developed country manages to maintain a balance between socioeconomic prosperity and the freedom of its citizens to move about safely.

Meanwhile for the objective this study is to analyse the accidents involving before, during and after activation and deactivation of lane close during work at highway New Klang Valley Expressway (NKVE), to identify the hazards, present before, during and after activation and deactivation of lane closure during work at Highway New Klang Valley Expressway (NKVE) and to recommend an improvement on the traffic management plan activity for site Highway New Klang Valley Expressway (NKVE). The scope study for this research focused on the New Klang Valley Expressway (NKVE) Highway, which has four lanes and performs lane closures for construction and maintenance works on the highway. Next, to inspect the work area and activities carried out for the closure of the lane and the data used is accident data taken through the company, starting from 2017 until 2021. At the same time, referring to the Malaysian Highway Authority guideline and the Manual On Traffic Control Devices Temporary Signs And Work Zones Control ATJ.

2. Methodology

The first process of research based on the flow chart is to identify the problem statement. This section can be in the introduction or future research mentioned by the author in the latest journal. The second research process, is to identify the objective and scope of the research. Identify objective can also be made depending on the statement of the problem here objective can be made as much as is allowed to be achieved in the research made. Next scopes of research are that a study is carried out where it is carried out with a more detailed description for a study to be carried out in that place and identifying the location of the scope of research, explain the method used based on the research that you want to do in that particular place. After identifying the objective and scopes of research, it continues to differentiate the objectives and scopes of research, it can make the research clearer with the research title. The review of literature through searching and reviewing relevant articles of previous works, as well as documentation from a company. The method of data collection will utilized quantitative method from accident data company from excel start 2017 until 2021. The next stage is data analysis, which consists of the analysis of accident details and descriptive information. The final stage summarizes the outcomes of the research by means of discussion and conclusion, as well as recommendation for further works. Figure 1 shows the research planning flowchart that was done to make this research.
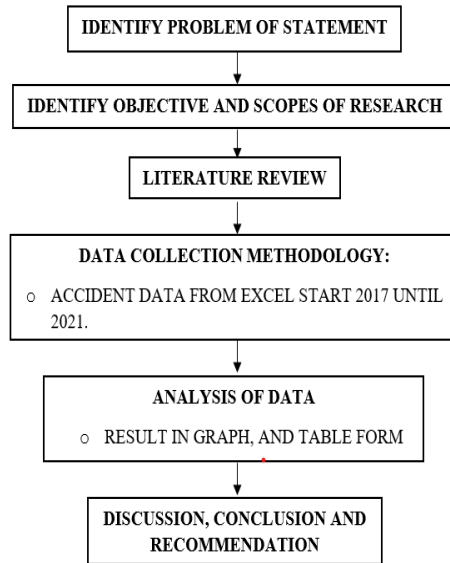
Figure 1: Research Planning Flowchart

3. Results and Discussion

The results and discussion section presents the findings of this study and the results of data analysis. All data and information was obtained through accident data from company 2017 until 2021. Data accident analysed descriptively.

3.1 Accident Data Highway Lane Closure

Figure 2 provides 2017–2021 accident data. This graft also categorises time into afternoon (1200-1859), evening (1900-2359), morning (0600-1159), and night (0600-1159). (0001-0559). Based on shift, morning shift recorded highest accident for 2018 and 2019. Meanwhile, in year 2017 & 2021 the highest case recorded during afternoon shift. This is might due to the probably due to the addition of vehicles on the road and the traffic congestion in the morning as people rushing to go work. Meanwhile in the afternoon, people rushing to take a short break and come home from work. In addition to that, in 2020 cases dropped sharply because that year the country was hit by the COVID-19 epidemic and the government imposed a lockdown on the people here. Therefore, this graft is very important because it is possible to know the number of accidents that occur every year and then be able to make a change in the work done on the highway.
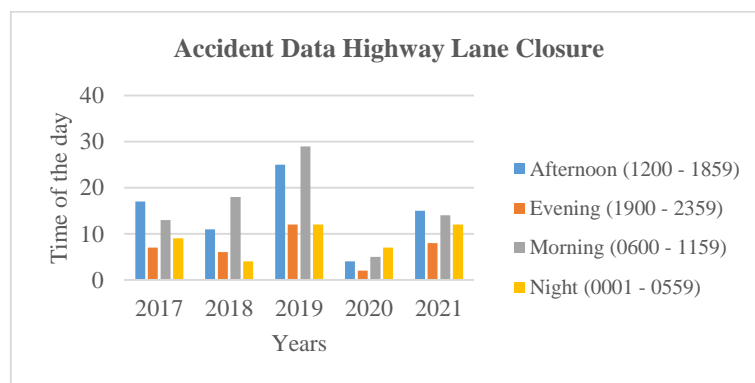
Figure 2: Accident Data During Highway Lane Closure

