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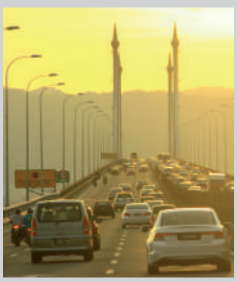
Research Report

Identifying Factors Associated with Sleep Quality among Manufacturing Workers Riding to Work in Klang Valley



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Abstract

Data on work-related accident reported by SOCSO shows that even though commuting accident contributed less than 45% of the total accidents reported by SOCSO in 2014, however, it shows an increasing trend starting from the year 2008. Review on studies conducted to identify risk factors of the commuting accident had found that most of the studies investigated on sleepiness among workers. Based on a survey conducted in 2010 among those involved in a commuting accident in Klang Valley, about 15% of them involved in a crash due to feeling sleepy or fatigue. Sleep quality could contribute to sleep deprivation. Sleep deprivation could impair driving and riding performance. Thus, this study aims to determine prevalence and factor associated with poor sleep quality among manufacturing company in Klang Valley. This is a cross-sectional study involving sample size of 460 respondents. Sleep quality was assessed using validated and translated Pittsburgh Sleep Quality Index (PSQI). Besides, socio-demographic details, work and riding information, and lifestyle and health status were also obtained from respondents. Daytime sleepiness was also assessed through validated Epworth Sleepiness Scale (ESS). The findings reveal that about 53.3% of the respondents reported had poor sleep quality. Meanwhile, about 176 respondents were identified as having daytime sleepiness. Out of 176 respondents, 65.3% of them found to have poor sleep quality and the association was strongly significant ($p<0.001$). Through multiple logistic regression analysis, five factors were identified significantly associated with sleep quality: ethnicity, shift work, insomnia, usage of medicine to induce sleep as well as sleep duration. Comprehensive countermeasures against poor sleep quality among working population are needed and not only at individual level but also require involvement at the organizational and societal level.

1. Introduction

1.1 Commuting Accident in Malaysia

Data on work-related accidents reported by SOCSO showed that commuting accidents had increased from 17, 297 cases in 2005 to 28, 130 cases in 2014 as shown in Figure 1 (Laporan tahunan SOCSO). Even though commuting accidents contributed less than 45% of the total accidents reported by SOCSO in 2014, it showed an increasing trend starting from 2008. As mentioned in Section 24 Employee's Social Security Act 1969, Act 4 states that a commuting accident is any accident happening to an insured person while the insured person is travelling on a route between his place of residence or stay and his place of work; is travelling on a journey made for any reason which is directly connected to his employment, or is travelling on a journey between his place of work and the place where he takes his meal during any authorized recess. Means of travel include any types of vehicle from cars to buses and trains as well as walking to and from work.

Further analysis on the distribution of commuting accidents conducted by MIROS in 2010 revealed that about 54% of the commuting accidents occurred while commuters were travelling to work, 31% while they were travelling back from work and 15% of the accidents occurred during working and rest hour. On average, the accidents occurred after 23 minutes at approximately 12 km from the starting point. The distribution by gender revealed that 83% of the workers were male and about 84% were motorcyclists. Almost 70% of them were shifted workers. About 51% of them were involved in single vehicle crash. As outlined in the Malaysian Road Safety Plan 2014 – 2020, under the strategic pillar of road users, safer programs for employers and employees are among the efforts to reduce the number of road accident fatalities in Malaysia.

