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Low Back Pain Problem amongst Port Crane Operator

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Abstract – P*urpose of this study to be conducted is to identify the risk factor of low back pain amongst port crane operator and to improve the health management program in the company. The objectives of this study are to evaluate the major group of port crane operator that having low back pain problem, to analyse the risk factors that associated to low back pain problem (WBV, Awkward prolonged sitting and shift work-psychological) , individual characteristics (sport activity or hobby), to analyse the associated rate operator's absence from work (medical leave) and low back pain problem and to propose the basic ergonomic assessment checklist for management to investigate health incident cases and fit-to-work (ergonomics) screening checklist for new recruitment. A survey research design through the distribution of the questionnaire and interview & field observation will be used for research methodology. The population of this study consists of port crane operators-Rubber Tyred Gantry Operator (RTG). Questionnaire method used to collect all relevant information from correspondence. Interview also will be conducted to gain further details information. Data were analyzed with the usage of Statistical Package for the Social Sciences (SPSS) to make the process of analysis easier. As result, firstly, the study shown that there are association of risk factor for working posture and years of exposure with Low back Pain. The null hypothesis was rejected and there is probability that these risk factors have influence the low back pain. It was also concluded that the null hypothesis was accepted which means there are no correlation of risk factors for heavy physical works, previous job experience, previous accident with low back pain problem. Thirdly, the study shown there are no correlation of rate operator's absence from work (medical leave) with low back pain problem as the null hypothesis was accepted with p value<0.05.* ***Copyright © 2015 Penerbit Akademia Baru - All rights reserved.***

Keywords: Port, Low Back Pain, Ergonomics, Occupational Safety & Health, Rubber tyre gantry, Back Pain

1.0 INTRODUCTION

Low back pain has been studied in many occupational and industries. Many risk factors that contribute to low back pain had also being studied in details. Many studies have been done either by qualitatively or quantitatively or both to measure the association between risk factor and low back pain. In this era, low back pain has become an accepted part of life, and an indication of a hard day's work, regardless of the type of occupation. Everyone experiences this to varying degrees regardless the profession of work. While some degree of muscle fatigue and pain can be lightened by rest, others take a much greater effects on the body and have the potential to result in permanent damage. The increased of the prevalence of low

back pain are still uncertain. However, many studies have been conducted and found the association of between low back pain and physical risk factor such as whole body vibration, awkward posture and exposure time (service period) occurred while working.

1.1 Low Back Pain

Low back pain is found to be one of the major contributions to occupational health disease. Many study has been conducted involving multi industries such as food processing [1], car assembly, port industry [2], mining [3] and construction. They also focused on the targeted job and group such as taxi, lorry, bus driver [4]; [5], forklift operators [6] and hotel workers [7]. Previous studies conducted mainly focused to identify the occupational risk factor that associate with low back pain such as whole body vibration [4]; [8], postural stress [9] and manual materials handling [4]. Anatomically, back pain can be identified when pain occur at C1 and S1 region. Narrow down further to low back pain, usually the pain occur at region of L1 and S1 [10]. Previous study showed that low back pain reported to be high prevalence with 64.8% of participant compared to other body part which shoulder (30.8%), knee pain (27%), neck (17%) and upper back (2.6%) [11]. Rubber tyred gantry crane operator is found to be highly risk to risk factors such as awkward postures, duration of work time spent in that awkward posture, vibrational jolts and shocks, repeated or continuous use of muscle force to maintain posture, and psychosocial factors (shift work, working in segregation, working to tight deadlines) [9]. A study conducted stated that the prevalence of low back pain seems to be very common nowadays [10]. Most of the studies have been conducted in North America, UK and Scandinavian country. The 12 months prevalence of LBP and backpain tended to increase with the frequency of abnormal trunk posture at work (bending forward and twisting) [12]. Previous study shows that the prevalence of low back pain was high [13, 14].

