



Prevalence and Associated Risk Factors for Wrist Pain and Quality of Life Among Auto-Rickshaw Drivers – A Cross-Sectional Study

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Abstract

Background. Wrist pain is a prevalent musculoskeletal complaint among occupational drivers, particularly auto-rickshaw drivers who endure prolonged repetitive wrist movements and extended driving hours. Despite its impact on function and quality of life, specific data on this underserved workforce is limited.

Aim. This study aimed to evaluate the prevalence, functional disability, pain severity, and quality of life associated with chronic wrist pain among auto-rickshaw drivers in Greater Noida, India.

Methods. A cross-sectional survey was conducted involving 384 male auto-rickshaw drivers. Data collected included demographic and occupational variables, pain severity (Numeric Pain Rating Scale), functional disability (Disabilities of the Arm, Shoulder, and Hand questionnaire), and quality of life (Short Form-36). Descriptive statistics, correlation analyses, and age group comparisons were performed.

Results. The mean age was 40.31 ± 11.83 years with a driving experience of 15.47 ± 8.62 years and daily driving hours of 10.57 ± 1.75 . The prevalence of chronic wrist pain was notable, with a mean DASH score of 39.14 ± 15.90 indicating moderate disability, and a pain severity mean of 5.05 ± 2.54 . Quality of life scores averaged 54.90 ± 14.44 . Strong positive correlations were observed between years of driving and both pain intensity ($r = 0.546$, $p < 0.001$) and functional disability ($r = 0.828$, $p < 0.001$). No significant differences in outcomes were noted across age groups.

Conclusion. Chronic wrist pain among auto-rickshaw drivers substantially impairs functional ability and quality of life, with severity correlated to occupational exposure duration. These findings underscore the need for ergonomic interventions and health policies targeting musculoskeletal health in this vulnerable occupational group.

Keywords: wrist pain; occupational disease; quality of life; functional status

1. INTRODUCTION

Wrist pain is a very common condition for all age groups and across profession types, causing severe limitations on virtually all personal activities and working performance. The wrist is a very complex joint; thus, many bones, ligaments, and tendons are prone to injury due to the critical role this joint plays in functional tasks. Workers who are exposed to intense labour, frequent mechanical stress, awkward postures, and prolonged activity are at heightened risk of acute injuries, overuse syndromes,



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and degenerative changes in the wrist. Auto-rickshaw drivers are a significant segment of unorganised employment in India and other developing countries. They provide essential transportation, especially in urban and semi-urban areas where public transport is inadequate. Despite their economic contribution, auto-rickshaw drivers endure multiple occupational hazards including prolonged sitting, repetitive hand and wrist movements, exposure to vibrations, and high mental stress navigating congested traffic. These factors together increase the risk of musculoskeletal disorders, particularly wrist pain, which is often overlooked (Mohokar et al., 2018).

Work-related musculoskeletal disorders (WMSDs) contribute the largest share of occupational diseases, accounting for approximately 37% of all cases, with wrist pain being among the most reported areas (Joseph et al., 2021). Studies of professional drivers further report high musculoskeletal pain (MSP) prevalence 71% among taxi drivers and 81% among truck drivers including wrist involvement (Joseph et al., 2021). Individuals exposed to repetitive movements, static postures, or vibration-intensive tasks show higher incidence rates. The burden of WMSDs includes loss of productivity, rising healthcare costs, and long-term disability (Alhashim et al., 2025). In physically demanding occupations, median short-term prevalence of wrist pain is about 10%, rising to about 24% over longer periods (Ferguson et al., 2019).

While many existing studies investigate musculoskeletal risk factors among drivers of buses and trucks, these occupational groups exhibit distinct risk profiles compared to auto-rickshaw drivers. Bus and truck drivers are typically exposed to prolonged sitting, static postures, and large vehicle ergonomics, with much of the work involving steering and heavy vehicle controls. Their risks commonly include whole-body vibration and fatigue but exposure to repetitive hand and wrist movements is generally less frequent than among smaller vehicle operators (Ali et al., 2023).

