

Prevalence of Pain in Medical Representatives using Two-wheeler for Daily Commute

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ABSTRACT

Aim: To investigate the prevalence of pain in medical representatives exposed to two-wheeler riding compared with medical representatives using other modes of commuting.

Materials and methods: A total of 105 medical representatives participated in the study with history of exposure to traveling of at least 300 minutes per week with at least 60 minutes per day for 5 days a week for more than 1 year. Fifty-two of them traveled by two-wheelers and were grouped under “two-wheeler group” and 53 were grouped under “control group” as they used bus, train, or car (not self-driven) as a mode of commute. The prevalence and intensity of pain was assessed by Numeric Rating Scale (NRS) for baseline pain and worst pain, Pain Disability Index (PDI), and the Pain diagram for the pain observed during last 2 weeks.

Results: Statistically significant difference was observed in pain levels between the two groups (two-wheeler group vs control group): Numeric Rating Scale baseline pain ($p = 0.0315$), NRS worst pain ($p = 0.0388$), and PDI ($p = 0.010$). The pain scores of the two-wheeler group showed positive dose–response relation with time of exposure to riding. The pain distribution pattern between two-wheeler group vs control group was quite different with lower back pain 36 vs 23% and ankle foot pain 2 vs 12%.

Conclusion: The study concludes that medical representatives traveling using two-wheelers as compared with bus, train, or car suffer from more cumulative trauma.

Clinical significance: Two-wheeler users have significantly higher prevalence of pain and pain-associated disability due to cumulative trauma disorder, which warrants further studies to improve the depth of our understanding about cumulative traumas.

Keywords: Cumulative trauma disorders, Ergonomics, Low back pain, Medical representative, Riders, Two-wheeler users.

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INTRODUCTION

India is a developing nation with crowded streets, limited parking spaces, ever-increasing fuel prices, and limited spending capacity over transportation, making two-wheelers one of the most preferred modes of commute in Indian cities and rural areas. In 2014 to 2015, two-wheeler population in the state of Maharashtra contributed to 72% of the total number of vehicles.¹ Good amount of data is available on mortality and morbidity associated with two-wheelers due to their proneness to accidents,² but there are very limited data available on demography of cumulative trauma disorders, and the significance of its impact on daily two-wheeler commuters.

Medical representatives are a group of population which has to travel from place to place on a daily basis because of their professional demands. In an urban environment, commuting with a two-wheeler and by public transport is equally convenient and accessible. So the number of individuals traveling with either mode of transport was easily available for study. This group also represents a large group of population in their active age group (20–40 years) who are exposed to travel on a daily basis for making their earning or education. Thus, the conclusions of this study will represent the pain suffered due to cumulative traumas in young active urban population exposed to traveling on a daily basis.

MATERIALS AND METHODS

Study Design

We conducted a comparative observational study at the All India Institute of Physical Medicine and Rehabilitation, Mumbai. The study protocol was approved by the ethics committee of the institute. Medical representatives attending the institute, giving history of commuting more than 60 minutes per day at least 5 days a week, i.e., 300 minutes of traveling per week, were included in the study. The study was conducted between October 2015 and February 2016. Medical representatives using two-wheelers as primary mode of commute were included in the “two-wheeler group,” whereas individuals using public transport, i.e., train, bus, or car, as a primary mode of commute were included in “control group.” Individuals in the age group of 20 to 40 years were included as it is the most active age group. Individuals were included in

the study only if they gave history of commuting for more than a year with the given mode of transport. Individuals giving history of comorbidities, such as old significant musculoskeletal injuries as fractures or ligament tears, anxiety disorders, thyroid disorders, diagnosed case of rheumatism, and ongoing pain management, were excluded. Individuals involved in driving cars also were excluded from the study as the cumulative trauma associated with car driving was entirely different and is beyond the scope of the study. The medical representatives attending the institute were informed regarding the study and consent was taken for their participation. The study proforma was provided to the medical representative and was collected and submitted for analysis in the same setting.

Outcome

The magnitude of the pain was assessed using Numeric Rating Scale (NRS)³ for baseline and worst pain experienced during last 2 weeks. Numeric pain rating scale is a simple and sensitive tool to gauge the severity of pain.⁴ Baseline and worst pains suffered by the individuals give us good idea in the undimensional aspect of the pain. When using the NRS, participants were asked to rate their pain on scale from 0 to 10 where 0 represents “no pain” and 10 represents the “worst pain possible” using whole numbers.

