

## PREVALENCE OF PROLAPSED INTERVERTEBRAL DISC WITH LOW BACK PAIN IN CHEF - CROSS SECTIONAL STUDY

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### ABSTRACT

**Background:** Low back pain (LBP) is a common musculoskeletal disorder and a leading cause of disability globally. Prolapsed intervertebral disc (PIVD) is a major structural contributor to LBP, causing localized pain, radiating symptoms, and functional limitations. Chefs are at high risk due to prolonged standing, repetitive bending, lifting, and awkward postures in confined kitchen spaces, which increase lumbar disc stress and degeneration. Despite this, limited data exist on PIVD prevalence in chefs, particularly in India.

**Objective:** To determine the prevalence of PIVD among chefs with LBP, assess associated disability, and identify occupational risk factors.

**Methods:** A cross-sectional study included 43 professional chefs from Ahmedabad, Gujarat, recruited via convenience sampling. Inclusion criteria were LBP with or without radiculopathy, positive clinical signs on Straight Leg Raise (SLR) or Slump Test, and ≥4–5 hours of daily kitchen work. Exclusion criteria included prior spinal surgery, systemic or non-PIVD causes of pain, and neurological red flags. Participants underwent SLR and Slump Tests, and completed the Oswestry Disability Index (ODI) to evaluate functional impairment. Data were analyzed using SPSS v25; p < 0.05 was considered significant.

**Results:** Participants had a mean age of  $41.95 \pm 4.41$  years; 53.48% were female. Radiating pain was reported by 93.02%. SLR positivity was observed in 39.53% and Slump Test positivity in 20.93%. ODI scores indicated severe disability in 55.81% and crippled status in 9.3%. A significant correlation was found between pain duration and disability severity ( $p = 0.001$ ), with longer pain associated with higher functional limitations.

**Conclusion:** PIVD is prevalent among chefs with LBP, particularly in those with prolonged pain and higher disability. Early screening, ergonomic modifications, posture education, and physiotherapy interventions are critical to prevent progression to chronic disability.

**Keywords:** Low Back Pain (LBP), Prolapsed Intervertebral Disc (PIVD), chefs, occupational health, Oswestry Disability Index (ODI), Straight Leg Raise (SLR) Test, Slump Test

## INTRODUCTION

Low back pain (LBP) is a major global health problem and one of the most common musculoskeletal complaints affecting individuals across various age groups and occupations.<sup>(1)</sup> It is recognized as the leading cause of disability worldwide and contributes significantly to work absenteeism, reduced productivity, and poor quality of life. Among the multiple etiologies of LBP, prolapsed intervertebral disc (PIVD) is a key structural cause, often resulting from progressive disc degeneration, repetitive mechanical loading, or acute trauma to the spinal region.<sup>(2)</sup> PIVD can lead to symptoms ranging from localized lumbar pain to radiating leg pain, neurological deficits, and significant functional limitations.<sup>(3)</sup>

The culinary profession specifically chefs is characterized by high physical demands, repetitive tasks, and prolonged work hours, making this group vulnerable to developing lumbar spine disorders. Chefs commonly spend long shifts standing in static postures, bending forward over counters, lifting heavy pots or crates, reaching overhead, and performing rapid, repetitive cutting or stirring movements. These repeated biomechanical loads increase intradiscal pressure and accelerate degeneration of the lumbar intervertebral discs. Continuous exposure to such stressors without proper ergonomic support contributes to cumulative trauma, predisposing chefs to disc protrusion or herniation.<sup>(4,5)</sup>

Many professional kitchens are designed with limited space and often lack adjustable-height workstations, compelling chefs to work in sustained forward-flexed postures. Prolonged trunk flexion increases the load on the lumbar discs by up to four to five times compared to standing upright.<sup>(6)</sup> Such positions reduce disc hydration and nutrient exchange, making the spine more susceptible to microtears and peripheral annulus damage that can lead to disc prolapse.<sup>(7)</sup> Furthermore, the fast-paced nature of food preparation requires frequent twisting, reaching, pushing, and pulling movements tasks that elevate the risk of lumbar injury when performed repetitively or without adequate rest.<sup>(6,7)</sup>