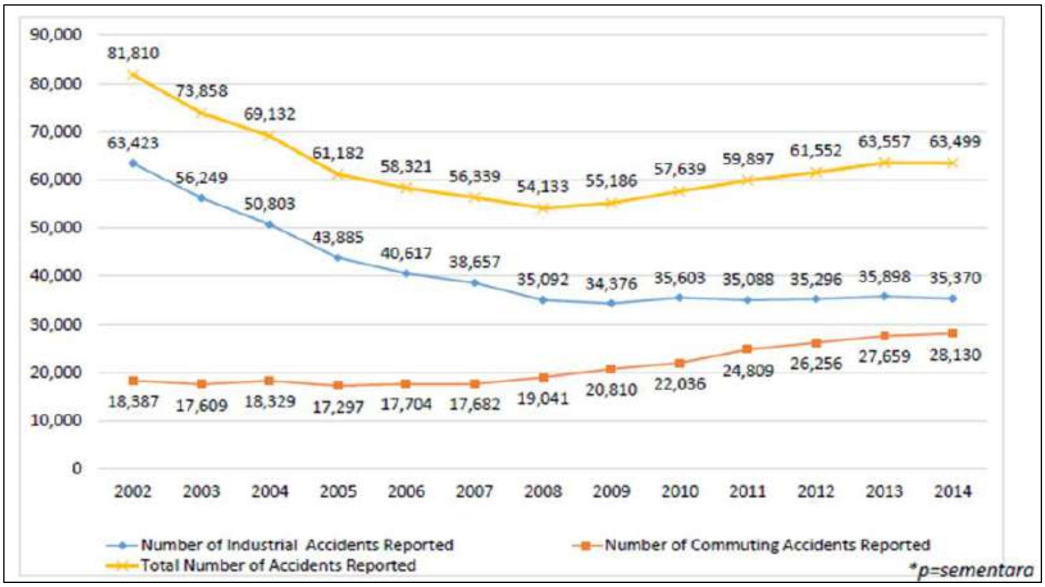

Figure 1 Number of accidents reported, 2002 – 2014 (*Source:* SOCSO)

1.2 Sleep Quality and Driving Impairment

Based on a survey conducted in 2010 among those involved in commuting accidents, about 15% of the respondents were involved in crash due to feeling sleepy or fatigue (Ilhamah & Wahida, 2010). Several studies of sleep quality had been conducted in Malaysia. A recent study conducted by Aziemah and her colleague (2014) found that about 44% of private car drivers had poor sleep quality and 50% of them were private workers. Another study conducted by MIROS among truck drivers revealed that almost 35% of the respondents had poor sleep quality (Mohamad Suffian A., 2014). However, there is still a lack of studies on sleep quality specifically on the working population. A study conducted among Japanese male and female workers in a telecommunication company revealed that 32% to 45% of the respondents had poor sleep quality (Doi Y et al., 2003). Further, about 20% of non-shift and 67% of shift male factory workers in Saudi Arabia had poor sleep quality (Metrek A et al., 2014). In addition, a study by Diane R and her colleague (1992) revealed that night and shift rotator nurse workers had 1.8 to 2.8 odds of reporting poor sleep quality.

Sleep quality includes the quantitative aspects of sleep, like sleep duration, sleep latency, number of arousals as well as depth and restfulness of sleep. Subjective measurement of sleep quality has been widely being used to measure sleep quality in the general population. The Pittsburgh Sleep Quality Index (PSQI) is a reliable, valid, and standardized one-month point subjective measurement for sleep quality which comprises subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications and daytime dysfunction.

Sleep quality may contribute to sleep deprivation. Chiara Cirelli (2015) stated that sleep deprivation exists when sleep is insufficient either because of reduced total sleep time (decreased quantity) or fragmentation of sleep by brief arousals (decreased quality). Sleep deprivation results in the accumulation of sleep debt and excessive daytime sleepiness. J. J., Pilcher and his colleague (1997) stated that sleep quality is better related to measures of sleepiness than sleep quantity in a nonclinical population. They revealed that poor sleepers in their studies reported increased levels of sleepiness.

Studies have shown that acute sleep deprivation can have the dose-response-like effect of performance impairment (Akerstedt, Peters, Anund, & Kecklund, 2005). Even relatively moderate levels of chronic sleep deprivation (sleeping 6 hours per night) over a 14-day period can lead to psychomotor impairments that are equivalent to being completely sleep deprived for up to two nights (Van Dongen, Maislin, Mullington, & Dinges, 2003).

Sleep deprivation results in a marked decrease of metabolic activity in the cortical and sub-cortical areas of the brain (Thomas et al., 2000), which are vital for efficient functioning of high order cognitive processes such as decision-making, attention, motor control, perception, and executive functioning (Fukui, Murai, Fukuyama, Hayashi, & Hanakawa, 2005; Jones & Harrison, 2001; Killgore, Balkin, & Wesensten, 2006; Lim et al., 2010). Likewise, emotional regulation and interpersonal processes are disrupted due to reductions of frontal and prefrontal cortical activity (Killgore et al., 2008; Tempesta et al., 2010).

