Understanding Road Accidents Along The Halsema Highway In Northern Luzon

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ABSTRACT

This paper exposes the factors that contribute to the occurrence of road accidents along the Halsema Highway and the possible intervention programs that the concerned agencies undertake to mitigate the occurrence of road accidents. It sought to explain the factors and understand the circumstances that affect road accidents necessarily since the Halsema Highway is a major route that connects Mountain Province to the world. Descriptive method was used in determining the environmental factors, vehicle factors and personal factors that contribute to road accidents. It was found in the study that most accidents happened during fair weather on roads with straight-flat feature. Lose brakes, malfunctioned steering and bald tires are among the mechanical defects that cause accidents. Poor driver condition and negative driver behavior are also factors that can lead to road accidents along the Halsema Highway. The interpretation of the findings showed that road accident is not solely blamed to one factor but it is a combination of poor road condition, mechanical malfunction and negative driver behavior.

Keywords

Driver Behavior, Driver Condition, Environmental Factor, Halsema Highway, Mechanical Defect
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Introduction

Vehicles of many sorts come and go while it cannot be avoided that accidents happen given the terrain, road conditions and weather. Despite the technology and design the governments adopt, road safety is still a major concern in many countries.

Most researchers consider human error, vehicle condition, and natural forces as common factors in vehicular accident. Human error may refer to the physical and mental condition of the driver or the negligence on the part of other road users like pedestrians and other drivers. It is posited on the article of Elliot (2009) that 95% of crashes are caused by human error as reported by Rae Tyson, the spokesman for National Highway Traffic Safety Administration (NHTSA) at Maryland. The article also reflected human error instances such as distracted driving, driving too fast, and not wearing seatbelt.

Negligence is also a common cause of road accident. According to Goguen (2017), negligence is a legal theory often used in car accident cases which refers to the failure to do something that the driver should have done or has behaved in a thoughtless manner, which has caused harm or injury to another person. Goguen (2017) also mentioned that the law requires drivers to be reasonably careful when encountering anyone they meet on the road. Some duties of drivers are driving at a reasonable speed, vigilance and keeping a proper lookout, maintaining control of the car, and maintaining and using the car's equipment.

Aside from human errors, poor condition of the vehicle is also considered as a factor in road accident. Vehicle condition refers to the poor state of the vehicle like dysfunctional parts or poorly maintained vehicle condition. The World Health Organization (2015) claims that safe vehicles play a critical role in averting crashes and reducing the likelihood of serious injury. This is why United Nation (UN) regulation on vehicle safety such as meeting standards on front and side impact regulations, electronic stability control and ensuring airbags and seatbelts fitted in all vehicles.

Nature can also become a factor in vehicular accidents due to the presence of fogs, erosions, slippery roads, sun glares, and the aftermath of torrential rain. Researchers at Berkley evaluated 1.4 million fatal crashes attributed to weather conditions from 1975 to 2000, and fatal crashes were more likely to happen on the first snowy day of the season (Elliot, 2009). According to the Fatality Analysis Reporting System (FARS), over 2,300 fatal United States car crashes in 2011

occurred during rain and more than 650 while snow or sleet was falling (Tapella and Eberspacher, 2017). Wolff (2015) also mentioned in his article that sun glare can cause visibility issues and is distracting. He also mentioned that decreased visibility due to rain and fog and increased drowsiness are some factors that can affect driving and contribute to accident. Further, Tapella and Eberspacher (2017) cited in their article that in 2011, nearly 25% of crashes in Illinois occurred during wet, icy, or snowy conditions. They also enumerated some weather conditions that affect drivers such as rain shower, thunderstorms and lightning, flooding, hurricanes, high winds, tornadoes, snow and ice, and hail.

Thence, to prevent road traffic injuries, WHO (2017) encourages governments to take actions to address road safety in a holistic manner, requiring the involvement from multiple sectors such as transport, police, health, education; and actions that address the safety of roads, vehicles, and road users.

It is also the objective of the Decade for Action for Road Safety 2011-2020, a program of the United Nations Road Safety Collaboration launched in May 2011 in over 110 countries to advocate road safety at the highest political levels; compiling and disseminating good practices in prevention, data collection and trauma care; sharing information with the public on risks and how to reduce these risks; and drawing attention to the need for increase funding (WHO, 2017).