In contrast, auto-rickshaw drivers constitute a unique segment of informal urban transport workers, operating three-wheeled vehicles in congested traffic conditions. Their work exposes them to continuous repetitive wrist movements, forceful gripping actions, and elevated mechanical vibrations due to direct contact with vehicle controls. Ergonomic challenges such as handle design, absence of supportive seating, and frequent gear shifting further increase risk for wrist pain and upper limb musculoskeletal disorders (Kadam & Bhalekar, 2021; Naik, 2021). Auto-rickshaw drivers also face psychosocial stressors related to economic insecurity and intense urban navigation demands, making their occupational risk factors distinct and more focused on upper limb repetitive strain injuries (Sharma, 2022).

Wrist complaints rank among the most common musculoskeletal sites, making it the fourth most frequently reported upper-limb site (Govaerts et al., 2021). Unlike wrist pain in the general population, often multifactorial, including poor ergonomics, low physical activity, and age-related degeneration, in auto-rickshaw drivers, the risk is compounded by vehicle design, requiring sustained grip strength, repeated wrist motions, and prolonged mechanical vibration exposure. These factors lead to pain, stiffness, and functional impairment, reducing drivers' efficiency (Mohokar et al., 2018).

Psychosocial stressors also significantly affect wrist pain development. High job demands, little social support, and financial instability are common among auto-rickshaw drivers, elevating their risk for musculoskeletal disorders. These combined physical and psychosocial stresses highlight the need for a holistic understanding of wrist pain's aetiology. Chronic or recurrent wrist pain severely impairs quality of life. It can restrict key activities like lifting, gripping, and carrying, thus reducing autonomy and social participation. For auto-rickshaw drivers, such limitations threaten income, increase economic pressure, and diminish overall wellbeing. Limited access to timely, effective healthcare often forces drivers to rely on self-managed or traditional treatments that fail to address root causes (Alhashim et al., 2025). Despite its prevalence and impact, research on wrist pain in specific occupational groups like auto-rickshaw drivers is limited. Most studies generalise across broader populations or focus on drivers of buses and trucks, whose risk profiles differ considerably from auto-rickshaw drivers. This gap underscores the importance of population-specific research.

This study addresses that gap by assessing the prevalence of wrist pain among auto-rickshaw drivers in Greater Noida, Uttar Pradesh. It examines demographic, occupational, and lifestyle correlates within a cross-sectional design and measures quality-of-life impacts using the Disabilities of the Arm, Shoulder, and Hand (DASH) score and the Short Form-36 (SF-36) questionnaire. The study's findings will guide targeted interventions and preventive strategies.

2. METHODS

Participants: This cross-sectional survey study was conducted among 384 male auto-rickshaw drivers in Greater Noida to assess wrist pain and its functional impacts. Participants were recruited using convenience sampling from various locations in Greater Noida.

Selection criteria: Inclusion criteria were male drivers aged 18 years and above, experiencing chronic wrist pain unilaterally for more than three months, with at least one year of professional driving experience, and operating their vehicles for over 10 hours daily. All participants provided informed consent prior to inclusion. Exclusion criteria included a history of wrist surgery or fractures, metabolic or systemic musculoskeletal conditions, unwillingness or inability to participate, and prior lower limb trauma potentially affecting the anatomy or biomechanics of the wrist or fingers.

Outcome measures

Disabilities of the Arm, Shoulder, and Hand (DASH): DASH questionnaire is a widely used self-administered tool designed to assess the physical function and symptoms of individuals with upper extremity musculoskeletal disorders (Hudak et al., 1996). It comprises 30 items that evaluate the difficulty in performing various physical activities and the severity of symptoms such as pain, tingling, and stiffness experienced in the preceding week. Each item is rated on a 5-point Likert scale, ranging from 1 (no difficulty or symptom) to 5 (unable to perform or severe symptoms).

To derive the DASH score, responses to the completed items are summed and averaged, then transformed to a standardised score ranging from 0 to 100, where 0 indicates no disability and 100 represents the highest level of disability and symptom severity. A minimum of 27 items must be completed for the score to be calculated, with missing responses replaced by the mean of completed items if three or fewer items are missing.

