Psycho-behavioural risks of low back pain in railway workers

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Background
Low back pain (LBP) is the most costly ailment in the work force. Risky work behaviour and psychological stress are established risk factors.

Aims
To explore the associations between workplace risk factors, psychological stress and LBP among Malaysian railway workers.

Methods
A cross-sectional study was carried out on railway workers in Malaysia. Socio-demographics, workplace risk factors for LBP, perceived psychological stress and history of LBP over the previous month were obtained by direct interviews using a structured closed-ended questionnaire. Descriptive, bivariate and logistic regression analyses were conducted.

Results
There were 513 study participants (70% response rate). The prevalence of LBP in the previous month was 69%. Multivariate analysis yielded four significant predictors of LBP: employment of ≥10 years, lifting and lowering heavy loads, prolonged standing posture and psychological stress.

Conclusions
The high prevalence of LBP and its significant associations with physical and psychological stress factors in railway workers points to an urgent need for preventive measures, particularly among workers in high-risk occupations.

Key words
Epidemiology; low back pain; musculoskeletal; psychological stress; railway workers; workplace risk factors.

Introduction
Low back pain (LBP) is associated with various workplace risk factors and results in substantial employee disability and compensation [1]. Globally, the lifetime prevalence of work-related LBP varies between 30 and 84% [2]. Malayan Railways (Keretapi Tanah Melayu Berhad), Malaysia’s largest railroad network provider, underwent privatization in 1997 with a subsequent restructuring plan from traditional diesel to an electric-based rail system resulting in greater efficiency, speed and passenger safety. As part of the Trans-Asian Railway Network, it has met International Railway Industry (ISO 14001) quality certification standards [3]. Railway workers may be exposed to lifting heavy loads, prolonged sitting or standing, non-neutral body postures, vibration and psychological stress due to rigid protocols and limited rest in the course of their work, particularly during locomotive engine operations, railway track maintenance, shunting, freight and fleet services, which are likely to perpetuate significant ‘yellow-flags’ of workers’ LBP [1,2,4]. To date, no published studies have examined the bidirectional associations between workplace risk factors, psychological stress and LBP in railway workers. This preliminary report explores the prevalence and associated psycho-behavioural risks of LBP among Malaysian railway workers.

Methods
This cross-sectional study was conducted between August and September 2012 among all workers
registered to the Cooperative Workers Society (KTMB) involving eight states within Peninsular Malaysia. Trained interviewers asked participants the following question about LBP: Did you have pain or discomfort in the lower back (with or without radiating pain in one or both legs) lasting for one day or longer during the previous month? LBP was defined according to the first US National Health and Nutrition Examination Survey (NHANES I) [5]. Subjects were classified as having LBP if they have reported pain in the dorsolumbar region (L1, L2, L3, L4 and L5) or radiating pain to the gluteal folds and lower limbs. We classified occupational risks according to validated items on (i) work behaviour, e.g. lifting and lowering heavy loads; (ii) work environment, e.g. working in vibrating vehicles and (iii) work posture, e.g. prolonged seated posture [6]. To measure perceived psychological stress, we used the validated Malay version of the Perceived Stress Scale (PSS-10) [7,8]. Analysis was performed using the Statistical Package of Social Sciences (SPSS) software, version 16.0. Following institutional ethical approval, the Cooperative Workers Society (KTMB) granted permissions and final approval.