In relation to global concern on road safety, the Philippines has its own law to regulate transportation which also define common carrier as a person, corporation, firm or association engaged in the business of transporting passengers or goods or both. "Common carrier is required to observe extraordinary diligence, and is presumed to have acted in case of the loss of the effects of passengers, or the death or injuries to passengers," Piad (2017).

Republic Act No. 4136, also known as an act to compile the laws relative to Land Transportation and Traffic Rules, to create a Land Transportation Commission and for other purposes, prohibits reckless driving. Section 48 of Article 5 of the same law states that:

"No person shall operate a motor vehicle on any highway recklessly or without reasonable caution considering the width, traffic, grades, crossing, curvatures, visibility and other conditions of the highway and the conditions of the atmosphere and weather, or so as to endanger the property or the safety or rights of any person or so as to cause excessive or unreasonable damage to the highway."

With these laws, the responsibility on safe driving lies on the shoulders of drivers who seat behind the wheel and who should ensure the vehicle's good condition. However, weather and road circumstances still play part in the occurrence of road accidents.

As informed by the Asian Development Bank Report (2012, p1), transport is a key sector in the Philippine economy, linking population and economic centers across the island and has seen modest improvement in the quality of its transport services, but a large part of the road network remains in poor condition, and intermodal integration is generally weak.

Hence, it is important to determine and understand the existing circumstances and factors that make Mountain Province Section of the Halsema Highway dangerous to traverse to be able to recommend measures that may help mitigate road accidents with the help of concerned agencies. Further, it is the objective of the study to determine the factors that contribute to the road accidents along the Halsema Highway and to identify law enforcement strategic programs that can be proposed to help mitigate road accidents. After understanding the hazards along the Mountain Province Highway, it was best to use the Geographic Information System (GIS) to map the road accidents and determine the accident hotspots. The geographic concentration of the road accident occurrences is further investigated to determine the appropriate intervention measures that can be employed to mitigate, if not to totally stop, road accident incidences.

In this study, the Multiple Causation Theory is fitted in as a framework since the concept can be applied in analyzing the road accident causes along the Halsema Highway. This theory, is an outgrowth of the Domino Theory. The contributory factors that were grouped into the following, according to Saari (n.d.) are behavioral which refers to the influences affecting the worker (driver), such as improper attitude, lack of knowledge, lack of skills, and inadequate physical and mental condition is included in this category

on behavioral; and environmental that comprises the improper guarding of other precarious work elements and dilapidation of equipment through usage and unsafe procedures.

This study is also attached to the concept of hazard perception in driving which, according to Horswill (2016), refers to a driver's ability to anticipate potentially dangerous situations on the road ahead. This framework explains the impact of driver behavior in the occurrence of road accidents.

It is also anchored on the concept of Safe System approach being advocated by the World Health Organization (WHO) which aims to ensure a safe transport system for all road users. This approach takes into account the people's vulnerability to serious injuries in road traffic crashes, and recognizes that the system should be designed to be forgiving of human error. The cornerstones of this approach are safe roads and roadsides, safe speeds, safe vehicles and safe road users, all of which must be addressed in order to eliminate fatal crashes and reduce serious injuries. As Sy (2017) posited, "Under the Philippine Road Safety Action Plan, developing and maintaining a road crash database system is under one of the key pillars for a safer road environment."

Consequently, the following factors were conceptualized from the study:

Environmental factors. Refers to the ecological situations of the road such as the road features and weather conditions contributing to the occurrence of road accidents.

Vehicle condition. It refers to the poor state of the vehicle like dysfunctional parts or poorly maintained vehicle condition.

Driver condition refers to the physical and psychological situation of the driver that may have affected his perception while driving.

Driver behavior discusses the attitude and discipline of the drivers which cause faulty actions that lead to accident.

Method

Participants

The study was conducted in Mountain Province, most specifically the Mountain Province Section of the Halsema Highway which stretches from Sinto, Bauko to Chakchakan, Bontoc.

Seven victim survivors, ten drivers and four police officers were interviewed to gather information on their involvement or experiences on the factors that caused the road accidents. The key informants recounted their observations that helped explain why accidents happened. They were not forced to answer questions that made them uncomfortable.