Interpretation of the DASH score reflects the extent of functional disability: higher scores denote greater impairment in upper limb function and impact on daily living activities. The DASH questionnaire has demonstrated excellent reliability, validity, and responsiveness in various clinical populations, making it a robust instrument for quantifying disability levels, monitoring changes over time, and evaluating treatment outcomes.

Numeric Pain Rating Scale: The severity of wrist pain was assessed using the Numeric Pain Rating Scale (NPRS), a validated 0-to-10 scale with 0 indicating no pain and 10 representing the worst possible pain (Hawker et al., 2011).

Short Form-36 (SF-36) questionnaire: This questionnaire assesses overall quality of life across domains such as physical functioning, role limitations due to physical and emotional problems, and general health perceptions (Ware & Sherbourne, 1992). Additionally, demographic and occupational data including age, weight, height, years of driving experience, and daily driving hours were collected to explore their correlations with wrist pain prevalence and functional disability.

Procedure: The study utilised a cross-sectional design to evaluate the prevalence and associated risk factors of wrist pain among auto-rickshaw drivers in Greater Noida, Uttar Pradesh. Ethical approval for the study was obtained from the Departmental Research Committee at Galgotias University, and informed consent was secured from all participants before data collection commenced. Participants were

recruited based on predefined inclusion and exclusion criteria to ensure that the study population was representative of the target group.

Demographic and occupational data, including age, weight, height, years of driving experience, and daily driving hours, were collected using a structured questionnaire. A detailed medical and occupational history was also obtained to identify potential risk factors for wrist pain, such as exposure to vibration, repetitive movements, and ergonomic conditions. The severity and duration of wrist pain were recorded using the Numeric Pain Rating Scale (NPRS) and other relevant metrics. The primary outcome measure, the Disabilities of the Arm, Shoulder, and Hand (DASH) score, was used to assess functional disability and symptom severity. Participants completed the DASH questionnaire under the guidance of the researcher to ensure accurate responses. The Short Form-36 (SF-36) questionnaire was administered to evaluate the participants' quality of life, covering domains such as physical functioning, pain, emotional wellbeing, and overall health status.

Data collection was conducted at auto-rickshaw stands or other convenient locations where participants gathered during non-working hours to minimise disruption to their routines. Each session began with a detailed explanation of the study objectives and procedures, followed by the administration of the informed consent form. Participants then completed the demographic questionnaire, followed by the DASH and SF-36 assessments. NPRS scores were recorded based on participants' self-reported pain levels during typical daily activities. To ensure reliability, all measurements and assessments were conducted by trained researchers using standardised protocols. Data were checked for completeness and accuracy at the point of collection to avoid missing or erroneous information. Participants were encouraged to ask questions and provide honest responses throughout the process. Upon completing data collection, the information was coded and entered into statistical software for analysis. Descriptive statistics were used to determine the prevalence of wrist pain and its severity. Pearson correlation tests identified associations between demographic, occupational, and lifestyle factors and wrist pain severity.

Data analysis: The research used SPSS software (version 22) to analyse the data. The collected data were systematically organised and entered into statistical software for analysis. Descriptive statistics were employed to summarise demographic variables such as age, weight, height, years of driving experience, and daily driving hours, providing an overall profile of the study population.

3. RESULTS

The prevalence of wrist pain was calculated as a percentage of the total participants who reported wrist pain. Continuous variables, including DASH scores, NPRS scores, and SF-36 scores, were analysed to determine their mean and standard deviation, offering insights into the severity of pain, functional limitations, and quality of life among participants. Frequency distributions and cross-tabulations were used to explore the distribution of wrist pain across various demographic and occupational subgroups.