1.2 Rubber Tyre Gantry

RTG's are large mobile gantries that move around the container yard in order to load and offload containers from road haulage vehicles and tug master tractor trailers. The main task for rubber tyre gantry crane operator is operating rubber tyred gantry for receiving or loading or shifting in the stack or housekeeping activity for containers to and from the yard for vessel operations or serving the land side customers for deliveries as per work order queues in a safe manner. Their other main task is to retrieve and stack containers within container yard rows. The crane contains a lifting frame of 25m, which provides access to the cab via ladders and houses drive, also monkey-ladder and operating gear. Four or sixteen rubber tyres attach to the lifting frame via four rotating and steerable wheel units. The driver's cab is under a rail mounted trolley running between frame legs. A header block and spreader (head unit) are set at a distance of 2200mm forward of a fixed cab point The RTG is controlled by an operator, who is accommodated in a cab measuring 2.1m in length x 1.8m in width x 2m in height. The cab is glass except for the structural supports, and the following interior elements: driver's seat, spare tip up seat to the rear cab wall, primary control consoles on either side of the driver's seat, Secondary control console located on the rear cab wall, touch screen on adjustable arm, cab systems screen, cab radio with adjustable microphone and commercial radio on left cab wall, heaters and adjustable foot plates. There are two primary control consoles, located on either side of the driver's seat. They are function for all major driving, container handling, safety controls and indicators. The left side controls allow the driver to steer and move the RTG, as well as the cab and header unit between frame legs. These also control the attachment/release of the header unit to the container. Controls on the right side consist of a joystick controlling the speed, direction of the cab, header unit, and RTG

movement. It also operates the cab lights and control system that integrated with operation department's database system as the operator need to log in all containers shifted in/ out of the yard area .

1.3 Low Back Pain in Port Crane Operator

The risk factor of whole body vibration, personal characteristics such as age, smoking habit, education, marital status, sport activity, or annual amount of car driving and postural load among quay crane operator[12]. It was found that, quay crane operator are second highest among 4 other port crane operator group in having the lifetime prevalence low back pain and 12-months prevalence low back pain. The main task for Rubber tyre gantry crane operator is operating rubber tyre gantry for receiving or loading or shifting in the stack or housekeeping activity for containers to and from the yard for vessel operations or serving the land side customers for deliveries as per work order queues in a safe manner. It was found that the common health's complaint from rubber tyre gantry operators received by management was back pain [13].Low back pain which is widely problem which not only affected occupational but it is also in normal routine human's life. Many of low back pain sufferers got it from many risk factors. Health effects of crane drivers working conditions are becoming an ever more important issue for terminal operators. Risks factors are commonly heard and studied include heavy physical work with frequent bending, lifting and rotating movements. It also may rise from physiological factors such as depression, anxiety, job satisfaction, private and work-related stress, low activity and educational level [14].

It was found that combined exposure is most probably the main contributor to LBP compared to single exposure [15]. Some of the risk factors studied for severe back and neck problems are prolonged awkward posture, bending of the spine and whole body vibration [16]. Besides, many studies conducted to find the association of low back pain with ergonomic risk factor such as whole body vibration, awkward postures and static sitting contribute to discomfort and low back pain [8]. The study found that the combination of risks factor are the main contribution to low back pain. Awkward postures can be define as any posture that is in an extreme angle or position from neutral or normal posture standing for example kneeling, stooping and squatting. The RTG crane operators need to lean forward and look down through the clear floor of the cab in order to lift and lower containers in the yard. They even have to be more focus during night shift as the condition of the surrounding is slightly dark and limited compared to day shift [17]. However, there was also possibility that with consistent evidence was found for no association between occupational sitting and LBP [18].Whole body vibration (WBV) had been found to be one of occupational risk factor in driving occupational. WBV affected the vertebrae, intervertebral and musculature which give the major impact to low back pain. There were studies stated that WBV can be the only major risk factor that contribute to low back pain. However, there are also studies found that the low back pain can be result of the association of WBV and other risk factor such as awkward postures, prolong sitting and lifting etc. [19]. One of the major risk factor is the relation between the exposure times of the risk with low back pain. Previous study shows that the association of low back pain is highest within experienced workers compared to inexperienced workers [11].The common individual characteristics are age, gender, anthropometry, posture, muscle strength, muscle imbalances, spine mobility, education, medical history, physical fitness, habit (e.g. smoking) and socioeconomic conditions [20]. Many studies conducted to study the association between individual characteristics such as age, weight and BMI. It was found that there were statistically significant risk factors of low

back pain with age, female gender, smoking, occupation, perceived work stress and heavy lifting [21].

