ORIGINAL ARTICLE

IMPACT OF OCCUPATIONAL FACTORS ON SAFETY AND HEALTH THROUGH ERGONOMIC APPROACH AMONG OLDER TAXI DRIVERS IN MALAYSIA

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ABSTRACT

One of the alternative professions that may include the older is taxi drivers. Subsequently, they have to take explicit thought during driving activities as indicated by their capacity and ability to sustain their lives while minimizing health problems and increasing safety. Therefore, this paper aimed to study from a user experience the impact of occupational factors on safety and health by an ergonomic approach among older taxi drivers in Malaysian. A cross-sectional study was led utilizing a self-administered survey instrument. Purposive method sampling was used based on inclusive criteria; age 60 years old and above, self-driving taxi more than one year, no disabilities, and registered with the Ministry of Transport. A total of 443 respondents participated in the study. SPSS software version 20.0 to analyse the data. More than half of the respondents (70.0%) felt back pain in the past 12 months, and 75.4% in the last seven days. There is a significant relationship health problem (p< 0.05) between variables; BMI, smoking status, carrying luggage into the trunk, supporting of the backrest for the whole body, the effect of the seat size on comfortable driving, feeling of back pain is mainly due to the seat design and long-distance driving and driving posture analysis at the high-risk position and awkward body posture on seat design during handling task. The low implication awareness on ergonomics education could increase health problems and decrease safety while handling the task among older taxi drivers in Malaysia.

Keywords: Older, Taxi Drivers, Safety and Health, Ergonomic, Malaysian.

INTRODUCTION

Malaysia is experiencing challenges in changing the demographic profile of the population. Department of Social Welfare Malaysia (DSWM) described that the people aged 60 years and above fall into a category of elderly as referred to the "World Assembly on Aging, 1982" in Vienna. Based on statistics from the Department of Statistics Malaysia[1], the population aged 65 years and above increased 0.2 per cent from 5.8 per cent in 2015 to 6.0 per cent and equivalent to 1.9 million in Malaysia in 2016. This number will continue to increase from year to year. The older population has increased dramatically compared to other age groups making it one of the indicators for a developed country. Malaysia is experiencing challenges to changing the demographic profile of the population and heading towards an older country. Therefore, based on these statistics, it is possible to expect the older community to continue employment even after retirement; their past environment influences this.

Therefore, the older community requires explicit thought to sustain their lives according to their capability and ability in this challenging world. Older characteristics may differ from other ages in terms of physiological, perceptual, sensory, cognitive, and motor capacities that may affect how the older people work together with tasks and behaviors[2]. The limited ability among the older could affect their lifestyle, health and also driving behavior. Therefore, an older community may continue to serve their services to other jobs after retirement or looking for manageable works according to their ability or do a part-time job to support family economic-financial and sustain life in the challenging world. These communities prefer to be taxi drivers to replace previous jobs after retirement. The job is considered a light job that is easy to handle, less energy, low cost, no specific requirement (standard licensed), no specific regulation. It is an advantage if they have experience in driving in a commercial or private car. According to data in 2016 from Land Public Transport Commission (LPTC), approximately 64,547 registered taxi drivers in Malaysia. These numbers are also representing taxi drivers under the older community category.

According to the annual statistical report 2007-2010[3], more than 80% of accidents involved in passenger cars are fatal crashes. Consequently, the characteristics of older taxi drivers are so vital to comprehend, and therefore, the ageing process makes old individuals increasingly susceptible to injuries. Furthermore, the body structure of older people is too fragile when compared to other adults. Because their body repairing mechanism

receives less energy to repair damaged and disrupted tissues, and their skeletal system is more pruned to damage through bone loss.

Employment as a taxi driver is a high risk that can lead to fatalities due to inter-motor vehicle accidents[4,5] with 14.9 taxi driver deaths than the 3.3 ratio for 100,000 other jobs. The employment of taxi drivers can be described by the low, dangerous, uneconomical pay for work and lower-class employment. The average working time of taxi drivers is 10.5 hours per day for 6.4 days in a week, and on average, this group allocates 3.5 hours of waiting time to get passengers for each day[6,7,8,9,10]. From previous studies, fatigue factors have always been associated with long driving periods. Long-term driving results in fatigue and can affect driving performance. It is classified as physical and mental fatigue[7,8,9,10]. Driving for an extended time causes fatigue and can affect driving performance, and it is classified as physical and mental fatigue. The measurement tool introduced by Hermanns et al. (2008) and Yusoff IS et al. (2020) also showed that awkward posture and exposure to high vibration when driving at high risk might lead to musculoskeletal disorders (MSDs). In other words, the leading cause of physical fatigue is due to driving posture[12].