Further, retired police investigators were also interviewed to augment the findings of the study. Personnel from the Planning Section of DPWH-MP were also consulted on the definition of road features and for information needed to augment the findings of the study.

Design

The study made use of the qualitative design and descriptive method since thematic analysis and documentary analysis were employed in determining the factors that contribute to the occurrence of road accidents along the specified stretch of the Halsema Highway. Through qualitative design, the researcher generated information and ideas to promote road safety for commuters and travelers who traverse Halsema Highway.

Materials

Document analysis, through frequency counting and GIS mapping were used to determine the environmental factors. The documents analyzed are reported vehicular accidents consolidated by the Mountain Province Police Provincial Office (MPPPO) which were duly retrieved by the researcher. The data were filtered according to profile and specific locale of the study.

Open-ended interview guide was used to gather data among the survivors of road accidents, drivers and responding officers on the factors that contributed to the occurrence of road accidents. The responses were transcribed, translated and analyzed to come up with themes. The themes generated from the responses were cross checked with the records at MPPPO for confirmation and consistency.

On-site surveys were also conducted to better understand the road conditions. Observations by the researcher and other informants were also used to corroborate the findings of the study.

Procedure

The researcher sent a request letter to the Provincial Director of the Mountain Province Police Provincial Office for the data on weather condition and road condition. Another letter was

sent to the chief-of-police of Bontoc Municipal Police Station to request the participation of some police officers while others were approached personally by the researcher.

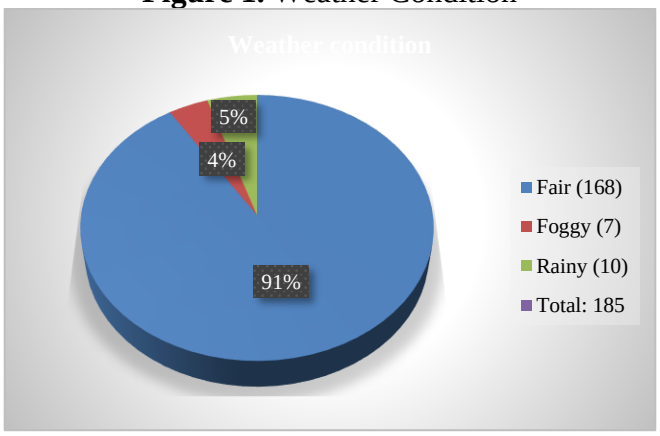
The three victim survivors and drivers were carefully chosen to ensure their participation since traumatic experiences need to be recounted. Data gathering proceeded. The researcher then interpreted the data collected.

Frequency counting was used to determine the environmental factors. Results of the interview from key-informants were analyzed through thematic method. The concept of the study was explained to the key-informants prior to the interview. The transcriptions were shown to key-informants for final consent and to make sure that the transcription bears the correct thought or ideas of the key-informants before it was interpreted in the study.

Results

The data analysis was done through frequency counting and the thematic analysis. The following are the results of the frequency counting on weather condition and road features.

Figure 1. Weather Condition



It can be seen in figure 1 that there are 168 road accidents that happened during fair weather condition. Ten incidences occurred when it was raining while 7 road accidents happened during a foggy weather condition.

Figure 2. Road Features

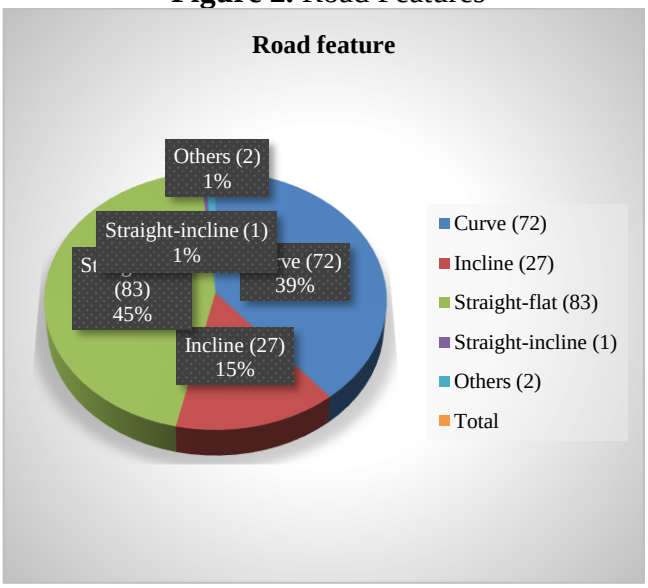


Figure 2 shows that there are 83 road accident cases that happened on a straight-flat road, 72 happened on curves, 27 road accidents occurred on inclining road while only one happened on a straight-incline road feature.