Table 1. Associations between socio-demography and work characteristics, psycho-behavioural risk factors and LBP among railway workers (n = 513)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>LBP: yes, n (%)</th>
<th>LBP: no, n (%)</th>
<th>OR</th>
<th>95% CI</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td><strong>Socio-demography and work characteristics</strong></td>
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<tr>
<td>Gender</td>
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</tr>
<tr>
<td>Male</td>
<td>284 (74)</td>
<td>100 (26)</td>
<td>2.2</td>
<td>1.5–3.4</td>
<td>***</td>
</tr>
<tr>
<td>Female</td>
<td>72 (56)</td>
<td>57 (44)</td>
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<td></td>
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<tr>
<td>Age group (years)</td>
<td></td>
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<tr>
<td>20–34</td>
<td>89 (57)</td>
<td>68 (43)</td>
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<tr>
<td>35–49</td>
<td>134 (76)</td>
<td>43 (24)</td>
<td>2.4</td>
<td>1.5–3.8</td>
<td>***</td>
</tr>
<tr>
<td>≥50</td>
<td>133 (74)</td>
<td>46 (26)</td>
<td>2.2</td>
<td>1.4–3.5</td>
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<tr>
<td>Occupation</td>
<td></td>
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<tr>
<td>Blue collar</td>
<td>183 (74)</td>
<td>63 (26)</td>
<td>1.6</td>
<td>1.1–2.3</td>
<td>**</td>
</tr>
<tr>
<td>White collar</td>
<td>173 (65)</td>
<td>94 (35)</td>
<td>1</td>
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<tr>
<td>Work duration (years)</td>
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<tr>
<td>&lt;10</td>
<td>91 (56)</td>
<td>71 (44)</td>
<td>1</td>
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<tr>
<td>≥10</td>
<td>265 (75)</td>
<td>86 (25)</td>
<td>2.4</td>
<td>1.6–3.6</td>
<td>***</td>
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<td>Daily working hours</td>
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<td>&lt;9</td>
<td>253 (68)</td>
<td>117 (32)</td>
<td>1</td>
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<td></td>
</tr>
<tr>
<td>≥9</td>
<td>103 (72)</td>
<td>40 (28)</td>
<td>1.2</td>
<td>0.8–1.8</td>
<td>NS</td>
</tr>
<tr>
<td>Risky work behaviours</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Lift and lowering heavy loads</td>
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<td></td>
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</tr>
<tr>
<td>Yes</td>
<td>145 (84)</td>
<td>28 (16)</td>
<td>3.2</td>
<td>2.0–5.0</td>
<td>***</td>
</tr>
<tr>
<td>No</td>
<td>211 (62)</td>
<td>129 (38)</td>
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<td></td>
<td></td>
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<tr>
<td>Work in vibrating vehicles</td>
<td></td>
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</tr>
<tr>
<td>Yes</td>
<td>88 (77)</td>
<td>26 (23)</td>
<td>1.7</td>
<td>1.0–2.7</td>
<td>*</td>
</tr>
<tr>
<td>No</td>
<td>268 (67)</td>
<td>131 (33)</td>
<td>1</td>
<td></td>
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<tr>
<td>Work at a pace set by machine</td>
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<tr>
<td>Yes</td>
<td>69 (82)</td>
<td>15 (18)</td>
<td>2.3</td>
<td>1.3–4.1</td>
<td>**</td>
</tr>
<tr>
<td>No</td>
<td>287 (67)</td>
<td>142 (33)</td>
<td>1</td>
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<tr>
<td>Work in a hot and humid environment</td>
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<tr>
<td>Yes</td>
<td>156 (83)</td>
<td>34 (17)</td>
<td>2.8</td>
<td>1.8–4.4</td>
<td>***</td>
</tr>
<tr>
<td>No</td>
<td>200 (62)</td>
<td>123 (38)</td>
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<tr>
<td>Work in a cold environment</td>
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<tr>
<td>Yes</td>
<td>167 (75)</td>
<td>57 (25)</td>
<td>1.6</td>
<td>1.1–2.3</td>
<td>*</td>
</tr>
<tr>
<td>No</td>
<td>189 (65)</td>
<td>100 (35)</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>Prolonged seated posture</td>
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</tr>
<tr>
<td>Yes</td>
<td>178 (66)</td>
<td>91 (34)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>178 (73)</td>
<td>66 (27)</td>
<td>1.4</td>
<td>0.9–2.0</td>
<td>NS</td>
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<tr>
<td>Prolonged standing posture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>180 (80)</td>
<td>45 (20)</td>
<td>2.5</td>
<td>1.7–3.8</td>
<td>***</td>
</tr>
<tr>
<td>No</td>
<td>176 (61)</td>
<td>112 (39)</td>
<td>1</td>
<td></td>
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<tr>
<td>Perceived psychological stress [mean (SD)]*</td>
<td>19.7 (3.7)</td>
<td>16.6 (4.9)</td>
<td></td>
<td></td>
<td>***</td>
</tr>
</tbody>
</table>

*Student’s t-test was used to obtain the mean (SD).

*P < 0.05, **P < 0.01, ***P < 0.001; NS, not significant.
Respondent confidentiality and anonymity were assured. A written consent was obtained.