Several occupational health studies have shown that jobs involving heavy lifting, awkward postures, and repetitive bending have a significantly higher incidence of lumbar disc herniation.<sup>(8)</sup> Although much research has investigated musculoskeletal disorders in healthcare workers, factory workers, and construction workers, comparatively fewer studies have focused on chefs despite their clear exposure to similar risk factors.<sup>(9)</sup> Previous evidence suggests that kitchen workers report high rates of musculoskeletal discomfort, particularly in the lower back, neck, and shoulders. In fact, some studies indicate that 60 - 90% of culinary workers experience LBP during their careers, yet early pathology, including PIVD, often remains underdiagnosed due to demanding work schedules and limited access to ergonomic training.<sup>(8,9,10)</sup>

The development of PIVD among chefs is not only influenced by mechanical factors but also by psychosocial elements such as high job stress, time pressure, and long, irregular working hours. Evidence indicates that stress-related muscle tension can further compromise spinal biomechanics, increasing the vulnerability of

intervertebral discs to injury. Chefs often work in high-heat environments with limited opportunities for rest breaks, compounding fatigue and reducing the body's ability to maintain optimal posture during prolonged tasks. Lifestyle factors such as insufficient physical activity, smoking, poor core strength, and inadequate recovery may also contribute to degenerative disc changes, thereby increasing the risk of PIVD.<sup>(8,10,11)</sup>

From a public health and occupational health perspective, it is critical to evaluate the prevalence of PIVD in chefs, as unmanaged disc herniation can progress to chronic pain, reduced mobility, and long-term disability. Early detection not only improves individual health outcomes but also reduces economic burdens on employers due to absenteeism or presenteeism.<sup>(12)</sup> Understanding the prevalence will aid in designing preventive strategies such as ergonomic workstation modification, training in safe lifting techniques, regular physiotherapy screening, and strengthening programs focused on core and lumbar stabilization.<sup>(8)</sup>

Despite the evident occupational demands placed on chefs, there is a scarcity of Indian studies assessing the burden of PIVD specifically in this population. Most available literature focuses broadly on LBP, with limited data linking PIVD to specific work-related risk factors in culinary environments. Therefore, a cross-sectional study exploring the prevalence of PIVD among chefs with low back pain is essential to bridge this gap. Such a study will not only quantify the extent of disc pathology but also help identify modifiable ergonomic and lifestyle risk factors that can guide targeted interventions and workplace reforms.

This research aims to comprehensively assess the prevalence of prolapsed intervertebral disc in chefs experiencing LBP, evaluate associated occupational risk factors, and provide evidence-based recommendations for prevention and early management. The findings are expected to contribute significantly to occupational health policies, physiotherapy guidelines, and ergonomic solutions within the culinary industry.

## METHODOLOGY

### AN INTERNATIONAL JOURNAL

**Study Design:** This study was a cross-sectional observational study conducted to determine the prevalence of Prolapsed Intervertebral Disc (PIVD) among chefs presenting with low back pain (LBP) in Ahmedabad, Gujarat.

**Study Population:** The study population consisted of professional chefs working in restaurants, hotels, and commercial kitchens across Ahmedabad, who reported symptoms of low back pain with or without radiculopathy.

**Study Duration:** The total duration of the study was 1 year.

**Sample Size:** A total of 43 participants were enrolled in the study.

**Sampling Method:** A convenience sampling method was used to recruit chefs who fulfilled the inclusion criteria and voluntarily agreed to participate.

**Selection criteria:** Participants for the study were selected based on specific inclusion and exclusion criteria to ensure accurate identification of chefs with signs of Prolapsed Intervertebral Disc (PIVD). The inclusion criteria required professional chefs experiencing low back pain (LBP), with or without radiating pain into one or both lower limbs. Only individuals engaged in prolonged standing or kitchen-related work for approximately 4 - 5 hours daily an occupational factor known to contribute to mechanical stress on the lumbar spine were considered. Participants were included if they presented with acute or subacute LBP that had not progressed to the chronic stage and demonstrated positive clinical findings on special tests, such as a Straight Leg Raise (SLR) angle restricted between 30° and 70°, or evidence of sciatica due to nerve root compression from disc herniation or vertebral osteophytes.

