

## ORIGINAL ARTICLE

# PREVALENCE OF LOW-BACK PAIN AMONG PUBLIC AMBULANCE WORKERS IN KELANTAN, MALAYSIA

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### ABSTRACT

*This study is to determine the prevalence and the associated factors of low-back pain (LBP), which has multifactorial causes, among ambulance workers in Kelantan, Malaysia. The cross-sectional study involved ambulance workers in the emergency department in all government hospitals in Kelantan. Those who did not consent, complete or return the questionnaire as well as having rheumatic diseases were excluded from the study. The participants were asked to answer a self-administered questionnaire in English. Descriptive analyses and Chi-square test were used. A total of 168 respondents had completed the questionnaires with a response rate of 85.0%. Questionnaires with more than 95.0% items completed were included in the analysis (n=143). The respondents had a higher proportion of male than female (63.6% versus 36.4%). Assistant Medical Officer comprised of 60.0% of all respondents and the rest were nurses. The respondents' age ranged between 23 to 58 years old with a mean age of 38.27 and standard deviation (SD) of 7.27. The mean duration of involvement in ambulance service was 9.68 years (SD 6.97). The majority (98.5%) of the respondents were Malay. Gender, smoking status and hobbies were the associated factors of LBP among ambulance workers. The modifiable risk factors should be emphasized to the ambulance workers as a measure to prevent the development of LBP.*

**Keywords:** Prevalence, low back pain, prehospital emergency care, Malaysia, ambulance workers

### INTRODUCTION

Low-back pain (LBP) is a common musculoskeletal disorder in the working population worldwide<sup>1</sup>. Almost 80% of the world's population will develop low-back pain at some time in their life<sup>2</sup>. It is estimated that, on any given day, about 10 million people experiencing LBP worldwide<sup>3</sup>. However, most low-back pain episodes are mild and rarely disabling. Nevertheless, relapses are common and individuals with long-standing low-back pain tend to show a more persistent course<sup>4-6</sup>. Many studies showed that the prevalence of LBP was high among healthcare workers<sup>7-10</sup>. The problem was extensively studied among nurses and doctors, however, relatively less attention was paid to the ambulance workers. Ambulance workers are often exposed to occupational hazards especially musculoskeletal injuries when performing tasks that put strain on the back such as patient lifting and performing cardiopulmonary resuscitation in the ambulance. Other possible stressors include psychological distress, working in a confined space and fieldwork with poor ergonomic working areas. Nevertheless, the problem of LBP among

ambulance workers was highlighted more than 40 years ago.

In one of the ambulance service in United Kingdom, it was reported that an average of 27 ambulance workers suffered back pain every year between 1968 to 1972<sup>11</sup>. The subsequent study on LBP among ambulance workers was almost non-existence until Tam published a paper looking at the possible risk factors of LBP among the ambulance workers in 2006<sup>12</sup>. Later, a number of studies were conducted addressing the association between LBP and depression, awareness, job satisfaction, previous medical histories and workplace ergonomics<sup>7, 9</sup>. The ambulance workers worked one or two shifts per week in pre-hospital service as well as patient care in Emergency Department on other shifts. Every ambulance case required two or three ambulance personnel depending on the severity of the patient. To our knowledge, this study is the first attempt to determine the prevalence and associated factors of LBP among ambulance workers in Malaysia, specifically in the state of Kelantan.

## METHODOLOGY

This study was a cross-sectional study over a 6-week period in all government hospitals in Kelantan including Hospital Universiti Sains Malaysia and nine Ministry of Health (MOH) district hospitals within the state of Kelantan namely Kota Bharu, Kuala Krai, Tanah Merah, Tumpat, Pasir Mas, Pasir Puteh, Machang, Jeli and Gua Musang. Ambulance workers of both teaching and government hospitals had similar job description. Ambulance workers in Emergency Department including nurses and Assistant Medical Officer (AMO) were included. In Malaysia, occupational groups that are included as ambulance workers, as classified under the Technicians and Associate Professionals group, Health Associate Professional subgroup, in The International Standard Classification of Occupation 2008 (ISCO-08), are Assistant Medical Officers and Trained Nurses. Those who did not consent for the study, did not complete or return the questionnaires were excluded. We also excluded participants with rheumatic diseases, history of back surgery or trauma, malignancy or multiple sclerosis.