The Pain Disability Index (PDI) is a simple and rapid instrument for measuring the impact that pain has on the ability of a person to participate in essential life activities. Pain Disability Index takes into account behavioral and psychological aspects of pain. Pain Disability Index also has good reliability and validity.⁵⁻⁷ The scale consists of seven categories of life activities listed, and the response is scored similar to numerical rating from 0 to 10, the index is scored with minimum of 0 and maximum score of 70. The self-explanatory questions were given to the participants to be filled up and were collected with the pro forma.

The topographic location of pain was assessed using a schematic human figure and the participants were advised to shade the area of pain. The participants were allowed to shade multiple areas of the figure as per their pain distribution pattern and number of sites. The areas were divided into various anatomical regions for the purpose of data collection (Fig. 1). If any item of the pro forma was not completed, the data of that participant were not included in the study.

Statistical Analysis

The difference between the age, duration of exposure in minutes per week, baseline and worst NRS scores, and

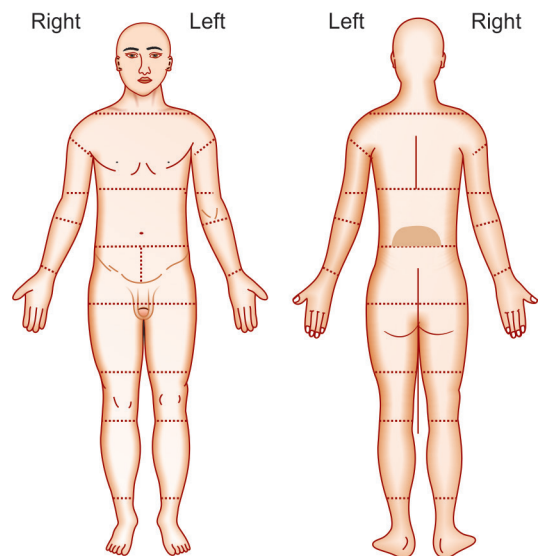


Fig. 1: Schematic human diagram for participants to mark the area of pain with an example of marking done by a participant in the painful region of the body

PDI was calculated using unpaired t-test. The linear correlation between the baseline NRS, worst pain NRS, and PDI was calculated using Pearson's test. The sample size was computed using the NRS as primary outcome parameter. A statistically detectable and clinically relevant within/between interaction effect size [f(V)] of 0.2 on this scale was chosen. The power of the study (1 - β) was chosen to be 0.8, an allocation ratio of 1:1, and the two-sided level of significance (α) to be 0.05. The required *a priori* total sample size computed by this method is 60. Data were analyzed using Microsoft Excel 2007 run on windows.

RESULTS

From a total of 120 medical representative screened for the study, 59 of them were two-wheeler users, whereas 61 were non two-wheeler (control group) users. Seven candidates from “two-wheeler group” and eight candidates from “control group” were excluded as they did not satisfy the inclusion criteria (Table 1).

No statistically significant difference was observed in the age of the individuals participating in the two groups (two-wheeler group \times control group), with $p = 0.8782$. No statistically significant difference was observed in the time duration of exposure in minutes/week of the two groups, with $p = 0.4412$. So the two groups were comparable in terms of age and duration of exposure (Table 2).

Comparison between Pain Scores

There was a statistically significant difference observed between the two groups (two-wheeler group \times control group) when the baseline pain and worst pain on NRS

Table 1: Data of medical representatives screened for the study

Two-wheeler group	Control group
Total no of candidates screened: 59	Total no of candidates screened :61
Total no of candidates excluded: 7	Total no of candidates excluded: 8
Reasons of exclusion	Reasons for exclusion
<ul style="list-style-type: none"> • Less duration of exposure to travel: 2 • History of major injury : 2 • History of comorbidity: 3 <ul style="list-style-type: none"> – History of anxiety disorder needing intermittent medications: 2 – History of hypothyroidism on treatment: 1 	<ul style="list-style-type: none"> • Less duration of exposure to travel: 2 • History exposure to car driving on daily basis: 1 • History of major injury: 2 • History of comorbidity: 3 <ul style="list-style-type: none"> – History of hyperuricemia on treatment: 2 – History of hypothyroidism on treatment: 1

Table 2: Demographic data of the “two-wheeler group” and “control group” and results of comparison of the two groups

	Two-wheeler group	Control group	p-value
Sample size	52	53	
Male:female	50:2	51:2	
Mean age [SD] (years)	28.76 (4.55)	28.6 (6.32)	0.8782
Duration of travel [mean (SD)] (minutes/week)	1030.96 (515.14)	958.3 (445.99)	0.4412
Baseline pain [mean (SD)]	3.75 (2.01)	2.92 (1.85)	0.0315
Worst pain [mean (SD)]	5.61 (2.52)	4.5 (2.60)	0.0388
PDI [mean (SD)]	24.76 (16.70)	17.35 (11.89)	0.0101

SD: Standard deviation

were compared, with $p = 0.0315$ and $p = 0.0388$ suggesting that pain in two-wheeler group was more than control group. Statistically significant difference was also found when PDI of the two groups was compared ($p = 0.0101$), suggesting that the impact that pain has on the ability of a person to participate in essential life activities was more on two-wheeler group than on control group.