The socioeconomic impact of low back pain is absenteeism and do not turn up which workers not be able to come to work. The study found the average days of absent was 5 days. There were trending of absenteeism due to back pain and joint paint recorded in in-house clinic medical report. Low back pain has been found to be one of the major issues of absenteeism among operators. Usually once the operator have been diagnose with low back pain, they will require more than three days of sick leave to six months to return work which is based on the chronic of the back pain diagnose by occupational health doctor. Employees usually got longer of sick leave when they have been diagnosed with low back pain [22]. This matter also gives rise to Social and Security Organization (SOCSO) compensation claims. In year 2012, there have been four SOCSO claims have been recorded due to low back pain. The factors of longer sick leave might be related to the amount of compensation that employee gain [22]. Shift work can be categorized as social work factor that can also contribute to low back pain. A study conducted involving nurse in Female Caregivers in Nursing Homes found that night shift work are one of the risk factor that contribute to low back pain [23]. It was found that there is correlation of low back pain and medical leave especially after night shift.

2.0 METHODOLOGY

A survey research design through the distribution of the questionnaire and interview & field observation will be used for research methodology as illustrated in Figure 1 and Figure 2. The population of this study consists of port crane operators-rubber tyre gantry operator (RTG).To study the low back pain occurrence among the port operators, a questionnaire consists of five sections construct. Questionnaire method used to collect all relevant information from correspondence. Interview also will be conducted to gain further details information. Data were analyzed with the usage of Statistical Package for the Social Sciences (SPSS) to make the process of analysis easier. The statistical methods used for data analysis are descriptive statistics and inferential statistic. Descriptive statistics – e.g. Mean, mod and percentages while inferential statistic. – Pearson correlation and Chi-square Test statistic.

3.0 RESULTS AND DISCUSSION

The demographic data of the operator was analyse in percentage value. The study involve 209 operators of port RTG crane (n=209). All of them are male in gender. The mean age of the experimental group is 34 years old with standard deviation 0.79. The wide range in ages is due to the varying age group for the RTG crane driver population. There was 25% of total operator was age between 21-30 years old, 52% was age between 31-40 years old, 23% was age between 41 and 50, and 1% was age between 51-60 years old.

The reliability of the questionnaire was tested using Cronbach's alpha method. It was found that the value of α=0.906 which shows high significance reliability of questionnaire set (see table 1).

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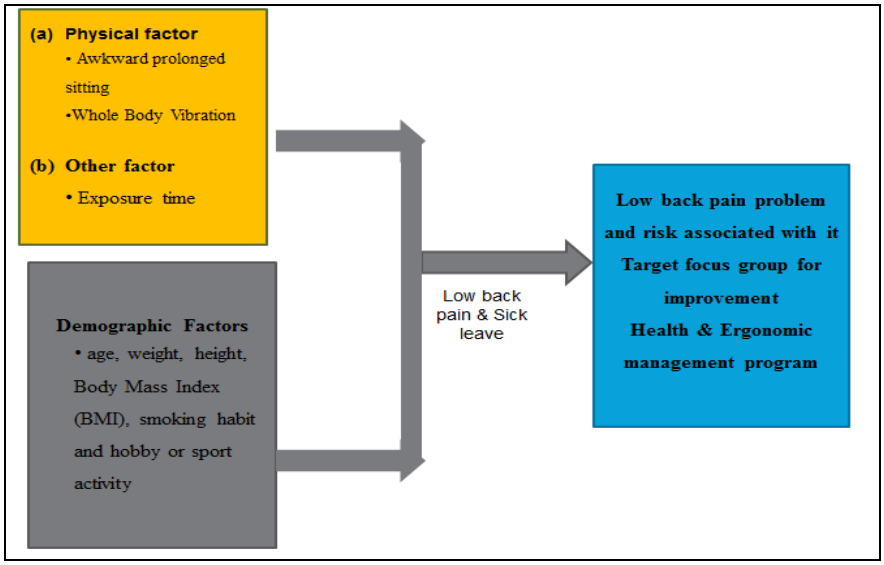