The participants were asked to answer a self-administered questionnaire in English, which took about 30 minutes to complete. Questionnaires were distributed after information of the study were explained and informed consent obtained. We gathered sociodemographic data in the first part of the questionnaire such as age, gender, marital status, job description of either AMO or nurse, height, weight, dominant hand, smoking status (a 'yes' or 'no' answer) and hobbies of either a choice of outdoor strenuous activity, indoor non-strenuous activity or no specific hobby involvement. The second part of the questionnaire was adopted from the standardized and validated Nordic Musculoskeletal Questionnaire (NMQ) to assess the presence of LBP for a specified period of time (lifetime, 12-month and 7-days). It was assessed by a 'yes' or 'no' response<sup>13</sup>. LBP was defined in this study as a pain and discomfort that was localized below the costal margin and above the inferior gluteal fold, with or without the presence of leg pain<sup>14,15,16</sup>. This was explained in the questionnaire. Additionally, a diagram with shaded area was also inserted to enhance the understanding. The researcher was available all the time during the session to clarify any terms by the participants.

### Sample size determination

The sample size was calculated using a single proportion formula, adopting 54% as the expected proportion of population with LBP as per previous literature<sup>1</sup>; a 0.05 significance (alpha) level at a 95% confidence interval (CI); and taking into consideration 9% absolute precision. A sample size

of 118 was calculated. A final sample size of 169 was required allowing for a predicted 30% non-response rate.

### Statistical analysis

Data were analyzed using statistical software (SPSS, version 22, SPSS Inc., Chicago, IL USA). The prevalence of LBP was calculated by dividing the number of ambulance workers with LBP by the total sample size. The prevalence was described in terms of period prevalence (one year and 1 month) as well as life time prevalence (the number of participants who had LBP at some points in their life). Descriptive analyses of socio-demographic were conducted. Results were presented as frequency (percentage) for categorical variables and mean (standard deviation [SD]) for numerical variables. The Chi-square test was used to determine the association of demographic profile with the occurrence of LBP at a 0.05 significance (alpha) level.

### Ethical issues

All subjects participated in the study were informed the purpose of the study and full voluntary consent were obtained before their participation. The study was approved by Human Research Ethics Committee Universiti Sains Malaysia [USM/JEPeM/274.4.(1.1)] and Medical Research and Ethics Committee Ministry Of Health Malaysia (KKM/NIHSEC/P14-441).

## RESULTS

A total of 168 respondents completed the questionnaire with a response rate of 85%. Questionnaires with more than 95.0% overall items completed were included in the analysis (n=143). The respondents had a higher proportion of male than female (63.6% versus 36.4%). AMO comprised of 60% of all respondents (n=86) and the rest were nurses. The respondents' age ranged between 23 to 58 years old with a mean age of 38.27 (SD 7.27). The distribution of respondents in relation to age group and job description for the male, female and whole population is summarized in Table 1. The mean duration of involvement in emergency medical service (EMS) was 9.68 years (SD 6.97). The majority (98.5%) of the respondents were Malay.

The lifetime prevalence of LBP among the respondents was 65.0% (95% CI 57.1 - 72.9), with a 12-months and 7-days prevalence rate of 88.8% (95% CI 83.6 - 94.0) and 20.3% (95% CI 13.6 - 26.9) respectively. More than 30% (n=28) of the respondents with LBP need sought treatment and 15% (n=14) had been hospitalized due to the problem in their lifetime. About 15% (n=14) of them suffered the LBP for more than 30 days duration in the previous 12 months.

**Table 1: Distribution of respondents in relation to age group and job description for male, female and the whole population.**

	Male (n = 91)		Female (n = 52)		All (n = 143)	
	n	%	n	%	n	%
Age (years)						
20 - 29	12	13.2	4	7.7	16	11.2
30 - 39	46	50.5	27	51.9	73	51.0
40 - 49	27	29.7	16	30.8	43	30.1
50 - 59	6	6.6	5	9.6	11	7.7
Job Description						
AMO	85	93.4	1	1.9	86	60.1
Nurse	6	6.6	51	98.1	57	39.9

LBP occurrence was reported to be highest in the 30-39 years old age group (n=45, 48.4%) and lowest in the 20-29 years old age group (n=10, 10.8%) but there was no significant association of LBP and age groups ( $p=0.455$ ). There was no significant association of marital status ( $p=0.950$ ), BMI ( $p=0.61$ ) or dominant hand ( $p=0.34$ ) with LBP. However there was significant association of gender ( $p=0.034$ ), smoking status ( $p=0.001$ ) and hobby ( $p=0.001$ ) with LBP. There was no significant association of job description ( $p=0.272$ ) and duration involved in EMS ( $p=0.328$ ) with LBP. Details of the association of demographic factors and LBP are summarized in Table 2.