Driving is a complex task that requires the successful operation of a number of psychological processes comprising learning, memory, perception, motor control, attention, decision making, and executive functioning (Groeger, 2002; Horswill & McKenna, 2004). Several distinct cortical and sub-cortical areas of the brain are active when driving and many of these same areas show a reduced activity during sleepiness. The cortical areas of the occipital lobes, posterior parietal lobes, premotor cortex, thalamic regions, and cerebellum are all active while driving (Spiers & Maguire, 2007). Cortical areas of the right prefrontal cortex are specifically activated when drivers process road traffic rules (Spiers & Maguire, 2007) and the anterior cingulate is active during tasks of collision avoidance and driving at safe distances (Uchiyama, Ebe, Kozato, Okada, & Sadato, 2003). However, cortical and sub-cortical brain areas experience reduced activity when sleep deprived. This suggests that sleepiness has specific deleterious effects on the safe operation of a vehicle. Meanwhile, sleep deprivation also impairs riding performance. A study on the effects of time of day and sleep deprivation conducted using instrumented powered two-wheeler revealed poorer performance in some motorcycle handling capabilities such as stability at low speed and emergency braking performance (stopping distances, reaction times and braking distances) among respondents with total sleep deprivation (Clement B et al., 2012).

According to NSF's 2005 Sleep in America poll, shift workers are more likely to suffer from insomnia by 61% as well as excessive daytime sleepiness by 30%. Shift workers are also more likely to drive while fatigued and almost twice as likely to fall asleep at the wheel (National Sleep Foundation). A study among nurse shift workers indicates that shift rotators and night nurses had 3.6 to 3.9 odds of sleeping while driving to or from work (Diane R et al., 1992). Meanwhile, Inoue Y and his colleague (1997) reported 7.2% and 5.4% of dozing off while driving or working among daytime and shift workers respectively.

The increase in the number of commuting accidents from 2008 to 2013 in Malaysia is alarming. Commitment and contribution from all related agencies are needed in order to reduce the number of commuting accidents. The Malaysian Road Safety Plan 2014 – 2020 has outlined programs for employers and employees as one of the efforts to reduce the number of road accident fatalities in Malaysia. Studies have proven that working condition especially shift work affect sleep quality among workers. In addition, sleep deprivation and sleepiness would have impaired driving and riding performance. Thus, it is vital to identify sleep quality and sleepiness among the working population in Malaysia.

1.3 Objectives

The general objective of this study is to investigate the associated factors of sleep quality among motorcyclists riding to work in the Klang Valley. This is then divided into several specific objectives as below:

i. To identify the prevalence of poor sleep quality among manufacturing workers riding to work.
ii. To determine the daytime sleepiness among manufacturing workers riding to work.
iii. To determine the relationship between sleep quality and daytime sleepiness.
iv. To determine the contributing factors (demographic, lifestyle, medical conditions, working information) associated with sleep quality among the working population.

1.4 Limitation of Study

Some limitations of the study should be considered. First, the study was carried out among workers from a specific manufacturing company in the Klang Valley, hence generalization of the Malaysian working population should be carefully made. Second, this study relied on a self-reported survey which may include reporting or information bias.

2. Methodology

A cross-sectional study design was employed to investigate the associated factors of sleep quality among motorcyclists riding to work in the Klang Valley. Ethical approval was obtained from the Malaysian Institute of Road Safety Research (MIROS) Research Committee.

2.1 Respondent Recruitment

Respondents were selected based on systematic random sampling. A company was randomly selected from the top manufacturing companies in Kuala Lumpur and Selangor with a high number of commuting accidents as reported by SOCSO. Perusahaan Otomobil Nasional (PROTON) Shah Alam was selected as the entry point. Sample unit will be selected by systematic random sampling from the sampling frame. The sampling frame is a list of workers who travel to work by motorcycle with at least one-month employment in the company. The sample unit comprises the workers of the selected company who travel to work by motorcycle. The respondents will be recruited based on determining inclusion and exclusion criteria. The inclusion criteria are Malaysian, worked for at least one month, riding motorcycle to work.