Figure 1: Figure of research framework

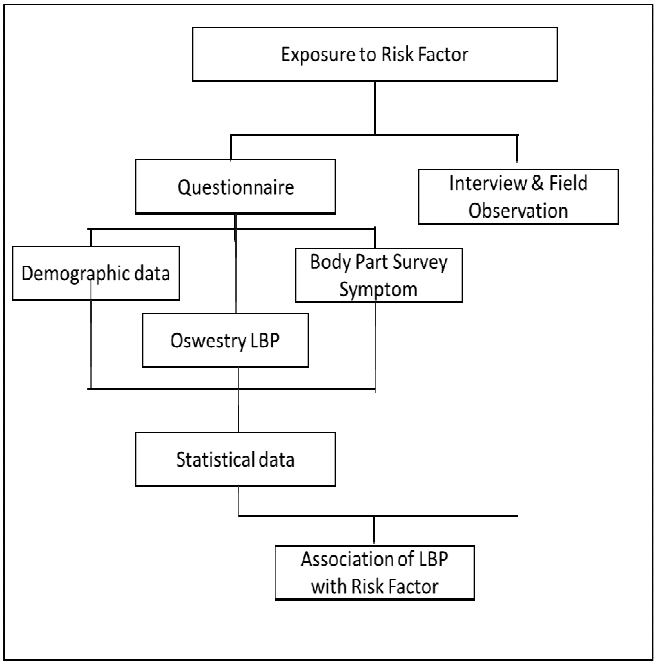

Figure 2: Research framework of the study

Table 1: Reliability Statistics -Cronbach's Alpha

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.906	.893	69

Study found from total operators, 67% of operators was normal, 32% was overweight BMI and 1% was obese. From total two hundred and nine operators, 3.8% operator did drinks alcohol and 95.7% did not drinks alcohol. For smoking habits, 80% of the operators are

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smoker and 20% are not smoker. From total operators, 85.2% have sports hobby and 14.3% not. From total operators, 46% had 13-15 years of experience, 26% had 7-9 years of experience, 13% had 4-6 years of experience, 10% had 10-12 years of experience and only 5% had 0-3 years of experience. It was found from total operators, 17.1% had previous job involving back pain factors and 82.4% are not. Based on the figure, 12.9% of the operators involved in incident previously and 86.7% are not. Figures also shows that 17.6% of total operator had previous job involving heavy physical risk factors and 81.9% are not. From total operators, 81.9% had previous job involving awkward posture risk factor and 17.6% are not.

3.1 LBP experience amongst operator

Figure 3 shows LBP experience by operator within previous 7 days and 12 months before answer the questionnaire. From total operators, 63.8% of total operators experienced LBP in previous 7 days and 35.7% were not. Based on figures, 71.9% of total operators experienced LBP in previous 12 months before and 27.6% were not.

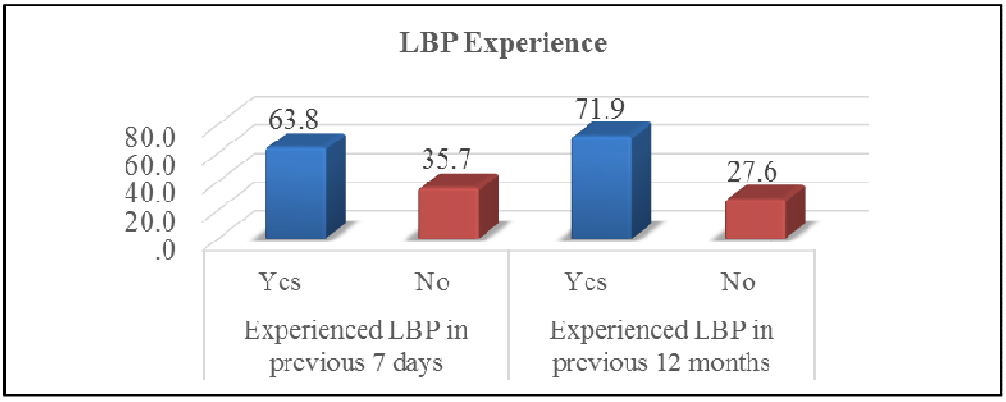

Figure 3: LBP experience by operators

3.2 Body Part Survey Symptom

Further survey conducted using body part survey symptom. Figure 4 shows that the operator have highest intensity of pain at shoulder, upper back body, lower back body, wrist, tight, knee and ankle within 12 months with average of 90% of total operators experienced the same symptoms. However, the operators did not sure whether the pain was due to their work as shown in Fig. 5.