Discussions

The results show that most accidents happen during fair weather and on a straight-flat road feature. There are also several conditions that cause contribute to the occurrence of road accidents such as environmental, vehicular and personal factors.

Contributory Factors Surrounding the Accident Prone Areas

This section presents the contributory factors surrounding the road accident prone areas along environmental, vehicular and personal factors.

Environmental Factors

Environmental factors refer to the ecological situations of the road such as the weather conditions and road features contributing to the occurrence of road accidents. These factors have a direct effect on the situation of both the vehicle and the driver which leads to either safety or danger. According to Hafeez and Kamal (2016), wrong and incompatible geometric designs may lead to sever accidents. The World Health Organization (2017) also cited on their report on road traffic injuries that the design of the road can have a considerable impact on their safety which is deliberated by the personnel of the Department

of Public Works and Highways (DPWH). In this study, the following are among the environmental factors that contribute to the occurrence of road accidents:

Weather Conditions. These are the weather situations that affect the occurrence of accident along the Mountain Province Highway.

Figure 1 above shows the weather conditions during the time that the accidents happened. It can be noted that fair weather condition has the highest rate of 168 or 91% of the overall weather condition. This can be explained with the fact that warm weather induces sleep among drivers, especially during the mid-day, since it causes a monotonous atmosphere. It is also speculated that fair weather affects road condition. During dry season, when rain fall is rare, the stone and rocks from the mountain slope fall down to the road making the surface of the road slippery.

Second highest weather condition is rainy with 10 road accident rates or 5%. Rain may cause landslides that can become a potential danger to road users since in some parts, road erosion takes with it the protective barriers and other road signs. Rain also causes rocks from the mountain to roll down the road, thus making the road slippery. Falling rocks can also hit passing vehicles, and rocks on the road can spell disaster to inattentive drivers.

This finding is supported by the report of Tapella and Eberspacher (2017) and Nokhanda, et al. (2008) that car crashes occur during rain, and it makes the surface of a road slippery, increasing the possibility of accidents; while Banik et. al, (2011) also stated that in the rainy season, majority of the roads become slippery and tend to be muddy for non-paved roads.

The weather condition with the lowest road accident is foggy with 7 occurrences or 4% rate. Fog causes low visibility even when a vehicle has a good headlight. If drivers are not paying extra care when there is fog, they can meet an accident because they cannot see obstructions and approaching vehicles.

Tarel et al. (2010) mentioned in their study that fog fades the colors and reduces the contrast of the observed objects with respect to their distances. This further supports the finding that fog is a contributory factor in road accidents.

It is surprising to know that most accidents happen during fair weather and not during rainy days. This may imply that weather condition is indeed considered as a factor in road accident but to various extent. Rain causes the road to become slippery, and rainwater brings stone to the roads affecting the tire rotation of vehicles; while a sunny day and fair weather induce sleep and escalates fatigue among drivers.

The weather condition reflects the need to consider Environment, a pillar in Traffic Management, in order to promote safety among road users, especially those who traverse the Mountain Province highway.

Road Features. According to Hafeez and Kamal (2016), wrong and incompatible geometric designs may lead to severe accidents. The World Health Organization (2017) also cited on their report on road traffic injuries that the design of the road can have a considerable impact on their safety which is deliberated by the personnel of the Department of Public Works and Highways (DPWH).

The different road features and its frequency are reflected on Figure 2. Road feature is defined as the design and characteristic of the sections of the Mountain Province Highway. It can be seen that road accidents mostly occur on straight-flat road feature with a rate of 83. As defined by an engineer at the DPWH-MP, a straight-flat feature is a road that lies on the same axis and follows a horizontal plane.

