

Original Research

## Autonomic Dysreflexia: Gaps in Awareness and Clinical Preparedness Among Healthcare Providers

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### ABSTRACT

**Background:** Autonomic dysreflexia (AD) is a potentially life-threatening emergency affecting patients with spinal cord injuries at or above T6 level. Despite its severity, healthcare provider knowledge regarding recognition and management remains understudied, particularly in developing healthcare systems.

**Objective:** To assess awareness and clinical preparedness regarding autonomic dysreflexia among healthcare providers in tertiary care settings in Pakistan.

**Materials and Methods:** This cross-sectional study utilized a structured questionnaire administered to 127 healthcare professionals (35 consultants, 92 residents) across three tertiary care hospitals in Rawalpindi and Islamabad, Pakistan. The survey assessed knowledge of AD pathophysiology, recognition, and management approaches. Data were analyzed using SPSS version 25.0.

**Results:** The mean age of participants was  $35.7 \pm 7.4$  years. Only 25.21% of respondents demonstrated adequate knowledge and preparedness for managing AD. Consultants showed significantly higher competency (48.15%) compared to residents (18.18%). Critical knowledge gaps were identified in first-line interventions, including proper patient positioning, identification and removal of noxious stimuli, and blood pressure management strategies.

**Conclusion:** This study reveals substantial gaps in awareness and clinical preparedness regarding autonomic dysreflexia among healthcare providers in Pakistan. The findings highlight an urgent need for targeted educational interventions, particularly for residents who often serve as first responders in emergencies.

**Keywords:** Autonomic dysreflexia, spinal cord injury, clinical preparedness, healthcare education, emergency management.

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## INTRODUCTION

Autonomic dysreflexia (AD) is a potentially life-threatening condition characterized by a constellation of symptoms affecting 48-90% of patients with spinal cord injuries (SCI) at or above the T6 level.<sup>1</sup> Typically emerging after spinal shock resolution, AD may develop within 2-4 weeks post-injury, with over 90% of cases manifesting within the first year.<sup>2</sup> The incidence and severity of AD correlate directly with the level and completeness of spinal cord injury, with approximately 17% of SCI patients experiencing at least one episode.<sup>3</sup>

AD presents with a characteristic clinical profile resulting from dysregulated sympathetic and parasympathetic activity, including sudden hypertension, bradycardia, headache, sweating, and piloerection.<sup>4</sup> Diagnostically, AD is defined as an increase of 40 mmHg in systolic blood pressure or 20 mmHg in diastolic blood pressure above baseline, or a systolic blood pressure of 150 mmHg when baseline measurements are unavailable.<sup>5</sup>

The pathophysiology involves exaggerated sympathetic outflow below the level of injury in response to noxious stimuli, most commonly bladder distension (>90% of cases) or bowel impaction. Other triggers include pressure ulcers, ingrown toenails, abdominal emergencies, labor, fractures, and various infections.<sup>6</sup> The absence of supraspinal inhibition results in uncontrolled sympathetic activity, causing vasoconstriction and hypertension. While baroreceptor-mediated vagal stimulation attempts to counteract this response through bradycardia, it cannot effectively reduce blood pressure due to the interrupted descending pathways.<sup>7</sup>

Without prompt intervention, AD can lead to

severe complications, including cerebrovascular accidents, intracranial hemorrhage, retinal hemorrhage, seizures, myocardial infarction, cardiac arrhythmias, and pulmonary edema.<sup>8</sup> Management focuses on identifying and eliminating the triggering stimulus while implementing measures to control blood pressure.

Despite the critical nature of this condition, awareness and clinical preparedness among healthcare providers remain suboptimal, potentially resulting in delayed diagnosis and improper management. While the literature emphasizes the importance of early recognition and intervention, studies evaluating healthcare provider preparedness in managing AD are limited, particularly in developing healthcare systems.

