

Prevalence and the Associated Risk Factors of Low Back Pain among Commercial Motorcycle Riders in Kedah, Malaysia: A Cross-Sectional Study

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Abstract Low back pain (LBP) is a prevalent condition, affecting 60-80% of individuals during their lifetime, with 23% experiencing chronic LBP. Due to the Malaysian Movement Control Order (MCO), numerous Malaysian residents were confined to their residences during the COVID-19 pandemic; consequently, the utilization of delivery services became more efficient and practical. As a result of the MCO, many individuals experienced job loss and transitioned to employment as commercial motorcycle riders, such as food delivery personnel, owing to the high demand for these services. **Methods:** This cross-sectional study employed a self-designed questionnaire comprising four sections: five questions on personal details, personal history, work history, and pain assessment. Convenience sampling was utilized in this investigation. **Results:** In a study of 207 respondents, 82.6% reported experiencing pain within the previous 12 months, with 58.9% specifically reporting pain in the lower back. Of the respondents, 47.3% were aged 24 – 29 years, 56.5% were current smokers, 60.9% had experienced motorcycles one to five times annually, 85% had previously been involved in motor vehicle accidents (MVA), 60.9% had worked as commercial motorcycle riders (CMR) for two to five years, and 60.9% worked for more than 10 hours per day. **Conclusion:** Low back discomfort is a significant issue for commercial motorcycle riders, with age, extended work hours, vibration exposure,

smoking, motor vehicle accidents, motorcycle falls, and duration of employment as CMR serves as key risk factors.

Keywords Low Back Pain, Commercial Motorcycle Riders, Questionnaires

1. Introduction

The prevalence of commercial motorcycle riders (CMRs) in Malaysia has experienced a substantial increase, particularly in the aftermath of the COVID-19 pandemic. Despite this notable rise in numbers, the well-being of these riders, specifically their physical health, remains insufficiently explored. This occupation is relatively novel, and its potential impacts—both positive and negative—on the riders' health have not been thoroughly investigated [1]. Considering this context, this study aimed to determine the prevalence of low back pain (LBP) and its associated risk factors among CMRs in Malaysia. LBP is defined as discomfort or distress experienced in the lower back region, extending from below the costal margin to above the inferior gluteal fold, often radiating towards the legs and feet [2]. Epidemiological data indicate that approximately 60-80% of individuals will experience LBP during their lifetime. Concurrently, several studies have demonstrated

that 23% of adults globally suffer from chronic LBP [3]. LBP is classified as acute when it persists for less than three months, comprising approximately 90% of cases, and chronic when it persists for > three months, constituting 10% of cases. Timely intervention is crucial for acute LBP to mitigate the potential exacerbation of pain due to alterations in pain modulation, central sensitization, and neuroplastic changes [4]. Malaysia is significantly affected by LBP, with 3.9 million Malaysians impacted, based on third-quarter 2022 population statistics [5]. Risk factors for LBP include sedentary lifestyle, smoking, obesity, drug use, poor posture, prolonged sitting, bending, lifting heavy loads, and twisting [6]. The LBP pain spectrum encompasses a range of sensations from sharp and prickling to throbbing and tender. Etiologically, LBP originates from mechanical causes such as injuries from falls or accidents, degenerative causes due to joint wear and tear, and inflammatory causes involving autoimmune diseases [3]. Considering these considerations, this study identifies a significant correlation between CMRs and LBP, supported by extensive large-population studies [7,8]. The primary objective of this study is to assess the prevalence of LBP among CMRs in the state of Kedah, Malaysia. Additional objectives include examining the interaction between various risk factors associated with LBP in this occupational cohort. While LBP is a well-documented global concern, limited research has elucidated its prevalence among CMRs in Kedah. The significance of this study lies in generating awareness among the public, within governmental spheres, and among employing companies regarding the prevalence of LBP among CMRs. These findings could facilitate the development of strategies to address the challenges of LBP in this workforce. The overarching aim is to elucidate the prevalence of LBP among CMRs and its associated risk factors, thereby promoting an informed approach to enhancing the well-being of these riders.