This result means that most road accidents that occurred along the specified stretch of the Halsema Highway happened on a straight-flat road. This result can be further explained by SPO2 Marlo T. Falolo, that “Drivers overtake at straight-flat roads, or they are over speeding.” The National Technical Information Service (2009) reported that statistics show that about 46 percent of the estimated 2,189,166 crashes, the vehicles were going straight prior to the occurrence of critical pre-crash event.

The second highest road accident frequency happened on curves with a rate of 72. Curve, as defined by Engineer Kadchao, “is a road that changes its path with respect to a point/center, and it is either horizontal or inclined.” Since drivers have reduced sight distance on curve roads, it can become a potential threat to drivers. For some, curves are itself warnings to drivers to slowdown, but it still offers surprises like inattentive drivers or inexperienced drivers coming from the opposite

direction who ignore pavement markings and road signs.

Quezon and Fekadu (2016) also found that some of the accident prone road sections are those located in a mountainous area; all of the area have similar geometrical features such as curved both horizontally and vertically, sloped (up to 9%, example Qajela road section) and bridge existence. Similarly, they also found out that, "Road traffic accidents are higher in mountainous areas, highly curved road geometries and bridge locations than the other sections of the road."

The third highest road accident frequency happened on an incline road feature with 27 road accident rate occurrences. Some of accident causes along inclined road are loss brakes and tire slips due to road condition. Keziks and Viba (2006) mentioned that it should intuitively be that steep turns on the roads increase the probability of an accident, for the following reason: steep turns reduce visibility and increase the probability of sideslip and, consequently, a driver is less likely to control his vehicle.

The lowest are straight-incline and others with one and two occurrences respectively. This can be explained by the fact that drivers usually shift to low gear when passing through a straight-incline road since it is increasingly elevated. Therefore, drivers are more careful while along this physical feature of the road unless the vehicle has a mechanical failure which could lead to road accident.

With the efforts of the Department of Public Works and Highways to source out fund to improve the Halsema Highway, accidents still happen especially in straight-flat sections because of bad driver behavior or negligence. It can be then said that road features can be treacherous, but negative motorists' behaviors also play a role in road accident since drivers need to pay attention to where they are going. The findings also denote that even if the Halsema Highway is already far improved from muddy foot trail to widened, cemented, two-way lane highway, danger is still around the corner, most especially during bad weather and bad human psyche condition. It is then generalized that Engineering, as a pillar, is deemed necessary in Traffic Management.

Vehicular factors. In this study, vehicle condition refers to the poor state of the vehicle like dysfunctional parts or poorly maintained vehicle condition. The mechanical parts of the vehicle, once defective, can cause accident that endangers the lives of the drivers and passengers. Haque and Hasan (2007) mentioned in their study the statement of Asia Development Bank, 1996 on studies carried out in the United Kingdom (UK) have identified that between 5.0 and 8.5 percent of accidents are directly caused by faulty vehicle condition (ADB, 1996). It was also reported by Sheehan (2017) that in the United Kingdom, despite tires ranking top for cars, of all vehicles – including bikes, buses and bicycles – the Department of Transportation figures showed that faulty brakes were the most common reason for collisions. Defective steering or suspension was the next most common contributor, ranking higher than poorly and over-loaded vehicles.

a. Loss Brakes. Loss brake is a common mechanical failure resulting to accidents where the brakes are not functioning to stop the wheels from rotating or making the vehicle come into halt. Oduro (2012) posited that vehicle users agreed that brake failure is caused by low or shortage of brake fluid in the master cylinder that causes brake ineffectiveness and the presence of air in the braking system. This implies that vehicular maintenance is sometimes neglected by drivers, especially that most vehicles that traverse the Halsema Highway transporting vegetables from Mountain Province to any point of Luzon. Interviews revealed that most vehicles used to ferry vegetables are old model trucks of which parts are either deteriorating or remedied.

b. Malfunctioned Steering. In some situation, steering wheel of vehicles can vibrate and become unstable while driving. In an interview with a key-informant who experienced an accident due to malfunctioned steering, "The steering wheel of the vehicle suddenly went stiff and cannot be managed, so I hit the mountain slope." Malfunctioned steering can be caused by lack of oil in the steering gear box and lack of grease on the steering rod extensions as explained by Elias and Bahaudin (2014) in their research. This means that dysfunctional steering is a cause of vehicular accident along the Halsema Highway.