This study aims to assess knowledge gaps and clinical preparedness regarding AD among healthcare professionals in tertiary care settings in Pakistan, where trauma-related spinal cord injuries are common. The findings will help identify specific training needs and inform the development of targeted educational interventions.

## MATERIALS AND METHODS

### Study Design and Setting

This cross-sectional, questionnaire-based study was conducted across three tertiary care hospitals in Rawalpindi and Islamabad, Pakistan, after obtaining approval from the institutional ethics committee.

### Participants

Healthcare providers who potentially encounter SCI patients were recruited, including consultants and residents from various specialties: surgery, anesthesia, internal medicine, neurology, cardiology, radiology, spinal surgery, neurosurgery, and physical medicine & rehabilitation. A total of 127 healthcare professionals participated, comprising 35 consultants and 92 residents.

### Survey Instrument

A structured questionnaire was developed to evaluate awareness and clinical preparedness regarding AD. The instrument contained three main sections:

1. **Demographics:** Professional designation, years of experience, specialty, and prior AD training.
2. **Recognition and Knowledge:** Understanding of AD triggers, symptoms, pathophysiology, and complications.
3. **Clinical Preparedness:** Self – reported confidence in managing AD, awareness of hospital protocols, and familiarity with first-line interventions

### Data Collection

After obtaining informed consent, questionnaires were distributed during academic gatherings, including symposiums, lectures, clinico-pathological conferences, and journal club sessions over two weeks. Participation was voluntary and anonymous.

### Statistical Analysis

Statistical analysis was conducted using SPSS software (version 25.0). For continuous variables, results were expressed as mean values with corresponding standard deviations, while categorical data were presented as percentages. Statistical comparisons between the consultant and resident groups were executed using suitable statistical methods, with statistical significance established at  $p < 0.05$ .

## RESULTS

### Demographic Characteristics

A total of 127 healthcare providers completed the questionnaire. The mean age of participants was  $35.7 \pm 7.4$  years. The sample included 35 consultants (27.6%) and 92 residents (72.4%).

### Knowledge Assessment

Overall, only 32 participants (25.21%) demonstrated adequate knowledge of AD by achieving passing scores on the assessment, while 95 (74.79%) showed significant knowledge deficits (Figure 1). Among consultants, 17 (48.57%) achieved passing scores compared to only 15 residents (16.30%), revealing a statistically significant difference in knowledge levels between the two groups (Figure 2).

### Clinical Preparedness

The assessment of clinical preparedness revealed critical gaps in knowledge of first-line interventions, including:

- Proper positioning of patients (sitting upright).
- Identification and removal of noxious stimuli (particularly bladder catheterization).
- Blood pressure management strategies.

Many participants were unfamiliar with institutional protocols for managing AD, and a substantial proportion reported low confidence in their ability to recognize and manage this condition effectively.

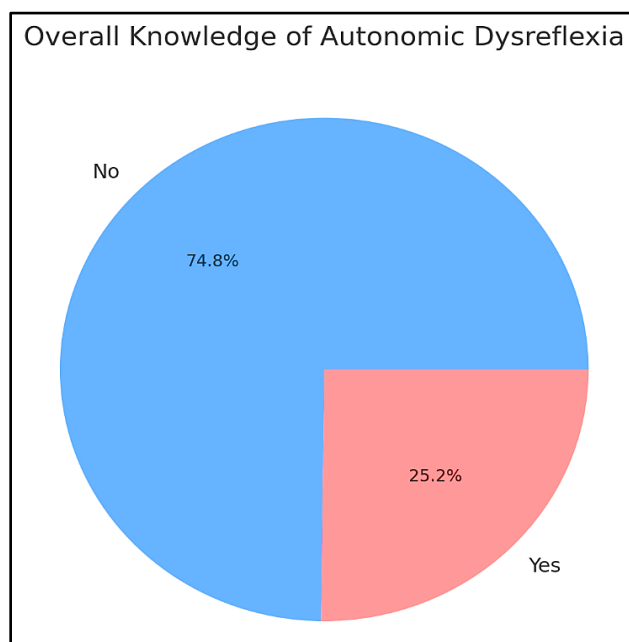


Figure 1: Overall Knowledge of Autonomic Dysreflexia.

