

Fatigue in Association with Road Crashes among Healthcare Workers in Malaysia

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Abstract— Fatigue is a common health problem among healthcare workers, ranging from ambulance drivers to specialist doctors. In Malaysia, a majority of healthcare workers prefer to commute to work by their own vehicles compared to public transport. Thus, they are exposed to excessive fatigue on the road while commuting to and back from work. The aim of this study is to find out the role of fatigue in association with road crashes among healthcare workers. The research was conducted using the semi-quantitative approach based on self-reported questionnaires. In total, 551 healthcare workers from five selected hospitals were involved in this study. Results showed that prolonged travelling time and distance to and back from work increased the risk of crash involvement. Most of the participants (37%) reported that the causes of road crashes were due to fatigue, sleepiness and microsleep while driving to and back from work. In addition, the findings show that the road crashes and near misses involvement on the road were significant due to fatigue. This research suggests that the hospitals' management may need to review their staffs' job scopes and workloads to overcome the fatigue problems and consider their feedback when designing work schedules. In addition, the management may take into consideration the need to relocate staff based on prolonged distance from home to the workplace and vice-versa.

Index Terms— Fatigue, commuting, hospital, road crashes.

I. INTRODUCTION

Healthcare workers are commonly exposed to shift work and long working hours or being on-call. This is due to the nature of their job of providing continuous healthcare services over long working hours. Thus, they are exposed to risks on the road while commuting to and from work.

In Malaysia, more than 40% of work-related accidents are due to commuting accidents [1]. Review of the statistics showed that most of the commuting accident causalities occurred during travel to and from work (88.5%), during the morning shifts (68.8%) and involving less than five kilometers of travel (55.0%) [2].

“Fatigue is a result of prolonged mental or physical exertion; it can affect people's performance and impair their mental alertness, which leads to dangerous errors” [3]. According to David, fatigue define as “a state of mind that a driver equates with sleepiness, tiredness and lack of energy that is associated with some measure of decrease in performance or a physiological indicator of reduced arousal [4].

Long working hours increase the risk of short sleep duration and sleep disturbances. Difficulties with sleep are due to the need to sleep at irregular times and at times that are out of phase with circadian rhythms. [5]. Sleep deprivation is associated with a decline in neurocognitive function which in turn leads to higher rates of fatigue-related injury and worker errors.[6].

A systematic review was conducted by Rodriguez-Jareño MC et al. on the effects of long working hours (LWH) on physicians' health and safety levels. Long working hours was

defined as more than 48 h/week in most studies, and some did not provide a definition. Long working weeks were associated with an at least two-fold increased risk of motor vehicle accidents [7]. Barger et al. studied on extended work shifts and the risk of motor vehicle crashes among interns found that every extended work shift that was scheduled in a month increased the monthly risk of a motor vehicle crash by 9.1 percent and increased the monthly risk of a crash during the commute from work by 16.2 percent. Interns worked five or more extended shifts and the risk that they would fall asleep while driving or while stopped in traffic was significantly increased [8].

The World Health Organization (WHO) identified fatigue as a leading factor in medical error and injury in healthcare [9]. Patterson PD also showed that poor sleep quality and fatigue are common among EMS workers in the U.S. There is preliminary evidence that poor sleep quality and fatigue can jeopardize patient and provider safety in the EMS setting. Greater than half (55%) of respondents were classified as fatigued. Patterson et al identified 1.9 greater odds of injury (95% CI 1.1, 3.3), 2.2 greater odds of medical error or AE (95% CI 1.4, 3.3), and 3.6 greater odds of safety compromising behaviour (95% CI 1.5, 8.3) among fatigued respondents versus non-fatigued respondents [10].

The effects of fatigue are worrying, since road accidents cause the loss of lives and contributes to severe losses (socially and economically) to the employees, organizations and the country as a whole. Therefore, this study aims to find out the role of fatigue in association with road crashes among healthcare workers in hospitals.

II. METHODOLOGY

A. Research Design and Sampling

This research utilized purposive sampling based on self-reported questionnaires. The purposive sampling refers to a specific group of people such as shift workers and on-call medical providers in government hospitals based on their job designations. In total, 551 shift workers from five hospitals located in 5 regions (North, South, East, Central and Sarawak) participated in this study. The respondents consist of shift workers and on-call medical providers in five hospitals.

The study was conducted 30 minutes before the end of a shift (30 minutes before time off). The questionnaires were prepared in two languages (Malay and English) and presented to the respondents and instructions were given to them on how to answer them. The respondents had the opportunity to seek clarification if needed. In total, 13 categories of shift workers and on-call staff working in hospitals were involved in this study. The shift workers include house officers, medical officers, specialist medical officers, dental officers & specialists, nurses, community nurses, drivers, assistant medical officers, pharmacists, pharmacy assistants, medical technologists, laboratory technologists, health care assistants and radiographers.