c. Bald Tires. Car tires need to be checked before travelling since it can be a cause of accident. Sharma (2016) posited that wheels of old vehicles can suddenly come out, causing damage to the vehicle and occupants. Further, low tire pressures

(Elias and Bahaudin, 2014) and tread that has worn below legal limits and damage are listed as the main tire issues (Sheehan, 2017), which suggest that many motorists neglect regular check on the condition of their car's tires. Oduro (2012) also suggested that incorrect tire pressure results in the vehicle pulling to one side when brakes are applied.

According to SPO2 Falolo, "One bad attitude of car owners is to still use the bald tires as long as it can still be used." Because of this negative way of valuing things, the tires may suddenly burst or deflate causing trouble on the road, risking safety.

The identified mechanical defects of the vehicles are indications that drivers are not regularly checking their vehicles before travelling. It also implies that some drivers or operators of public utility vehicles are not properly maintaining the vehicles they are using.

Vehicular factors or mechanical defects can always be avoided if the drivers or vehicle owners check the battery, light, oil, water, brakes, air, engine, tools, and self (BLOWBAGETS) before travelling to ensure security along the way and safe arrival to destinations. This basic measure is ventured on the advocacy of the World Health Organization which is the Safe System approach with the aim to ensure safe transport system for all road users.

Personal Factors

Human error refers to the different forms of negligence and physical challenges or distractions that a driver faces, leading to road crashes (Sy, 2017). Issa (2016) proved in his research that human factor is highly involved in traffic accident with the percentage of 82%. Also, Alam and Ahsan (2013) found out that over speed and careless attitude of the drivers are the two most contributory factors of accidents on the highway. This is also supported by Mali, et. Al. (2017) who mentioned on their study that the main cause of accidents and crashes are due to human errors which leads to over speeding, drunken driving, distractions to driver, red light jumping and avoiding safety gears like seat belts and helmets.

Thematic analysis reveal that there are two personal factors that cause road accidents along the Mountain Province highway. These are driver condition and driver behavior. Driver condition refers to the physical situation of the driver that may have affected his perception while driving. On the other hand, driver behavior refers to the attitude and discipline of the drivers which cause faulty actions that lead to accident. Elliot (2009) refers to human error instances as distracted driving, driving too fast, and not wearing seatbelt. However, in this study, driver behavior includes inattentive, driving under the influence of liquor, too fast or over speeding, fatigue or sleepy, bad turning, bad over taking and encroachment.

A. Driver Condition

It is essential to be vigilant in driving since safety should always be the priority in reaching destinations. Hence, it is important that drivers are physically and mentally active to observe defensive driving. However, there are circumstances that cannot be avoided which lead to the driver's poor condition such as lack of sleep and medicine or liquor intake. As Goguen (2017) mentioned, the law requires drivers to be reasonably careful when encountering anyone they meet on the road.

Thematic analysis reveal that there are several human errors that cause road accidents along the Mountain Province highway. Elliot (2009) refers to human error instances as distracted driving, driving too fast, and not wearing seatbelt. In this study, driver behavior includes inattentiveness, driving under the influence of liquor, too fast or over speeding, fatigue or sleepy, bad turning, bad over taking, and encroachment.

a. Driving under the influence of liquor (DUI).

Driving under the influence of liquor is a common cause of road accident. In an interview with SPO2 Falolo, he said that, "Tipsy or drunk drivers cannot feel the speed of their vehicle. They think that they are not going too fast because of the bravery they mustered before driving." This statement is supported by a key-informant who survived after his motorcycle plunged at Sitio Tikitik, when he said, "Yes, I admit that I was drunk. I thought I can drive, and I did not notice that I was going too fast".

Driving under the influence of liquor, as a factor, is supported by the study of Hassen et. al (2011) which says that the reasons given by the respondents for why they drove after drinking alcohol were; they believed that they were skillful and have self confidence in driving and to enjoy with friends after drinking.