The exclusion criteria ruled out chefs who did not report LBP or radicular symptoms, those with a history of spinal surgery, and individuals showing clinical signs or confirmed diagnosis of cauda equina syndrome. Participants with back or leg pain originating from systemic, medical, or non-PIVD causes were excluded. Additionally, chefs presenting with neurological red flags such as saddle anesthesia, pain radiating to the shoulder blade, tingling sensations in the arms or legs, or loss of bladder or bowel control were not included in the study to avoid confounding conditions unrelated to lumbar disc pathology.

## Materials Used

- Mat: Used for positioning participants during the Slump Test and SLR Test.
- Pen: For documenting observations and recording data.
- Paper: For maintaining participant records and test outcomes.
- Scales/Measurement Tools: Used for scoring and evaluating outcome measures such as ODI.

**Outcome measurement:** The outcome measurements in this study included the Slump Test, Straight Leg Raise (SLR) Test, and the Oswestry Disability Index (ODI). The Slump Test was used as a neurodynamic assessment to evaluate neural tissue mobility and tension, particularly of the sciatic nerve, helping identify symptoms associated with lumbar disc herniation. During this test, the participant sat upright and sequentially underwent spinal flexion, cervical flexion, knee extension, and ankle dorsiflexion. Reproduction of radicular symptoms such as shooting pain or tingling indicated a positive result suggestive of neural irritation linked to PIVD.



Figure 1: SLUMP test



Figure 2 : SLR test

The Straight Leg Raise (SLR) Test was performed with the participant in a supine position, where the examiner passively lifted the straightened leg to determine the angle at which pain or neurological symptoms occurred. Radicular pain occurring between 30° and 70° of hip flexion was considered a positive finding, reflecting nerve root compression commonly seen in PIVD.

Oswestry Disability Index (ODI) was administered as a validated self-report questionnaire to quantify functional disability related to low back pain. It comprises 10 sections addressing daily activities, each scored from 0 to 5, and the total score was converted into a percentage to categorize disability levels ranging from minimal to severe. Together, these outcome measures provided a comprehensive assessment of neural involvement, radicular symptoms, and functional impairment among chefs experiencing low back pain.

**Procedure:** This cross-sectional prevalence study was conducted on a sample of 43 professional chefs to assess the presence of Prolapsed Intervertebral Disc (PIVD) among individuals experiencing low back pain (LBP). After obtaining ethical clearance from the Institutional Ethics Committee and securing informed consent from all participants, eligible chefs were selected through a convenience sampling method based on predefined inclusion and exclusion criteria.

Participants were informed about the study objectives, the significance of spinal health, and the importance of ergonomics in reducing the risk of PIVD. Clinical screening was then performed, which included administering the Straight Leg Raise (SLR) Test and the Slump Test to identify signs of neural tension and potential disc herniation. In addition to clinical tests, the Oswestry Disability Index (ODI) questionnaire was used to evaluate the extent of functional impairment associated with LBP.

Suspected cases of PIVD were identified based on the combined results of SLR, Slump Test, and ODI scores. The collected data were systematically analyzed to determine the prevalence of suspected PIVD and to explore its association with the duration of pain and the reported level of disability.

Finally, participants received physiotherapy recommendations and ergonomic advice aimed at promoting musculoskeletal health and preventing further complications.

**Statistical Analysis:** Data were analyzed using SPSS version 25.0. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to describe demographic variables and outcome measure scores. The prevalence of PIVD was calculated using proportion analysis. Associations between clinical findings and disability levels were evaluated, and a p-value < 0.05 was considered statistically significant.

