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# Low back pain, quality of life, and functional disability among drivers and nurses working in home healthcare services: a cross-sectional study

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## Abstract

**Background** Low back pain (LBP) is a prevalent issue among workers in physically demanding occupations, including drivers and nurses. This study aims to evaluate the severity of low back pain, its impact on quality of life, and functional disability among drivers and nurses working in home healthcare services.

**Methods** This observational, descriptive, and analytical study was conducted with 100 participants (50 drivers and 50 nurses) working in home healthcare services. Pain severity was assessed using the Visual Analog Scale (VAS), functional disability using the Oswestry Disability Index (ODI), and quality of life using the Short Form-36 Health Survey (SF-36). Differences between groups were analyzed using independent t-tests and Mann-Whitney U tests. Analysis of Covariance (ANCOVA) was performed to control for age, sex, and BMI, while multiple linear regression was used to identify predictors of disability scores ($p < 0.05$).

**Results** Drivers had significantly higher mean age, height, and weight compared to nurses ($p < 0.05$), while Body Mass Index (BMI) was similar between groups ($p > 0.05$). No statistically significant differences were observed between the groups regarding pain intensity (VAS), disability level (ODI), and quality of life (SF-36) subscales. ANCOVA for age, sex, and BMI confirmed no significant effect of occupational group on clinical outcomes. Multiple regression analysis revealed that pain intensity during activity, rather than the occupational group, was the strongest predictor of disability level ($p < 0.001$).

**Conclusion** Nurses and drivers working in home healthcare services exhibited comparable levels of low back pain severity, functional disability, and quality of life. Pain intensity during activity, rather than occupational role, emerged as the primary determinant of functional disability.

**Clinical trial** Not Applicable.

**Keywords** Low back pain, Disability, Nurse, Driver, Quality of life, Home healthcare services

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## Introduction

Low back pain (LBP) is one of the most prevalent musculoskeletal disorders worldwide and represents a major public health problem affecting individuals across different age groups and occupations [1]. It is a leading cause of disability, work absenteeism, and reduced productivity, imposing a substantial economic and social burden on healthcare systems [2]. Occupational LBP is particularly common among workers exposed to physical workload, repetitive movements, prolonged static postures, and inadequate ergonomic conditions [3]. Understanding occupation-specific risk factors is essential for developing effective preventive strategies and improving workers' health and well-being [4].

Nurses, in particular, are exposed to frequent bending, lifting, twisting, and patient handling activities, often performed in time-pressured and ergonomically challenging environments [5]. These repetitive and physically demanding tasks increase mechanical stress on the lumbar spine and contribute to the development of musculoskeletal disorders [6]. Previous studies have consistently reported a high prevalence of LBP among nurses, with associated consequences such as functional limitations, decreased quality of life, and increased risk of chronic pain and burnout [7–9].

Occupational health challenges in home healthcare are best understood through the Systems Engineering Initiative for Patient Safety (SEIPS) model [10]. This framework suggests that musculoskeletal outcomes are shaped by the interaction between the worker (e.g., nurse or driver), the tasks performed, the tools used, and the uncontrolled environment of patients' homes [11]. Unlike hospital settings, home healthcare operates in constrained spaces with inadequate equipment and varying patient conditions, limiting standardized ergonomic practices [12]. Specifically, nurses frequently perform transfers and daily care without assistive devices, exacerbating physical strain and increasing the risk of LBP and related disability [13]. Beyond clinical staff, drivers also play a crucial role in home healthcare by transporting personnel and medical supplies [14]. Although not directly involved in patient care, their occupation entails prolonged sitting, static postures, and whole-body vibration—all recognized risk factors for LBP. Extended driving hours, insufficient lumbar support, and limited postural variation further contribute to musculoskeletal complaints [15]. Despite these risks, drivers in healthcare settings remain underrepresented in the literature compared to clinical staff.