## DISCUSSION

The lifetime prevalence of LBP among ambulance workers in the state of Kelantan determined during the study period was 65.0% (CI 57.1 - 72.9). In comparison to the LBP prevalence of other healthcare workers, to look at variation of prevalence rate, the current figure is comparable with physiotherapists in Nigeria (69.8%) and Australian physical therapist (62.5%) with similar study design<sup>17,18</sup>. However, it was higher compared to the prevalence among Iranian physician<sup>19</sup> and dental personnel in the North-Eastern State of Malaysia (44.9%)<sup>20</sup>. Similarly, the current figure was higher than that obtained by mail surveys involving nearly 700 ophthalmologists in Northeastern, US (39%)<sup>21</sup>. Another mail survey on 285 dentists in Queensland, Australia also showed a smaller prevalence rate of 22.1%<sup>22</sup>. The higher prevalence rate in this study may be due to a broader definition of LBP and the nature of work of ambulance worker as compared to other study populations. Variations in the definition of LBP reflected the difficulties we faced to make a specific anatomical diagnosis of LBP, owing to the complexity of the muscular, ligament, bony as

well as neural elements of the back<sup>18-10, 7, 18, 21, 22</sup>. In contrast, the prevalence rate was lower than that of few other studies involving other groups of health care workers. In 2003, Smith et al. reported that the prevalence rate of LBP among nurses in rural Japan was 82.6%<sup>23</sup>. A study conducted among Malaysian nurses in the state of Negeri Sembilan also had a higher prevalence of LBP (79.4%)<sup>24</sup>. Lin et al. published a similar figure in a study involving nurses in Taiwan (82.0%)<sup>25</sup>. Similarly, in Tunisia, the prevalence of LBP among the overall hospital staff was 74.5%<sup>26</sup> (Table 3).

On the other hand, the 12-month prevalence of LBP obtained in the current study is 88.8% (CI 83.6 - 94.0), which is higher than that of other previous studies of other population. A study involving 3000 Australian adult populations in 2001 revealed a 12-months prevalence rate of 67.6% (CI 65.5 - 69.7)<sup>27</sup>. Similarly, in New Zealand, the 12-month prevalence rate of LBP among 3003 adult subjects was 54%<sup>1</sup>. The current figure is also higher than other studies involving different health care workers. Among nurses in specialized hospitals in African, the figure was 70.8%<sup>28</sup>. In the neighboring country, Thailand, the 12-months prevalence rate of LBP was 61.5%. An almost similar figure was obtained among female nurses in Yemen (59.8%)<sup>29</sup>. Most recently, a study on nurses working in the university hospitals in Iran showed that the 12-months prevalence rate of LBP was 45.7%<sup>30</sup>.

The 7-day prevalence of LBP among ambulance workers involved in this study was 20.3 (CI 13.6 - 26.9), which is much lower as compared to 62.8% of the Brazilian urban cleaning workers<sup>31</sup>. However, no other figure on the 7-days prevalence of LBP among healthcare workers obtained from previous studies to compare with the result of our current study.

**Table 2: Association between demographic factors and LBP (n=143)**

	LBP, n (%)		p value
	Yes	No	
Age (years)			0.455 <sup>a</sup>
20 - 29	10 (10.8)	6 (12.0)	
30 - 39	45 (48.4)	28 (56.0)	
40 - 49	32 (34.4)	11 (22.0)	
50 - 59	6 (6.5)	5 (10.0)	
Gender			0.035 <sup>a</sup>
Male	65 (69.9)	26 (52.0)	
Female	28 (30.1)	24 (48.0)	
Marital Status			0.950 <sup>b</sup>
Single*	7 (7.5)	4 (8.0)	
Married	86 (92.5)	46 (92.0)	
BMI			0.610 <sup>a</sup>
Less than 25	29 (52.7)	22 (44.0)	
25 to 29.9	31 (33.3)	20 (40.0)	
30 or more	13 (14.0)	8 (16.0)	
Dominant Hand			0.343 <sup>b</sup>
Right-handed	87 (93.5)	44 (88.0)	
Left-handed	6 (6.5)	6 (12.0)	
Smoking Status			0.001 <sup>a</sup>
Smoker	29 (31.2)	1 (2.0)	
Non-smoker	64 (68.8)	49 (98.0)	
Duration involved in EMS			0.328 <sup>a</sup>
Less than 5 years	26 (28.0)	11 (22.0)	
Between 5 to 10 years	36 (38.7)	16 (32.0)	
More than 10 years	31 (33.3)	23 (46.0)	
Job description			0.272 <sup>a</sup>
Assistant Medical Officer	59 (63.4)	27 (54.0)	
Nurses	34 (36.6)	23 (46.0)	
Hobbies			0.001 <sup>a</sup>
Out-door Activity	62 (66.7)	20 (40.0)	
In-door Activity	9 (9.7)	3 (6.0)	
No Specific Hobby	22 (23.7)	27 (54.0)	