2. Materials and Methods

2.1. Parameters

A self-designed questionnaire utilizing a visual analog scale (VAS) was developed, referencing two articles: "Prevalence and exposure to factors associated with low back pain (LBP) among commercial motorcycle riders in southeastern Nigeria" [8] and "Prevalence and associated factors of low back pain among motorcycle taxi drivers in Sriracha" [2]. Consequently, four outcome measures were employed. The VAS demonstrates a reliability of 0.80 - 0.87 and a validity of 0.44 - 0.67 [9]. Risk factor analysis was conducted using the study "Risk factors analysis: Work-related musculoskeletal disorders among male traffic policemen using high-powered motorcycles" by Diyana et al. [10]. Additionally, an article by Rusli et al.

[11], "A comparison of characteristics between food delivery riders with and without traffic crash experience during delivery in Malaysia," elucidated the risk variables associated with motorcycle riders.

2.2. Study Setting

This investigation was conducted in Kedah, Malaysia. Commercial motorcycle riders were predominantly located at gas stations, McDonald's outlets, Kentucky Fried Chicken outlets, Domino's Pizza outlets, Pizza Hut outlets, Pandamart, and in proximity to shopping centers such as Amanjaya Mall and Central Square in Sungai Petani, Kulim Central in Kulim, and Aman Central in Alor Setar.

2.3. Study Design

This research employed an observational, cross-sectional study design, wherein relevant data were collected at a specific time point without follow-up. This methodology is typically utilized to determine the prevalence or frequency of diseases or risk factors. The questionnaire was developed using validated outcome measures, such as visual analog scales, with reference to existing literature and subsequent modifications. The instrument was then validated through distribution to several lecturers at the Faculty of Health Professions, AIMST University, to obtain feedback and review for improvement. Modifications were implemented based on the received feedback, and a Malay version of the questionnaire was subsequently formulated. The Malay version was distributed to Malay lecturers and clinical instructors for additional feedback. Further modifications were made according to the received input, and a pilot study was conducted in Penang, Malaysia, with 10 respondents. The questionnaire comprises four sections: personal details (five questions), personal history (13 questions), work history (10 questions), and pain assessment (14 questions). Closed-ended questions are predominantly used to construct multiple-choice answers and dichotomous questions, with some questions incorporating "other" answer options or comment fields. The overall reliability of the questionnaire was low, with a Cronbach's alpha of .08. Cronbach's alpha for personal history was 0.06, personal history was 0.11, work history was 0.20, and pain assessment was 0.38. Questionnaires were administered to patients with CMR who met the inclusion criteria and were not excluded. The questionnaires were available in two languages, English and Malay, and were distributed via Google Forms. The questionnaires were accessible online and in physical format. The study procedure involved providing respondents with either a printed questionnaire or access to Google Forms on a tablet. Respondents then reviewed the questions and provided answers according to their understanding and level of agreement or disagreement.

Upon completion, respondents returned the printed questionnaires to the researcher, while those completing online questionnaires submitted their responses electronically. The entire procedure took up to 15 minutes.

2.4. Study Sampling

The sample population for this study comprised CMR, including riders from Grab Food, Food Panda, McDonald's, Kentucky Fried Chicken, Pizza Hut, and Domino's Pizza in Kedah, Malaysia. The sample size was determined based on G-power calculations.

2.5. Study Duration

This study was approved by the AIMST University Human Ethics Committee (AUHEC), with application reference number AUHEC/FAHP/2023/22/02/R12.

2.6. Data Collection Duration

The data collection period spanned from April 2023 to June 2023. Researchers identified CMR at McDonald's Restaurant. Several individuals were approached for data collection while operating their motorcycles with the Grab Food bag securely attached to the vehicle (Figure 1). Researchers contacted them individually, provided a comprehensive introduction, and explained the nature and objectives of the study. The researchers offered a detailed explanation of the study and an assessment of the findings. Consent was obtained through the signing of the survey document and completion of all questions (Figure 2).