Regardless of the specific occupational role, LBP extends beyond localized physical discomfort, significantly impacting both functional capacity and overall quality of life. Within the SEIPS framework, the functional disability resulting from LBP acts as a systemic disruption, limiting an individual's daily productivity, work efficiency, and social participation [16]. As quality of life encompasses physical, psychological, and social dimensions, it has become an essential metric in occupational health research for evaluating the broader burden of work-related disorders [17]. By assessing both functional disability and quality of life, we gain a comprehensive understanding of how musculoskeletal strain permeates the professional and personal lives of healthcare workers, shifting the focus from symptom severity alone to the holistic health impacts of the work system [18].

Although numerous studies have investigated LBP among healthcare workers, comparative research examining different occupational roles within the same environmental context remains scarce [5, 8, 19]. Current epidemiological evidence predominantly focuses on clinical staff, creating a significant research gap regarding the support roles that are vital to service delivery. Within the unique ecosystem of home healthcare, nurses and drivers operate as a synergistic unit, sharing similar temporal pressures, uncontrolled environments, and a lack of ergonomic infrastructure. However, their mechanical exposure profiles differ fundamentally: while nurses face episodic high-intensity loading during patient handling, drivers are subjected to prolonged static postures and whole-body vibration. Neglecting any member of this interdependent team not only overlooks a vulnerable population but also hinders the development of holistic, team-based ergonomic interventions. Therefore, this study aims to bridge this gap by comparing LBP intensity, functional disability, and health-related quality of life between nurses and drivers. By analyzing these variables within a shared occupational setting, this study provides a comprehensive assessment of the total occupational burden in home-based care, thereby establishing a foundation for more inclusive, system-wide preventive health policies and tailored ergonomic interventions.

## Methods

### Study design

This study was designed as an observational, descriptive, and analytical study conducted to evaluate low back pain, quality of life, and functional disability among drivers and nurses working in home healthcare services.

### Participants

The study population consisted of drivers and nurses employed in the Home Healthcare Services of the Istanbul Metropolitan Municipality. A convenience sampling technique was employed to recruit participants. A total of 100 participants were included, comprising 50 drivers and 50 nurses, who voluntarily agreed to participate in the study. Data collection was carried out between

January 2018 and April 2018. Potential participants were identified through institutional records and invited to the study during their shift breaks.

Participants were included if they were aged 23 years or older, had been working in their current occupation for at least one year, had experienced low back pain for more than six months, and had provided written informed consent. Individuals who had undergone lumbar spine surgery within the previous six months or had severe musculoskeletal or neurological conditions affecting the lumbar region were excluded from the study (Fig. 1).

### Data collection

Socio-demographic and occupational characteristics were collected using a structured research proforma specifically designed for this study. This form included parameters such as age, sex, height, weight, occupation, and duration of employment, as well as clinical history regarding chronic diseases, regular medication use, and previous musculoskeletal disorders. Height and weight were self-reported by the participants. While objective anthropometric measurements were not performed due to the field-based nature of the study, self-reported data in occupational health research is a pragmatic approach, though it may introduce a slight bias in BMI calculations. (Supplementary File 1).

Pain intensity was assessed using the validated Visual Analogue Scale (VAS). Participants were asked to mark their level of pain on a 10-cm horizontal line, where '0' represented 'no pain' and '10' represented 'unbearable pain.' The distance (in cm) from the starting point to the mark provided a continuous score of pain intensity. The VAS is a widely accepted, highly reliable, and valid tool for measuring acute and chronic pain in musculoskeletal disorders [20].

The level of functional disability due to LBP was measured using the Turkish version of the Oswestry Disability Index (ODI). The index consists of 10 items assessing pain intensity and its impact on daily activities (e.g., personal care, lifting, walking, sitting, standing, sleeping, social life, and traveling). Each item is scored from 0 to 5, with the total score converted into a percentage (0–100%). Higher scores indicate greater levels of disability (0–20%: minimal, 20–40%: moderate, 40–60%: severe, 60–80%: crippled, 80–100%: bed-bound). The Turkish version of the ODI has been previously validated and demonstrated high internal consistency (Cronbach's alpha = 0.91) [21].