3.3 Research hypothesis- Association of risk factor with low back pain

To study the association of risk factor with low back pain, research hypothesis was studied at 95% confidence. Null hypothesis (H_0): There is no significant influence of risk factors towards the low back pain problem. Alternate hypothesis (H_1): There is significant influence of risk factors towards the low back pain problem.

Which, α= (0.05). If significance of test p-value < α (0.05), H_0 is rejected and with 95% confidence and we can conclude There is no significant influence of risk factors towards the low back pain problem. Whether if the p-value < α (0.05), we accept the H_0 as we can conclude that there is significant influence of risk factors towards the low back pain problem.

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3.3.1 Association of age with LBP

To study the association of age with LBP, hypothesis below are studies,
H_0: There is no significant influence of age towards the low back pain problem. H_1: There is significant influence of age towards the low back pain problem.

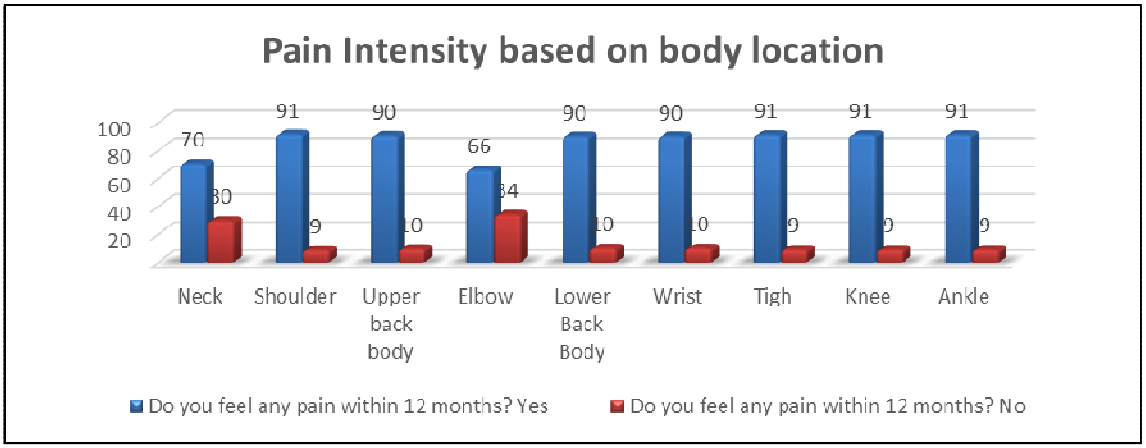

Figure 4: LBP experience by operators

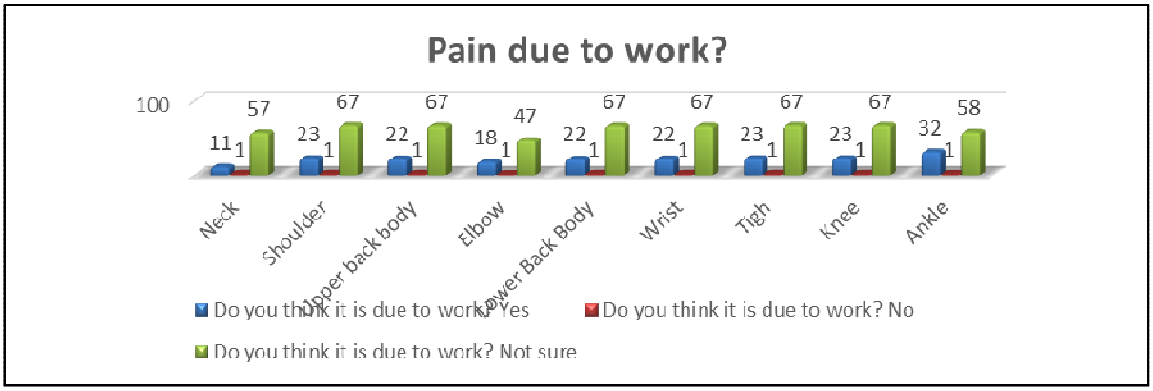

Figure 5: LBP experience by operators

Table 1: Chi-square table for age and LBP

	Experienced back pain within 7 days before?			Experienced back pain within 12 months?		
Age group	**p value**	**OR**	**CI (95%)**	**p value**	**OR**	**CI (95%)**
21-30						
31-40		-	-		-	-
41-50	0.001			0.021		
51-60						

Since the p-value (0.001) < α. (0.05) as tabulated in table 1, for 7 days prevalence and p-value (0.021) < α. (0.05) for 12 month prevalence, the null hypothesis is rejected with 95% confidence. Therefore, there is enough evidence to conclude that there are significant influence of age towards the low back pain problem.