The findings on driving under the influence is much associated with optimistic bias which states that people tend to be more positive and hopeful rather than being realistic. Drunk drivers tend to have faulty perception on how they can manage driving since alcohol has distorted their ability to see and think straight.

b. Fatigue/sleepy. Fatigue/sleepy is also a factor under driver condition when the driver is tired and drowsy that his driving attention and awareness to the environment is abridged. From the statements of the key-informants, fatigue/sleepiness can be caused by drinking liquor before driving, hot temperature of the environment, and monotonous ride which supports the findings of Hafeez and Kamal (2016) who posited that early hours of the morning and the middle of the afternoon are the peak times for fatigue accidents and long journeys on monotonous roads, particularly on motorways, and mostly drivers fall asleep during that period of the day.

The Royal Society for the Prevention of Accidents (ROSPA, 2017) reported that sleepiness reduces reaction time (a critical element of safe driving); it also reduces vigilance, alertness and concentration, so the ability to perform attention-based activities (such as driving) is impaired. The speed at which information is processed is also reduced by sleepiness which the quality of decision-making may also be affected.

Sleep related accidents tend to be more severe, possibly because of the higher speeds involved and because the driver is unable to take any avoiding action, or even brake, prior to the collision (ROSPA, 2001). In relation to this, Cummings, et. Al (2001) summarized that an estimated one fourth to one half of driver's report having fallen asleep at the wheel at least once; studies in the United States have estimated that between 1% and 4% of crashes may be attributed to the driver falling asleep or being drowsy; studies from Norway, Australia, and Britain have given estimates of 4%, 6%, and 16% respectively.

Not feeling well, drowsiness or being exhausted can lead to road accidents, thus, drivers need to be more cautious about their physical condition. Drivers should not risk their safety or the safety of their passengers because of the determination of reaching their destination.

B. Driver Behavior

Aside from the physical condition of the driver, negative driving behavior is also a factor in road accident. Tasca (2002) posited that driving behavior is aggressive if it is deliberate, likely to increase the risk of collision and is motivated by impatience, annoyance, hostility and/or an attempt to save time. This implies that the attitude and discipline of the drivers can cause faulty actions that lead to accident.

Among the negative driver behaviors exposed in this study are inattentive, driving too fast or over speeding, bad turning and encroachment.

a. Inattentiveness. Distracted driving occurs when some kind of triggering event external to the driver, results in the driver shifting attention away from the driving task; distraction can be from inside or outside the vehicle (JP Research, 2015).

Inattentiveness may also mean not thinking clearly or having other thoughts in mind. In an interview with an informant on March 28, 2018, he said that, "I was not drunk but I have lots of problems that time and I was thinking what to do. I did not notice that a kid was crossing the road so I slammed it (car) on the side (barrier)."

It is then safe to rationalize that being inattentive or not focusing on driving activity or not being vigilant about incoming vehicles is a cause of road accident since concentration is divided. Reduced focus does not allow drivers to notice incoming dangers such as encroachment and over speeding.

b. Driving too fast or over speeding. Too fast or over speeding refers to the speed of the vehicle beyond the maximum speed regulation or limit. Mohanty and Gupta (2014) posited that the most important causative variable affecting road crashes is speed of the vehicle. On the other hand, Iligan (2017) also reported that based on police data for 2016, **speeding** ranks second in the top causes of road crashes, while **wrong overtaking** is third.

In an interview conducted by the researcher with PO3 Dexter Lobchoy, Investigator at BMPS, he noted that, "Other drivers, especially motorcycle riders, never learn from the dangers of over-speeding. They are too fast in driving." This is supported by the statement of a commuter who refused to be named when she said that there are drivers of utility vehicles who drive very fast so that they can go back again for another round in the queue. This is explained in Environment, a

Traffic Management pillar, which deals with potentially disastrous population explosion, changes in the urban environment due to scale and density of a new urban concentration and new activities carried out

c. Bad turning. Bad turning is made when drivers suddenly overtake the vehicle in front, not anticipating another speeding vehicle is coming from the opposite direction, which may result in collision (Sharma, 2016). According to JP Researcher (2015), a sudden lane change, so as to perform a turn maneuver, is highly undesirable and is likely to cause a rear end collision and this situation can be avoided by creating right/ left turn lanes.