Figure 1. Data using a questionnaire at a gas station (Grab Food)



Figure 2. Data using a questionnaire at a gas station (Food Panda)

2.7. Selection Criteria

Male Commercial Motorcycle Riders (CMRs) who operate their motorcycles within the state of Kedah for occupational purposes were included in this study. The age range for inclusion was 18–35 years, as evidence has demonstrated disc degeneration in 30% of individuals at one or more levels by age 35 [12]. A minimum of 6 hours of daily motorcycle riding was required [6,13]. Employment in this motorcycle-riding occupation was required to have lasted for more than six months. The survey participants were required to be willing to participate and possess the capacity to comprehend either Malay or English, as the questionnaire was produced in both languages. Exclusion criteria comprised individuals who required assistance to comprehend Malay or English, non-commercial motorcycle riders in Kedah, and CMRs in Kedah who declined participation in the survey.

2.8. Technique of Sampling

Convenience sampling, a non-probability sampling technique, was employed to collect data from the readily available respondents. This sampling technique was selected due to its ease of implementation, time efficiency, cost-effectiveness, and convenience.

2.9. Statistical Tools

Statistical Package for Social Science (SPSS) software was utilized to analyze the collected data. The data analysis involved descriptive statistics and the generation of tables and graphs. The frequencies and percentages of selected variables were tabulated and computed.

3. Results

Table 1 presents data on 221 total respondents, of whom

207 met the inclusion criteria. All participants were male and had been employed for a minimum of 6 months. The age distribution was as follows: 21.7% (45 individuals) were 18-23 years old, 47.3% (98 individuals) were 24-29 years old, and 30.9% (64 individuals) were 30-35 years old. Regarding marital status, 48.3% (100 individuals) were single, 50.7% (105 individuals) were married, and 1.0% (2 individuals) were divorced. The racial composition comprised 72.9% (151 individuals) Malay, 16.4% (34 individuals) Chinese, and 10.1% (21 individuals) Indian. With respect to educational attainment, 69.1% (143 individuals) had completed secondary school, while 30.9% (64) had attended university or college. Chi-square test results indicated statistically significant associations between LBP and age ($p=0.00$), marital status ($p=0.00$), race ($p=0.00$), and educational level ($p=0.00$), as evidenced by $P<0.05$. These findings elucidate the demographic composition and educational profiles of the study participants.

As presented in Table 2, 56.5% (117 riders) were smokers, 51.2% (106 riders) engaged in physical activity 1-3 days/week, and 51.7% (107 riders) reported sleeping 7-9 hours/day. A substantial proportion, 60.9% (126 riders), experienced 1-5 falls/year, and 85.0% (176 riders) were involved in accidents. Of these, 56.0% (116 riders) were classified as minor. The primary anatomical regions that impacted the ground during falls were the hand (24.2%, 50 riders), knee (13.0%, 27 riders), and head (8.7%, 18 riders). The predominant motorcycle brands were Yamaha (45.4%; 94 riders), Honda (36.2%; 75 riders), and Suzuki (12.1%; 25 riders). Most motorcycles had engine capacities of 100-150cc (75.4%, 156 riders) and were 2-5 years old (45.5%, 94). Shock absorbers were inspected at intervals of 6 months to 1 year by 85.5% (177 riders), and 31.4% (65 riders) implemented modifications. The primary riding posture was upright (57.5%, 119 riders). Frequent back movements were reported, with 69.6% (144 riders) indicating back movements of >10 times/day. All risk factors presented in Table 2 demonstrated a correlation with LBP, apart from sports injuries, which exhibited a "P" value of 0.14.