## RESULTS

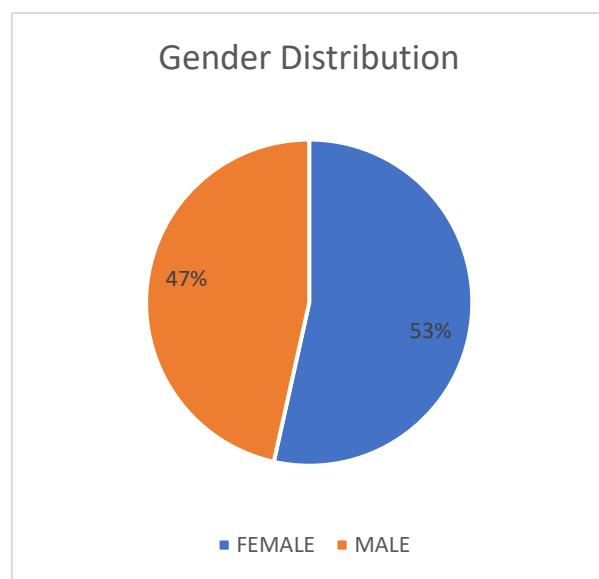
**Table 1: Distribution of the study patients by age (n=43)**

Age	Mean	SD
	41.95	4.41

The average age of the study participants was approximately 42 years, with a standard deviation of

4.41, indicating a moderate spread around the mean age.

### Chart 1: Gender Distribution



The gender distribution of the study participants showed that out of 43 individuals, 23 (53.48%) were female and 20 (46.52%) were male, indicating a slightly higher representation of females in Study.

**Table 2: Duration of Pain, Radiating Pain, and Seat Compatibility Among Study Participants**

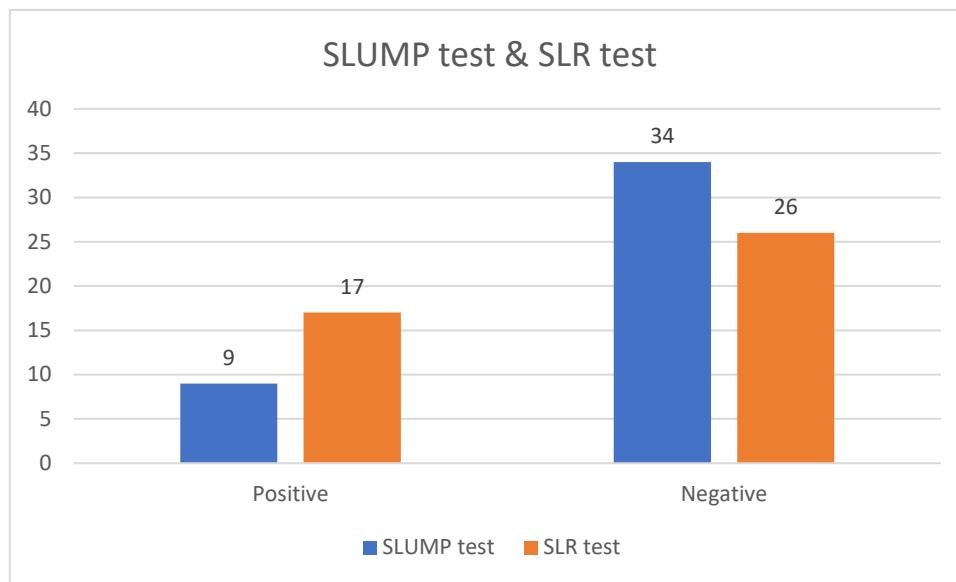
Parameter	Category	Frequency	Percentage (%)
<b>Duration of Pain (Months)</b>	≤ 6	28	65.11
	7–12	14	32.55
	≥ 12	1	2.33
Mean ± SD		5.04 ± 2.69	
<b>Radiating Pain</b>	Yes	40	93.02
	No	3	6.98
<b>Seat Compatibility</b>	Comfortable	22	51.16
	Satisfactory	21	48.84

Most participants (65.11%) had pain for less than 6 months, with an average duration of about 5 months. A very high proportion (93.02%) reported radiating pain, indicating nerve-related symptoms in the majority. Seat compatibility responses were almost evenly split, with 51.16% finding their seat comfortable and 48.84% rating it as satisfactory, suggesting that seating ergonomics may not be optimal for many participants.