2.2 Sampling Size

The sample size was determined using a single proportion formula based on the estimated 44% of private car drivers having poor sleep quality (Aziemah et al., 2014) with consideration of a 5% tolerable error at 95% confidence interval. Thus, the minimum required sample size was calculated to be 378 respondents. After considering any drop-out or non-response, the final sample size was 460 respondents.

2.3 Research Tools

Each respondent was administered with three sets of questionnaires: (1) General questionnaire, (2) Pittsburgh Sleep Quality Index (PSQI) questionnaire on sleep quality assessment and (3) Epworth sleepiness scale (ESS) questionnaire to measure general daytime sleepiness. Respondents were asked to complete the general questionnaire which consisted of demographic variables, work information, commuting to work details, history of motor vehicle crash, medical status and lifestyle.

Besides administration of the three questionnaires as mentioned above, the physical measurement of respondents was also conducted. Their body weight and height were measured using electronic medical scale waist level model TPRO 3300 while their blood pressure was measured using Automatic Blood Pressure Monitor model OMRON HEM-7203.

2.3.1 Sleep Quality Assessment

Participants were asked to complete a validated and translated Pittsburgh Sleep Quality Index (PSQI). This questionnaire assesses the quality and patterns of sleep. It differentiates "poor" from "good" sleep by measuring seven (7) components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction over the last month. Scoring of answers is based on a 0 to 3 scale, whereby 3 reflects the negative extreme on the Likert Scale. The score for each component will then be summed up as Global PSQI score. A Global PSQI score of "5" or greater indicates a "poor sleeper".

2.3.2 Daytime Sleepiness Assessment

Respondents were also required to complete the Epworth sleepiness scale (ESS) questionnaire to assess general daytime sleepiness which consists of eight questions. They were required to rate their sleepiness by rating the chance of falling asleep whilst doing some activities such as sitting and reading, watching television, etc. (Johns 1991).

The total score for ESS will indicate whether the respondents are either having good restful sleep or likely to have excessive daytime sleepiness. The ESS score was the sum of score for eight items and can range from 0 (least sleepy) to 24 (sleepiest). A total score below 10 points is usually reported as normal (Hartenbaum et al., 2006).

2.4 Data Collection

Based on the calculated sample size, a minimum of 460 respondents were selected. Written consent was obtained from the respondents and they were informed that any information provided would be undisclosed to a third party. Data collection was conducted using the three sets of questionnaires. In parallel with the administration of questionnaire, the respondent's body weight and height as well as blood pressure were measured by a trained research officer. Token was awarded to each respondent once he/she has completed the questionnaire.

2.5 Statistical Analysis

All data were entered into a database by trained research assistants while data cleaning was done by the research officer. Then, the data were analysed using a software, namely EPI Info Software version 3.3.2 and IBM SPSS Statistic version 20. Frequency distribution and proportion were tabulated using descriptive analysis. Cross-tabulation matrix was used to compare frequencies between groups while the percentages were compared using the Chi-square test. The logistics regression analysis was also performed to determine the relationship between the independent variables and the dependent variable. The dependent variable is sleep quality while factors of socio-demographic, working information, riding to work as well as lifestyle and health condition are measured as the independent variables.

3. Results

A total of 472 employees participated in the study. After the data cleaning process, out of this number, 42 data were excluded for analysis due to the incompleteness of data. Thus, about 430 data were eligible for analysis.

3.1 Distribution of Respondents

This study involved 430 workers who rode their motorcycle to work, predominantly male (93.7%) with an average age of 39.7 (SD:8.5) years old. Most of the respondents were Malays (96.0%) and married (83.0%). The distribution of respondents was dominated by those who work in the technical or operation division (77.6%) and received up to RM3000 of salary per month (72.4%). Besides, the average Body Mass Index of the respondents was 26.6 (SD: 4.9) which was in the overweight range and 58.6% of them exercised less than three times a week.

3.2 Prevalence of Poor Sleep Quality

Scoring of sleep quality was carried out on 430 out of the 472 respondents. Results of the Global Score of PSQI revealed that more than half of the respondents had poor sleep quality (53.3%). Table 1 shows the prevalence of poor sleep quality among the selected respondents.