Table 3 presents the data from a survey of commercial motorcycle riders in their occupational contexts. The distribution of respondents' workplaces was as follows: Grab Food (78 riders, 37.7%), pandas (93 riders, 44.9%),

Dominos (seven riders, 3.4%), Pizza Hut (four riders, 1.9%), McDonald's (21 riders, 10.1%), and Kentucky Fried Chicken (four riders, 1.9%). Approximately 27.5% of the riders held secondary employment. Their work experience varied, with 35.7% employed for seven months to one year and 60.9% employed for 2-5 years. The average daily riding duration ranged from 7-9 hours (39.1%) to over 10 hours (60.9%). The majority (58.9%) worked seven days per week. The average daily distance traveled predominantly exceeded 61 km (85.5%). Most riders (66.2%) maintained speeds of 81-100 km/hr. Bag placement during work was primarily performed on motorcycles (89.9%). For those carrying bags, the load was predominantly 0-10 kg (8.2%). A significant portion (86.5%) of riders ascended stairs during work, with 63.3% climbing to 1-3 floors. Riders typically mounted and dismounted motorcycles more than 16 times daily (90.8%). All risk factors in Table 4 were significantly associated with LBP ($p < 0.05$). The data provided insights into the occupational characteristics and conditions of commercial motorcycle riders.

The majority (171 individuals, 82.6%) reported experiencing pain at varying frequencies (96 individuals, 46.4%–1-5 times). Pain was predominantly localized to the neck (74 individuals, 35.7%), shoulder (77 individuals, 37.2%), and lower back (122 individuals, 58.9%). Radiating pain was reported in 44 (21.3%) patients. The mean pain intensity was 1.70 (SD = 0.46) on a scale of 1 to 10. Pain occurred frequently in the morning (44 individuals, 21.3%), and alleviation was often achieved through rest (160 individuals, 77.3%). The exacerbating factors included motorcycle riding (141 individuals, 68.1%) and bending movement (66 individuals, 31.9%). Family history (72 individuals, 34.8%) and motorcycle accidents (186 individuals, 89.9%) were associated with pain, and rainy days exacerbated the pain in 66 individuals (31.9%). All risk factors in this table were correlated with LBP, except for body pain ($p=0.53$), pain occurring upon rising from bed ($p=0.14$), no specific time pain ($p=0.08$), throbbing pain ($p=0.14$), exacerbating factors such as static postures ($p=0.06$), lifting heavy weights causing additional pain ($p=0.06$), and pain change over time ($p=0.63$). These data enhance the understanding of pain attributes and associations and provide insights into pain experiences.

Table 1. Descriptive information of the respondents for personal details

	Variable	Frequency	Percentage (%)	Mean (SD)	p
1	<u>Age</u>				
	18-23	45	21.7	2.09 0.72	0.00
	24-29	98	47.3		
	30-35	64	30.9		
2	<u>Marital status</u>				
	Single	100	48.3	1.53 0.52	0.00
	Married	105	50.7		
	Divorced	2	1.0		
3	<u>Race</u>				
	Malay	151	72.9	1.38 0.67	0.00
	Chinese	34	16.4		
	Indian	21	10.1		
4	<u>Educational level</u>				
	Secondary school	143	69.1	3.31 0.46	0.00
	University or college	64	30.9		

Note: SD: Standard deviation

Table 2. Analytical information of the respondents for personal history

	Variable	Frequency	Percentage (%)	Mean (SD)	p
1	Do you smoke?				
	Yes	117	56.5	1.58 (0.73)	0.00
	No	61	29.5		
	Smoked previously	29	14.0		
2	How many days do you exercise per week?				
	0 day	69	33.3	1.89 (0.74)	0.00
	1 – 3 days	106	51.2		
	4 – 6 days	27	13.0		
	7 days	5	2.4		
3	How many hours do you sleep a day?				
	1 - 3 hours	6	2.9	2.62 (0.67)	0.00
	4 - 6 hours	82	39.6		
	7 - 9 hours	107	51.7		
	> 10 hours	12	5.8		
4	Have you had sports injuries before?				
	Yes	93	44.9	1.52 (0.50)	0.14
	No	114	55.1		
5	How often in a year do you fall from the motorcycle?				
	0 time	71	34.3	1.71 (0.55)	0.00
	1 – 5 times	126	60.9		
	6 – 10 times	10	4.8		