**Table 3: Distribution of Participants Based on SLUMP Test and SLR Test Results (n = 43)**

Test Type	Positive		Negative	
	Frequency	Percentage (%)	Frequency	Percentage (%)

SLUMP Test	9	20.93	34	79.07
SLR Test	17	39.53	26	60.47

**Chart 2: SLUMP test and SLR test**

The results show that 20.93% of participants had a positive SLUMP test, while the majority (79.07%) tested negative, indicating that fewer individuals showed signs of neural tension through this test. In contrast, the SLR test identified a higher proportion of positive cases (39.53%), suggesting more participants showed signs of nerve root irritation or possible disc involvement. Overall, the SLR test detected more suspected PIVD-related findings than the SLUMP test, indicate its higher sensitivity in this group of chefs with low back pain.

**Table 4: Distribution of the study patients according to Oswestry disability index (n=43)**

Oswestry disability index	Mean	SD
Pain intensity	2.88	1.25
Personal care	2.11	1.21
Lifting	2.3	0.96
Walking	2.13	0.98
Sitting	2.16	1.06
Standing	2.09	1.01
Sleeping	1.46	1.09
Sex life	2.13	0.91
Social life	2.25	0.81
Travelling	2.11	0.76

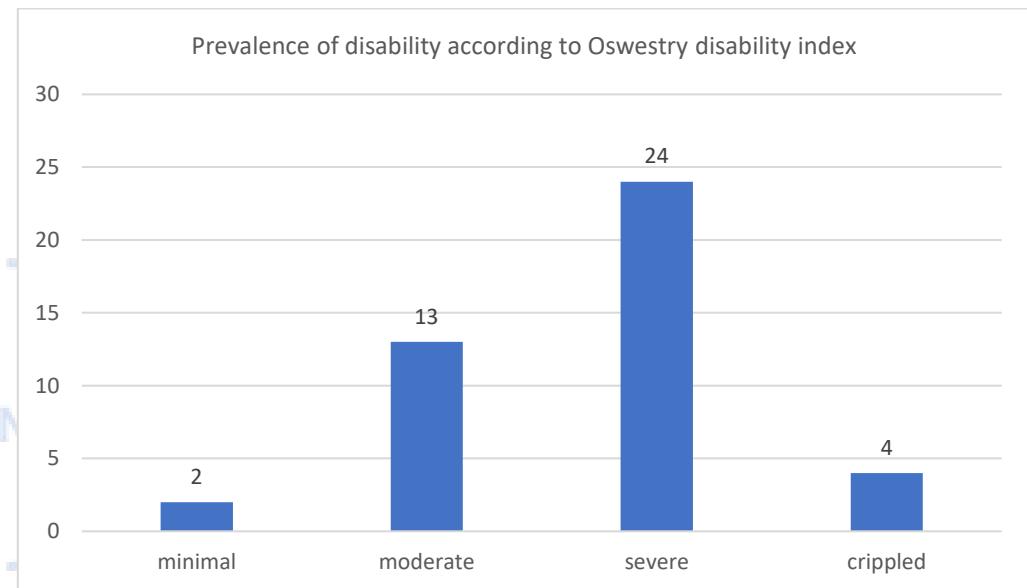
The Oswestry Disability Index scores show that pain intensity had the highest mean value (2.88), indicating it was the most significant contributor to disability among participants. Activities such as lifting, social life, sitting, walking, and personal care also showed moderate difficulty, with mean scores ranging from 2.09 to

2.30. Domains like standing, sex life, and travelling had similar moderate impact. Sleeping had the lowest score (1.46), suggesting fewer sleep-related issues. Overall, the participants experienced mild to moderate functional limitations across most daily activities, primarily driven by pain and activity-related discomfort.