Table 1 Prevalence of poor sleep quality

Sleep quality	n	%	95% CI
Good	201	46.7	42.0-51.6
Poor	229	53.3	48.4-58.0

Based on the ESS score, about 176 respondents obtained a score of 10 and more which was classified as sleepy during the daytime. Out of 176 respondents, 65.3% of them were found to have poor sleep quality and the association was strongly significant (p<0.001). Table 2 shows the relationship between excessive daytime sleepiness (ESS Score) and sleep quality.

Table 2 The relationship between excessive daytime sleepiness (ESS score) with sleep quality

Excessive daytime sleepiness	All (N=430) n (%)	Good (N=116) n (%)	Poor (N=314) n (%)	p-value
Normal (<10)	254 (59.1)	140 (55.1)	114 (44.9)	**0.000***
Sleepy (≥ 10)	176 (40.9)	61 (34.7)	115 (65.3)	

**Significant at 0.05 level of confidence*

3.3 Factors Associated with Poor Sleep Quality

Table 3 shows the prevalence of poor sleep quality by socio-demographic factors. By comparing their age, respondents between 25 to 35 years old (58.0%) were the largest proportion with poor sleep quality. Those assessed with poor sleep quality were predominantly Malay respondents (54.7%). Divorced and married respondents were the highest proportion with poor sleep quality with the percentage of 75.0 and 54.3 respectively.

Further distribution by work-related factors as described in Table 4 shows that there was a clear distinction in the percentages of respondents with poor sleep quality between the work division and shift system. Respondents who were working in the administrative division showed a higher portion of poor sleep quality (59.4%) as compared to those from technical or operation division with a percentage of 51.4. In addition, respondents who were working in shift system (61.2%) appeared to have poor sleep quality. More than half of respondents with poor sleep quality did not take any short nap during their permitted recess time (54.9%).

Table 5 demonstrates the prevalence of poor sleep quality based on riding-related factors. The findings reveal that the average distance travelled by respondents with poor sleep quality was a bit longer compared to those assessed with good sleep quality, regardless of travelling to work or back from work. A similar finding was observed for the duration of riding where respondents with poor sleep quality travelled in a long time to work or back from work. Respondents that made stops while travelling back from work seemed to have poor sleep quality (59.8%).

Table 3 Association of socio-demographic factors with sleep quality

Socio-demographic factor		All (430) Mean ±SD / n (%)	Sleep quality		
			Good (201) Mean ±S /n (%)	Poor (229) Mean ±SD n (%)	p-value[a]
Age (in years old)		39.7 ± 8.5	40.0 ± 8.6	39.3 ± 8.4	
	Below 25	15 (3.5)	7 (46.7)	8 (53.3)	0.621
	25 to 35	112 (26.0)	47 (42.0)	65 (58.0)	
	36 to 45	174 (40.5)	87 (50.0)	87 (50.0)	
	46 to 55	129 (30.0)	60 (46.5)	69 (53.5)	
Sex	Male	403 (93.7)	191 (47.4)	212 (52.6)	0.296
	Female	27 (6.3)	10 (37.0)	17 (63.0)	
Ethnicity	Malay	413 (96.0)	187 (45.3)	226 (54.7)	**0.017***
	Chinese	7 (1.6)	6 (85.7)	1 (14.3)	
	Indian	6 (1.4)	4 (66.7)	2 (33.3)	
	Others	4 (0.9)	4 (100.0)	-	
Education level	Lower education	4 (1.0)	4 (100.0)	-	0.060
	Secondary school	258 (62.2)	122 (47.3)	136 (52.7)	
	University/ college	153 (36.9)	65 (42.5)	88 (57.5)	
Marital status	Single	69 (16.0)	37 (53.6)	32 (46.4)	0.326
	Married	357 (83.0)	163 (45.7)	194 (54.3)	
	Divorced	4 (0.9)	1 (25.0)	3 (75.0)	

No. of child	0	89 (20.7)	42 (47.2)	47 (52.8)	0.995
	1 to 3	189 (44.0)	88 (46.6)	101 (53.4)	
	4 and above	152 (35.3)	71 (46.7)	81 (53.3)	