3.3.2 Association of Years of Experience with LBP

To study the association of years of experience with LBP, hypothesis below are studies, H_0: There is no significant influence of years of experience towards the low back pain problem. H_1: There is significant influence of years of experience towards the low back pain problem.

Table 2: Chi-square table for years of experience and LBP

	Experienced back pain within 7 days before?			Experienced back pain within 12 months?		
Years of Experience	**p value**	**OR**	**CI (95%)**	**p value**	**OR**	**CI (95%)**
0-3 years 4-6 years 7-9 years 10-12 years 13-15 years	0.001	-	-	0.005	-	-

Since the p-value (0.001) < α. (0.05) for 7 days prevalence and p-value (0.005) < α. (0.05) for 12 month prevalence, the null hypothesis is rejected. Therefore, there is enough evidence to conclude that there are significant influence of years of experience towards the low back pain problem.

3.3.3 Association of history of incident with LBP

To study the association of history of incident with LBP, hypothesis below are studies, H_0: There is no significant influence of history of incident towards the low back pain problem. H_1: There is significant influence of history of incident towards the low back pain problem.

Since the p-value (0.102) > α. (0.05) for 7 days prevalence and p-value (0.821) > α. (0.05) for 12 month prevalence, the null hypothesis is accepted. Therefore, there is enough evidence to conclude that there are no significant influence of history of incident towards the low back pain problem.

Table 3: Chi-square table for history of incident and LBP

	Experienced back pain within 7 days before?			Experienced back pain within 12 months?		
	p value	**OR**	**CI (95%)**	**p value**	**OR**	**CI (95%)**
Involved in incident previously	0.102	2.188	0.841,5.686	0.821	1.112	0.443,2.789
Never involved in incident previously						

3.3.4 Association of heavy physical job history with LBP

To study the association of heavy physical job history with LBP, hypothesis below are studies, H_0: There is no significant influence of heavy physical job history towards the low back pain problem. H_1: There is significant influence of heavy physical job history towards the low back pain problem.

Table 4: Chi-square table for history of heavy physical job history and LBP

	Experienced back pain within 7 days before?			Experienced back pain within 12 months?		
Previous Job - Heavy physical?	**p value**	**OR**	**CI (95%)**	**p value**	**OR**	**CI (95%)**
Yes No	0.182	0.614	0.299,1.261	0.271	0.654	0.307,1.393

Since the p-value (0.182) > α. (0.05) for 7 days prevalence and p-value (0.271) > α. (0.05) for 12 month prevalence, the null hypothesis is accepted. Therefore, there is enough evidence to conclude that there are no significant influence of heavy physical job history towards the low back pain problem.

3.3.5 Association of awkward posture job history with LBP

To study the association of heavy physical job history with LBP, hypothesis below are studies, H_0: There is no significant influence of awkward posture job history towards the low back pain problem. H_1: There is significant influence of awkward posture job history towards the low back pain problem.

Table 5: Chi-square table for history of awkward posture job history and LBP

	Experienced back pain within 7 days before?			**Experienced back pain within 12 months?**		
Previous Job-Awkward Posture	**p value**	**OR**	**CI (95%)**	**p value**	**OR**	**CI (95%)**
Yes No	0.004	2.792	1.352,5.765	0.020	2.358	1.127,4.931

Since the p-value (0.004) < α. (0.05) for 7 days prevalence and p-value (0.02) < α. (0.05) for 12 month prevalence, the null hypothesis is rejected. Therefore, there is enough evidence to conclude that there are significant influence of awkward posture job history towards the low back pain problem.

3.3.6 Association of absenteeism (within 7 days before) with LBP

To study the association of absenteeism (within 7 days before) with LBP, hypothesis below are studies, H_0: There is no significant influence of absenteeism (within 7 days before) towards the low back pain problem. H_1: There is significant influence of absenteeism (within 7 days before) towards the low back pain problem.