**Table 5: Prevalence of disability according to Oswestry disability index (n=43)**

Disability	Frequency	Percentage (%)
Minimal	2	4.65
Moderate	13	30.23
Severe	24	55.81
Crippled	4	9.3

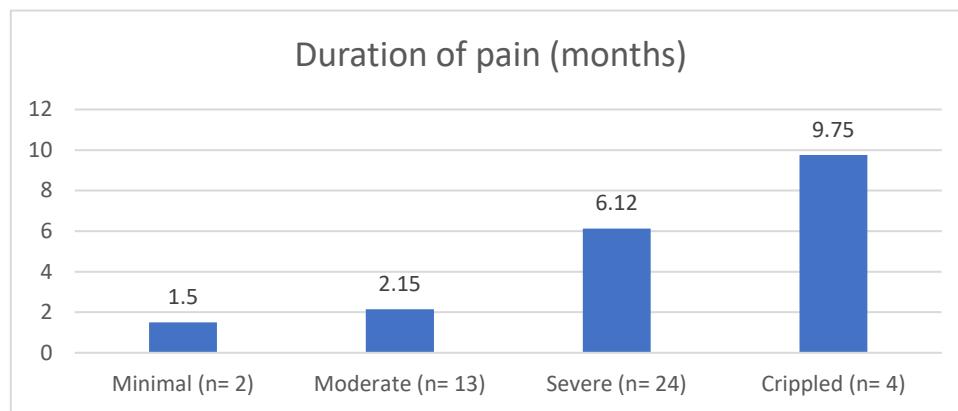
**Chart 3: Prevalence of disability according to Oswestry disability index**



Most participants showed a high level of disability according to the Oswestry Disability Index. More than half (55.81%) had severe disability, while 30.23% had moderate disability, indicating substantial functional limitations in daily activities. A small proportion were classified as crippled (9.3%), reflecting extreme disability, and only 4.65% had minimal disability, showing that very few participants had near-normal functioning.

**Table 6: Association between duration of pain with disability (n=43)**

Disability (N= 43)	Duration of pain (months)		p value
	mean	SD	
Minimal (n= 2)	1.5	0.7	0.001
Moderate (n= 13)	2.15	0.93	
Severe (n= 24)	6.12	1.26	
Crippled (n= 4)	9.75	1.7	

**Chart 4: Association between duration of pain with disability (n=43)**

The findings show a strong association between the duration of pain and the severity of disability. Participants with minimal disability had the shortest pain duration (mean 1.5 months), while those with moderate disability reported slightly longer pain duration (2.15 months). Pain duration increased substantially in the severe disability group (6.12 months) and was highest among those classified as crippled (9.75 months). The statistically significant p-value (0.001) indicates that longer pain duration is strongly linked to higher disability levels. This suggests that delayed management of symptoms may contribute to worsening functional impairment.

## DISCUSSION

### INDIAN JOURNAL OF PHYSICAL THERAPY

This cross-sectional study investigated the prevalence of lumbar prolapsed intervertebral disc (PIVD) among chefs experiencing low back pain (LBP) and examined the associated disability levels. Chefs commonly work under physically demanding conditions involving prolonged standing, bending, lifting heavy utensils, and repetitive trunk movements all of which increase the mechanical load on the lumbar spine. A total of 43 chefs were assessed through clinical tests such as the Straight Leg Raise (SLR) and Slump Test, along with the Oswestry Disability Index (ODI) to evaluate functional impairment.

The study findings indicate a high prevalence of suspected PIVD among chefs, reinforcing the notion that culinary professions pose significant occupational risks for lumbar spine disorders. Similar trends have been reported in previous studies globally. Subramaniam et al.<sup>27</sup> documented a 65.8% prevalence of LBP among South Indian kitchen workers, while Yates<sup>28</sup> reported musculoskeletal discomfort in 98.1% of Canadian food-service workers, with 68.5% specifically reporting LBP. These values closely mirror the prevalence observed in our cohort.

Occupational risk factors identified in earlier research closely align with those in the present study. Nagasu<sup>(13)</sup> highlighted that large kitchen environments, absence of rest breaks, and poorly adjusted workstations were significant contributors to LBP among Japanese cooks. These findings parallel our sample, where 93% reported radiating pain and many worked extended hours in ergonomically stressful environments. Similar ergonomic challenges have been documented in Indian, Malaysian, and Korean culinary workplaces, where

poor postures, repetitive bending, and inadequate lumbar support were strongly associated with LBP.<sup>(14,15,16)</sup> Studies from Taiwan<sup>(17)</sup> and India<sup>(18)</sup> further emphasize the role of prolonged standing and heavy lifting in increasing lumbar musculoskeletal strain.