Health-related quality of life was evaluated using the SF-36 Health Survey. This instrument comprises 36 items categorized into eight domains: physical functioning, role limitations due to physical health, role limitations due to emotional problems, energy/fatigue, emotional well-being, social functioning, pain, and general health perceptions. Scores for each domain range from 0 to 100, where higher scores represent better health status. The Turkish adaptation of the SF-36 has shown strong psychometric properties, including high reliability and validity across various patient populations [22].

### Ethical approval

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of Haliç

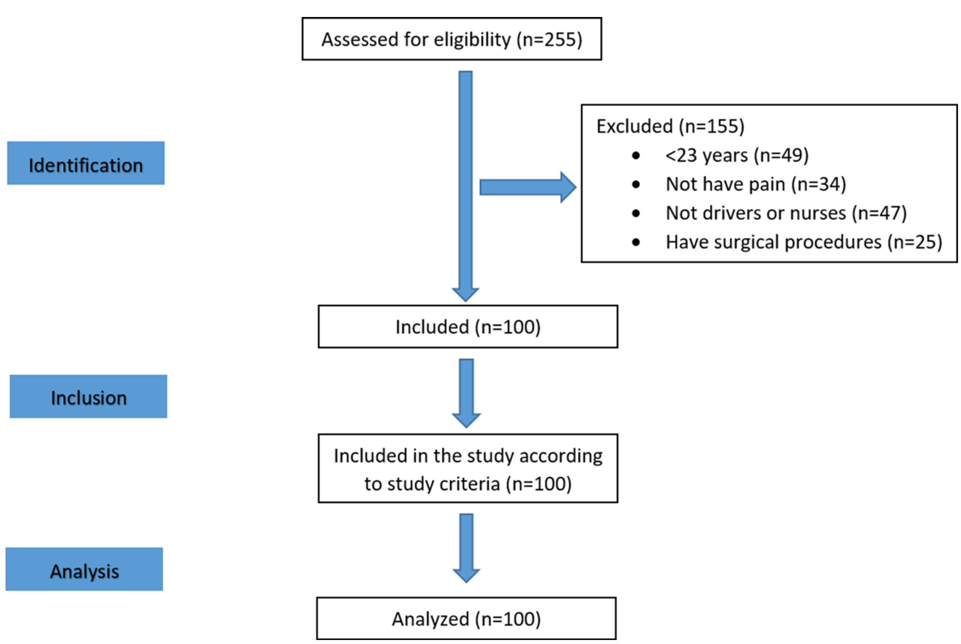


**Fig. 1** STROBE flow chart. STROBE, Strengthening the reporting of observational studies in epidemiology

University (Approval No: 127; Date: 24.04.2017). Written informed consent was obtained from all participants prior to participation.

### Sample size

The sample size was determined based on a power analysis conducted using G*Power (version 3.1.9.7). Considering a medium effect size (Cohen's d = 0.58) derived from previous literature comparing LBP-related disability in different occupational groups, a total sample of at least 96 participants (48 per group) was required to achieve a statistical power of 0.80 at a significance level of α = 0.05 [13, 23]. Our final sample of 100 participants (50 per group) was deemed adequate to detect significant differences between nurses and drivers while accounting for potential data loss.