Dose–Response Relationship

The correlation between baseline pain NRS *vs* duration of exposure to riding ($R = 0.3772$, $p = 0.0058$) and worst pain NRS *vs* duration of exposure to riding ($R = 0.2877$, $p = 0.038626$) is positive and statistically significant (Graph 1). The correlation between PDI and exposure to

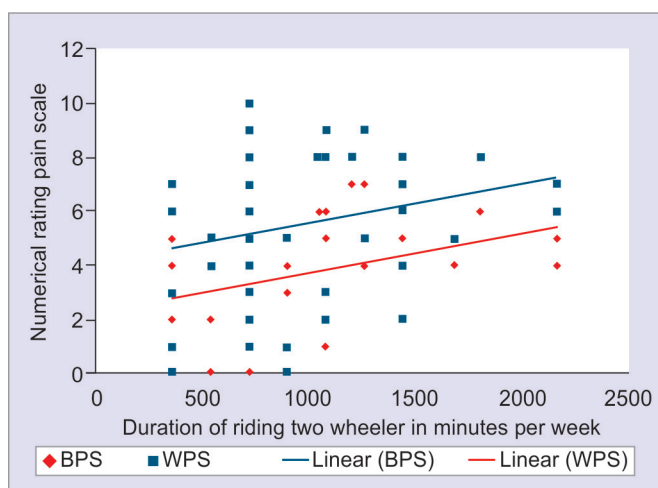
riding was very weakly positive with $R = 0.1537$ and was not statistically significant ($p = 0.2766$; Graph 2).

Pain Distribution

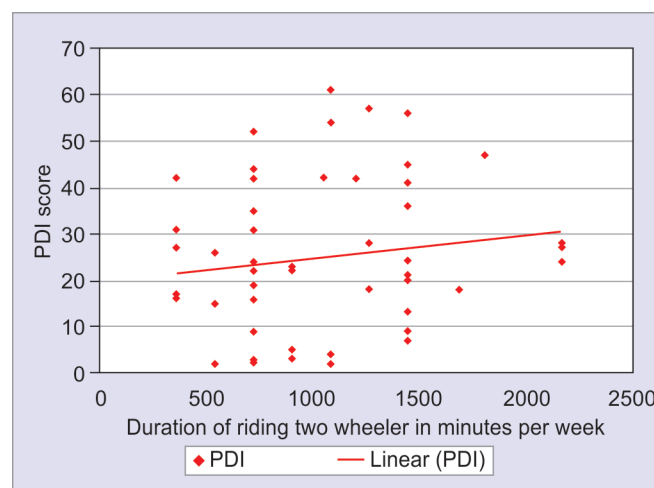
Low back pain was the commonest among the two-wheeler users, with 36% of participants complaining about it, other areas commonly involved in the pain were neck pain (22%), upper back pain (13%), and wrist-hand region pain (11%) (Graph 3).

DISCUSSION

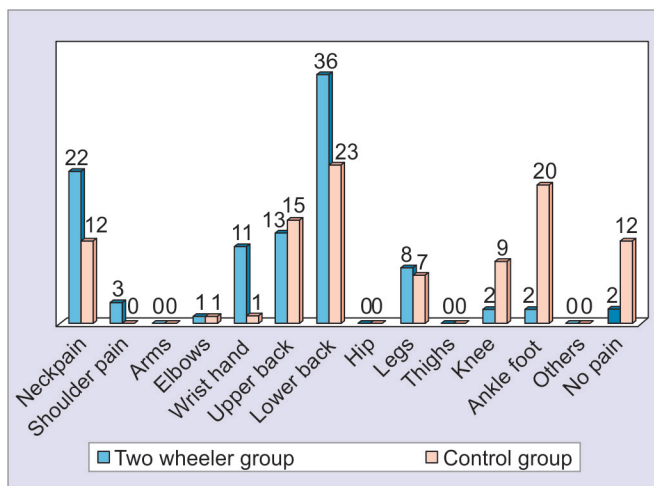
The goal of the study was to identify if there is any increase in the prevalence of pain in the individuals riding two-wheelers. The study also attempts to measure the impact of