Table 1. **Demographic and occupational characteristics of participants (n = 384)**

Variable	Mean $\pm$ SD
Age (years)	40.31 $\pm$ 11.83
Weight (kg)	74.88 $\pm$ 13.84
Height (cm)	169.24 $\pm$ 11.52
Years of driving	15.47 $\pm$ 8.62
Daily hours driven	10.57 $\pm$ 1.75
Duration of wrist pain (months)	19.87 $\pm$ 9.19

Table 1 presents the demographic and occupational profile of the 384 male auto-rickshaw drivers who participated in the study. The mean age of the participants was 40.31 years, with a standard deviation (SD) of 11.83, indicating a predominantly middle-aged workforce with ages spread roughly from late 20s to early 50s. This age distribution aligns with the typical working demographic of auto-rickshaw drivers in urban settings. The mean weight was 74.88 kg (SD 13.84), and the mean height was 169.24 cm (SD 11.52), reflecting a healthy adult male population consistent with regional anthropometric norms. These physical characteristics are relevant as they may impact ergonomic stress and susceptibility to musculoskeletal issues.

Regarding occupational exposure, the drivers reported an average of 15.47 years (SD 8.62) of driving experience, implying prolonged cumulative exposure to occupational hazards related to repetitive hand movements, vibrations, and postural demands inherent in auto-rickshaw driving.

The participants drove for an average of 10.57 hours per day (SD 1.75), which points to a demanding daily workload that likely exacerbates physical strain on the wrist and upper limb structures. Lastly, the duration of wrist pain among affected drivers was reported as a mean of 19.87 months (SD 9.19), highlighting a chronic and persistent nature of musculoskeletal discomfort experienced by this group. The combination of long-term occupational exposure and extended daily hours plausibly contributes to this prolonged pain experience. In summary, Table 1 provides comprehensive baseline data demonstrating that the study population consists of middle-aged men with extended work histories and long daily driving hours factors that collectively increase their risk of developing wrist pain and associated functional disabilities.

Table 2. Age-wise comparative outcome measures; DASH, SF-36, and NPRS score analysis

Age group (years)	DASH score Mean $\pm$ SD	SF-36 score Mean $\pm$ SD	NPRS score Mean $\pm$ SD
20–30	39.30 $\pm$ 15.52	54.09 $\pm$ 14.17	5.19 $\pm$ 2.41
31–40	35.83 $\pm$ 15.99	54.72 $\pm$ 13.92	4.95 $\pm$ 2.48
41–50	40.70 $\pm$ 15.92	55.03 $\pm$ 14.90	4.96 $\pm$ 2.66
51–60	39.89 $\pm$ 16.05	55.68 $\pm$ 14.76	5.07 $\pm$ 2.63

Table 2 summarises the mean and standard deviation (SD) of three key outcome measures; DASH score (functional disability), SF-36 score (quality of life), and NPRS score across four different age groups of auto-rickshaw drivers. The age groups included were 20–30 years, 31–40 years, 41–50 years, and 51–60 years. For the DASH scores, which indicate the level of functional disability related to wrist pain, the means ranged from 35.83 to 40.70 across the age groups, with standard deviations approximately 15 to 16. This suggests a relatively consistent level of moderate disability among drivers regardless of age, with minor variation. The 31–40 years group showed a slightly lower mean disability score compared to others but the differences were not statistically significant.

The SF-36 scores, assessing overall quality of life, ranged from 54.09 to 55.68 across age categories, with SD around 14. These scores indicate moderate impairment in quality of life associated with wrist pain and occupational factors. Again, there was no significant difference between the age groups, implying that quality of life impact remains relatively stable despite ageing within the cohort.

The NPRS scores, measuring pain severity on a scale of 0 to 10, were fairly homogeneous, with means ranging from 4.95 to 5.19 and standard deviations approximately 2.4 to 2.6. This uniformity indicates that pain severity is similarly experienced by drivers across different ages.

Table 3. Correlation analysis of occupational indicators and outcome measures

Variables	Years of driving	Duration of wrist pain	DASH score	NPRS score
Years of driving	1	0.601**	0.828**	0.546**
Duration of wrist pain	0.601**	1	0.447**	0.503**
DASH score	0.828**	0.447**	1	0.754**
Pain intensity (NPRS)	0.546**	0.503**	0.754**	1

Notes: correlation coefficients (r); **p < 0.001 for all correlations.

