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Prevalence of musculoskeletal discomfort with associated disability among adult male motorcyclist

Zahra Khan Afridi^{1*}, Areeba Khan¹, Fatima Masood¹, Danish Rasool² and Muhammad Ather Hashmi¹

Abstract

Background This study conducted to determine the prevalence and severity of musculoskeletal discomfort among two-wheeler riders; however, musculoskeletal discomfort refers to pain, discomfort, or impairment in the muscles, bones, joints, tendons, ligaments, or other structures that support the body's movement. It is a common problem experienced by individuals involved in various physical activities, including motorcycle riding.

Methods This investigation was longitudinal research in which the Nordic muscular questionnaire (NMQ) was used to rule out the possibility of musculoskeletal disorders in motorcyclists. In Karachi, Pakistan, data were collected beginning in September of 2021 and continuing through February of 2022 using the convenience sampling method. Sixty-four individuals made up the sample. Participants were males ranging between the ages of 19 and 50 who rode standard motorcycles for their commute for about 6 to 8 h daily. Participants who had a tumor, an infection, or other comorbid are excluded.

Results Sixty-four participants were included in this study, out of which 40 (62.5%) reported difficulty and discomfort in their neck, followed by their lower back (48.5%), shoulders (34.4%), and hips (26.6%). Sixteen motorcyclists (25%) complained wrist pain. When asked out their level of discomfort. However, 51.6% of individuals experienced lower back pain at the 12th month, while 46.9% had neck pain. 28.1%, 17.2%, and 14.1% reported shoulder, hip, and upper back discomfort. 51.6% of individuals had not seen a specialist for lower back symptoms. Lower back, neck, shoulders, and hip have been affected the longest, according to participants.

Conclusion In conclusion, motorcyclists had a substantially greater rate of musculoskeletal problems than other drivers. Regulating musculoskeletal disorders in motorcyclists helps reduce symptoms and clinical indications of disease.

Keywords Musculoskeletal, Disorder, Motor bikers, Pain, Discomfort, Nordic musculoskeletal questionnaire

Background

The two-wheeler is one of the quickest and most fuel-efficient ways of transportation. Compared to other means of transportation, riders on two-wheelers face a range

of situations that contribute to their discomfort. Physiological and psychological elements are included. The use of two-wheelers for an extended period may result in musculoskeletal disorders. This is referred to as driving-related musculoskeletal diseases (DMSDs) [1]. DMSD symptoms include lower back soreness, disk dislocation, and spinal injury. Furthermore, DMSD is widespread in circumstances of inadequate riding position [1]. As per the findings of a study conducted by Evayanti et al. in 2020 on 200 male professional drivers aged 19–64 years in Nigeria, the prevalence rate of low back pain is 73.5%, with up to 74% of drivers reporting that it has affected

*Correspondence:

Zahra Khan Afridi
Afridi.123@hotmail.com

¹ Ziauddin College of Rehabilitation Sciences, Ziauddin University, E/40/1/1 Wahid Colony, Wahid Colony, Karachi, Pakistan

² Ziauddin College of Rehabilitation Sciences, Ziauddin University and Hospitals, E/40/1/1 Wahid Colony, Wahid Colony, Karachi, Pakistan



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their driving performance. However, it has been widely reported that occupational motorcyclists and drivers are at increased risk of low back pain [2]. Furthermore, riding a motorcycle for whatever reason, whether for business, commuting, or even for recreation, has always been a dangerous proposition for the most vulnerable road user: motorcycle riders are males. However, these road users are immediately exposed to the road conditions and hazards during a crash [3]. Still, they are also more likely to suffer from a health issue that could result in the same occurrence or, even worse, a fatality. Given that riding a motorbike is both physically and psychologically demanding, thus, motorcyclists must be physically and mentally fit to steer [3].

Furthermore, a study conducted by Diyana et al. in 2019 on the postural assessment of riders in various motorbike configurations (sports/standard) discovered that increased riding duration (in a static posture) was associated with increased postural risks [4]. Evidently, in the seated position, the lumbar lordosis flattens, the pelvis moves posteriorly and backwards, and the intradiscal pressure in the lumbar spine also rises. It has been observed that two-wheel riders who ride for an extended period of time are more susceptible to various health problems such as low back pain, spinal damage, and disk prolapse. When it comes to functional status, it is the ability to carry out the activities of daily living necessary to meet one's basic needs, maintain one's mental health, and maintain one's overall well-being [1].