### Statistical analysis

All statistical analyses were performed using IBM SPSS Statistics, Version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies (n) and percentages (%). The normality of the data distribution was assessed using the Shapiro-Wilk test and visual inspection of histograms. For comparisons between the two groups (Drivers vs. Nurses), the Independent Samples t-test was used for normally distributed continuous variables (e.g., Age, Vitality, Mental Health), and the Mann–Whitney U test was employed for non-normally distributed variables (e.g., VAS scores, ODI, and other SF-36 subscales). Categorical demographic data (e.g., Sex, Work Experience) were compared using the Chi-square test or Fisher's Exact test, as appropriate. To control for potential confounding factors, an Analysis of Covariance (ANCOVA) was conducted to compare clinical outcomes and quality of life scores between groups, adjusted for age, sex, and body mass index (BMI). The effect size for the ANCOVA model was reported as partial eta-squared ($\eta^2$). Additionally, a multiple linear regression analysis was performed to identify independent predictors of the disability level (ODI score). The model included the occupational group, age, sex, BMI, and activity-related pain intensity (VAS-Activity) as independent variables. Effect sizes were calculated to determine the magnitude of differences: Cohen's d was used for parametric tests, and the rank-biserial correlation ($r_{rb}$)was used for non-parametric tests. A p-value of $<0.05$ was considered statistically significant for all analyses.

**Table 1** Demographic and occupational characteristics of the participants

| Variables | Drivers (*n* = 50) | Nurses (*n* = 50) | *p* | Effect size |
|---|---|---|---|---|
| Age (years) | 39.42 ± 7.21 | 35.88 ± 6.69 | 0.012*[a] | 0.51[d] |
| Height (cm) | 173.8 ± 4.5 | 162.1 ± 4.2 | < 0.001*[a] | 2.68[d] |
| Weight (kg) | 82.5 ± 6.8 | 68.4 ± 7.5 | < 0.001*[a] | 1.96[d] |
| Body Mass Index (kg/m$^2$) | 27.56 ± 2.45 | 26.26 ± 3.86 | 0.082[b] | 0.19[r] |
| Work experience (years) n (%) | | | 0.73** | |
| 1–5 yrs | 21 (42%) | 22 (44%) | | - |
| 6–10 yrs | 12 (24%) | 14 (28%) | | |
| 11–15 yrs | 11 (22%) | 11 (22%) | | |
| > 16 yrs | 6 (12%) | 3 (6%) | | |
| Sex (Male/Female), n (%) | 46/4 (92% / 8%) | 3/47 (6% / 94%) | < 0.001** | - |
| Chronic Diseases, n (%) | 8 (16%) | 10 (20%) | 0.606 | - |
| Regular Medication Use, n (%) | 6 (12%) | 9 (18%) | 0.401 | - |
| History of Musculoskeletal Disorders, n (%) | 12 (24%) | 11 (22%) | 0.811 | - |

[a]: Independent Samples t-test

[b]: Mann–Whitney U test

*: Statistically significant difference ($p < 0.05$)

[d]: Cohen's d,

[r]: Rank-biserial correlation

**: Chi-square test

## Results

The demographic and anthropometric characteristics of the participants are summarized in Table 1. Statistical comparisons revealed that drivers were significantly older, taller, and heavier than nurses ($p < 0.05$). However, no significant difference was observed in Body Mass Index (BMI) between the groups ($p = 0.082$). Regarding clinical history, the prevalence of chronic diseases, regular medication use, and previous musculoskeletal disorders (excluding the current LBP) were comparable between nurses and drivers ($p > 0.05$), ensuring baseline clinical homogeneity.

Table 2 presents the comparison of VAS, ODI, and SF-36. No significant differences were found between drivers and nurses across any of these primary outcomes ($p > 0.05$), with consistently small effect sizes observed for all domains.

To account for the baseline differences in age and sex, an ANCOVA was performed. Even after adjusting for age, sex, and BMI, occupational group membership had no significant effect on pain or quality of life (Table 3). Finally, the multiple linear regression model identified pain intensity during activity as the sole independent predictor of functional disability ($B = 4.16$\$, $t = 18.60$\$, $p < 0.001$). Factors such as age, sex, BMI, and even the specific occupational group did not significantly contribute to the variance in ODI scores (Table 4) (Fig. 2).