Some aspects make older drivers distinct from other workers regarding exposure expectations when dealing with MSD-related jobs. As shown by Yang et al. (2014), their average working time is 10.5 hours a day, 6.4 days a week, and an average of 3.5 hours a day for passengers[6]. Past researchers[7,8,13,14,15] have found that other occupational factors, such as whole-body vibration, limited driving space, long working hours, long-distance driving, total mileage, taxi driver time, monotonous driving, work stress, and job dissatisfaction, that contribute to low back injuries[7,8,14,15]. From past literature, fatigue is continuously related to a long driving time and can be directly influenced by the driver's performance. Therefore, this is further classified into two: physical and emotional exhaustion. Taxi drivers are at high risk of disrupting the human biological clock rhythm and risk of stress, exhaustion, insomnia, anxiety, etc.[6].

The application of ergonomics, for example, safety and health for older taxi drivers, is essential for a better working way of life and minimizing medical problems on work-related MSDs. Furthermore, it increases the health level and safety among older taxi drivers. Therefore, the principal objective of this study is to assess the impact of occupational factors on safety and health from an ergonomic approach of the older Malaysian taxi drivers from their experience. According to the authors' best knowledge, this is the first study that applies an ergonomic approach

was made in the context of Malaysia to assess this problem.

MATERIALS AND METHODS

The cross-sectional study was done utilizing a self-administered questionnaire to investigate the characteristics of background details among older taxi drivers in Peninsular Malaysia. The survey was managed around both the rural and urban areas in four regions of Malaysia. The purposive sampling technique was chosen, and 443 respondents participated in the survey. The sample determining of 443 was based on the formula epidemiology krejcie and Morgan (1970) The primary inclusion criteria that have to select the samples; above 60 years of age, having a minimum of 1-year experience in taxi driving, and having SPAD registration. However, drivers who have had a history of major surgery or a history of neurological problems which have already attended any course or training related to occupational health and part-time drivers who work less than 4 hours a day have been excluded. The "Budget Car" and "Hired Car" taxi drivers were only selected for the study and the characteristics of the car itself. The car seats should be in standard seat design, and no modification was involved. Each survey took approximately 10-15 minutes to complete. The respondents kindly asked to obtain a small token of appreciation if they successfully took part in the survey. Complete information related to their experience, work characteristics, health issues, and details of the driving posture were collected.

The face-to-face interviews were conducted with the older taxi drivers to obtain fully completed questionnaires and minimize the misinterpreted responses. The questionnaire consisted of two sections. The initial part of the questionnaire was on socio-demographic characteristics and the past medical history of the respondent. The second part of the questionnaire was on the background of user experience such as total number of picking up passengers per day, working hours per day, period of resting time per day, type of employment, number of years working as a taxi driver, total driving distance per-week, the regular starting time of driving, competency and confident level of driving, feelings about the back pain within past seven days as well as last 12 months and type of activities doing in the leisure time.

The interviews were conducted at the public area, bus stations, railway stations, taxi stations, shopping malls, business zones, rural and urban hotspot areas, etc. According to statistics available in 2016, the most highly registered taxi types were budget taxi services (61.2 per cent) and hired car services (26.6 per cent) with SPAD compared to other services (Table 1). Other than that, these taxi types are listed as cheap taxi types with standard/regular car seat designs

compared to the various types of taxi services, as defined in the specification. Data analysis was conducted using version 20 of the SPSS program. Descriptive statistics were collected for all variables in the analysis. The binary logistic regression technique was used to determine the relationship between occupational performance with health and safety among older taxi drivers.

RESULTS

Socio-demographic details of the older taxi drivers

The majority (57.6%) of older drivers used 'budget' as a type of taxi. Almost all respondents were male (98.9%). The mean (±SD) age of the respondents was 66.0±3.8 years, and age ranged from 60 to 83 years old. Most older taxi drivers were aged more than 66 years old (50.3%). BMI was overweight (48.5%), and the majority was Malay (68.6%); the second was India (17.8%), secondary school (59.1%) for education level. The majority (66.4%) of respondents worked under the company. Mean income per month RM 2000±796.8 from RM200 to RM6000.The smoking status answers smoker (yes) more than half (66.1%). The details of background older taxi drivers are shown in Table 2.