B. Instrument

The survey questionnaire consists of three sections, namely, Three-Dimensional Work Fatigue Inventory (3D-WFI), commuting information and demographic profiles. Information about commuting accidents and near misses involvement included severity of accidents, time and distance of accidents, causes of accidents, etcetera. Demographic Profile included age, marital status, job designations, years in service, departments and health conditions.

The Three-Dimensional Work Fatigue Inventory (3D-WFI) was adapted and adopted by Michael et.al to measure fatigue. Fatigue is divided into physical fatigue, mental fatigue and emotional fatigue. In total, there were 18 items to evaluate physical, mental and emotional fatigue. All items used a five-point response scale ranging from (1) "Never", (2) "Less than once a month", (3) "At least once a month", (4) "At least once a week", and (5) "Every day" to assess how often the respondents were exposed to the situation over the past 12 months [11]. The 3D-WFI was validated by the Department of Community Health, Universiti Kebangsaan Malaysia (HUKM).

III. RESULTS & DISCUSSION

In total, five hundred and fifty-one healthcare workers from five hospitals participated in this study. Based on Table 1, most of the participants were females (71.7%), married (70.6%) and Malay (73.1%). The majority of them were between ages 31-40 (44.8%) and only 3.1% were aged 51 and above. The mean age for participants was 35 years. Most of the participants had working experience between 6-10 years (31%), followed by 1-5 years (26.9%) and only 1.8% had

working experience of less than a year. The mean for working experience was 10 years in government hospitals.

Most of the participants had tertiary educational background such as Certificates or Diplomas (52.5%) and Degree holders (26.7%). Only 0.7% of participants had primary education. Most participants were in grade 20-40 (53.9%), followed by grade 41-56 (28.5%), grade below 19 at 15.4% and only 1.3% were from top management. In total, 18.7% had experienced involved in road crashes over the past one year, while 34.5 % had experienced involved in near misses for the same duration of time.

TABLE 1. DEMOGRAPHY

Item	Frequency	Percent
Gender		
Male	156	28.3
Female	395	71.7
Marital Status		
Single	142	25.8
Married	389	70.6
Divorced/Widow	19	3.6
Ages (Mean: 35 years old)		
23-30	186	33.8
31-40	247	44.8
41-50	100	18.2
51 and above	17	3.2
Working Experience (Mean: 10 years)		
Less than one year	10	1.8
1-5 years	148	27.9
6-10 years	171	32.0
11-15 years	86	15.8
16- 20 years	69	12.7
21 years and above	54	9.8
Education Level		
Primary	4	0.7
Secondary	77	14
Certificate/ Diploma	289	52.5
Degree	147	26.7
Master/PhD	34	6.1
Grade		
Top Management	7	1.8
Grade 41 - 56	157	28.5
Grade 20 - 40	297	53.9
Grade below 19	85	15.8
Road Crashes		
No	410	81.3

Item	Frequency	Percent
Yes	94	18.7
Near Misses		
No	332	65.5
Yes	175	34.5
Types of Injury		
No Injury	67	72.0
Minor	26	28.0

As shown in Table 2, the findings indicate that there were significant differences ($p < 0.05$) between crash involvement and travelling distance and time to and from work among healthcare workers. The mean of travelling distance (Kilometre) and travelling time (Minute) were higher among those involved in road crashes. This indicates that healthcare workers who had prolonged travelling distance and travelling

time were at high risk involvement in road crashes. Based on the findings, healthcare workers working on shifts or on call, travelled to and from work ranging between less than 1 kilometre to 90 kilometres and the travelling time ranging between 3 minutes to 120 minutes. A study done by Zainy et.al on Indonesian Commercial Vehicle drivers found that prolonged driving was closely associated with undue fatigue that represented a road safety risk factor [12]. Another study done by Iridiastadi et.al found that a minimum of six hours of intermittent driving was adequate in inducing fatigue and sleepiness, despite the seemingly sufficient amount of rest break [13]. The study done by Shen et.al found that distributions of driving-distance were not different from the length-of-driving-time distributions by driver age category, gender, time-of-day, and day-of-week. Driving distance and the length of driving time provide similar fatal crash risk ratio estimates [14].

TABLE 2. CRASH INVOLVEMENT BASED ON TRAVELING DISTANCE AND TIME

Item	Crash Involvement	Frequency	Mean	S.D	p-value
Distance (KM)	No	403	14.34	12.122	0.000*
	Yes	92	20.60	18.430	
Travelling Time (Minutes)	No	407	24.07	13.648	0.000*
	Yes	91	32.12	20.885	

* T-test were significant at $p < 0.05$

As illustrated in Table 3, most of the participants reported that the causes of road crashes were due to fatigue, drowsy and microsleep while driving to and back from work (37.0%), followed by slippery road (8.7%), interrupted while driving (7.6%), visibility or blind spot issue (6.5%) and negligence (6.5%). In total, 23.9% declared that road crashes were caused by other road users. Other causes of accidents including animal crossings, no signal, close distance driving and driving near the side lane (9.8%). According HaGani, Hershler and Shlush, 56.7% healthcare workers in Israel had at least one incident due to drowsy driving and most of the road crashes occurred while driving to or from work. Physicians and nurses had the highest rate of commuting crashes and drowsy driving [15]. Another study done by Vitalis, Runyoro and Selemani on secondary data collected from the repository database of traffic police at the division of Tanzania Road Safety Squad found that dangerous driving and drivers' negligence had a significant positive effect on the likelihood of road accidents [16].