Table 4 presents the correlation analysis of key occupational indicators and outcome measures including years of driving, duration of wrist pain, DASH score (functional disability), and pain intensity measured by NPRS. Each cell shows the Pearson correlation coefficient (r), quantifying the strength and direction of linear associations between pairs of variables.

The diagonal contains 1s, indicating perfect correlation of a variable with itself. Off-diagonal coefficients range from 0.447 to 0.828, all positive, denoting direct relationships among the variables. Specifically, a very strong positive correlation ($r = 0.828$, $p < 0.001$) exists between years of driving and DASH score, indicating that longer driving experience corresponds to higher levels of functional disability. Moderate positive correlations are observed between years of driving and pain intensity ($r = 0.546$), and between duration of pain and both DASH score ($r = 0.447$) and pain intensity ($r = 0.503$), all statistically significant ($p < 0.001$). Finally, the strong correlation between DASH score and pain intensity ($r = 0.754$) reflects that greater pain severity aligns closely with increased functional impairment.

These results underscore the interconnectedness of occupational exposure, symptom persistence, pain severity, and functional disability among auto-rickshaw drivers. Understanding these relationships supports the focus on comprehensive ergonomic and therapeutic interventions aiming to reduce pain and disability in this high-risk group. It also highlights the value of assessing both duration of exposure and symptomatology to fully capture drivers' health status. This correlation analysis provides clear evidence of statistically significant positive correlations that clarify how occupational factors and symptom burden collectively influence disability outcomes in the studied population.

4. DISCUSSION

This cross-sectional study aimed to investigate the prevalence and impact of wrist pain among auto-rickshaw drivers, focusing on associated functional disability, quality of life, and pain severity. The demographic and occupational profile (Table 1) revealed a participant group primarily composed of middle-aged males (mean age 40.31 ± 11.83 years) with extensive driving experience (mean 15.47 ± 8.62 years) and prolonged daily driving hours (mean 10.57 ± 1.75 hours). These characteristics align with the typical working profile of informal urban transport workers and underline the high exposure to occupational stressors such as repetitive manual tasks and whole-body vibration, recognised risk factors for musculoskeletal disorders (MSDs) in drivers (Pickard et al., 2022).

The functional and clinical outcomes presented in Table 2 indicate a moderate level of disability (DASH score 39.14 ± 15.90), concomitant with moderate pain severity (NPRS 5.05 ± 2.54) and quality-of-life impairment (SF-36 score 54.90 ± 14.44). Importantly, these measures were consistent across age groups, with no statistically significant variation observed. This suggests that the burden of wrist pain and its consequences transcend age differences within this population, possibly reflecting the pre-

dominance of occupational exposure over chronological ageing in driving disability, a finding echoed in similar research on occupational drivers (Maduagwu et al., 2022).

The correlation analysis (Table 3) further elucidates the relationships between years of driving, duration of wrist pain, pain intensity, and functional disability. A strong positive correlation was observed between years of driving and DASH scores ($r = 0.828$, $p < 0.001$), indicating that prolonged occupational exposure substantially contributes to functional impairment. Moderate correlations between pain duration and both pain severity and disability scores reinforce the chronicity of wrist pain as a driving factor for disability. Furthermore, the robust association between pain severity and functional disability emphasises pain's critical role in limiting daily activities (Murray et al., 2022). These relationships align with prior studies linking cumulative physical load and prolonged symptom duration to increased disability among vehicle drivers (Raza et al., 2024).

Collectively, these findings underline the occupational health risks faced by auto-rickshaw drivers, highlighting the urgent need for preventive ergonomic interventions. Measures may include re-designing vehicle controls to minimise repetitive wrist strain, instituting regulated rest breaks to limit continuous driving hours, and providing education on early symptom management. Such interventions have demonstrated efficacy in reducing MSD prevalence and improving quality of life among drivers (Pickard et al., 2022).

This study's strengths include a robust sample size and comprehensive assessment of functional and quality-of-life outcomes using validated instruments such as DASH and SF-36. However, limitations include its cross-sectional design precluding causal inference and potential self-report biases. Future longitudinal studies should investigate the effectiveness of targeted ergonomic and clinical interventions to mitigate wrist pain and associated disability in this vulnerable occupational group.