In addition, motorcycle taxi operators commonly endure extended working hours, thereby subjecting themselves to inclement weather conditions, atmospheric pollution, and the encompassing vehicular milieu [5]. Consequently, the occupational demands of motorcycle taxi drivers may have detrimental effects on their overall health and well-being. The prevalence of back discomfort is commonly reported as the predominant health issue experienced by motorcycle taxi drivers [5]. In a study conducted by Berrones-Sanz, an investigation was carried out to assess the occupational and health conditions of 95 motorcycle taxi drivers in Mexico. The findings revealed that approximately 49.5% of the participants experienced musculoskeletal issues. Based on the findings of this study, it is evident that the occupation of motorcycle taxi drivers potentially plays a role in the development of musculoskeletal disorders [6]. Nevertheless, the study conducted by Truong et al. did not yield any evidence suggesting a correlation between the occupation of motorcycle taxi drivers and the occurrence of respiratory difficulties. In a more precise manner, the researchers found no statistically significant disparities in respiratory complications between individuals working as motorcycle taxi drivers and those who ride

motorcycles for non-taxi purposes. This finding is noteworthy considering that motorcycle taxi drivers generally experience higher levels of pollution exposure [5].

On the same vein, engaging in motorcycle riding necessitates intricate and hazardous maneuvers. Furthermore, it is subjected to various biochemical factors, including pollution, noise, and the prolonged stresses resulting from the act of driving long distances on uneven and deteriorated road surfaces. When an individual maintains a stationary seated posture, there is a rise in pressure within the posterior region of the spinal disk, accompanied by strain on the passive elements located at the posterior aspect of the spine. The aforementioned factor contributes to a higher prevalence of musculoskeletal disorders [7].

In a nutshell, motorcycles are viewed as a primary mode of transport by lower- and middle-class folks due to their numerous advantages, such as cheap fuel consumption and ease of maneuvering in congested traffic [8]. However, the objective of this study is to determine the frequency and intensity of musculoskeletal pain in individuals who ride two-wheelers, and to evaluate how this pain is linked to their functional abilities. The investigation aims to identify the specific areas of the body that are most affected among motorcyclists in Karachi, Pakistan.

The research findings have significant clinical implications. By identifying the prevalence and severity of musculoskeletal discomfort among motorcyclists, healthcare professionals can develop targeted interventions to mitigate the impact of work-related musculoskeletal disorder. The introduction of specific questionnaires for disability assessment enhances the clinical utility of the study, enabling clinicians to evaluate the functional status of motorcyclists and tailor treatment plans accordingly.

In summary, the purpose of this study was to assess the frequency and intensity of musculoskeletal discomfort experienced by individuals who ride two-wheelers. Additionally, the study aimed to investigate the relationship between this discomfort and the individuals' functional abilities. Furthermore, the study sought to introduce innovative methods of evaluating musculoskeletal discomfort and to offer valuable insights that could inform clinical practices, policy-making, and future research endeavors in this area.

Methods

Study setting

The study was conducted through convenience sampling techniques from the general population who were a standard motorcyclist area included (North Nazimabad, Naya Nazimabad, Safoora Goth) Karachi, Pakistan.

Target population

Male aged between 20 and 80.

Study design

Longitudinal study.

Sampling technique

Purposive sampling technique.

Study duration

Ten to 12 months after approval of synopsis.

Sample size

The sample size was calculated using OpenEpi software, keeping confidence interval 95% and level of significance 0.05; a sample size of 64 was calculated. The sample size was calculated by a study reference conducted in 2019 A study on musculoskeletal disorders among two-wheeler riders of Kerala state in India.

$$\text{Sample size } n = [\text{DEFF} * Np(1 - p)] / [(d^2 / Z^2_{1-\alpha/2} * (N - 1) + p * (1 - p))]$$

Selection criteria**Inclusion criteria**

- Age group 20–80 years.
- Standard motor cyclist uses as a daily commute.
- Males are included, as they use standard motor bikes for their daily transport, while females are negligible.

Exclusion criteria

- Age group below 20 years and above 50 years was excluded.
- Individual with neurological disorder, heart disease, and injuries or surgeries are excluded.
- Individual using anticoagulant or corticosteroids were excluded.

Data collection procedure

A purposive sampling strategy was used to acquire data from a large general population. For data gathering, we picked 64 people who use standard motorcycles for their daily commute. The details of the study were explained to the participants, and they were then asked for their permission to proceed. Interested recruiters were provided with a copy of the “consent form” to read and sign before enrolling.

The participants filled a Nordic musculoskeletal questionnaire. Fifteen minutes was given to the participant to

fill out the questionnaire. The overall duration for data collection is 12 months, with 2 to 4 h a day.