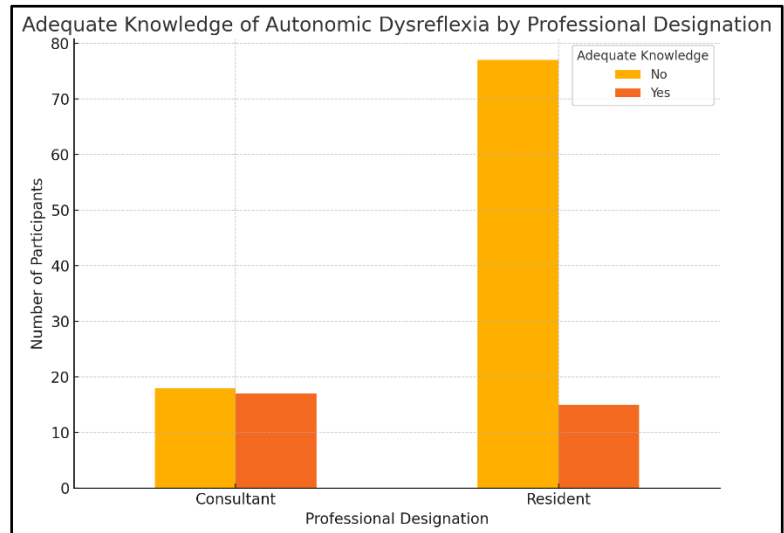
## DISCUSSION

This study reveals concerning gaps in both awareness and clinical preparedness regarding autonomic dysreflexia among healthcare providers in tertiary care settings in Pakistan. Despite AD being a well-documented emergency, only one-quarter of respondents demonstrated sufficient knowledge to manage this condition effectively.

The disparity in knowledge between consultants and residents is particularly noteworthy, with consultants showing significantly higher competency levels. However, even among consultants, more than half lacked adequate knowledge about AD management. This finding is concerning given that AD requires prompt recognition and intervention to prevent potentially fatal complications.

The low preparedness among residents (18.18%) is especially problematic since they often serve as first responders in emergencies. This highlights a critical gap in medical education and training programs. Studies from developed healthcare systems have consistently shown that early recognition and intervention significantly reduce AD-related morbidity and mortality. In contrast, our findings suggest that many tertiary care physicians in Pakistan are unfamiliar with first-line interventions, potentially leading to delayed diagnosis and increased risk of serious complications.

The knowledge deficits identified in this study align with findings from international research suggesting that AD remains underrecognized in many healthcare settings. The condition was first documented in case reports by Hilton and Bowlby in 1860 and 1890, respectively, yet awareness remains limited among healthcare professionals.<sup>9</sup> This is particularly concerning given that "silent dysreflexia" (elevated blood pressure without symptoms) may occur in up to 43% of men with



**Figure 2:** Knowledge by Different Professions.

SCI at T6 and above during bladder voiding, which would go undetected without proper monitoring.<sup>10</sup>

The management of autonomic dysreflexia (AD) requires simultaneous diagnostic evaluation and blood pressure control. Initial intervention involves positioning the patient upright and loosening constrictive clothing and devices (wristwatches, catheter straps, compression stockings, abdominal binders)<sup>11</sup>. Subsequently, systematic identification and elimination of noxious stimuli should be initiated.

### Trigger Identification and Removal

Bladder distention and bowel impaction represent the predominant triggers for AD episodes. Assessment should begin with evaluation of the urinary system by flushing indwelling catheters or performing catheterization if not already present. Lidocaine gel application is recommended before catheterization or digital rectal examination to prevent further noxious stimulation. Other potential triggers include pressure ulcers, ingrown toenails, and renal calculi.<sup>12</sup> When no obvious reversible cause is identified, a comprehensive investigation including abdominal and retroperitoneal imaging is warranted.