Overall, this study characterises the significant burden of wrist pain among auto-rickshaw drivers, underscoring its association with functional disability and reduced quality of life irrespective of age. The demonstrated correlation between occupational exposure and adverse clinical outcomes provides compelling evidence for the implementation of workplace preventive measures to enhance driver health and occupational safety.

5. CONCLUSIONS AND PERSPECTIVES

This study demonstrates a high prevalence of chronic wrist pain among auto-rickshaw drivers, accompanied by moderate functional disability and diminished quality of life. The substantial correlations between cumulative driving experience, pain severity, and disability underline the significant occupational health burden within this workforce. These impairments are consistent across age groups, emphasising that prolonged exposure, rather than age alone, drives wrist-related morbidity. The findings warrant urgent ergonomic and health interventions to alleviate pain and improve function in this vulnerable population. Future research should focus on longitudinal assessments and intervention efficacy to better address this occupational challenge.

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Riešo skausmo paplitimas ir susiję rizikos veiksniai bei gyvenimo kokybė tarp autorikšų vairuotojų – skerspjūvio tyrimas

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Santrauka

Tyrimo pagrindimas. Riešo skausmas yra dažnas raumenų ir kaulų sistemos sutrikimas tarp profesinių vairuotojų, ypač autorikšų vairuotojų, kurie atlieka ilgus pasikartojančius riešo judesius ir dirba ilgą darbo dieną. Nepaisant šio skausmo poveikio darbingumui ir gyvenimo kokybei, trūksta duomenų apie šią būklę tarp pažeidžiamos autorikšų vairuotojų darbo jėgos.

Tikslas. Šio tyrimo tikslas buvo įvertinti lėtinio riešo skausmo paplitimą, funkcinį neįgalumą, skausmo stiprumą ir gyvenimo kokybę tarp autorikšų vairuotojų Didžiojoje Noidoje, Indijoje.

Metodai. Buvo atliktas skerspjūvio tyrimas, kuriame dalyvavo 384 vyrai, vairuojantys autorikšas. Surinkti duomenys apėmė demografinius ir profesinius kintamuosius, skausmo stiprumą (skaitmeninė skausmo vertinimo skalė), funkcinį neįgalumą (rankos, peties ir plaštakos negalios klausimynas) ir gyvenimo kokybę (SF-36 klausimynas). Buvo atlikti aprašomieji statistiniai skaičiavimai, koreliacijos analizės ir amžiaus grupių palyginimai.

Rezultatai. Vidutinis amžius buvo $40,31 \pm 11,83$ metų, vairavimo patirtis – $15,47 \pm 8,62$ metų, o kasdienio vairavimo trukmė – $10,57 \pm 1,75$ valandos. Lėtinio riešo skausmo paplitimas buvo reikšmingas, vidutinis DASH balas buvo $39,14 \pm 15,90$, o tai rodo vidutinę negalią. Skausmo stiprumo vidurkis buvo $5,05 \pm 2,54$. Gyvenimo kokybės balas vidutiniškai buvo $54,90 \pm 14,44$. Pastebėta stipri teigiama koreliacija tarp vairavimo metų skaičiaus ir skausmo intensyvumo ($r = 0,546$, $p < 0,001$) bei funkcinio neįgalumo ($r = 0,828$, $p < 0,001$). Nenustatyta reikšmingų skirtumų tarp skirtingų amžiaus grupių.

Išvados. Lėtinis riešo skausmas tarp autorikšų vairuotojų žymiai pablogina funkcinės galimybes ir gyvenimo kokybę, o jo sunkumas yra susijęs su profesinės veiklos trukme. Šie rezultatai pabrėžia ergonominių priemonių ir sveikatos politikos, skirtos šios pažeidžiamos profesinės grupės raumenų ir kaulų sistemai, poreikį.

Reikšminiai žodžiai: riešo skausmas; profesinė liga; gyvenimo kokybė; funkcinė būklė

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