3.2   Medical Certificates Recorded During Highway Lane Closure

Figure 3 shows five categories from 2017 to 2021, with the graft showing employees' medical certificate (MC) codes and accident times. This graft helps detect accident times and MC. Based on shift, afternoon shift recorded highest (MC) for 2017 and 2019. Meanwhile, in year 2018 & 2021 the highest case recorded for (MC) during morning shift. This is might due to the probably the increase in the number of vehicles on the highway or the negligence of the workers themselves and it was the year with the highest number of accidents on the highway and people rushing come home from work. Meanwhile in the morning, the traffic congestion in the morning as people rushing to go work. This graft is very important because it can identify the times when accidents often occur as well as the amount of work given (MC) each year. In 2020, the number of worker cases decreased due to the movement control order (MCO) due to the infectious disease, which is the COVID-19.
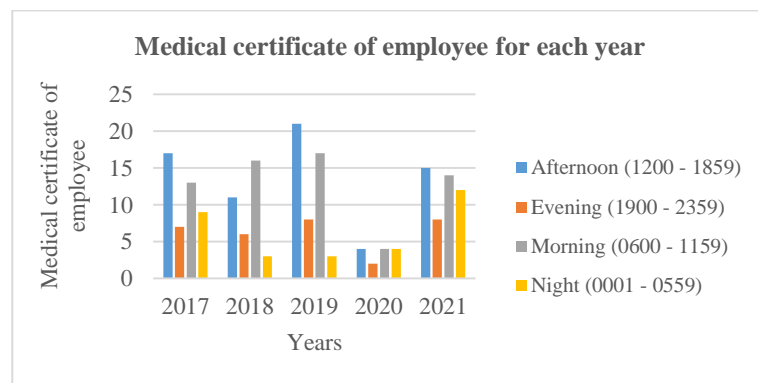
Figure 3: Medical certificate of employee for each year

3.3   Accident Classification

Figure 4 provides 2017–2021 employee accident data. This graft also investigates workplace accidents, worker behavior, and traffic accidents. Grafts that have been classified for ease of understanding start with N/A, unsafe act and finally unsafe condition. The N/A symbolizes a highway user who crashes or causes an accident, whether deliberate or not, causing property damage but no worker injuries. Graft 2017 and 2019 recorded highest is unsafe condition. In year 2018 and 2021 the highest case recorded during unsafe act. This is due to the live traffic situation due to the various types of vehicles that are always moving on the highway as well as the diverse and fast driving of highway users. Meanwhile unsafe act some highway users who do not care about the safety of others at the same time do not comply with the procedures that have been established for a worker and highway user. In 2020 there was a very sudden decrease in accidents following the spread of the COVID-19 epidemic which limited movement in and out due to movement control orders. This graft is very important because it can identify the number of accident classifications
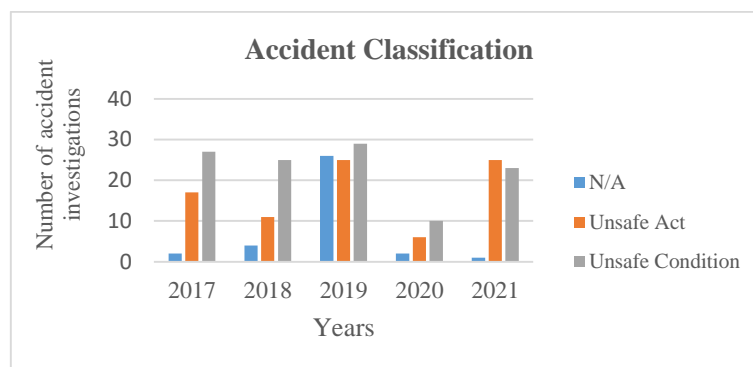
Figure 4: Accident Classification 2017 until 2021

3.4 Accidents Distribution Among Workers

Figure 5 provides 2017–2021 worker accident data. This project includes four sorts of workers, one of whom uses the road. They are contractors, Egenda infrastructure services (EIS) staff, road users, and subcontractors. Based on graft recorded highest is subcontractor for year 2019 and 2021. Meanwhile, in year 2018 and 2019 the highest case recorded is contractor and for 2017 it has the same number of EIS staff. This may be due to a lot of work involving the highway, regardless of whether it is night or day involving lane closures and additional vehicles on the highway. Meanwhile in the contractor may be due to the work involving the highway which takes a long time to complete and the highway users do not comply with the procedure when the works are being done on the highway. In 2020, there was a very sudden drop in accidents due to the spread of the COVID-19 epidemic which has limited movement in and out due to movement control orders.
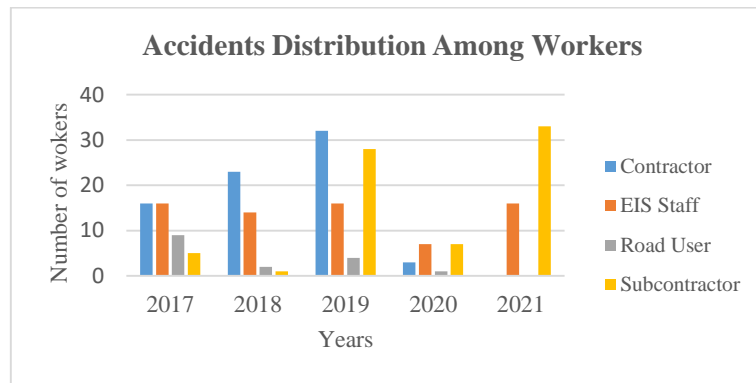

