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INDONESIAN DRIVERS' CHARACTERISTICS ASSOCIATED WITH ROAD ACCIDENTS

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ABSTRACT

The prevalence of road accidents in Indonesia is still extremely high, with human error being claimed as a major contributing factor. Profiles of the drivers involved in the accidents are not typically available, and studies covering this subject are also limited. In this paper, Indonesian road transportation will be discussed, particularly with respect to traffic accidents and the associated characteristics of the drivers. Also of interest is the description of certain demographic aspects and their relation to road accidents. Data were collected from the news, along with an online survey of 138 commercial drivers, 10% of whom were female). It was found that spending an inordinate amount of time driving per week induces sleepiness and fatigue and is considered as one of the prime causes of accidents. It was also determined that lack of concentration was one of the dominant (~51%) causes. Differences in age, gender, and driving experience did not seem to be related to the likelihood of accidents.

Keywords: Driver characteristics; Driving hours; Fatigue and sleepiness; Road accidents

1. INTRODUCTION

The number of vehicles in Indonesia has been steadily increasing over recent years, according to the Indonesia Bureau of Statistics (BPS, 2014), and is indirectly related to the large amount of road accidents in the past five years. Contributing factors such as fatigue and sleepiness, lack of experience, unfamiliarity with terrain, deficient technical skills, lack of concentration, and other factors that can be categorized into human errors are often mentioned in many fatal accident cases. These factors have been discussed by researchers, and the issues continue to be reported in the literature. The demographical aspect is also important, but has received a comparatively lower degree of attention (Di Milia et al., 2011; Phillips & Sagberg, 2013). This may be due to the lack of reliable data related to the people involved in accidents; the recording and collection of these kinds of data requires serious efforts. In addition, data related to the direct causes of accidents and other aspects remain limited. That said, accidents caused by sleepiness have increased significantly based on data from 2011-2013, as well as the use of mobile phones and driving at high speed (Rio, 2016).

Over the last five years, road accidents have been increasing in Indonesia at an alarming rate, around 15.3 individuals die from road accidents per 100,000, with the highest percentage being motorcycle passengers (36%), followed by bus passengers (35%) and pedestrians (21%) in

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2010 (WHO, 2015) and during 2015, there is 27 thousand people die and accidents involved motorcycles is the highest one (Auditya, 2016). Media reports frequently mention human error as the cause, with other details such as age, sex, occupation, and driving duration being unavailable.

Based on worldwide data, road accidents have been claimed as the leading cause of death compared to other causes, as reported by WHO (see Figure 1). This means that it is crucial to understand all information associated with such accidents. Human error as the main cause has been mentioned in several studies as well as in the news. In Indonesia, exact statistics on the contribution of human error to accidents are not definitively known; however, in other countries it accounts for 95% (UK) and 94% (US). In many other nations, the estimate is around 97–98% (Karacasu & Er, 2011). Decisions need to be taken by drivers in the moment (Hughes et al., 2015); this is affected by the driver, road and vehicle conditions, and environmental factors. An error can occur in perceiving stimulus, which may result in improper decision-making, leading to an accident (Tyagi et al., 2009).