Data collection tool**Nordic musculoskeletal questionnaire**

The Nordic musculoskeletal questionnaire is a reliable questionnaire that provides the prevalence and outcomes of musculoskeletal pain in 9 body regions including neck, shoulder, elbow, wrist/hands, upper back, low back, hip/thigh, knee, and ankle/feet. The general demographics part of the questionnaire includes the name of participants, age, gender, and years since using a two-wheeler.

Validity and reliability of Nordic musculoskeletal questionnaire

The findings of the construct validity assessment indicated a perfect correspondence (100%) between the self-administered NMQ and the interview outcomes. Moreover, a specificity value of 85% was achieved for the

lower back, neck, and shoulder region, with a specificity value of 100% being attained as well. The obtained results of the reliability test yielded a Cronbach’s alpha value exceeding 0.945, indicating an excellent level of reliability [9].

Data analysis

The Nordic questionnaire was used to score using mean, frequencies, and standard deviation, and the obtained data will be analyzed by “SPSS” software version 20.

Using SPSS software, the principal investigator first evaluates each group’s data using means and SDs, frequencies, and percentages for categorical variables in order to acquire the relevant results at 6th month and at 12th month.

Results

In this research, we determined the level of musculoskeletal disability and discomfort in bike riders; therefore, NMQ questionnaires have been used to collect both general and particular data, which have been collated. Table 1 presents the demographic information collected from the people who took part in the research.

A value of 25.53 years was shown as the mean age of the individuals, with 9.50 as the standard deviation. The ages range from 17 to 80 years of age, respectively. There was a mean value of 3.34 years of experience among the bike riders, with a standard deviation of 1.67 years. Since they rode two-wheelers, all of the individuals claimed that they had suffered from at least one of the discomfort

Table 1 Demographic data

	N	Range	Minimum	Maximum	Mean	Std. deviation
Participants	64	63.00	1.00	64.00	32.5000	18.61899
Age	64	63.00	17.00	80.00	25.5313	9.50851
Motor bike usage	64	6.00	2.00	8.00	3.3438	1.67350
Valid N (listwise)	64					

symptoms associated with DMSD. One possible explanation for this is that occupational riders are required to ride their motorcycles often and for extended periods.

Figure 1 shows that 64 people who took part in this study, 40 individuals (62.5%) reported with the pain and discomfort in their neck, followed by other regions 31 individuals reported (48.5%) lower back, 22 (34.4%) shoulders, 17 (26.6%) hips, and 16 (25.0%) in their wrists among the motorcycle riders. Sixty-two and a half percent of questioned individuals stated that they could not take part in normal day-to-day activities because of the pain in their necks. Concerns regarding the lower back (reported by 48.5% of respondents), shoulders (reported by 34.4% of respondents), hips (reported by 26.6% of respondents), and wrists (reported by 25% of respondents) are also significant sources of disturbance in day-to-day living.

According to the data obtained from the participants in the last 12th month, Fig. 2 demonstrates that 51.6% of the individual’s experienced difficulty in their lower back, and 46.9% of them had suffered from neck difficulties throughout the 12th month. They also reported experiencing issues with their shoulders, hips, and upper back,

with the relevant percentages being 28.1%, 17.2%, and 14.1%, respectively. The vast majority of the study participants, about 51.6% of the total, did not seek aid from a professional to treat the troubles they were having with their lower backs.

In a nutshell, when the participants were asked how long they had been experiencing the problem, most of them said that it had been going on for a more extended period in their hip, lower back, shoulders, and neck than in any of the other body regions.

Discussion

The aim of the study is to examine the prevalence of musculoskeletal discomfort and associated disability among motorcyclists in Karachi, Pakistan, by utilizing the Nordic musculoskeletal questionnaire to identify the most prevalent body locations affected by pain and discomfort when riding a motorcycle. In spite of this, the results of our study showed that 62.5% of motorcycle riders experience pain in their neck, followed by 48.5% who experience pain in their lower back, 34.4% who suffer from pain in their shoulders, 17.2% and 25.0% who suffer from pain in their hip and wrists, respectively, and the percentage