<sup>a</sup> Pearson Chi-Square Test

<sup>b</sup> Fisher's Exact Test

\* Single status included unmarried, divorce and widow

In general, even though the lifetime prevalence of LBP among the respondents of the current study is comparable with other previous studies of either similar or different population and settings, all the figures clearly showed that the 12-months prevalence of LBP is significantly higher among the ambulance workers in Kelantan. However, the same pattern is not observed in the 7-days prevalence. The difference in the figure obtained from the current study and other previous studies may be due to different risk factors faced by various disciplines of the healthcare sector. It is also possibly due to the difference in the definition of LBP used in each study as well as the respondent's perspective and interpretation of LBP. It is also important to note here that at current situation there are no dedicated ambulance workers working in ambulance services in Malaysia. They are also involved in patients care in Emergency Department when they are not doing pre-hospital service shifts.

There was no association between the age groups of the respondents and the occurrence of LBP.

This findings was in agreement with other studies that indicate LBP was a problem faced by any age group, especially in the presence of prolonged exposure to ergonomic hazards<sup>4</sup>. Even though previous studies showed that the prevalence of LBP is known to increase in tandem with age, a meta-analysis of 59 articles revealed that LBP occurred commonly in children and adolescents too<sup>32</sup>. A study among school children in Iran showed that the LBP and other musculoskeletal diseases did occur in this age group in relation to the weight of schoolbags suggesting structural/mechanical mechanism linking to LBP<sup>33</sup>.

In the current study, the proportion of male respondents with LBP was found to be higher than that of female respondents and there was a significant relationship between gender and occurrence of LBP. This finding was at odds with the majority of other cross-sectional studies involving general adult population, which showed that the prevalence of LBP was higher in the female, as compared to male. A cross-sectional

study by Bener et al. involving 2180 primary healthcare patients in Qatar showed that the LBP was more prevalence in female (67.7%) as compared to male (51.6%)<sup>34</sup>. A similar finding was observed among the adult population of Madrid, Spain with a prevalence rate of 14.1% among female as opposed to only 7.8% among male population<sup>35</sup>. Among the middle-aged rural community in Korea, the lifetime, 6-months and point prevalence of LBP were higher among

female<sup>36</sup>. The proposed reason for our observation was explained by the duty of staff of ambulance workers. In almost all hospitals in the current study, the male workers of the particular shift were expected to perform the heavy lifting works. Male participants in the study were also noted to participate more in outdoor activities. Both of these factors might contribute to higher occurrence of LBP among males in this study.

**Table 3: Lifetime prevalence of LBP among various health care workers in previous studies.**

Authors (years)	Occupation (country)	N	Prevalence (%)
Adegoke <i>et al.</i> (2008)	Physiotherapists (Nigeria)	126	69.8
Cromie <i>et al.</i> (2000)	Physical therapist (Australia)	824	62.5
Dhimitri <i>et al.</i> (2005)	Ophthalmologists (US)	697	39.0
Jellad <i>et al.</i> (2013)	Hospital staff (Tunisia)	433	74.5
Leggat and Smith (2006)	Dentists (Australia)	285	22.1
Lin <i>et al.</i> (2012)	Nurses (Taiwan)	178	82.0
Mehrdad <i>et al.</i> (2012)	Physician (Iran)	405	15.1
Samat (2011)	Dentists (Malaysia)	350	44.9
Smith <i>et al.</i> (2003)	Nurses (Japan)	247	82.6
Rahmah <i>et al.</i> (2008)	Nurses (Malaysia)	126	79.4

The respondents' BMI were calculated based on their weight and height, using a formula of weight divided by the square of height (m<sup>2</sup>). Based on the calculated BMI, the respondents were divided into three, groups due to small sample size: (1) BMI of less than 25 (underweight and normal weight), (2) BMI between 25 and 29.9 (overweight), and (3) BMI of 30 and more (obese). In the current study, more than half of the respondents with LBP had BMI of less than 25. We found no significant relationship between individual BMI and the occurrence of LBP. This study has yielded results that contradict with other studies, which showed that the prevalence of LBP was high among the overweight and obese people. The possible explanation is most likely because of variations in definition of back pain and inaccurate input on weight and height since the respondents were asked to write down their own height and weight. Thus the ability to demonstrate an association with BMI was blunted by the imprecise and subjective measurement. As for other studies, the investigators or representatives measured the anthropometry of each subjects using a pre-determined measurement tool, thus a more accurate and reliable measurements were obtained<sup>37, 38</sup>.