**Results**

There were 729 workers invited to participate and 513 workers (70%) volunteered consent to participate in this study. Three hundred and fifty-six (69%) had LBP in the last month. The mean (±SD) age of the respondents was 41.4 (±10.7) years. The mean (±SD) work duration of respondents was 17.6 (±10.8) years. The mean (±SD) of daily working hours was 8.4 (±0.9) h. LBP was significantly higher in males, among workers aged 35–49 years and those aged 50 years or older, blue-collar workers and those employed for 10 years or more. LBP was significantly higher among workers with workplace risk factors, particularly those lifting and lowering heavy loads, working with vibrating vehicles and at a pace set by machines, working in a hot and humid environment, working in a cold environment and working in a prolonged standing posture. Odds ratios (ORs), 95% confidence intervals and P values are shown in Table 1. Mean (±SD) of PSS score was 18.8 (±4.3) and the scores ranged from 0 to 32. PSS score was significantly higher among workers with LBP (19.7 ±3.7) compared with those without LBP (16.6 ±4.9, P < 0.001) (Table 1). Multiple logistic regression analyses yielded four significant predictors of LBP. The most significant predictor of LBP in the model was ‘lifting and lowering heavy loads’ (OR = 2.9, 95% CI: 1.4–3.2, P < 0.001), followed by ‘working for more than 10 years’ (OR = 2.1, 95% CI: 1.4–3.2, P < 0.001), ‘prolonged standing posture’ (OR = 1.7, 95% CI: 1.1–2.7, P < 0.001) and ‘perceived psychological stress’ (OR = 1.2, 95% CI: 1.1–1.3, P < 0.001). The total model was significant (P < 0.001) and accounted for 25% of the variance (Table 2).

**Discussion**

The prevalence of LBP among Malaysian railway workers was 69%, which is comparatively lower than that found in American railway workers (75%) [9]. LBP was significantly higher among males in the economically productive and middle age groups, with blue-collar workers being employed for ≥10 years suffering the bulk of the total LBP burden. A Belgian study concluded that novice workers experienced higher risks of LBP due to lack of job experience [10], while another study denied the associations between the duration of employment and LBP [9].

As elicited in the final regression model, the current results were the first to evidence work duration, workplace risk factors (lifting and lowering heavy loads; prolonged standing posture) and perceived psychological stress as significant predictors of LBP among railway workers, albeit these attributes were extensively described among workers in other occupations [1,4,10]. Lifting and lowering heavy loads was the most important workplace risk factor to cause LBP in railway workers. Maintenance workers and shunters who predominantly lift heavy loads like locomotive generators or batteries would support the prevailing association in this study. The prevalence of LBP was significantly higher among workers working in warm or cool environments, working with prolonged standing posture and those workers operating vibratory vehicles or machines. Vibration arising from rail tracks or train speed may be a risk factor for LBP [9].

The study employed a cross-sectional population-based approach, which limits the ability to draw causal inferences between variables being studied. Subsequent investigations to explore possible causal relationships between psycho-behavioural risks and LBP among railway workers to confirm these findings may be of merit. The significant associations between psycho-behavioural determinants and LBP among railway workers found in this study provide evidence to initiate preventive action. This study concludes that LBP among railway workers is highly prevalent among male blue-collar workers in the economically productive age group and most significantly associated among workers who lift and lower heavy loads. Health education programmes to increase workers’ awareness regarding workplace risk factors would help achieve primary prevention. Ergonomic preventive measures and policies should be implemented.
Key points

• The prevalence of low back pain among Malaysian railway workers was significantly higher among males in the economically productive and middle age groups, with blue-collar workers being employed for ≥10 years suffering the bulk of total low back pain burden.
• Psycho-behavioural risk factors, particularly ‘lifting and lowering heavy loads’, were the most significant predictors for workers’ low back pain, followed by ‘prolonged standing posture’ and ‘psychological stress’.
• Increasing workers awareness on workplace risk factors through health education programmes and implementation of ergonomic preventive measures or policies would help to achieve primary prevention.

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Acknowledgement
We are grateful to Mr Mohamed Faid Bin Musa, President of Cooperative Workers Society, Keretapi Tanah Melayu Berhad (KTMB), for his support and approval of the study and to all railway workers who participated.

Conflicts of interest
None declared.

References