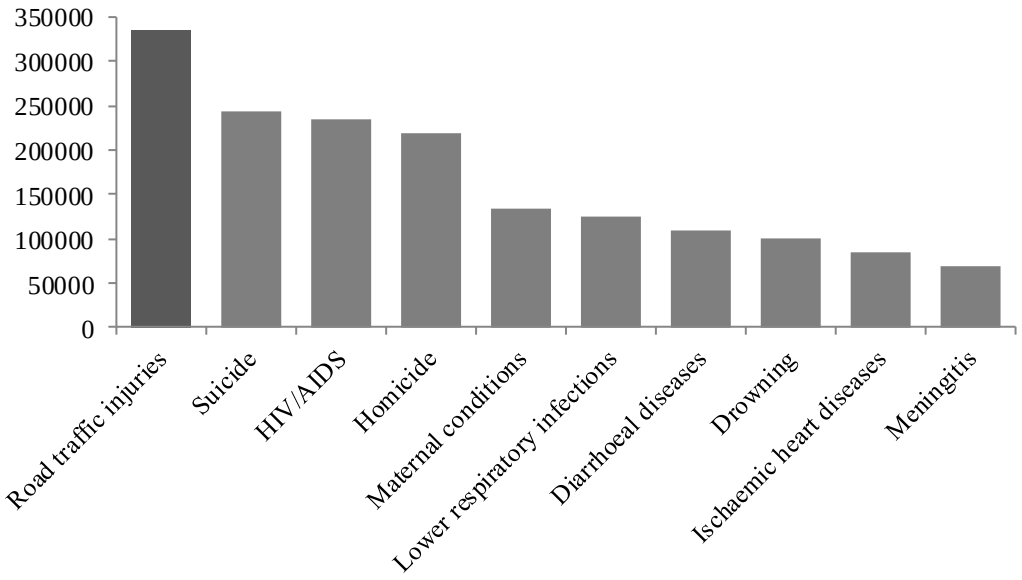

Figure 1 Road accident injuries and other causes of death worldwide (WHO, 2015)

Phillips and Sagberg (2013), in examining sleepiness as a cause of accidents, indicated road conditions, driving distance, and lack of experience as factors that exacerbate sleepiness while driving, thereby increase the risk of accidents. As regards the latter factor, several researchers have found that those with less experience become more tired when having to read and process a lot of information while driving (Giroto et al., 2016; Zhang et al., 2016). The risk of road accidents associated with age has characteristics resembling the letter "U." Younger drivers (under 27 years) and the elderly (over 63) have a higher accident rate when driving heavy vehicles (Duke et al., 2010). Novice and young drivers tend to have a shorter first crash compared to experienced young drivers according to driving-pattern-tracking result using a global positioning system (Ayuso et al., 2014), while for older drivers the problem is more related to unstable driving behaviors, which can lead to accidents (Hong et al., 2016).

Accidents experienced by young car drivers are also affected by the number of accompanying passengers and their ages (Ouimet et al., 2015). Younger teenage passengers increase driving risk, particularly fatal crash risk compare to solo driving or to older teenage drivers. This condition might be driven by optimism bias with respect to the driver's skills; they may feel

less afraid of having an accident because they perceive themselves to be more highly skilled than their peers (White et al., 2011). This optimism may relate with a lower perception of accident risk, and perception to be less likely to have an accident compare to their peer. Young drivers are also somewhat associated with accidents involving loss of control or speeding or with accidents during darkness and other conditions, compared to other drivers (Clarke et al., 2006). One strategy that could be applied to remediate this situation is increasing the amount of time required to gain one's driver's license (Gulliver et al., 2013).

There have been several studies focussing on gender, including that conducted by Özkan and Lajunen (2006). These researchers placed emphasis on the type of accident (passive or active) and perceptual motor skills affected by masculinity or feminity nature. Based on data collected using some questionaires, masculinity score related to perceptual-motor skills and feminity score more likely to have higher relation with safety skills. This may affected by men has more quantity and quality driving time compare to women. Research on road accidents that discusses the difference between genders or driver's age still has many aspects to explore., and in Indonesia the researches related to this issue is limited, the topic itself and standpoint of discussion. The current paper therefore represents an effort to initiate a discussion of drivers' characteristics as related to road accidents in Indonesia. The study will focus on how the number of vehicles has grown from 2010-2014, as well as the increase in those holding a driver's license, an overview of traffic accidents data, and accident characteristics as experienced by drivers and others. The main objective was to describe drivers' profiles in certain regards and to determine potential correlations to road accidents. Road transportation data are based on reports issued by the Indonesian Bureau of Statistics (BPS, 2014), and accidents characteristic is collected through a survey about traffic accidents experienced to a number of Indonesian drivers (conducted in June and July 2016 using questionnaires). An online link to the questionnaires was distributed via a number of routes, including social media and email; we also directly interviewed taxi, bus, and other public transportation modes drivers in Jakarta, Indonesia.