[a] *p-value of Chi-square test* **Significant at 0.05 level of confidence*

Table 4 Association of work-related factors with sleep quality

Work related factors		**All (430) n (%)**	**Sleep quality**		
			Good (201) n (%)	**Poor (229) n (%)**	**p-value[a]**
Division	Administrative	96 (22.4)	39 (40.6)	57 (59.4)	0.165
	Technical/operation	333 (77.6)	162 (48.6)	171 (51.4)	
Income level	≤3000	310 (72.4)	143 (46.1)	167 (53.9)	0.687
	>3000	118 (27.6)	57 (48.3)	61 (51.7)	
Shift	Yes	129 (30.0)	50 (38.8)	79 (61.2)	**0.030***
	No	301 (70.0)	151 (50.2)	150 (49.8)	
Nap during recess	Yes	204 (47.4)	99 (48.5)	105 (51.5)	0.481
	No	226 (52.6)	102 (45.1)	124 (54.9)	
Work posture	Static	40 (9.3)	20 (50.0)	20 (50.0)	0.675
	Flexible	389 (90.7)	181 (46.5)	208 (53.5)	
Part-time job	Yes	74 (17.5)	34 (45.9)	40 (54.1)	0.782
	No	350 (82.5)	167 (47.7)	183 (52.3)	

[a] *p-value of Chi-square test* **Significant at 0.05 level of confidence*

Table 5 Association of riding related factors with sleep quality

Riding related factors		**All (430) Mean ± SD/ n (%)**	**Sleep quality**		
			Good (201) Mean ± SD / n (%)	**Poor (229) Mean ± SD / n (%)**	**p value[a]**
Duration of riding	Go to work	28.5 ± 14.5	27.0 ± 15.15	29.85 ± 13.78	0.292
	Back from work	30.2 ± 15.5	28.54 ± 15.87	31.67 ± 15.09	0.428

Distance travelled	Go to work	20.5 ± 15.2	19.0 ± 14.67	21.73 ± 15.66	0.366
	Back from work	20.7 ± 15.5	19.26 ± 14.77	22.0 ± 16.03	0.768
Stops while travel	Go to work	94 (22.0)	45 (47.9)	49 (52.1)	0.841
	Yes	334 (78.0)	156 (46.7)	178 (53.3)	
	No				
	Back from work	102 (23.9)	41 (40.2)	61 (59.8)	0.129
	Yes	324 (76.1)	160 (48.8)	168 (51.2)	
	No				

[a] *p-value of Chi-square test* **Significant at 0.05 level of confidence*

The prevalence of poor sleep quality by lifestyle-related factors are stated in Table 5. Respondents with Body Mass Index (BMI) higher than 30 or considered obese and BMI of overweight had the largest proportion of poor sleep quality with 65.6% and 57.8% respectively. In addition, predominantly respondents with poor sleep quality slept less than seven hours in the previous month (57.6%) as compared to those who slept seven hours or more. About 62% of the respondents who self-reported to use medication to induce sleep had poor sleep quality. It was found that the proportion of respondents with poor sleep quality was higher among those who were smoking (57.2) and did not exercise at all in a week (57.3%). Respondents who were diagnosed with hypertension and insomnia were found to have poor sleep quality. However, only hypertension and insomnia had shown a significant association with poor sleep quality.

The associated factors with poor sleep quality are presented in Table 7. Based on univariate analysis, the factors significantly associated with poor sleep quality were ethnicity, shift work, hypertension, insomnia, BMI, use of medication to induce sleep and sleep duration. In order to determine the factors significantly associated with poor sleep quality after considering the effect of other variables, a multiple logistic regression analysis was used. The dependent variable was the sleep quality status (good, poor) while the independent variables were ethnicity, education level, shift work, hypertension, insomnia, BMI, sleep duration, use of medication to induce sleep, caffeine, experience of riding and stopping while travelling back from work. A backward stepwise logistics regression was done to screen for significant variables. At alpha of

0.05, the variables found to be significantly associated with sleep quality were ethnicity, shift work, insomnia, usage of medicine to induce sleep as well as sleep duration.