An important finding of the present study is the strong positive correlation between pain duration and disability severity. Participants with minimal disability reported an average pain duration of 1.5 months, while those categorized as crippled averaged nearly 10 months of symptoms. This pattern supports existing chronicity models suggesting that persistent LBP beyond 6 - 12 months significantly increases the risk of long-term functional decline.

Biomechanically, chefs frequently adopt sustained forward-flexed postures, repetitive twisting, and load-handling activities, which increase compressive and shear forces on the intervertebral discs—particularly at the L4 - L5 and L5 - S1 segments. Al Amer<sup>(19)</sup> and Murtezani<sup>(20)</sup> similarly reported that bending, twisting, and lifting are major contributors to LBP in occupations involving physical labour. Improper kitchen layouts, confined spaces, and lack of ergonomic considerations further exacerbate disc degeneration and lumbar strain, as demonstrated in studies exploring trunk load and postural demands in work environments.<sup>(21)</sup> Footwear and hard flooring conditions also play a role by amplifying ground reaction forces that are transmitted to the spine.<sup>42</sup> Additionally, inadequate core endurance and poor postural awareness shift load-bearing demands onto passive spinal structures, further increasing the risk of injury.<sup>(20,21)</sup>

Given these risks, ergonomic interventions are essential for reducing LBP and preventing progression to PIVD among chefs. Evidence from various occupational health studies suggests that comprehensive ergonomic programs combining education, workstation modification, and physical conditioning are more effective than education alone. For example, Aghilinejad M<sup>(22)</sup> demonstrated a significant reduction in LBP after ergonomic workshops, while Chanchai<sup>(23)</sup> reported improvements in musculoskeletal symptoms through participatory ergonomic approaches. Pehlevan<sup>(24)</sup> found that combining ergonomics education with core stabilization exercises significantly decreased ODI scores, fatigue, and pain levels among factory workers. Emerging technologies such as wearable posture sensors and supportive exoskeletons also show potential for reducing lumbar load in high-risk jobs, as discussed by Lazzaroni.<sup>(25)</sup>

Educating chefs on proper biomechanics such as hip-hinge lifting techniques and core stabilization combined with ergonomic kitchen design and adequate rest breaks, may help reduce the risk of lumbar disc injuries. These practical strategies align with anecdotal guidance from chef communities, which emphasize posture correction, mobility routines, and supportive footwear.

Overall, this study highlights a notable prevalence of suspected PIVD and significant disability among chefs, underscoring the occupational hazards inherent to culinary work. The strong association between prolonged pain duration and higher disability levels reinforces the importance of early detection and timely physiotherapy interventions. Implementing ergonomic modifications, promoting awareness of spinal health,

and encouraging preventive physical conditioning are crucial steps toward improving musculoskeletal well-being and reducing the long-term burden of spinal disorders in the culinary profession.

## CONCLUSION

This study reveals a considerable prevalence of radiologically confirmed PIVD among chefs suffering from low back pain, particularly in those with severe and crippled disability levels. Notably, participants with confirmed PIVD had significantly longer durations of pain, suggesting that chronic LBP may be predictive of underlying disc pathology. These findings underscore the urgent need for ergonomic interventions, early clinical screening, and targeted physiotherapy to prevent progression to chronic disability in culinary professionals. Integrating spine health education and regular musculoskeletal assessments in the hospitality industry could significantly reduce the burden of occupational back disorders like PIVD.

The present study has certain limitations, including a small sample size, convenience sampling, and reliance on self-reported outcomes, which may affect the accuracy and generalizability of the findings. The absence of radiological confirmation and the exclusive focus on chefs also restrict broader comparison and diagnostic precision, while the cross-sectional design prevents establishing cause-effect relationships. Future research should involve larger and more diverse samples, incorporate radiological tools such as MRI, and compare chefs with other professions to gain wider occupational insights. Additionally, evaluating ergonomic interventions, integrating objective physical assessments, and developing structured ergonomic training programs may help reduce the risk and impact of PIVD in culinary workers.

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