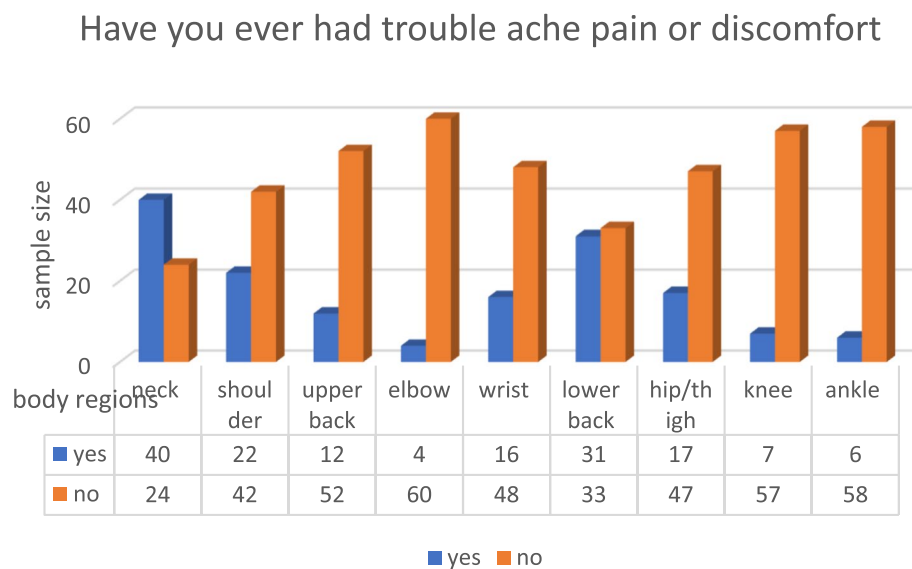


Fig. 1 Have you ever had trouble ache pain or discomfort

Have you ever had trouble ache pain or discomfort in last 12 months

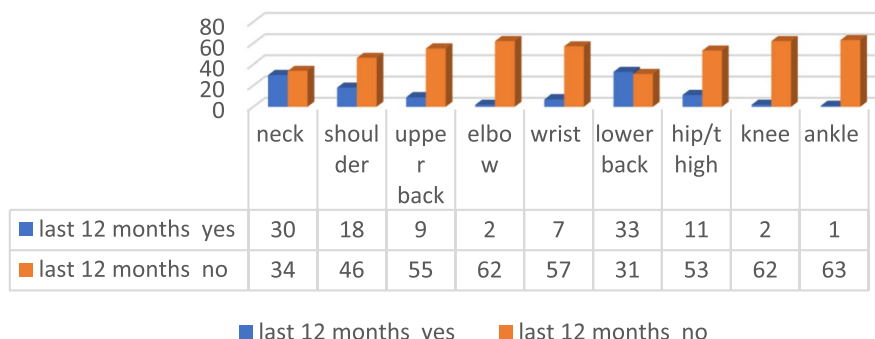


Fig. 2 Have you ever had trouble ache pain or discomfort in last 12 months

of knee and ankle pain sufferers is the lowest of all categories. This was according to the data that was gathered before the 12 months’ period, but when the data was gathered again after the 12th month, the reading was different. 51.6% of those surveyed reported lower back pain, which was higher than the 62.56% of those surveyed who had neck pain prior to the 12th-month period; nevertheless, 46.9% of them had suffered from neck issues during the last 12th month. In addition, they reported having problems with their shoulders, hips, and upper backs, with the relevant percentages being 28.1%, 17.2%, and 14.1%, respectively.

Furthermore, according to the study done by Rashid et al. in 2021, it stated that motorcyclists, male, are considered being the most susceptible group of road users. Riding a motorbike for either work-related purpose, commuting, or even recreation have always been perilous for this group [3]. Not only are these categories of road users immediately exposed to the conditions and dangers of the road in the case of a collision, but they are also more likely to suffer from a health problem that might result in the same collision or, even worse, death [3].

An investigation done in 2019 demonstrated that motorcyclists have reported a number of dangers, including weariness, body discomfort caused by motion, noise, vibration, and pollution from other cars. Long-distance riding on uneven and rocky roads leads to prolonged strain, being confined to a stationary posture, and psychological discomfort resulting from feelings of direct or indirect risk, all of which may eventually lead to an accident, injury, or disease. Overuse of the musculoskeletal system can cause musculoskeletal pain and low back

pain for both professionals and non-professionals [10]. In addition, a study illustrated, extended use of high-powered motorbikes increases the risk of work-related musculoskeletal disorders including low back pain, disk dislocation, and spine injury. It is well-documented that stress and fatigue are key factors to two-wheeler accidents for a number of causes, including work-related circumstances [4]. In light of this, despite the vast number of people who ride two-wheelers in India, relatively few studies have been done to evaluate riders’ levels of comfort and postural alignment. Sai Praveen and Ray (2015) conducted a study on 221 male Indian motorcyclists who traveled an average of 610 km each month on their bikes. They found that 95% of users reported having had some level of discomfort in the recent past, with 87% saying that the majority of their suffering was concentrated in the region of the lower back. According to the findings of Arunachalam and colleagues, motorcyclists who were required to maintain a prolonged static posture with large angular deviations of certain body joints were more likely to have symptoms of MSD [11].