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Table 2 continued

6	Have you ever been in a motor vehicle accident?				
	Yes	176	85.0		
	No	31	15.0	1.15(0.36)	0.00
6a	What type of accident is it?				
	Minor	116	56.0	2.14 (0.65)	0.00
	Major	60	29.0		
6b	During the fall from the motorcycle, which body part hits the ground first?				
	Head	18	8.7	4.30 (2.42)	0.00
	Shoulder	31	15.0		
	Elbow	21	10.1		
	Hand	50	24.2		
	Buttock	1	0.5		
	Hip	1	0.5		
	Leg	19	9.2		
	Knee	27	13.0		
	Ankle	4	1.9		
7	What is the brand of your motorcycle?				
	Honda	75	36.2	2.13 (0.97)	0.00
	Suzuki	25	12.1		
	Yamaha	94	45.4		
	Kawasaki	4	1.9		
8	What CC is the motorcycle you are using?				
	< 100cc	8	3.9	2.19 (0.51)	0.00
	100 – 150cc	156	75.4		
	151 – 200cc	41	19.8		
	> 200cc	2	1.0		
9	How old is the motorcycle you are using?				
	0 - 1 year	27	13.0	2.56 (1.05)	0.00
	2 - 5 years	94	45.5		
	6 - 10 years	48	23.2		
	11 - 15 years	30	14.5		
	16 - 20 years	5	2.4		
	> 21 years	3	1.4		
10	How often do you check your shock absorber?				
	6 months - 1 year	177	85.5	1.28 (0.77)	0.00
	2 - 5 years	14	6.8		
	> 6 years	2	1.0		
	Never	14	6.8		
11	Have you made any modifications to the motorcycle?				
	Yes	65	31.4	1.65 (0.48)	0.00
	No	142	68.6		

Table 2 continued

11a	What did you change?				
i	Seat	18	8.7	1.89 (0.31)	0.00
ii	Suspension	23	11.1	1.87 (0.34)	0.00
iii	Brakes	17	8.2	1.90 (0.30)	0.00
iv	Engine	17	8.2	1.92 (0.27)	0.00
v	Wheels	44	21.3	1.76 (0.43)	0.00
12	How do you sit when riding a motorcycle?				
	Slouched sitting	87	42.0	1.55 (0.51)	0.00
	Sitting upright	119	57.5		
	Lean to side	1	0.5		
13	How often do you make rapid, explosive movements or swerves involving back movement to avoid Accidents or rain per day?				
	0 times	8	3.9	3.46 (0.91)	0.00
	1 – 5 times	42	20.3		
	6 – 10 times	13	6.3		
	> 10 times	144	69.6		

Table 3. Analytical information of the respondents for work history

	Variable	Frequency	Percentage (%)	Mean (SD)	P
1	Which company do you work for?				
	Grab Food	78	37.7	2.08 (1.31)	0.00
	Food Panda	93	44.9		
	Dominos	7	3.4		
	Pizza Hut	4	1.9		
	McDonald	21	10.1		
	Kentucky Fried Chicken	4	1.9		
2	Do you have any other jobs aside from being a commercial motorcycle rider?				
	Yes	57	27.5	1.72 (0.45)	0.00
	No	150	72.5		
3	How long have you worked as a commercial motorcycle rider?				
	7 months – 1 year	74	35.7	2.68 (0.54)	0.00
	2 – 5 years	126	60.9		
	6 – 10 years	7	3.4		
4	How many hours do you ride your motorcycle on average per day?				
	7 – 9 hours	81	39.1	3.61 (0.49)	0.00
	> 10 hours	126	60.9		
5	How many days a week do you work?				
	< 2 days	2	1.0	3.53 (0.63)	0.00
	3 – 4 days	9	4.3		
	5 – 6 days	74	35.7		
	7 days	122	58.9		

