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Gender Based Differences in Pain, Anxiety, and Disability in Response to Epidural Steroid Injection for Low Back Pain

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ABSTRACT

Emerging research suggests that pain perception, tolerance, and response to treatment may differ between males and females due to a complex interplay of biological, psychological and sociocultural factors. **Objective:** To determine gender differences in pain intensity, anxiety, depression, and disability outcomes following epidural steroid injection in patients with chronic low back pain. **Methods:** This comparative cross-sectional study was conducted from July 2024 to January 2025 after taking approval from the IRB of Evercare Hospital Lahore. Total 9 male and 9 female patients with low back pain were enrolled from the Anesthesia and Pain Medicine Department. Fluoroscopy-guided epidural injection was performed in all patients. Patients were followed at 3 and 6 weeks to assess pain, anxiety, depression, and disability. Data were analyzed using SPSS v26. **Results:** At both 3 and 6 weeks, females reported significantly lower mean Visual analogue scores (2.44 ± 0.53 and 2.11 ± 1.06, p=0.007) compared to males (5.11 ± 2.52 and 5.11 ± 2.26; p=0.002). Oswestry Disability scores were considerably lower in females at 3 weeks and 6 weeks; p=0.040. However, no significant gender differences were observed in HADS anxiety and depression scores at any follow-up point (p>0.050). **Conclusions:** The current study suggests that female patients demonstrated greater reductions in pain and disability scores than male patients following fluoroscopy-guided epidural steroid injection, whereas changes in anxiety and depression scores were comparable between genders. These findings indicate that gender may influence physical, but not psychological, recovery outcomes after the procedure.

INTRODUCTION

Chronic low back pain (LBP) is a prevalent medical condition and the leading cause of work-related limitations worldwide [1]. It is the second most frequently reported symptom prompting visits to primary healthcare [2]. Epidemiological data show that it affects up to 23% adults worldwide, with 24%-80% recurrence rates within one year. In Pakistan, through a telephonic survey conducted in 2021, its prevalence was found to be 15.75% [3]. LBP is characterized by discomfort lasting longer than 12 weeks, situated between the lower ribs and gluteal crease, and may or may not be accompanied by pain radiating to the legs [4]. The source of pain may include intervertebral discs, vertebral bones, spinal ligaments, or paraspinal muscles [5]. Multiple predisposing factors, genetic, environmental, social, neurological, and mechanical, contribute to its development. Notably, 85% of low back pain cases have no identifiable underlying etiology, while 97% are attributed to musculoskeletal causes [6, 7]. Diagnosis is primarily clinical, supplemented by imaging modalities when indicated [7]. Management of chronic LBP includes both non-pharmacological and pharmacological strategies. Pharmacological treatment may involve oral,

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topical, or injectable medications [8]. For patients not responding to conservative treatment, invasive procedures such as epidural steroid injections (ESIs) administered via transforaminal, interlaminar, or caudal routes serve as valuable non-surgical options for symptom relief and functional improvement [9]. Emerging research suggests that pain perception, tolerance, and response to treatment may differ between males and females due to the complex interplay of biological, psychological, and sociocultural factors [10].

However, literature specifically comparing gender-based responses to epidural steroid injections remains limited. Moreover, there is a paucity of local studies evaluating gender-based differences in response to epidural steroid injections in terms of pain relief, anxiety reduction, and disability improvement. This study aims to determine gender differences in pain intensity, anxiety, depression, and disability outcomes following epidural steroid injection in patients with chronic low back pain.