In the Philippines, the Philippine National Police (PNP)-Highway Patrol Group (HPG) released a report claiming that **bad turning** or **changing direction** without using the vehicle's signal lights is the number one cause of accidents in the country (Iligan, 2017). In an interview with SPO2 Falolo, he said that "As a driver, it is important to always show road courtesy like using signal lights and following road signs to avoid accident." He also said that some accidents which they had responded to were results of making a U-Turn in prohibited areas, overtaking in hazardous sections, and not using signal lights.

d. Encroachment. In this study, encroachment refers to the intrusion of a vehicle on another lane due to distraction and sleepiness. Sharma (2016) explained that road encroachment is not only infringement and violation of rule of law, but it also results to accident, especially during night with poor street lighting. From the interviews, encroachment happens in curves when drivers try to cut-short the distance while disregarding safety. It also happens when drivers are drowsy and are not focused on their own lane.

Human error is always linked to road accidents since it affects perception of hazard in driving. Perception of hazard is expected to be anticipated by drivers to help them be cautious on what might happen if they are not careful enough. This concept is equally important in guaranteeing the safety of the driver himself and the passengers as well.

The identified factors are tied to the concept of hazard perception in driving since there is a need for drivers to take pre-cautionary measures such as checking the vehicle condition before travelling; not risking safety due to weather and bad physical condition; and maintaining road courtesy and vigilance while driving. Driver condition and driver behaviors are always linked to road accidents since it affects the driving perception which is equally important in guaranteeing the safety of the driver himself and the passengers as well.

Law Enforcement Strategic Operations

The following are proposed law enforcement strategic operations that were crafted from the identified factors that contribute to road accident incidences. These were based on the existing programs of the Department of Public Works and Highways (DPWH) and the Philippine National Police (PNP). The other proposals were derived from agencies such as Provincial Tourism and the Provincial Risk Reduction and Management Office suggested.

Maintenance of pavement markings and barrier reflectors

Pavement markings and barrier reflectors serve as guide to motorists, most especially during rainy seasons where there is low visibility it is why the Department of Public Works and Highways should maintain the pavement markings, especially on accident hotspots to aid drivers in the proper direction. Barrier reflectors must also be maintained to warn drivers of the limits of the road and the possible hazards that lie beyond the barrier.

Continuance of Kalsada Program

DILG Secretary Mel Senen Sarmiento said the KALSADA program aids to help the local government units in progressively improving local road conditions by providing technical and capacity development assistance to provinces through raining, mentoring and coaching on local road management as well as funding for road upgrading, improvement, and rehabilitation (DILG, 2016).

In this study, it is suggested that this program be continued because through it, road is cleared of loose gravel and stones that may affect safety in driving. Therefore, pavement markings, barrier signs and reflectors are maintained and made visible to all road users.

Mobilization of Barangay Patrol and Tourism (BPAT)

It is also proposed that the Barangay Patrol and Tourism be mobilized to ensure that right of way is always observed, along with the prevention of illegal parking. It is also the function of the BPATs to make sure that tourists will park their cars properly and safely, so as not to obstruct the view of other road users.

Information Drive on the Use of Emergency Hotlines

Emergency hotline programs are being adopted by nearly all agencies, especially the BFP, PNP, PDRRMO, DOH and the DPWH. However, the awareness on this is not reaching all commuters and road users traversing the Halsema Higway. It is proposed that campaigns in the form of Radio Program announcements and the use of social media be mobilized. It is then suggested that Hotline Numbers be posted along accident hotspots for people to immediately call for help in cases of emergency.

It is believed that the proposed strategic operations will help promote safety along the Halsema Highway through constantly reminding the travelers on security measures. It is also supposed that proper coordination and response from the community members save life and property.

Conclusions

Most vehicular accidents that transpired along the mountain Province section of the Halsema Highway happened during fair weather and on a straight-flat road. However, road accident is not solely blamed to one factor but it is a combination of poor road condition, mechanical malfunction, and negative driver behavior. The factors determined are influential to vehicular accidents regardless of the good weather and better road conditions.

There are also government programs that are existing but are not sustained; thus, law enforcement strategic operations need to be implemented and sustained by concerned agencies to promote safety and security among drivers who traverse the Halsema Highway.

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