Table 3 continued

6	What is the average distance travelled daily?				
	0 – 20 km	1	0.5	3.81 (0.51)	0.00
	21 – 40 km	8	3.9		
	41 – 60 km	21	10.1		
	> 61 km	177	85.5		
7	What is the average speed of riding when working?				
	30 – 40 km/hr	3	1.4	4.82 (0.69)	0.00
	41 – 60 km/hr	4	1.9		
	61 - 80 km/hr	42	20.3		
	81 - 100 km/hr	137	66.2		
	> 101 km/hr	21	10.1		
8	Do you carry a delivery bag during work, or is the bag strapped to the motorcycle?				
	Carry delivery bag	21	10.1	1.90 (0.30)	0.00
	The bag is strapped to the motorcycle	186	89.9		
8a	If you carry the bag during work, how heavy is the load?				
	The bag is strapped to the motorcycle	186	89.9	1.18 (0.56)	0.00
	0 – 5 kg	4	1.9		
	6 – 10 kg	7	8.2		
9	Do you climb the stairs during your work?				
	Yes	179	86.5	1.14 (0.34)	0.00
	No	28	13.5		
9a	How many floors do you climb per day?				
	1 – 3 floors	131	63.3	2.16 (0.76)	0.00
	4 – 6 floors	39	18.8		
	7 – 9 floors	5	2.4		
	> 10 floors	4	1.9		
10	How often do you get on and off the motorcycle per day?				
	0 – 5 times	3	1.4	3.86 (0.51)	0.00
	6 – 10 times	5	2.4		
	11 – 15 times	11	5.3		
	> 16 times	188	90.8		

Table 4. Analytical information of the respondents for pain assessment

	Variable	Frequency	Percentage (%)	Mean (SD)	p
1	Have you ever experienced pain in the last 12 months?				
	Yes	171	82.6	1.17	0.00
	No	36	17.4	(0.38)	
1a	How many times have you experienced pain this year?				
	0 time	36	17.4		0.00
	1 – 5 times	96	46.4	2.34 (0.94)	
	6 – 10 times	44	21.3		
	> 10 times	31	15.0		
1b	When is your recent pain?				
	0 month	36	17.4		0.00
	1 – 4 months	156	75.4	1.91 (0.53)	
	5 – 7 months	12	5.8		
	8 – 12 months	3	1.4		
1c	Which part of the body do you experience the pain?				
	Neck	74	35.7	1.64 (0.48)	0.00
	Shoulder	77	37.2	1.63 (0.49)	0.00
	Elbow	7	3.4	1.97 (0.18)	0.00
	Wrist	10	4.8	1.95 (0.22)	0.00
	Upper back	55	26.6	1.73 (0.44)	0.00
	Lower back	122	58.9	1.41 (0.49)	0.01
	Waist	99	47.8	1.52 (0.50)	0.53
	From back to legs	20	9.7	1.90 (0.30)	0.00
	Buttock	31	15.0	1.85 (0.36)	0.00
	Upper leg	16	7.7	1.92 (0.27)	0.00
	Lower leg	15	7.2	1.93 (0.26)	0.00
	Knees	12	5.8	1.94 (0.23)	0.00
	Ankles	1	0.5	2.00 (0.07)	0.00
2	<u>Does your pain travel to your leg?</u>				
	Yes	49	23.7	1.76 (0.43)	0.00
	No	158	76.3		
2a	<u>Does it travel to both legs and only one leg?</u>				
	Both legs	18	8.7	1.39 (0.73)	0.00
	Only one leg	31	15.0		
3	On a scale of 1 to 10, what score will you give your pain right now?				
	VAS 1 – 4	99	47.8		0.00
	VAS 5 – 7	61	29.5	1.23 (0.80)	
	VAS 8 – 10	11	5.3		