Table 1: Number of licenses and break down of the taxi services based on their type.

Taxi services	Number of licenses	Percentage (%)
Budget	**39,505**	**61.2**
Airport	3,135	5.0
Premier	376	0.6
Hired Car	**17,224**	**26.6**
TEKS1M	935	1.4
Executive	3,372	5.2
Total	64,547	100

Source: SPAD, 2016

Table 2: Background older taxi drivers.

Factors	N (%)	Mean ± (SD)	Min.	Max.
Category taxi				
Hired car	188(42.4)			
Budget	255(57.6)			
Gender				
Male	438(98.9)			
female	5 (1.1)			
Age		66±3.8	60	83
60>65	220(49.7)			
>66	223(50.3)			
Factors	**N (%)**	**Mean ± (SD)**	**Min.**	**Max.**
60>65	220(49.7)			
>66	223(50.3)			
BMI				
Underweight	6 (1.4)			
Normal	137(30.9)			
Overweight	215(48.5)			
Obese	85(19.2)			
Ethnicity				
Malay	304(68.6)			
India	79(17.8)			
Chinese	59(13.3)			
Education				
None	18(4.1)			
Primary school	161(36.3)			
Secondary school	262(59.1)			
University	2(0.2)			
Jobs sectors				
Company	294(66.4)			
Self - employed	149(33.6)			
Income per-month (RM)		2000±796.8	200	6000
Smoking status				
Yes/frequent	293(66.1)			
No/never	150(33.9)			

N=443,Abbreviations and Notes: SD = Standard deviation, Min indicates Minimum, Max indicates Maximum

Table 3: Characteristics of the elderly taxi drivers

Factors	N (%)
Taxi Model	
Iswara	234 (52.8)
Saga	97(21.9)
Waja	33(7.4)
Wira	79(17.8)
Number of passengers obtain per-day	
6-10times	412(93.3)
>11times	30(6.7)
Rest taken per-week	
Yes	208(47.0)
No	235(53.0)
Total hours of driving per-day	
1>7hours	37(8.4)
>8 hours	406(91.6)
Average hours of driving per-week	
48-56 hours	28(6.3)
>56 hours	415(93.6)
Having a sleep/nap till waiting the passenger	
Yes	188(42.4)
No	255(57.6)
Waiting hours per-day for passengers	
<1 hours	132(29.8)
2>3hours	201(45.4)
>4hours	110(24.8)
Average driving distance per-week	
51>150km	1(0.2)
151>250km	37(8.4)
>250km	405(91.4)
Possibility of driving until mid-night	
Always	106(23.9)
Not frequent	168(37.9)
Never	169(38.1)
Confident level of driving skills	
Average	79(17.8)
Confident	364(82.1)
Driving time	
Morning	250(56.4)
Afternoon	142(32.1)
Evening/night	27(6.1)
Anytime	24(5.4)
Feeling of back pain in last 12-month period	
Yes	310(70.0)
No	133(30.3)
Feeling of back pain in last 7 days	
Yes	334(75.4)
No	109(24.6)
Factors	**N (%)**
Cause of the back pain due to the job	
Yes	420(94.8)
No	23(5.2)
Carrying luggage into the hood	
Yes	435(98.2)
No	8(1.8)
Loading of luggage weight	
1>5kg	42(9.5)
6>10kg	180(40.6)
>11kg	213(48.1)
Never	8 (1.8)
Total years of experience in driving	
1>5 yrs	160(36.1)
6>15yrs	192(43.3)
>16yrs	91(20.5)

Characteristics of the older taxi

According to the results given in Table 3, taxi model Iswara model are the highest (52.8%), Saga model is the second-highest (21.9%), followed by Wira model (17.8%) and Waja model (7.4%). The majority (93.3%) respondents of the older taxi drivers' average number of passengers obtain per-day was 6-10 times, and half (53.0%) of them were never taken a rest per week. Most of them (91.6%) were driven more than 8 hours per-day and average of 56 hours per-week. Moreover, 57.6% of the elderly taxi drivers do not prefer to have a sleep/nap during their waiting time. About 45.4% was waiting 2-3 hours and 24.8% of the respondents should be waited more than four hours per-day to obtain a customer. Around 91.4% of the drivers were driven more than 250km per-week. Furthermore, less than half (38.1%) of the respondents were not driving the taxi until mid-night. However, only 23.9% always stays until mind-night. Most of the elderly taxi drivers prefer morning time (56.4%) to begin the driving of their taxi and 82.1% was confident with the level of their driving skills. More than 70.0% were complained that they were having back pain within most recent 12-month period and furthermore, 75.4% stated that the feeling of the back pain in the previous 7 days. About 94.8% of the elderly taxi drivers believed that feeling back pain is majorly due to their work environment. Meanwhile, vast majority of them (98.2%) consistently convey traveller's luggage into the trunk, and nearly fifty percent (48.1%) of them have carried luggage that was weighted more than 11kg. Moreover, their total highest driving experience as taxi drivers was ranged within 6 -15 years, and the percentage was 43.3%. Respondents using Iswara model are the highest (52.8%), Saga model is the second-highest (21.9%), followed by Wira model (17.8%) and Waja model (7.4%).