Figure 5: Accidents Distribution Among Workers 2017 until 2021

3.5 Injuries Sustain for Right Leg

Table 1: Percentage for Types of Injuries and Medical Certificates by Right Leg

RIGHT LEG				
Type of Injuries	Number of Injuries	Percentage (%)	Number of Medical Certificates	Percentage (%)
Thigh	2	18%	3	2%
Knee	3	27%	85	49%
Leg	4	37%	53	30%
Ankle	2	18%	33	19%
Foot	0	0%	0	0%
Toe	0	0%	0	0%
Total	11	100%	174	100%

Table 1 shows details injuries sustain for right leg. Total number of injuries occurred at right leg is 11, but it was the highest number of medical certificates accumulated which was 174. The longest medical certificates of 85 day was for knee injuries. This is due to it was caused by doing cleaning work on the highway. The worker jumped into the roadside drain to avoid being hit by a car and fractured his right leg. The hazard found in this case is hit by a car. The second longest medical certificates of 53 day was for leg injuries. Deactivation of lane closure at emergency lane triggered this. The root causes for this accident TMV driver intend slowly reversed and suddenly the hit the guardrail cause workers were injured due to the accident and one of the workers severe major injury on his right leg. The hazard found in this case is hit by a car.

3.6 Head Injuries

Table 2: Percentage for Types of Injuries and Medical Certificates by Head

HEAD				
Type of Injuries	Number of Injuries	Percentage (%)	Number of Medical Certificates	Percentage (%)
Head	9	69%	56	90%
Eyes	1	8%	2	3%
Nose	0	0%	0	0%
Ear	0	0%	0	0%
Lips	2	15%	4	7%
Neck	1	8%	0	0%
Total	13	100%	62	100%

Table 2 show head injuries Total number of injuries occurred at head is 13, but it was the highest number of medical certificates accumulated which was 62. The longest medical certificates of 56 day was for head injuries. This is due to hit by a vehicle during routine maintenance work on Turf, Culvert and Drainage (Grass Cutting) involving lane closure. The root causes for this accident was as a result of the violation, a worker suffered a serious head injury due to the speeding vehicle that hit him. The hazard found in this case is hit by a car. The second longest medical certificates of 4 day was for lips injuries. This is due to was routine maintenance median cleaning at highway. The root causes for this accident while cleaning on the highway he was hit by an unknown small particle fragment on the left side of his lips and suffered a minor injury on his left lips. The hazard found in this case is hit by an unknown small particle fragment.

3.7 Discussions

In this chapter, the researcher has suggested some control measures based on the results received through the study of accident cases involving workers on the NKVE highway.

3.7.1 LED Signboard at Site

The control measure that can be done on the hazard that always occurs present before, during and after activation and deactivation of lane closure during work at highway, the first is to install all large and clear signboards, perhaps using LED signboards that state the work being done ahead and give early warning to road users to be careful and sensitive to the surrounding conditions in this way it can reduce hazards to workers such as being hit by highway users while doing work on the highway [5].

3.7.2 Lane Closure Formation on The Highway

The control measure that can be made is that the traffic management team (TMT) together with the safety vehicle (SV) do parallel formation. Safety vehicles as an escort play a role in protecting the (TMT) such as workers and vehicles (TMT) from being hit by highway users. This is because the previous formation was a parallel formation which caused vehicles on the highway to still move to avoid traffic congestion but the formation caused accidents occurs as a result of the vehicle still moving and the user may be driving a fast vehicle without being sensitive to the condition of the road ahead. Here the parallel formation is better than the previous one because this formation can prevent accidents and hazards from happening to workers because (SV) can prevent highway user vehicles from moving until the activation and deactivation process of lane closure is completed [6].

3.7.3 Installation of Lighted Cones

Install lights on the safety cone using batteries, it can reduce accidents on the highway involving workers as well as highway users. This method can be used for various works involving lane closure at night at the same time it is easy for highway users to see or be aware of the works being carried out with lighted cones as long as they do not dazzle and do not interfere with driving on the road [6].

4. Conclusion

Overall, objectively identify the hazards, analyze the accidents involving before, after and during activation and deactivation of line close during work at highway New Klang Valley Expressway (NKVE) determine the category of traffic accidents against workers that are coded as the most critical in the accident data company.

Acknowledgement

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