2. METHODOLOGY

2.1. Sample and Survey Procedure

Two types of data were collected in this study; those from government institutions and the media, and those gathered from drivers as respondents. Data from the institutions were obtained from BPS and the WHO report (2015); news reports on various online media were also collected as additional up-to-date information. As mentioned above, respondents' data were collected using an online survey tool. A convenient sampling method was applied in this research, with a minimum respondent number of 30 people. In all, 148 sets of data were collected, of which 138 were valid for analysis. All respondents had a car driver's license.

2.2. Item of Questions

The questionnaires consisted of 16 questions, the first three relating to individual information. The remainder concerned driving habits and any incidents/accidents experienced by the respondents, and their opinion of the cause. Specifically, the questions asked about these issues: 1) average driving hours per week; 2) driving routes (in the city/out of town/both); 3) time when the respondents most often drove; 4) information related to the accident; 5) information about first, second, third, and fourth accidents since respondents started driving; 6) their opinion regarding the cause of the accident/s.

2.2.1. Result analysis

The survey results and data gathered from the BPS were expected to generate certain information, namely: 1) growth in the number of vehicles, number of driver's licenses, and

accident data; 2) demographic characteristics of the drivers, such as gender, age, driving experience, and number of accidents; 3) driving hours per week, correlated to the number of accidents experienced by Indonesian drivers; 4) driving hours per week and drivers' opinions related to the cause of an accident, such as sleepiness and fatigue and other factors; 5) driving experience and its correlation to road accidents.

3. RESULTS

3.1. General Data (Growth in Number of Vehicles and Driver's Licenses and Accident Rate)

As mentioned above, data obtained from the BPS included growth in the number of motor vehicles and driver's licenses, as well as the number of road accidents. Table 1 shows the corresponding data.

Table 1 Vehicle and driver's license numbers per year

	Growth rate per year			
	2011	2012	2013	2014
Passenger vehicles	6.4%	10.3%	10.1%	9.7%
Buses	0.2%	0.9%	0.5%	4.9%
Freight vehicles	5.8%	6.6%	6.2%	11.0%
Motorcycles	12.7%	11.0%	10.9%	9.7%
Driver's licenses, type A	15.8%	5.1%	12.0%	-3.9%
Driver's license, type B1	47.9%	-16.4%	-3.3%	-13.1%
Driver's license, type B2	109.9%	-18.5%	-15.9%	-28.5%
Driver's license, type C	10.2%	2.8%	3.1%	-2.6%

Note: driver's license type A: light passenger/freight vehicle; type B1: medium passenger/freight vehicle; type B2: heavy freight vehicle, type C: motorcycle (Source: Indonesia Bureau of Statistics/BPS, 2014)

Table 1 above demonstrates that the number of vehicles has continued to increase for all three types, with the highest increase on average being for motorcycles (11.08%). It can also be seen that the number of type C driver's licenses decreased in 2014. This may be related to the number of motorcyclists who do not have driver's licenses, which is estimated at about 40% (Sumiyati, 2016) or some motorcycles having only been registered to one person. There was also a fall in type A licenses, while the number of vehicles itself has increased. The latter could be indirectly related to cases of road accidents, which have also been increasing. Data on road accidents for 2010-2014 can be seen in Table 2.

Table 2 Type of injuries suffered in road accidents from 2010-2014 in Indonesia (BPS, 2014)

	Year				
	2010	2011	2012	2013	2014
Fatalities	19,873	31,195	29,544	26,416	28,297
Serious injuries	26,196	35,285	39,702	28,438	26,840
Minor injuries	63,809	108,945	128,312	110,448	109,741

The highest number of accidents occurred in 2012, with the rate decreasing in 2013-2014 (see Figure 1). The latest data from the Indonesian Police Department reported a decrease (9%) in

the number of fatalities in 2015, although the number of accident cases increased by about 7%. Even though a variety of programs have been executed by the government to reduce the rate, the statistics for fatalities are relatively high. Human error has been indicated as a major contributing factor, while other important variables include road infrastructure and environmental conditions (Zhang et al., 2016).