Graph 1: Changes in the baseline NRS pain score and worst NRS pain score with increasing minutes of exposure per week in “two-wheeler group”



Graph 2: Changes in the PDI with increasing minutes of exposure per week in “two-wheeler group.” BPS: Baseline NRS pain score; WPS: Worst NRS pain score



Graph 3: Difference in the pattern of distribution in "two-wheeler group" and "control group"

this pain on day-to-day life of these individuals. This study tries to identify if a particular pattern of pain is observed in such individuals. The subjects chosen were from medical marketing profession, i.e., medical representatives. They represent a group of population of an urban environment which is in the age group of 20 to 40, an active lifestyle, with good amount of stress of professional competition, with responsibilities of family and home, and with active participation in social, recreational, and sexual activities. The character of this group can strongly represent the overall urban population of this age group.

Prevalence of Pain

Our study showed significantly higher prevalence of pain in two-wheeler users as compared with individuals using trains, buses, or cars (not actively involved in driving) for daily commute. In our study, both baseline pain NRS and worst pain NRS were significantly higher as compared with the control group. Similar study was done in 1998 involving police officers, which suggested that the prevalence of low backache was significantly higher in officers involved in car driving as a primary task during duty hours as compared with general duty officers; the study also found that the police motorcyclists had more point prevalence of back pain as compared with police car driver group. The higher PDI also suggests that this higher pain levels significantly disrupt the day-to-day activities of the two-wheeler users. Thus, two-wheeler users are more prone for musculoskeletal pain and higher level of cumulative trauma. As the two groups were well matched, the factor we felt responsible for such a difference in pain scores is lack of chance to change posture during commute, lack of back support, recurrent active recruitment of muscles for balancing purpose and to handle the weight of the bike, and environmental stress factors, such as exposure to cold^{8,9} or

heat.¹⁰ Our subjects were from an urban environment and riding in traffic conditions may be more stressful as compared with a rural or suburban environment. There is also a very minimal possibility of customization for bikes from ergonomic point of view in our setup.

Dose-response Relationship

Our study showed positive dose (minutes of exposure per week) to response (pain scores) relationship. The lower *r* values of correlation suggest that the correlation is not very strong. Our study could not strictly differentiate riders riding environments preferably on highways or riding on crowded city roads, which we feel significantly affects the cumulative trauma associated with riding and thus effects the correlation with pain. The similar study done on police officer involved in car driving also showed an inconsistent dose-response relationship.¹¹

Distribution of Pain

In our study, pain distribution was more around neck, lower back, upper back, shoulder, and wrist-hand region. Each site of pain may be associated with cumulative effect of posture of the rider or could be due to isolated causes. Neck pain could be associated with posture as well as improper or heavy head gear and use of heavy bag. Wrist-hand pain and shoulder pain could be associated with improper positioning of handle bars or disproportionate weight or balance of the bike. Individuals suffering from low back ache were on higher side in both the groups, which suggests that the pain could be associated with posture and riding primarily or aggravation of underlying problem. Due to very less amount of research on this subject, we could not find good data to support these findings. The percentage of individuals having no pain was 16.98% in the control group, whereas only 3.84% of individuals were pain free in two-wheeler group. Individuals in the two-wheeler group had 1.61 sites of pain per person on average, whereas the control group had 1.24 sites of pain on average.

LIMITATION OF STUDY

Our study could not measure the exact time of exposure to two-wheeler riding or traveling and was dependent on the history given by the participants. Our study could not isolate the riding conditions of the two-wheeler users as we feel riding on highways or riding on crowded roads is a very important factor for cumulative traumas leading to pain. Our study only included medical representatives so that the confounding factors could be minimized, but the population of medical representatives may not completely represent the population of urban two-wheeler users. Our study had only 4% female population, so the findings of this study need not represent female two-wheeler riders.

CONCLUSION

The findings of the study can be concluded as follows:

- There is a higher prevalence of musculoskeletal pain in medical representatives exposed to daily long-term use of two-wheelers.
- There is also a significant disability or limitation of daily activities associated with this pain in two-wheeler users.
- There is a good dose–response relationship between exposure to two-wheeler use and pain.
- Lastly, the various areas of distribution of pain point out toward the research and ergonomic intervention possible in this subject.

CLINICAL SIGNIFICANCE

Two-wheeler users have significantly higher prevalence of pain and pain-associated disability due to cumulative traumas. The pain due to two-wheeler use also follows peculiar topographic distribution pattern. These findings open up scope for further studies in subjects of biomechanics, ergonomics, and environmental factors associated with cumulative traumas in two-wheeler users and their management.

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