METHODS

This comparative cross-sectional study was conducted at the Department of Anesthesia and Pain Medicine, Evercare Hospital, Lahore, Pakistan. This study included 18 patients presenting to the pain clinic between July 2024 and January 2025 with complaints of low back pain (with or without radiculopathy). After institutional research and ethics committee approval, IRC/24/06/001, participants were recruited using a non-probability consecutive purposive sampling technique. Informed written consent was obtained from all patients before inclusion in the study. For sample size; WHO sample size calculator was used, and the formula applied was $n = 2\sigma 2(Z1\text{-}\alpha + Z1\text{-}\beta)2/(\mu 1\text{-}\mu 2)2$. The estimated sample size was 18 [9 in each group], using 20% level of significance, 80% power of the test, and an expected mean of pain among male taken as 7.3 ± 2.3 and in female as 6.1 ± 3.0 [11]. Patients of either gender aged between 30 and 80 years, classified as ASA I–III, with MRI-confirmed degenerative disc disease or herniated disc disease [with or without radiculopathy] and with a history of failed pharmacological and physical therapy, were eligible for inclusion. ASA I: normal healthy patient, ASA II: patient with mild systemic disease, and ASA III is defined as a patient with severe systemic disease that limits activity but is not incapacitating. This classification is based on the standard American Society of Anesthesiologists Physical Status Classification System [12]. Patients were excluded if they had contraindications to the procedure (local infection, bleeding disorders), allergy to any drugs used [contrast, steroids, local anesthetic], prior lumbar epidural injection within the past 6 months, history of psychiatric illness or opioid addiction, or diagnosis of fibromyalgia. Demographic details, including age, gender, ASA classification, and clinical history, were documented. Baseline assessment was conducted using the Visual Analog Scale (VAS) for pain [13], Hospital Anxiety and Depression Scale (HADS) [14], and the Oswestry Low Back Disability Questionnaire (ODI) [15]. The VAS for pain [13] consists of a 10-cm line ranging from 0 (no pain) to 10 (worst imaginable pain); higher scores indicate greater pain intensity. The Hospital Anxiety and Depression Scale (HADS) [14] include 14 items—7 for anxiety and 7 for depression—each scored from 0 to 3, giving subscale scores from 0 to 21. Scores of 0–7 are considered normal, 8–10 borderline, and 11–21 abnormal. The Oswestry Disability Index (ODI) [15] assesses functional disability related to low back pain through 10 items, each scored from 0 to 5, with a total score converted to a percentage (0–100%). Scores of 0–20% indicate minimal disability, 21–40% moderate, 41–60% severe, 61–80% crippled, and 81–100% bed-bound. Patients were divided into two equal groups based on gender (male and female). All patients underwent fluoroscopy-guided lumbar epidural steroid injection (interlaminar, transforaminal, or caudal) using triamcinolone 80 mg. The procedure was performed in the prone position after confirming needle placement by the spread of contrast. Post-procedure, patients were monitored in the post-anesthesia recovery unit for two hours using electrocardiography, pulse oximetry, and non-invasive blood pressure monitoring. Discharge was based on standard institutional criteria. Follow-up assessments were conducted at 3 weeks and 6 weeks post-procedure, using the same tools (VAS, HADS, ODI) to evaluate changes in pain, anxiety, depression, and disability levels. Data were analyzed using SPSS version 26. Quantitative variables were expressed as mean ± standard deviation for normally distributed data or as median (interquartile range) for non-normal data. Categorical variables were presented as frequencies and percentages. The independent sample t-test was used for normally distributed continuous variables, while the Mann-Whitney U test was used for non-normally distributed data. Chi-square was applied to compare qualitative variables. A p-value<0.050 was considered statistically significant.

RESULTS

A total of 18 patients were included; the mean age noted was higher in female (57.22 ± 12.60 years) compared to male (49.11 ± 14.24 years), though this variance was not statistically significant (p=0.219). ASA physical status was similar between groups, with the majority classified as ASA II. Radiculopathy was more common among female (88.9%) than male (55.6%), but this difference did not reach statistical significance (p=0.114). Both groups had an equal proportion of patients (88.9%) using NSAIDs pre-surgery (p<0.001). At baseline, there were no significant differences

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between male and female in terms of pain scores (VAS), disability (ODI), or psychological status (HADS-D and HADS-A). The mean baseline VAS was 8.00 ± 1.87 in female and 7.77 ± 1.98 in male (p=0.810). The mean baseline ODI was 21.33 ± 8.68 in female and 24.22 ± 9.48 in male (p=0.510). Mean HADS depression scores were 7.55 ± 4.61 in females and 10.22 ± 9.90 in males (p=0.475), while HADS anxiety scores were 9.25 ± 5.38 in female and 7.33 ± 5.40 in male (p=0.468) (Table 1).

Table 1: Comparison of Demographic Characteristics of Both Groups

Variables	Male (n=9), n (%), Mean ± SD	Female (n=9), n (%), Mean ± SD	p-value
Age (Years)	49.11 ± 14.24	57.22 ± 12.60	0.219
ASA Status (I)	1 (11.1%)	2 (22.2%)	0.513
ASA Status (II)	7 (77.8%)	7 (77.8%)	
ASA Status (III)	1 (11.1%)	0 (0%)	
Radiculopathy (Yes)	5 (55.6%)	8 (88.9%)	0.114
Radiculopathy (No)	4 (44.4%)	1 (11.1%)	
NSAIDS Pre Surgery (Yes)	8 (88.9%)	8 (88.9%)	<0.001
NSAIDS Pre Surgery (No)	1 (11.1%)	1 (11.1%)	
Baseline VAS	7.77 ± 1.98	8.00 ± 1.87	0.810
Baseline HADS Depression score	10.22 ± 9.90	7.55 ± 4.61	0.475
Baseline HADS Anxiety score	7.33 ± 5.40	9.25 ± 5.38	0.468
Baseline ODI	24.22 ± 9.48	21.33 ± 8.68	0.510