**Table 2** Comparison of pain intensity and functional disability between drivers and nurses

| Outcome Measure | Drivers ($n=50$) Mean ± SD | Nurses ($n=50$) Mean ± SD | *p* | Effect Size[b] |
|---|---|---|---|---|
| VAS (0–10) – Rest | 1.84 ± 1.80 | 1.62 ± 2.09 | 0.184 | 0.14 |
| VAS (0–10) – Activity | 3.12 ± 2.22 | 3.86 ± 2.59 | 0.098 | -0.18 |
| ODI | 12.30 ± 11.08 | 13.92 ± 12.44 | 0.254 | -0.12 |
| SF-36 | | | | |
| Physical Functioning | 80.20 ± 15.68 | 80.00 ± 19.34 | 0.449 | 0.01 |
| Role Physical | 63.50 ± 32.75 | 60.50 ± 35.63 | 0.334 | 0.05 |
| Bodily Pain | 71.00 ± 19.49 | 69.20 ± 22.84 | 0.366 | 0.04 |
| General Health | 65.50 ± 16.92 | 63.80 ± 20.44 | 0.280 | 0.06 |
| Vitality[a] | 58.60 ± 16.03 | 56.40 ± 18.59 | 0.528 | 0.13[d] |
| Social Functioning | 79.50 ± 18.25 | 78.75 ± 21.60 | 0.435 | 0.02 |
| Role Emotional | 63.99 ± 36.25 | 60.00 ± 36.93 | 0.301 | 0.06 |
| Mental Health[a] | 69.16 ± 12.33 | 68.20 ± 13.43 | 0.710 | 0.07[d] |

VAS: Visual Analog Scale, ODI: Oswestry Disability Index, SF-36:Short Form-36 items

*: Statistically significant difference ($p < 0.05$)

[d]: Cohen's d

[r]: Rank-biserial correlation

[a]: Independent samples t-test

[b]: Mann–Whitney U test

**Table 3** Group comparisons adjusted for potential confounders (Age, Sex, and BMI)

| Dependent Variable | F | *p* (Group Effect) | Partial $\eta^2$ |
|---|---|---|---|
| VAS – Rest | 0.294 | 0.589 | 0.003 |
| VAS – Activity | 0.363 | 0.548 | 0.004 |
| ODI Total Score | 2.000 | 0.963 | < 0.001 |
| SF-36 Physical Functioning | 0.085 | 0.771 | 0.001 |
| SF-36 Bodily Pain | 0.594 | 0.941 | < 0.001 |
| SF-36 General Health | 0.000 | 0.994 | < 0.001 |

VAS: Visual Analog Scale; ODI: Oswestry Disability Index; SF-36: Short Form-36 Health Survey; BMI: Body Mass Index

Values represent the F-statistic, p-value, and effect size (Partial $\eta^2$) derived from the ANCOVA model

$p < 0.05$ indicates statistical significance

**Table 4** Multiple linear regression analysis of factors affecting disability level (ODI)

| Predictor | B | SE | t | *p* | 95% CI |
|---|---|---|---|---|---|
| Intercept | -11.97 | 5.86 | -2.04 | 0.044* | -23.61;-0.34 |
| Group (Nurse vs. Driver) | 0.17 | 1.34 | 0.13 | 0.900 | -2.49;2.83 |
| Age (years) | 0.08 | 0.09 | 0.93 | 0.353 | -0.09;0.26 |
| Sex (Female vs. Male) | 1.05 | 1.49 | 0.71 | 0.481 | -1.90;4.01 |
| BMI (kg/m$^2$) | 0.08 | 0.19 | 0.41 | 0.685 | -0.29;0.45 |
| VAS (Activity) | 4.16 | 0.22 | 18.60 | < 0.001* | 3.71;4.60 |

ODI, Oswestry Disability Index; SE, standard error; CI, confidence interval; VAS, Visual Analog Scale