According to the study done in Malaysia by Karmegam et al., the responsibility of controlling traffic congestion, escorting VIPs (very important persons), and coordinating traffic falls on the shoulders of the country’s traffic police. On the other hand, for which traffic police personnel are required to operate a wide variety of vehicles, including motorcycles, as part of their day-to-day activities. They could ride for long stretches of time while they are on the job, which might lead to muscular discomfort, a drop in productivity and performance at work, and even some potential health problems [12]. Therefore, for

this reason, more study is necessary to exclude the possibility of the functional restriction as well as the other effects that were anticipated.

Conclusion

In conclusion, the research findings indicate that motorcyclists exhibited a significantly higher prevalence of work-related musculoskeletal disorders compared to drivers of other vehicles. To mitigate symptoms and identifiable clinical markers of disease in motorcyclists and drivers, it is imperative to regulate the factors that contribute to work-related musculoskeletal issues.

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Authors' contributions

Methodology [ZKA, AK]; conceptualization [ZKA, DR]; investigation [FM, ZKA, AH]; writing—original draft [ZKA, AH, DR]; writing—review and editing [all authors].

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Availability of data and materials

Data is however available from the authors upon reasonable request.

Declarations

Ethics approval and consent to participate

This research investigated and affirmed by the Al-shifa Physiotherapy Clinic ethical review committee. All of the methods used in this investigation adhere to the moral standards established by the institutional research advisory group (IRB) reference no: ASC-PT-001/09/2021, which are based on the principles of autonomy, confidentiality, non-maleficence, and fairness. Prior to commencing data collection, participants were asked to provide their consent to participate in our study. Participants were informed about the study and its purpose, and they voluntarily completed the consent form.

Competing interests

There is no competing interest.

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References

- Anoop GA, Binoosh SA. A study on musculoskeletal disorders among two-wheeler riders of Kerala state in India. *Kerala Technol Cong KETCON*. 2019;6:411–8.
- Evayanti LG, Rekeyasa KS, Indonesia SH. The difference of musculoskeletal disorders between taxi drivers and taxi motorcyclists in Kuta District. *InnCOV 2020: the proceedings of the 1st seminar the emerging of novel coronavirus, nCov 2020, 11–12 February 2020, Bali, Indonesia*. European Alliance for Innovation. 2020;6(40):167.
- Rashid H, Omar AR, Mahmud Z, Fauzi WM. Musculoskeletal disorders (MSDs) among non-occupational motorcyclists: what are the issues? *Asian J Univ Educ*. 2021;16(4):220–9.
- Diyana MA, Karmegam K, Shamsul BM, Irniza R, Vivien H, Sivasankar S, Syahira MP, Kulanthayan KC. Risk factors analysis: work-related musculoskeletal disorders among male traffic policemen using high-powered motorcycles. *Int J Ind Ergon*. 2019;1(74):102863.
- Truong LT, Tay R, Nguyen HT. Investigating health issues of motorcycle taxi drivers: a case study of Vietnam. *J Transp Health*. 2021;1(20):100999.
- Berrones-Sanz LD. The working conditions of motorcycle taxi drivers in Tláhuac, Mexico City. *J Transp Health*. 2018;8:73–80.
- Lampe DW. Improving passive driver fatigue, sitting health risk factors and user experience in automobiles. Conception, development and evaluation of a novel interactive seating system. 2023.
- Memon A, Imran A, Aftab S, Nawaz U, Ishaque F. Low back pain among student motorcyclists: a cross-sectional study. *J Dow Univ Health Sci*. 2019;13(2):113–6.
- Chairani A. Validity and reliability test of the Nordic musculoskeletal questionnaire with formal and informal sector workers. In 7th international conference on public health 2020. Sebelas Maret University; 2020. pp. 100–106.
- Islam A, Ahmed S, Kamruzzaman M, Akhter S. Effect of physical exercise and routine intervals on LBP assessment using VAS, OLBPDQ, and RMQ among professional motorbike riders in Dhaka city. *J Phys Educ Sport*. 2020;20(4):1747–53.
- Arunachalam M, Singh AK, Karmakar S. Perceived comfortable posture and optimum riding position of Indian male motorcyclists for short-duration riding of standard motorcycles. *Int J Ind Ergon*. 2021;1(83):103135.
- Karmegam K, Irniza R, MT SB, Vivien H, Mani KK, Sivasankar S, MI MH. High-powered police motorcycle: muscle discomfort among Malaysian traffic police riders. *Malaysian J Public Health Med*. 2020;20(1):255–9.

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