Table 6: Chi-square table of absenteeism (within 7 days before) and LBP

	Experienced back pain within 7 days before?			Experienced back pain within 12 months?		
Absence due to LBP within 7 days before	**p value**	**OR**	**CI (95%)**	**p value**	**OR**	**CI (95%)**
Yes **No**	0.070	1.731	0.946,3.166	0.163	1.590	0.827,3.054

Since the p-value (0.07) > α. (0.05) for 7 days prevalence and p-value (0.163) > α. (0.05) for 12 month prevalence, the null hypothesis is accepted. Therefore, there is enough evidence to conclude that there are no significant influence of absenteeism (within 7 days before) towards the low back pain problem.

3.4 Environmental surrounding contribution study

Further investigation was conducted to obtained feedback from the operators on the environmental or surrounding of workplace. The operators was requested to answer 10 likert-scale questions. Based on the survey, 94% of total operators agreed that the cabin's condition was clean and comfortable. During field observation, researcher can confirmed that the condition of cabin was clean and comfortable with air conditioner was installed in the cabin. The operators agreed (87%) that the condition of seat are comfortable and have suspension. They also agreed that the control item are reachable. Most operators agreed that the vibration in the cabins are too high. However, further quantitative study need to be conducted to determine the vibration level in the cabin. From the survey, it shows that the operators did not understand about ergonomics (88% strongly disagree and 10% disagree). It shows that, the operators might have not being exposed to ergonomics awareness and training. It was supported with 88% of operators agreed that the training provided did not includes ergonomics subject. However, the operator agreed that they have been provided with sufficient rest time. Most of the operators experienced fatigue after their shift and most of them agreed that the night shift are more tired compared to day shift.

Oswestry Low Back Pain Disability Questionnaire has been designed to give us information as to how back pain is affecting affected operator's ability to manage in everyday life. Based on the analysis, it was found that 3% of the total populations (n=209) got severe disability. 27% of the total population had moderate Disability and 70% had minimal disability as illustrated in the chart below. The operators that had affected with severe disability was then interviewed for further investigation.

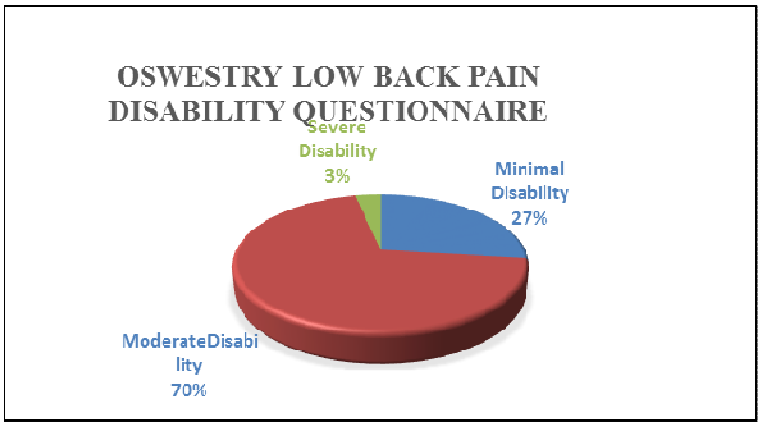

Figure 6: Oswestry Low Back Pain disability questionnaire

From the feedback from Oswestry Low Back Pain Disability questionnaire, it was found that there were five operators had severe disability which pain remains the main problem for them but activities of daily living are affected. Further investigation were carried out, interview

session was held with one of them selected. Besides that, an interview with HSE representatives also conducted to further investigate the Occupational safety and health management in the company. The interviewed operators stated the job task for RTG operator was picking up container from/onto PM and stack on/from storage area. While on the RTG, the operator involved has to wait about 20 minutes to one hour for the next PM to arrive. Their working hour is 6 hours with 4 hours (Overtime). They were instructed to have rest every 2 hours for 30 minutes in their shift and able to handle 70-90 containers per shift. The operators described and illustrated position of normal working position as picture (Figure 7) and aerial view of operator (Figure 8). According to operator, they has yet received any training pertaining ergonomics and have very limited information and understanding which regards to ergonomics matter. However, been told by their superior to relax his muscle after every 30 minutes. Most of them did not perform it because of they tried to chase for boxes to gain incentives.Some of them also do not aware on reporting health incident to HSE department until they went to hospital and diagnosed with low back pain.