3.2. Survey Data Collected

As mentioned earlier, from the 148 datasets collected, only 138 were suitable for further analysis, because put 2016 as their born year. The valid data consisted of 90% male and 10% female respondents. Profiles showed that 68.6% worked as commercial drivers (bus, public transportation, travel, taxi, Uber, and so on); 13.6% were students; 14.3% were employees; and the rest were self-employed, *chauffeur*, and others. Respondents were aged between 20 to 61 years old (mean = 36.98 years), and participants reported having been able to drive since 12 and 37 years (mean = 18.77 years), for those who answer has been able to drive under 17 years old, is more related to when they started learn to drive a car. While it prohibited by law, it happened in Indonesia. Number of hours spent driving within one week ranged from 1 to 120 hours (mean = 46.97 hours). About 90% of respondents used vehicles with manual system transmission, while the remaining 10% used automatic systems. Thoee data are summarized in the table below.

Table 3 Survey results (1)

	%	Age (range)	Occupation				Years of driving experience	Car transmission	Hours driving/ week
			Std	Dri	Empl	Entre			
Men	90	20- 61	13	96	15	0	12-27	Manual: 113 Automatic: 6 Manual and automatic: 6	1-150
Women	10	22-42	5	0	5	4	14-37	Manual: 4 Automatic: 7 Manual and automatic: 2	7-48

Note: Std = student; Dri = driver; Empl = Employee, Entre = Entrepreneur

From Table 3, it can be seen that there were no female respondents working as a commercial driver, which is in line with real-life conditions in which the number of females who become paid drivers is low compared to men. The range of years of driving experience is relatively wider for females than male, and taken on average the number of males who use manual transmission is higher than that for females. The number of hours spent driving per week were relatively fewer for women compared to men, because many male respondents worked as drivers with long hours.

The data also shows that 47.6% of respondents had been driving in the age range of 15-18 years (which was categorised as being a young driver), with the length of experience of others ranging from 4-6 years (14.5%) to 10-12 years (10.9%) and 25-27 years (10.9%). While these data do not necessarily indicate the profile of the general Indonesian population, the result still appears to reflect real conditions. It can be happened affected by Indonesian permissive nature that reflected from parents who permitt their children to learn how to drive (car or motorcyle) even they are still under age.

In addition, female respondents' driving routes were limited to the city, while some male respondents were also driving out of town (see Table 4).

Table 4 Survey results (2)

	Driving route	Accident experience	Drivers' opinions of cause of accidents
Men	In the city: 115 Out of town: 1 Both: 9	Yes: 70 Never: 56	Driving skills: 15 Machine problems: 6 Lack of concentration: 35 Fatigue and sleepiness: 12
Women	In the city: 14 Out of town: 0 Both: 0	Yes: 8 Never: 6	Driving skills: 3 Machine problems: 1 Lack of concentration: 3 Fatigue and sleepiness: 0

Based on the opinions of the respondents, accidents were most often caused by a lack of concentration while driving (50.7%), insufficient driving skills (24.0%), sleepiness and fatigue (16.0%), and mechanical problems (9.3%). In Table 4, it may be observed that sleepiness and fatigue were not mentioned as a cause by female respondents. One possible explanation is that their driving hours were relatively short compared to those of their male counterparts. In addition, no women reported being employed as a *chauffeur or public transport driver*, as opposed to about 68% of men who did. This condition reflect real condition in Indonesia, that most of public transportation driver are male.

The responses to the question on what times of day participants drove indicated that 60% of respondents most frequently drove in the morning, while 40% tended to drive in the afternoon and night-time. Based on the response to the question on accidents, 44.3% noted that they had experienced an accident, 42.1% expressed that they had done so at least once, and 12.1% stated that they had crashed three to five times. On average, the first accident happened within two years after they passed their test (30.7%), while 8.6% crashed less than three months afterward. The amount of people who had had a second accident was lower by 27.2%, while for a third incident it declined by 40.7% and for a fourth it decreased by about 45% compared to the amount of one-time-only crash victims. The data comparing this are shown in Table 5.