## Pharmacological Management

Antihypertensive therapy should be initiated when systolic blood pressure exceeds 150 mmHg and causative factors cannot be rapidly identified. In cases where bladder management fails to normalize blood pressure, medication should precede evaluation for fecal impaction. For persistent hypertension, 0.5-1 inch of nitroglycerin ointment may be applied topically, offering the advantage of easy removal if hypotension develops. While sublingual nifedipine was historically utilized, it is no longer recommended due to hypotension risk. For patients recently administered sildenafil, alternative agents such as prazosin or captopril are preferred due to contraindications with nitrates. Additional pharmacological options include diazoxide, sodium nitroprusside, hydralazine, and labetalol.<sup>13</sup>

## Monitoring Protocol

Blood pressure should be monitored at 2–5-minute intervals during the acute episode and for a minimum of 2 hours following symptom resolution to detect recurrence.<sup>14</sup>

## Special Considerations in Pregnancy

Autonomic dysreflexia represents a significant complication in pregnant women with spinal cord injuries at or above T6.<sup>15</sup> Risk is highest during labor but persists throughout pregnancy. AD-associated hypertension must be differentiated from preeclampsia based on clinical presentation. Epidural anesthesia is recommended during labor regardless of sensory deficit. Potential life-threatening complications include intracranial hemorrhage, retinal hemorrhage, seizures, myocardial infarction, cardiac arrhythmias, and pulmonary edema.<sup>16</sup>

## Preventive Strategies

Prophylactic management may occasionally be indicated using  $\alpha$ - and  $\beta$ -adrenergic blocking

agents. For surgical procedures and childbirth in high-risk patients, regional anesthesia is recommended<sup>17</sup>

Our findings highlight the urgent need for comprehensive educational interventions targeting healthcare providers who manage SCI patients. These interventions should emphasize the pathophysiology, recognition, and management of AD, with particular focus on first-line interventions and the importance of prompt action.

## CONCLUSION

This study demonstrates that knowledge about autonomic dysreflexia is alarmingly deficient among healthcare providers in tertiary care settings in Pakistan. The findings highlight an urgent need for targeted educational interventions to improve awareness and clinical preparedness, particularly among residents who often serve as first responders.

Given the potentially life-threatening nature of AD and the high prevalence of spinal cord injuries in Pakistan, implementing structured training programs and standardized management protocols is essential. A nationwide initiative to raise awareness through seminars, workshops, and simulation training could significantly improve outcomes for patients at risk of this serious complication.

## Recommendations

1. Incorporate formal AD training in medical and nursing curricula.
2. Develop and implement standardized AD management protocols in all healthcare facilities.
3. Provide regular simulation-based training for healthcare teams.
4. Create and distribute educational materials for healthcare providers and patients.
5. Establish a nationwide awareness program

through seminars, workshops, and poster presentations.

6. Conduct follow-up studies to evaluate the impact of educational interventions.

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**Additional Information**

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**Human Subjects:** Consent was obtained by all patients/participants in this study.

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**Financial Relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

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**AUTHORS CONTRIBUTIONS**

Sr.#	Author’s Full Name	Intellectual Contribution to Paper in Terms of:
1.	Muhammad Shoaib, & Muhammad Usman	1. Study design and methodology.
2.	Muhammad Shoaib, Muhammad Usman, & Musab bin Noor	2. Paper writing.
3.	Muhammad Shoaib, Musab bin Noor, & Syed Tamim Ul Hassan	3. Data collection and calculations.
4.	Faraz Tahir, & Taimoor Ali	4. Analysis of data and interpretation of results.
5.	Muhammad Shoaib, Muhammad Usman, & Faraz Tahir	5. Literature review and referencing.
6.	Muhammad Usman, Syed Tamim Ul Hassan, & Taimoor Ali	6. Editing and quality insurer.