TABLE 3. ROAD CRASHES CAUSES

Item	Frequency	Percent
Fatigue/drowsiness/Microsleep	34	37.0
Visibility/ Blind Spot	6	6.5
Slippery Road	8	8.7
Negligence	6	6.5

Item	Frequency	Percent
Interrupted	7	7.6
Caused by other road users	22	23.9
Others	9	9.8

As shows in Table 4, there was a significant difference ($p < 0.05$) between fatigue and healthcare workers commuting to work and back from work. Healthcare workers involved in road crashes showed that fatigue scored higher while commuting back from work (Mean= 65.1) compared to going to work (Mean= 55.8). Most of the healthcare workers were involved in road crashes while commuting back from work (66.7%), compared to commuting to work (33.3%). A similar finding was obtained by HaGani, Hershler and Shlush on healthcare workers in Israel, which showed that most of the road crashes (57.5%) occurred on the way back from work compared to when going to work (42.5%) [15].

TABLE 4. FATIGUE ASSOCIATED WITH COMMUTING ACCIDENTS GO AND BACK FROM WORK

Commute	Road Crashes	Mean	S.D	p-value
Go to Work	33.3%	55.80	18.82	0.003*
Back from Work	66.7%	65.10	16.21	

*T-test was significant at $p < 0.05$

As mentioned in Table 5, there were significant differences ($P < 0.05$) between fatigue and road crashes and near misses. The mean was higher among healthcare workers who had experiences in road crashes (Mean= 61.96) and near misses (Mean=61.98) associated with fatigue. A study done by Shamsa et.al illustrated that the mental health of long-haul truck drivers in Iran was one of the greater influences on road accidents caused by fatigue and drowsiness [17]. According to the British Medical Association, fatigue and sleep deprivation (associated with long working hours and shift work) impacts on personal safety risks, such as an increased likelihood of occupational accidents, road traffic crashes and needle stick injuries [18]. In China, accidents caused by fatigue driving accounted for approximately 20% of the total number of traffic accidents and approximately 40% of major traffic accidents in China [19].

According to The RoSPA OS&H Bulletin October, approximately 36% per cent of London bus drivers have reported a ‘near miss’ at work in the last year due to fatigue. The survey of 1,353 Transport of London drivers found that 79% believed that their working hours led to sleepiness while driving. The respondents worked an average of 44 hours per week and got an average of six hours 30 minutes of sleep between shifts. Furthermore, around 17% of drivers indicated that they had fallen asleep whilst driving the bus at least once in the past 12 months, 5% had experienced a road crash due to fatigue and 36% had at least one ‘close call’, while 77% of those who had experienced a road crash and 88% of those who had a near-miss believed their employer did not know the incident was due to the driver feeling sleepy. The study also found that 55.5% of respondents said that they had wanted to stop the bus due to fatigue at least once in the past 12 months, with 28% wanting to stop more than three times, and 21% of drivers indicated that they had to fight sleepiness at least 2-3 times a week [20]. Another study done by Rashid et.al on prevalence and factors that contributed to road crash involvement (RCI) among medical doctors based on systematic review and meta-analysis found that RCI prevalence among medical doctors worldwide ranged from 7.9%-24.6%. Factors associated with increased risk of RCI include lack of sleep and fatigue related to long working hours [21].

TABLE 5. FATIGUE ASSOCIATED WITH ROAD CRASHES AND NEAR MISSES

Item	Frequency	Mean	S.D	p-value
Road Crashes				*0.001
No	398	55.19	17.74411	
Yes	91	61.96	17.59161	
Near Misses				*0.000
No	323	53.51	17.96206	
Yes	169	61.98	16.32445	

* T-test were significant at $p < 0.05$

IV. CONCLUSION

Fatigue is one of the main challenging factors among shift workers especially in the healthcare line. Therefore, the management should take initiative actions to overcome it and make sure their staff commute to and back work safely. It is suggested that the hospital management should invite the staff, get feedback and input from them when designing work schedules based on their job scopes and workloads. In addition, the management could create a comprehensive assessment of fatigue related issues and possible risks. This is important for their staff to identify all possible risks and come up with solutions to overcome the problems. Besides that, the management may encourage and create a teamwork ecosystem to support staff who work on night shifts and long hour shifts and provide a comfortable resting room for them. Furthermore, the management may consider relocate their staff to the nearest branch hospital to reduce the risks caused by long distance travelling. The management may provide workshops and awareness talks on fatigue management and help them to identify and overcome fatigue problems. Healthcare workers’ safety, health and welfare should be taken seriously as their role is to help save people’s lives.

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