Table 5 Survey results (3)

Length of time after starting to drive before experiencing an accident (78 respondents)	%	Number of accidents experienced
After 3 months	15.8%	
3-6 months	9.2%	1-2 times = 12.3% of respondents
6-12 months	3.9%	3-5 times = 20.7%
1-2 years	14.5%	> 8 times = 1.8%
Over 2 years	56.6%	

Based on the survey data, driving time per week did not seem to be directly related to the accident rate. Respondents who worked as a driver had longer driving times per week compared to others, and mentioned sleepiness and fatigue as the cause of their accident(s). Others with relatively shorter driving hours did not choose it as the answer, including respondents who were categorized as young drivers. This may have been because the respondents who worked as a driver did not have enough time to have a sufficient rest before their next duty. Sleepiness has been reported as a contributing factor in 5% of accidents in the United Arab Emirates, with

most of these occurring at speeds greater than 100 km/h (Al-Houqani et al., 2013). For Indonesia, however, the exact number of accidents related to sleepiness is not currently available.

This survey was also unable to identify whether driving experience was linked to accident rate; that said, the results indicate that accidents were experienced by drivers with two or more years of driving experience (55.2%). Further studies, featuring larger sample sizes, are expected to provide more information to confirm this result. Additional studies are also required to consider hours of driving and route taken, in order to yield more insightful findings.

4. DISCUSSION

Despite the relatively small sample size, the results of this study showed that one cause of accidents claimed by the respondents was lack of concentration, which could have been influenced by distraction. Distractions experienced by young drivers could also come from their passengers. It has been suggested that driving while accompanied by (same-age) peers, without an older adult present, should be avoided to reduce the risk of accident (Ayuso et al., 2014). Because driving jobs demand the ability to maintain attention, driving continuously with full attention for long durations may increase fatigue and decrease performance (Boksem et al., 2005).

In Indonesia, detailed accident information that includes young drivers is still limited. Research on this subject could help the government to create a right-content safe driving campaign for the young generation or older drivers. Lack of concentration will entail a higher accident risk when external factors are involved, such as roadway conditions or the natural environment (Misokefalou et al., 2016). Any government monitoring and control program to reduce the external factors that can disrupt drivers' concentration would certainly be fairly helpful (such as abandoning cellphone use while driving).

Other factors that should be highlighted are sleepiness and fatigue, which were experienced by most respondents who worked as drivers and were required to perform long-duration driving. This result is in line with findings from other studies. This should also be a concern for the Indonesian government when it comes to reducing road accident rates. For drivers with long-duration activities, detailed research needs to be conducted to determine the influence of impairment on concentration. Does this come from external factors, or are incidents more related to sleepiness and fatigue (Wang & Pei, 2014; Soccolich et al., 2013)? Although topics related to road accidents are very broad, it should be emphasized that the study of humans, as drivers in various aspects, is invaluable as a means of improving road safety. The research can be include but not limited to effect of distraction in various condition, monotony, how traffic sign perceived by drivers and it relation to reduce traffic accidents, physiology aspects, etc.

5. CONCLUSION

The results of this study demonstrate that the number of motorized vehicles in Indonesia is growing substantially. Although road accidents have apparently decreased in the past three years, their rate as compared to the number of vehicles is still relatively high. From the perspective of regulation implementation, there are less driver's licenses being issued for all vehicle types, in contrast to the expanding pool of motor vehicles. Driver's characteristics relating to accidents show that they are mostly experienced by novice drivers and those who have been on the road for more than three years. Time of day when driving happened and duration of rides showed a correlation to fatigue and sleepiness, as reported by respondents' opinions (as the cause of accidents). A conclusion related to the effect of gender could not be drawn, mainly due to the relatively small sample size. For the cause of accidents, the

contributing factors were mostly characterized by lack of concentration while driving. This study was one of the first of its kind, and definitely requires further validation; however, some of the findings here were consistent with those reported in the literature.

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