* Statistically significant at $p < 0.05$

## Discussion

LBP remains a critical occupational health challenge for healthcare workers exposed to persistent physical demands. The primary objective of this study was to compare LBP severity, functional disability, and quality of life between drivers and nurses in the home healthcare sector. A key finding of this study is that despite drivers being demographically older and having higher body weights, showed similar mean levels of pain, disability, and quality of life. After statistical adjustment for age, sex, and BMI, no significant association between occupational group and clinical outcomes was detected; however, these results should be interpreted cautiously given the strong demographic imbalance between groups. Our results indicate that pain intensity during activity, rather than the profession itself, is the primary predictor of functional disability.

Although not statistically significant, the trend toward higher pain and disability among nurses reflects the strenuous nature of home-based nursing [24]. Nurses frequently perform repetitive bending, lifting, and patient transfers in non-standardized environments without adequate ergonomic support [25]. These tasks increase mechanical load on the lumbar spine and contribute to cumulative musculoskeletal strain [7, 9, 12, 14, 24]. In contrast, drivers face prolonged sitting, whole-body vibration, and static postures [26]. Interestingly, the lack of significant difference in disability scores suggests that the intense physical load of nursing may offset despite demographic characteristics typically considered less unfavorable for LBP risk.

Chronic LBP substantially impacts both physical and psychological well-being [27]. In this study, the observed SF-36 domain scores indicate that the burden of LBP in nurses extends beyond physical discomfort, affecting both physical and mental domains of health-related quality of life. Furthermore, the notable demographic imbalance—male-dominated driving roles versus female-dominated nursing roles—reflects regional occupational gender segregation. While we controlled for sex in our models, may also reflect unmeasured sex-related biological or sociocultural factors.

Activity-related pain appeared to a significant predictor within the tested model of functional disability in both occupational groups. This finding further emphasizes that pain management may represent an important clinical target to minimize functional disability among home-based service professionals. In addition, the absence of a statistically significant difference in SF-36 scores suggests comparable perceived health status between the groups, although formal equivalence cannot be inferred. Despite the distinct physical demands of nursing and the prolonged sedentary burden associated with driving, both occupations appear to share a similar burden on health-related quality of life.

These findings may be interpreted within an Human Factors and Ergonomics (HFE)/SEIPS perspective, suggest that LBP in home healthcare is a systemic outcome