Risk factors of the older taxi drivers

The results of Table 4 show that the result analysis risk factors which have a relationship with health problems on work MSDs at upper torso body parts of the older taxi drivers. The result showed a significant relationship (<0.05) contributing to risk to develop MSDs; BMI – underweight & obese (Od ratio: 4.93, CI: 1.57,15.53, P: 0.00), smoking experience - Yes (Od ratio: 2.33, CI: 1.09,4.97, P: 0.03), lifting passenger goods- Yes (Od ratio: 16.51, CI: 2.58,105.85, P: 0.00), seat backrest supports entire back body.- No (Od ratio: 3.27, CI: 1.27,8.34 , P: 0.01) and posture analysis (RULA) - action scores 3 & 4 (Od ratio: 8.72, CI: 0.97,78.34, P: 0.05).However, there was an increase in risk factors but no significant relationship factors for seat size affecting driving comfort - Yes (Od ratio: 1.49, CI: 0.32, 7.02, P: 0.61) and back pain problems caused by seat design sitting and long driving - Yes (Od ratio: 1.07, CI: 0.13, 8.68, P: 0.95).

Table 4: Risk factors for work MSDs at upper torso body parts.

Variables	Ratio (Od)	95% (C.I)	*P* value
BMI			
Normal	1.00		
Underweight & obsess	4.93	(1.57,15.53)	0.00**
Smoking Experience			
No	1.00		
Yes	2.33	(1.09,4.97)	0.03**
Lifting Passenger Goods			
No	1.00		
Yes	16.51	(2.58,105.85)	0.00**
Seat Backrest Supports Entire Back Body			
Yes	1.00		
No	3.27	(1.27,8.34)	0.01**
Score Action analysis Posture (RULA)			
1>2	1.00		
3>4	8.72	(0.97,78.34)	0.05**
Variables	Ratio (Od)	95% (C.I)	*P* value
Seat Size Affecting Driving Comfort			
No	1.00		
Yes	1.49	(0.32,7.02)	0.61
Back Pain Problems Caused by Seat Design Sitting and Long Driving			
No	1.00		
Yes	1.07	(0.13,8.68)	0.95

*N=443. **Significant p <0.05, Abbreviations and Notes: CI = Confident Interval, Od. = odds*

DISCUSSION

The first national car (Proton) model used for taxi services widely in Malaysia is the first edition of the Proton Iswara model in the 1990s and 2000s. Thus, the study showed that 52.8% of respondents had chosen the Proton Saga Iswara model and 21.9% for the second edition of Proton Saga. This model has high demand among older taxi drivers because the selling price in the market is lower than other Proton model variations, easy to maintain, more economical, and same supplier seats for all economic variations of Proton models. Overall, the highest prevalence of MSDs occurring in the last seven days of driving was in the back, and lower limbs, namely left and right hips (93.6%; 92.1%), right and left buttocks (92.0%; 91.0%), lower back (87.4 %), middle back (81.7%) and upper back (74.7%)) as well as neck (53.0%). On the other hand, based on a study conducted by Ahmad et al. (2017), taxi drivers in Jeddah were found to contradict the results of a study of limb MSDs in the last seven days of driving: lower back and knees (29.4%), neck (27.4%), upper back (23.5%) and shoulders (20.0%). However, there is almost a similarity of MSDs prevalence of the last seven days of driving with the results of studies on the middle back limb (79.0%) and upper back of the body (65.0%) that have been conducted by Srivastava S. & Kiran U. V. (2014). Overall, a total of 92.3% of older taxi drivers' complaints agreed that all MSDs problems occurred in the last 12 months and the last seven days of driving on the limbs were due to seat design and driving posture. Previous researchers have also agreed that vehicle seat design affects driving performance and influences the comfort and physical health condition of the driver himself[1,7,8,9,18].