Female exhibited significantly greater reduction in pain intensity as measured by VAS at both 3 weeks (2.44 ± 0.53) and 6 weeks (2.11 ± 1.06) compared to male (5.11 ± 2.52 at 3 weeks and 5.11 ± 2.26 at 6 weeks), with p-values 0.007 and 0.002, respectively. Disability scores, as assessed by ODI, were also significantly lower in females at both 3 weeks (5.88 ± 2.14 vs. 17.33 ± 15.23; p=0.040) and 6 weeks (3.55 ± 1.23 vs. 14.44 ± 14.95; p=0.040) compared to males. However, no statistically significant differences were observed between genders in HADS scores for either depression or anxiety at 3 or 6 weeks (p>0.050) (Table 2).

Table 2: Comparison of Outcome Variables among Male and Female Gender

Variables		Male (n=9)	Female (n=9)	p-value
VAS	3 Weeks	5.11 ± 2.52	2.44 ± 0.53	0.007*
	6 Weeks	5.11 ± 2.26	2.11 ± 1.06	0.002*
HADS Depression Score	3 Weeks	6.88 ± 6.62	3.55 ± 2.24	0.172
	6 Weeks	5.33 ± 3.97	5.66 ± 4.89	0.867
HADS Anxiety Score	3 Weeks	5.11 ± 4.31	4.55 ± 3.28	0.762
	6 Weeks	4.88 ± 4.72	4.55 ± 3.71	0.870
ODI	3 Weeks	17.33 ± 15.23	5.88 ± 2.14	0.040*
	6 Weeks	14.44 ± 14.95	3.55 ± 1.23	0.040*

*Statistically significant at p<0.05.

DISCUSSION

The gender-related differences observed in our study are partly consistent with previous research. Several studies suggest that females may respond more favorably to epidural steroid injections (ESI), potentially due to biological or pain-processing differences. Davison *et al.* reported that male patients were more likely to fail non-surgical management for low back pain compared to female [17], and Şencan *et al.* also noted higher ESI success rates among women, though the difference did not reach significance [18]. Pericot-Mozo *et al.* in contrast to our psychological findings, found lower median HADS scores in females than males at follow-up [16]. However, other studies, including Monzon *et al.* [19], Raak *et al.* [20], and Ross [21], found no meaningful gender-related differences in ESI outcomes, suggesting that the influence of gender may vary across populations and clinical settings. Chronic lumbar pain is closely linked with psychosocial factors such as anxiety, depression, maladaptive coping, and fear-avoidant behaviors that can intensify pain perception and hinder functional recovery [22, 23]. These variables may contribute to inconsistencies in the literature, as psychological status can affect treatment response regardless of gender. Supporting this, Inman *et al.* emphasized the roles of coping mechanisms, expectations, and anxiety when evaluating sex-related differences in ESI response [11]. Overall, while some evidence suggests that gender may influence physical recovery following ESI, psychological outcomes appear more strongly shaped by individual psychosocial profiles than by gender alone.

This study has several limitations. Firstly, the small sample size limits the statistical power and generalizability of our findings. Secondly, follow-up period of only 6 weeks may not fully capture long-term effects of ESI on pain relief, disability, or psychosocial outcomes. Thirdly, although baseline characteristics were comparable, residual confounding factors such as physical activity level, socioeconomic status, or comorbidities may have influenced the outcomes. Future research should use larger, multicenter cohorts with longer follow-up to clarify the interplay of gender and psychosocial factors in ESI outcomes.

CONCLUSIONS

The current study suggests that female patients demonstrated greater reductions in pain (VAS) and disability (ODI) scores than male patients following fluoroscopy-guided epidural steroid injection, whereas changes in anxiety and depression (HADS) scores were comparable between genders. These findings indicate that gender may influence physical, but not psychological, recovery outcomes after the procedure.

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Formal analysis: MI, RK
Writing and Drafting: AB, RK, AK, AN, AW
Review and Editing: SWK, AURG, MI, AB, RK, AK, AN, AW

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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