Table 4 continued

4	Which time(s) of the day does your pain occur?				
	Once I get up from bed	93	44.9	1.55 (0.50)	0.14
	Morning	44	21.3	1.79 (0.41)	0.00
	Afternoon	10	4.8	1.95 (0.22)	0.00
	Evening	34	16.4	1.84 (0.37)	0.00
	Night	83	40.1	1.60 (0.49)	0.00
	No specific time	91	44.0	1.56 (0.50)	0.08
5	What type of pain do you experience?				
	Throbbing (beating with a strong, regular rhythm; pulsating)	93	44.9	1.55 (0.50)	0.14
	Shooting (sudden and piercing)	45	21.7	1.78 (0.41)	0.00
	Prickling (tingling sensation)	47	22.7	1.77 (0.42)	0.00
	Sharp (stinging or needle-like pain)	63	30.4	1.70 (0.46)	0.00
	Tender (aching pain)	129	62.3	1.38 (0.49)	0.00
5a	If having pain, is your pain radiating or localized pain?				
	Radiating pain	44	21.3	2.44 (0.77)	0.00
	Localized pain	127	61.4		
6	<u>What is the frequency of your pain?</u>				
	Hourly	11	5.3		
	Daily	79	38.2	3.09 (1.20)	0.00
	Weekly	61	29.5		
	Monthly	20	9.7		
7	What is the duration of your pain in a day?				
	1 – 5 hours	155	74.9		
	6 – 10 hours	10	4.8		
	11 – 15 hours	3	1.4	1.96 (0.69)	0.00
	16 – 20 hours	1	0.5		
	21 hours - days	2	1.0		
8	What are the easing or relieving factors (s) for your pain?				
	Rest	160	77.3	1.23 (0.42)	0.00
	Physiotherapy treatment	6	2.9	1.97 (0.17)	0.00
	Painkiller	28	13.5	1.86 (0.34)	0.00
9	<u>What is the aggravating factor(s) for your pain?</u>				
	Riding a motorcycle for a long time	141	68.1	1.32 (0.47)	0.00
	Working with arms elevated and away from the body	37	17.9	1.82 (0.38)	0.00
	Bending movements	66	31.9	1.68 (0.47)	0.00
	Twisting movements	55	26.6	1.73 (0.44)	0.00
	Static postures	90	43.5	1.57 (0.50)	0.06
	Physical activities	53	25.6	1.74 (0.44)	0.00

Table 4 continued

10	Do your family members experience low back pain?				
	Yes	72	34.8		
	No	90	43.5	1.87 (0.74)	0.00
	Maybe	45	21.7		
11	<u>Does lifting heavy weights cause extra pain?</u>				
	Yes	90	43.5	1.57 (0.50)	0.06
	No	117	56.5		
12	<u>Does your pain change with time?</u>				
	Yes	107	51.7	1.48 (0.50)	0.63
	No	100	48.3		
12a	<u>Did the pain become worse or get better?</u>				
	Worse	61	29.5	1.74 (0.80)	0.00
	Better	46	22.2		
13	<u>Does a rainy day make your back pain worse?</u>				
	Yes	66	31.9	1.68 (0.47)	0.00
	No	141	68.1		
13a	<u>Do you ride in the rain?</u>				
	Yes	202	97.6	1.02 (0.15)	0.00
	No	5	2.4		
13b	<u>If you ride in the rain, do you ride the motorcycle faster?</u>				
	Yes	30	14.5	1.86 (0.35)	0.00
	No	177	85.5		
14	<u>Have you fallen from a motorcycle before?</u>				
	Yes	186	89.9	1.10 (0.30)	0.00
	No	21	10.1		
14a	<u>Have you felt back pain after falling from the motorcycle?</u>				
	Yes	112	54.1	2.26 (0.63)	0.00
	No	74	35.7		
14ai	<u>What is the onset/start of the pain?</u>				
	Sudden	46	22.2	2.76 (1.01)	0.00
	Gradual or taking place slowly	66	31.9		
14aii	<u>What is the severity of the pain?</u>				
	Mild	43	20.8	2.82 (1.10)	0.00
	Moderate	60	29.0		