The results have shown no significant difference between the respondents' age groups, which are 60-65 years of age and above 66 years old. As per Pruesser et al. (1998), the drivers whose age is within the range of 65 - 69 years are 2.26 times higher at risk to meet a fatal multi-vehicle crash contrasted with the drivers whose age is within the range of 40- 49 years[19]. About 66.4% of older taxi drivers in Malaysia work under a company to ensure their life and family well-being. Similar results were recorded previously study in Nigeria[20]. According to them, 85% of taxi drivers in Nigeria were employed under taxi companies as drivers as means of living. The average income per month for an older taxi driver in Malaysia was RM 2000.00, and similar results were stated by AL-Dubai et al. (2012) in their research on "Prevalence and determinants of low back pain among taxi drivers in Malaysia"[21].

Further, according to the previous research, spending more time picking up and waiting for passengers every day or per week leads to low back pain injury[22]. Tamrin et al. (2007) revealed that the monotones in long-distance driving affected the factors like low back pain and other injuries related to MSDs[15]. The results of the current study showed that 91.4% of the older taxi drivers who drive more than 250km per week had been potentially led to developing body muscle problems. Furthermore, the study found that having back pain in the past 12 months among taxi drivers in Malaysia was 70.0% and having back pain in the past seven days was 75.4%. A similar trend of results was also found in previous research which was conducted in Taiwan and Japan. According to them, the predominance of lower back pain in the past 12 months and past seven days among taxi drivers were 45.8% and 51%, respectively[13,14].

The results showed a significant association between MSDs in the upper limbs and low back with BMI - underweight and obese (Od ratio: 4.93, CI: 1.57, 15.53, P: 0.00). Previous studies conducted among taxi drivers in Iran who worked for more than four years found that obesity, gastrointestinal diseases, fatigue, MSDs, sensory complaints, including haemorrhoids were higher than other populations[23]. This statement is based on reports from taxi drivers stating that they eat junk food that they quickly get on the road while driving[24]. This attitude is an unhealthy dietary imbalance or poor eating behaviour. Obese taxi drivers are prone to cardiovascular disease, hypertension, stage 2 diabetes, and other diseases[25]. It can be concluded that obesity is one of the risk factors that carry various diseases such as stroke, cardiovascular disease, hypertension and diabetes, as well as causing problems to arthritis and MSDs[26]. According to Yesurajan M. & Indra T. (2017), smoking can increase the risk of cardiovascular disease. This factor causes about 30% of all deaths due to cancer and is the leading cause of chronic lung disease. The results on the seat support variable supporting the entire back of the body - No (Od ratio: 3.27, CI: 1.27, 8.34, p: 0.01) showed a significant association with MSDs problems on the upper limbs and lower back. Thus, there are similarities with the study's statement that uncomfortable chairs and uncomfortable backrest support are the causes of pain in lower back pain[27]. Seating comfort is also closely linked to the driver's seat. Although there is an interaction between the driver and the vehicle seat, Gyi D. E. (2012) has identified when the backrest supports the back body. The pelvic bones will naturally twist until the backrest fully supports the body. Accordingly, the study results on the seat support variable keeping the entire back of the body - No (Od ratio: 3.27, CI: 1.27, 8.34, p: 0.01) showed a significant association with MSDs problems in the upper limbs and lower back. Comfort in the car driver's seat had a substantial relationship with features on the driver support seat posture[7,8,9]. There was a significant association between MSDs in the upper limbs and lower back on RULA posture analysis

with analytical action level scores of 3 & 4 (Od ratio: 8.72, CI: 0.97, 78.34, p 0.05). This is due to several things, including static posture when driving for a long time. There are previous studies confirm that posture in a long sitting position while driving has a cumulative effect of fatigue on the back muscles of the body and causes muscle tension in the spine leading to low back pain problems[7,9,29,30].

CONCLUSION

In conclusion, this study gives a concrete base on the characteristics among old taxi drivers, especially recognizing relationships and risk factors essential to cause health problems due to occupational driving carrier in taxi among older in Malaysia. It also helps us initiate the prevention of MSDs in health and identify risk factors within the cycle of economic challenges. Therefore, more investigation is expected to explore this topic that will benefit older taxi drivers to enhance their health and improve quality of life, especially their safety during their job.

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COMPETING INTERESTS

The authors declare no potential conflict of interest and all ethical considerations, such as plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy, have been observed diligently by the authors.

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