Table 6 Association of lifestyle related factors with sleep quality

Lifestyle related factors		All (430) n (%)	Sleep quality		
			Good n (%)	Poor n (%)	p value[a]
Consume caffeine	Yes	269 (62.6)	85 (52.8)	76 (42.7)	0.052
	No	161 (37.4)	116 (43.1)	153 (56.9)	
Smoking	Yes	152 (35.3)	65 (42.8)	87 (57.2)	0.221
	No	278 (64.7)	136 (48.9)	142 (51.1)	
Exercise (times per week)	0	75 (17.4)	32 (42.7)	43 (57.3)	0.738
	< 3	252 (58.6)	120 (47.6)	132 (52.4)	
	≥ 3	103 (24.0)	49 (47.6)	54 (52.4)	
Exercise duration (minutes)	<20	219 (63.1)	104 (47.5)	115 (52.5)	0.976
	≥20	128 (36.9)	61 (47.7)	67 (52.3)	
Sleep duration (in hours)	< 7	380 (88.4)	161 (42.4)	219 (57.6)	**0.000***
	≥ 7	50 (11.6)	40 (80.0)	10 (20.0)	
Use of medicine to induce sleep		350 (81.4)	133 (38.0)	217 (62.0)	**0.000***
BMI	<18.5	15 (3.5)	8 (53.3)	7 (46.7)	**0.001***
	18.5–24.9	149 (34.7)	88 (59.1)	61 (40.9)	
	25.0–29.9	173 (40.2)	73 (42.2)	100 (57.8)	
	> 30	93 (21.6)	32 (34.4)	61 (65.6)	
Diabetes		35 (8.1)	16 (45.7)	19 (54.3)	0.899
Hypertension		76 (17.7)	27 (35.5)	49 (64.5)	**0.031***
Sleep apnoea		3 (0.7)	1 (33.3)	2 (66.7)	0.640
Insomnia		8 (1.9)	1 (12.5)	7 (87.5)	**0.050***
Stroke		3(0.7)	1 (33.3)	2 (66.7)	0.640
Asthma		19 (4.4)	11 (57.9)	8 (42.1)	0.319

[a] *p-value of Chi-square test* **Significant at 0.05 level of confidence*

Table 7 Logistic regression analysis of factors associated with poor sleep quality

Factors		Unadjusted odd ratio (95% CI)	p-value[a]	Adjusted odd ratio (95% CI)	p-value*
Demographic					
Education level	Up to high school	1.000	0.268	1.000	
	More than high school	1.254 (0.839 – 1.875)		1.584 (0.967 – 2.595)	0.068
Ethnicity	Malay	5.640 (1.597 – 19.921)	**0.002***	4.775 (1.197 – 19.048)	**0.027***
	Non Malay	1.000		1.000	
Work-related info					
Position	Administrative	1.385 (0.874 – 2.194)	0.164		
	Technical/ operation	1.000			
Shift	Yes	1.591 (1.045 – 2.421)	**0.029***	1.707 (1.028 – 2.833)	**0.039***
	No	1.000		1.000	
Riding related info					
Stops while travel back from work	Yes	1.417 (0.902 – 2.225)	0.128		
	No	1.000			
Experience of riding	2 years and below	0.952 (0.525 – 1.726)	0.107		
	3 to 4 years	0.608 (0.325 – 1.137)			
	5 to 6 years	1.186 (0.567 – 2.479)			
	7 to 8 years	1.000			
Health condition					
Hypertension		1.754 (1.049 – 2.933)	**0.030***		

Insomnia		6.306 (0.769 – 51.704)	**0.036***	15.69 (1.404 –175.298)	**0.025***
BMI	<18.5	1.000	**0.001***	**1.000**	
	18.5 – 24.9	0.792 (0.273 – 2.300)		0.721 (0.203 – 2.561)	0.613
	25.0 – 29.9	1.566 (0.543 – 4.511)		1.370 (0.387 – 4.856)	0.626
	> 30	2.179 (0.725 – 6.551)		1.792 (0.488 – 6.583)	0.380
Lifestyle					
Consume caffeine	Yes	1.475 (0.996 – 2.184)	**0.052**		
	No	1.000			
Use of medicine to induce sleep		9.246 (4.824 – 17.720)	**0.000***	**9.903 (4.901 – 20.012)**	**0.000***
Sleep duration (in hours)	< 7	5.441 (2.643 – 11.203)	**0.000***	7.695 (3.257 – 18.179)	**0.000***
	≥ 7	1.000		1.000	