The marital status findings deserve mention. We found that 92.5% of the respondents with LBP were married but there was no significant relationship between marital status and the occurrence of LBP among the respondents in this study. In the current study, majority of the respondents were married with a small proportion of the respondents being single, including one widower and one divorcee. Other studies of different population groups showed that being

married was one of the risk factor for LBP and other musculoskeletal diseases. A study on relationship between socio-demographic factors and LBP involving more than 25,000 adult Iranian populations found out that the odd of getting LBP increased in married people, compared to being single<sup>39</sup>. Another population-based cross-sectional study conducted among more than 3,000 individuals of 20 years and older, residing in Southern Brazil also shared a similar finding, as regard to marital status<sup>40</sup>. Additionally, being married was also one of the identified risk factors of LBP among military service members of US<sup>41</sup>.

In the current study, the majority of the respondents were right-handed. However, dominant hand was not significantly associated with LBP. This finding replicated similar finding by Estrich in a study involving 965 dental practitioners, whereby they found out that LBP and other musculoskeletal disorders (MSD) were not related to dominant hand<sup>42</sup>. This finding also should eliminate the belief that those with left-hand dominant were at risk of developing LBP when attending to a patient in a patient compartment of an ambulance. In Malaysia, the design of the ambulance's patient compartment necessitates an ambulance worker to attend a patient from the patient's right side. In theory, this provides some advantages to the right-handed personnel, while it might cause some difficulties to those with left-hand dominant.

With regard to the significant association of smoking habit and the occurrence of LBP, our finding was consistent with previous LBP prevalence literatures. In a study involving 142 workers in a package producing industry aged 17

to 50 years old, Yildirim et al. found that smoking was one of the risk factor for LBP<sup>43</sup>. Similarly, a systemic review of 27 studies involving twin subjects also showed that smoking is one of the significant risk factors for LBP with pooled odd ratio of 3.0 (95 CI: 2.8 - 3.3)<sup>44</sup>. It was consistently the strongest predictor of LBP regardless of the BMI among 6,700 participants in the US<sup>45</sup>. A large epidemiological study involving 65,400 adult participants in Japan revealed that smoking was associated with chronic LBP (adjusted Odd Ratio 1.17, CI 1.27 - 1.67)<sup>46</sup>.

In the current study, the respondents were asked to choose one out of three options that suits their hobby: out-door activities, indoor activities as well as no specific hobbies. Involvement in out-door activities or strenuous activities signify physically active individuals, whereas preference for indoor activities or non-strenuous activities or no specific hobbies may indicate sedentary life-style. The majority of the respondents with LBP were involved in out-door activities. We found a significant relationship of the occurrence of LBP with physical activities. Being involved in physical activities was not a protective factor against LBP in this study. Evidence from the literatures found that involvement in the moderate- and high-intensity ranges of physical activity was a predictor of LBP<sup>47-49</sup>. However, a systemic review of 8 high-quality studies on the association between sedentary behavior and LBP, published between 1998 and 2006 showed limited causative evidence to suggest that sedentary lifestyle is a risk of having LBP<sup>50</sup>.

Limitation of this study includes limited data collection which involved government ambulance service only that is the main ambulance service in Malaysia. There are other government and non-government operating ambulance services in the region such as St. John's Ambulance and Fire and Rescue Department. Further studies should be done to include more centers and bigger sample size. Extra cost and time should also be considered. The sample size in this study was collected based on our sample size determination. The design of this study did not allow us to investigate causal factors of low back pain among the ambulance workers. Further studies need to be done to determine this.

## CONCLUSION

In conclusion, the prevalence of lifetime and 12-months LBP among ambulance workers in Kelantan were high. More than half of the respondents with LBP were AMO, right handed, younger than 40 years old, married and served more than 5 years in ambulance service. This study has identified male gender, smoking and out-door hobbies to be significantly associated with occurrence of LBP among the ambulance workers. LBP is a multifactorial condition and the

modifiable risk factors should be emphasized to the ambulance workers as a measure to prevent the development of LBP.

## Conflict of interest

The authors declare that there was no potential conflict of interest.

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