4. Discussion

The primary objective of this study was to determine the prevalence of low back pain (LBP) among commercial motorcycle riders in Kedah, Malaysia and to identify associated risk factors. This study found that the prevalence of LBP was 58.9%, which is consistent with previous findings [6,10]. This study included male respondents aged 18–35 years, and a statistically significant association was observed between age and the presence of LBP. Younger individuals may be less aware of proper ergonomics and body mechanics while riding, potentially leading to poor posture and an increased risk of back pain. Additional risk factors for LBP in motorcycle riders include physical exertion, high spinal load, lifting, bending, twisting, and exposure to whole-body vibration [11,14]. The seat design and vibration exposure were found to be particularly significant factors. Seat pain was associated with a 62% higher prevalence of musculoskeletal issues, whereas substantial vibration exposure was associated with a 58% higher prevalence of musculoskeletal complaints [14]. The waist is the area most affected by pain [11]. Extended working hours have also been identified as a risk factor for LBP. Vibration exposure can cause microtrauma, muscular fatigue, compression forces on spinal discs, and impact blood vessels and nerves, leading to back pain. A study conducted among Nigerian commercial bike riders found a 25% prevalence of LBP [8], with risk factors including poor posture, manual handling, high body mass, stress, and anxiety. These risk factors are applicable to motorcycle riders, as they share similar work requirements. Smoking was found to be another significant risk factor, with 56.5% of respondents in this study being smokers compared to 23.4% in the study [8]. Smoking constricts blood vessels and diminishes blood flow to the spine, resulting in degeneration and increased susceptibility to injury. Falls from motorcycles and riding in inclement weather were the predominant activities among the study participants. Falls have been associated with a higher prevalence of LBP among motorcycle taxi drivers [15]. LBP among tailors can necessitate increased physical exertion, suboptimal postures, elevated muscular tension, and exposure to lower temperatures, all of which may contribute to back pain [16]. In this study, 85% of the respondents reported involvement in a motor vehicle accident (MVA), in which 41% of MVAs resulted in fractures, sprains, strains, soft tissue injuries, herniated discs, and nerve damage, potentially leading to acute or chronic back pain. Post-traumatic inflammation, psychosocial factors, such as anxiety and post-traumatic stress disorder, and pre-existing back conditions can exacerbate pain following MVA. Based on these findings, it is recommended that companies implement new regulations to provide medical leave, reduce riding duration, monitor and address unsafe riding behaviors, and cover or subsidize the cost of treatment for motorcycle riders. Compensation and support should be

provided to riders experiencing post-retirement pain. The implementation of these measures could safeguard the rights and well-being of future motorcycle riders. This study contributes to the existing body of knowledge on this subject and addresses gaps in understanding.

5. Conclusions

LBP significantly affects CMR, with a prevalence of 58.9% of CMR experiencing LBP, exacerbated by factors such as aging, smoking, falls, and prolonged work hours. The study's limitations pertain to its age-restricted sample, which may not accurately represent low back pain prevalence across all age groups among commercial motorcycle riders (CMR). Furthermore, this study focused on specific CMR categories, potentially limiting its generalizability. Time constraints affected data collection and sample size, impacting the statistical power. Expanding this study geographically and across states may reveal diverse risk factors. Including various rider subgroups and gender representations can minimize bias. Further research should address female CMR and extend it to other regions to gain more comprehensive insight. Identifying and addressing these risks through ergonomic training, safety measures, and awareness campaigns can enhance riders' well-being and reduce accidents. More extensive research is required to comprehensively understand occupational health concerns.

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