[a] *p value of likelihood ratio test*   * *p-value for Wald*

4. Discussions

The findings of this study reveal that 53.3% of the manufacturing workers were reported to experience poor sleep quality based on the assessment using the internationally validated tool: the Pittsburgh Sleep Quality Index (PSQI). The prevalence of poor sleep quality was similar to the findings of a previous study among the working population in Malaysia. A study by Nazatul et al. (2008) identified that about 57.8% of female nurses in a government hospital had poor sleep quality. However, the prevalence of sleep deprivation was quite high as compared to a study conducted by Aziemah and her colleague (2014) among the general population of private vehicle drivers which revealed that about 48.7% of the respondents had poor sleep quality. This finding is consistent with another study (Doi Y et al., 2003) that found the prevalence of poor sleep quality was higher among the working population in comparison with the general population in Japan.

Through the multiple logistic regression analysis, five factors were significantly associated with sleep quality. They included ethnicity, shift work, insomnia, usage of medicine to induce sleep as well as sleep duration. The distribution by ethnicity revealed that Malay respondents had the highest proportionate of having poor sleep quality. Nazatul and her colleague (2008) also obtained the same finding where the prevalence of poor sleep quality was significantly the highest among nurses. In contrast, studies by Aziemah et al. (2014) and M. Suffian A et al. (2015) found that ethnicity had no significant association with sleep quality.

This study also found that shift workers were prone to have poor sleep quality as compared to non-shift workers. Many studies have proven that shift workers experienced poor sleep quality compared to non-shift workers. A study conducted by Metrek Ali et al. (2014) among male factory workers in Saudi Arabia found that the mean score of all components of PSQI was significantly higher among shift works compared to those working non-shift. Meanwhile, Hakkanen and Summala (2001) also had proven that shift work would cause reduction in sleep. Shift systems could either be in two (12-hours shift) or three shift system (8-hours shift), fixed or rotated shift. In nature, shift systems would disturbing circadian rhythm which requires the worker to adapt and make an adjustment to the disturbed normal biological body clock. The major circadian rhythm involved in the sleep/wake schedule. Shift work would cause acute troublesome to the workers in the difficulty of getting to sleep, shorten sleep and somnolence during working hours which continues into successive days off (Torbjorn Akerstedt, 2003; Harold A. Thomas, 2003).

In addition, this study also discovered an alarming finding where about 81.4% of the respondents self-reported on the usage of medicine to induce sleep for at least once in the previous one month and 62% of this group were reported with poor sleep quality. A review conducted by Yuriko Doi (2005) found that medication used to aid sleep was suggested as one of the recognised risk factors for insomnia and sleepiness among nurses. Diane R et al. (1992) in her study reported that nurses used medication to get to sleep where night nurses and rotators had twice the odds of using medications to get to sleep in comparison to day/evening nurses. The use of sleep medication specifically benzodiazepine sedative-hypnotic could trigger various side effects including reducing the overall sleep quality by lessening the restorative deep sleep and dream sleep (helpguide.org). For future research, there is a need to explore further on the contributing factors of sleep-inducing medication usage among manufacturing workers.

5. Conclusion and Recommendations

In conclusion, this study has established the prevalence and associated factors of poor sleep quality among the workers in a manufacturing company in the Klang Valley. The highlighted findings include the following: 1) about 53.3% of the respondents had poor sleep quality. The prevalence of poor sleep was comparably higher than private vehicle drivers in general. 2) there were five factors associated with poor sleep quality which ethnicity, shift work, insomnia, use of medication to get to sleep and sleep duration. Beside sleep duration, quality of sleep was also an important aspect to be considered. Comprehensive countermeasures against poor sleep quality among the working population are not only an individual responsibility but also requires organizational and societal contribution. SIRIM 4:2014 Good Practices in Implementing Commuting Safety Management which was introduced in 2014 has provided guidelines to the non-logistics company in Malaysia to put into practise intervention of commuting accident including recommendations to prevent sleepiness and fatigue among workers.

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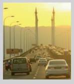

Research Report

Identifying Factors Associated with Sleep Quality among Manufacturing Workers Riding to Work in Klang Valley

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