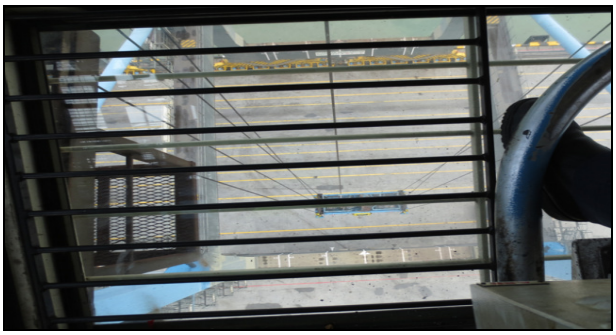

Figure 7: Aerial view from RTG operator's cabin

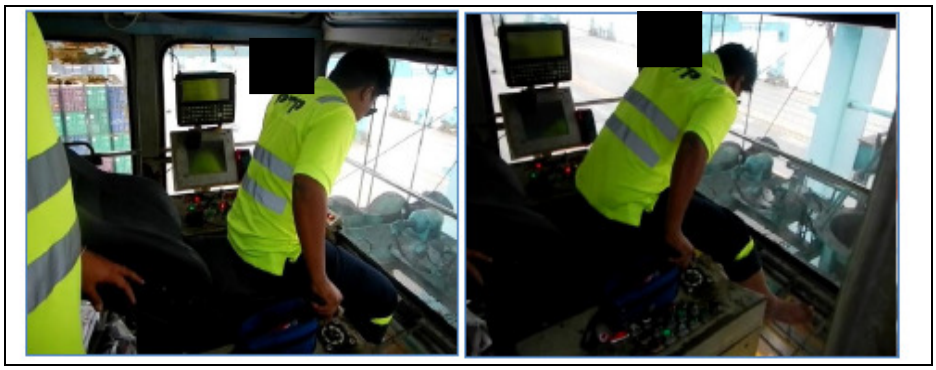

Figure 8: Condition of RTG

Further interview session was conducted with company's Health Safety & Environment (HSE) representative. After reviewing the Hazard Identification, Risk Assessment & Risk Control (HIRARC) for activity handling the RTG, it was found that the management did not captured Ergonomic risk in the risk assessment. The assessment focused only on safety hazard. Besides that, standard operating procedure was also reviewed. As same as HIRARC,

the ergonomics hazard was not identified in the Safe operating procedure (SOP). As for training, the company have yet establish an ergonomics plan to train workers at the moment. It was due to lack of resources in house and the cost engaging the consultant is very high. The clear procedure for Health's incident reporting was also not derived by the company which cause HSE department did not submit the report to Department of Occupational Safety & Health (DOSH) and incident investigation was not carried out either. Researcher have opportunity to observe the cabin operator's cabin. It was found that the cabin were clean and comfortable. The seat was fit in with suspension and the control items are easy reachable (See figure 8).

4.0 CONCLUSION

The study was conducted to analyse the correlation of risk factors with low back pain problem (WBV, Awkward prolonged sitting and shift work-psychological) , individual characteristics (age, BMI, drink alcohol, smoking habit and sport activity and hobby) , the correlation of rate operator's absence from work (medical leave) with low back pain problem and to propose the basic ergonomic assessment checklist for management to investigate health incident cases and fit-to-work (ergonomics) screening checklist for new recruitment/current employee. Therefore, there were several conclusions that can be derived based on findings in this study.

Firstly, the study shown that there are association of risk factor for working posture and years of exposure with Low back Pain. The null hypothesis was rejected and there is probability that these risk factors have influence the low back pain. It was also concluded that the null hypothesis was accepted which means there are no correlation of risk factors for heavy physical works, previous job experience, previous accident with low back pain problem. Thirdly, the study shown there are no correlation of rate operator's absence from work (medical leave) with low back pain problem as the null hypothesis was accepted with p value<0.05. Lastly, in this study it shows that the necessity of preventive maintenance focused on LBP and health promotion need to be focused on working environment and working posture. Besides that, educational programs may have a valuable rule in LBP prevention.

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