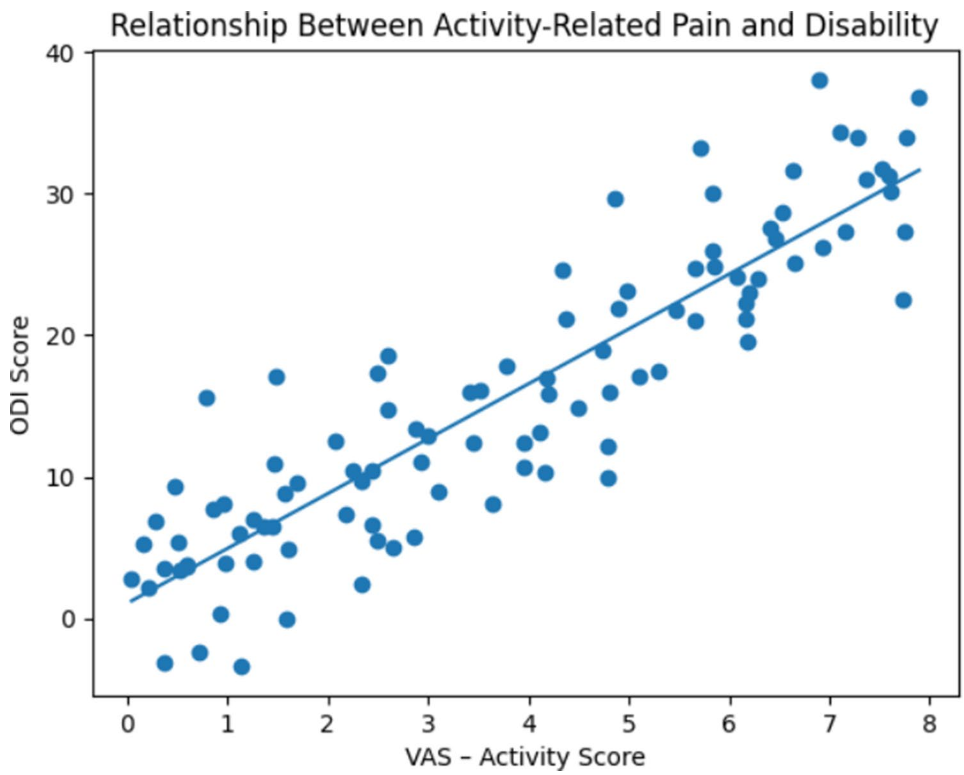


**Fig. 2** Relationship between activity-related pain intensity (VAS–Activity) and functional disability (ODI)

of a mismatch between workers and their environment. Preventive strategies must be tailored: for nurses, training should focus on safe patient handling and the use of assistive devices [28]; for drivers, interventions should prioritize seating ergonomics and vibration reduction [29]. Additionally, workplace policies supporting early LBP identification are essential to prevent progression to chronic disability [30]. Since the specific mechanisms (e.g., exact vibration magnitude or lifting force) were not quantified, our interpretations rely on established ergonomic theories. Future research utilizing wearable sensors or dosimeters is warranted to provide precise exposure data.

Several limitations should be considered. First, the cross-sectional design precludes causal inferences. Second, the substantial imbalance in sex, age, and weight between groups constitutes a significant limitation; although statistically adjusted, these variables are inherently linked to the occupational roles, potentially leading to residual confounding. Third, the study was conducted within a single institution, which may limit the generalizability of the results to other organizational cultures or geographic regions. Fourth, the reliance on self-reported measures for both clinical outcomes and anthropometric data (height/weight) may have introduced recall bias or BMI inaccuracies. Finally, specific unmeasured confounders, such as daily driving duration, frequency of patient handling, leisure-time physical activity, and prior ergonomic training, were not recorded. Future longitudinal, multi-center studies with objective ergonomic assessment tools are needed to validate these findings.

## Conclusion

This study found no statistically significant differences between drivers and nurses in home healthcare with respect to LBP severity, functional disability, or health-related quality of life after adjustment for selected demographic variables. Activity-related pain was significantly associated with functional disability and may represent an important clinical target across occupational groups. Taken together, these findings support the potential value of ergonomic and pain-focused preventive strategies for both clinical and support staff in home-based care settings, while warranting confirmation in larger longitudinal studies.

### Abbreviations

| | |
|---|---|
| ANCOVA | Analysis of Covariance |
| BMI | Body Mass Index |
| CI | Confidence Interval |
| HFE | Human Factors and Ergonomics |
| LBP | Low Back Pain |
| ODI | Oswestry Disability Index |
| SD | Standard Deviation |
| SE | Standard Error |
| SEIPS | Systems Engineering Initiative for Patient Safety |
| SF-36 | Short Form–36 Health Survey |
| SPSS | Statistical Package for the Social Sciences |

STROBE Strengthening the Reporting of Observational Studies in Epidemiology
VAS Visual Analog Scale

## Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12912-026-04659-z.

Supplementary Material 1

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### Author contributions

AE: Study design, data collection, manuscript drafting. ÖFÖ: Study design, statistical analysis, manuscript drafting and revision. ANTVDB: Study supervision, manuscript revision, and final approval. All authors read and approved the final manuscript.

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### Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

### Ethics approval and consent to participate

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of Haliç University (Approval No: 127; Date: 24.04.2017). Written informed consent was obtained from all participants prior to participation.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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## Publisher's note