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Acute low back pain: Epidemiology, etiology, and prevention: WFNS spine committee recommendations

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ABSTRACT

Objective: Acute low back pain is a highly prevalent condition that poses significant challenges to healthcare systems worldwide. In this manuscript, we present the most current, evidence-based guidelines from the World Federation of Neurosurgical Societies (WFNS) Spine Committee on the epidemiology, etiology, and prevention of acute low back pain (LBP) lasting $\leq$ 4 weeks.

Methods: We performed a literature review 2012–2022 using the PubMed, Medline, and CENTRAL databases with the keywords "acute low back pain", "acute back pain", "low back pain", "epidemiology", "etiology", "costs", "risk factor", "cultural", "developed", "developing" and "prevention". Systematic screening criteria were applied, resulting in 13 final articles on epidemiology and etiology of LBP, 2 manuscripts on costs, 5 articles on risk factors, and 23 articles on prevention strategies for acute LBP. These were presented at two separate international meetings, where members of the WFNS Spine Committee voted on five final consensus statements presented here.

Results: and Conclusions: There is a high incidence and prevalence of acute LBP, particularly in high-income countries, which is felt to be at least partially due to demographic shifts with an aging population and lifestyle changes including higher rates of obesity and physical inactivity. Acute LBP has a significant impact on quality of life and ability to work, resulting in high direct and indirect costs worldwide. Early diagnosis and appropriate management of acute LBP is recommended to prevent this pain from turning into chronic LBP. The WFNS Spine Committee's recommendations respresent the latest guidelies to help improve patient care for acute LBP worldwide.

1. Introduction

Acute low back pain (LBP) is one of the most common reasons why individuals seek consultation with general physicians.[1] Its relevance has been increasing due to factors such as population aging, the adoption of less physically demanding lifestyles in different cultures, and the accumulation of multiple risk factors.[2] Acute LBP is characterized by the sudden or gradual onset of pain in the lower back, lasting from a few days up to four weeks.[3] Patients often describe the pain as stabbing, tearing, or cutting; it sometimes radiates into the lower extremities, producing "sciatic-like" symptoms. Importantly, acute LBP leads to a significant reduction in quality of life, limited participation in daily activities, and decreased work capacity.[4]

This paper focuses exclusively on acute low back pain, as it differs from chronic low back pain in terms of duration and underlying factors. Chronic low back pain is known to have a more complex etiology and is influenced by a wider range of factors, including social, psychological, and cultural elements, that can have a more profound impact on chronic than acute LBP.[5] It is therefore critical to treat these two conditions as distinct entities.

The goal of this study was to perform a systematic literature review of all relevant recent studies on the epidemiology, etiology, and pretention of acute LBP lasting $\leq$ 4 weeks. We then used a Delphi method with two consensus meetings to generate five consensus statements from the World Federation of Neurosurgical Societies (WFNS) Spine Committee. These guidelines provide the latest evidence-based

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recommendations to enhance spine care and facilitate decision-making for healthcare professions and patients worldwide.

2. Methods

Members of the WFNS Spine Committee conducted a systematic literature review on the epidemiology (including prevalence and incidence), etiology (including risk factors, costs and ramifications), and potential prevention strategies for acute LBP. There was a particular emphasis on gathering data in both developed and developing regions worldwide, encompassing diverse cultural and socioeconomic backgrounds. Following PRISMA and Cochrane guidelines[6], the authors performed a search 2012–2022 in the PubMed, Medline, and CENTRAL online databases using various combination of the following keywords: "acute low back pain", "acute back pain", "low back pain", "epidemiology", etiology", "costs", "risk factor", "cultural", "developed", "developing" and "prevention".

Search strategy and screening criteria are shown in Figs. 1–4. In brief, duplicate articles, manuscripts without available full text, studies not in English, studies with <50 participants, non-human studies, and clinically non-relevant studies were excluded. We focused on official guidelines from neurosurgical and spine societies and randomized controlled trials, as well as large retrospective and prospective clinical studies. An initial search on epidemiology and etiology of acute LBP yielded 3354 articles, of which 13 met final inclusion criteria (Fig. 1). The online search on cost of acute LBP produced 459 manuscripts, of which 2 were included in our final analysis (Fig. 2). The search on risk factors for acute LBP identified 2546 articles, with 5 articles meeting inclusion criteria (Fig. 3). Finally, the search on prevention strategies for acute LBP yielded 2916 articles, of which 23 met inclusion criteria (Fig. 4).

These 43 manuscripts were summarized and presented at two separate international meetings of the WFNS Spine Committee, which brought together 21 participants from various countries including Brazil, China, Germany, Great Britain, India, Italy, Ivory Coast, Japan, Pakistan, Russia, South Africa, Turkey, and the U.S. Participants produced, revised, and anonymously voted on recommendation guidelines first at the May 2022 meeting in Pakistan, and then at the second September 2022 meeting in Turkey. To ensure a high degree of validity, the Delphi method was employed throughout the entire process.[7] Voting for each statement was conducted on a scale from 1 to 5 (1 = strongly agree, 2 = agree, 3 = somewhat agree, 4 = disagree, 5 = strongly disagree). Positive or negative consensus was achieved when the sum of agreement (1, 2, 3) or disagreement (4,5) votes were ≥ 66%.

3. Results and discussion

3.1. Epidemiology and etiology of acute LBP

Particularly in the developed world, acute LBP is extremely common, with most patients experiencing symptoms at some point in their lifetime and seeking consultation from their primary care physicians.[2] In one study, up to 25% of all Americans reportedly suffered LBP symptoms within the last three months. One-year LBP prevalence was reported to be 38%, and lifetime prevalence was 40%.[8] An older review combining twelve different studies revealed a one-year prevalence between 11 and 36%. However, the authors of this comprehensive review noted substantial heterogeneity among studies (including varying definitions of onset and duration of acute LBP, as well as different assessment strategies), limiting the ability to appropriately compare and pool data. They also highlighted that cultural differences between countries significantly impact these findings.[9] Perhaps most relevant to this manuscript, there have been relatively few studies published on the epidemiology of acute LBP in the last ten years (2012–2022).

Many different pathologies are considered to cause acute LBP, including nociceptive pain from muscle pull due to poor posture or mechanical overload, facet joint pain, neuropathic pain from nerve irritation, or nociplastic pain from CNS amplification, the latter sometimes referred to as "non-specific" LBP.[2] Significant cultural differences are also noted,[10] with some western countries like the U.S., Germany, and Belgium reporting 1-year prevalence rates close to 40%, while developing countries like Nigeria, Indonesia, or India report much lower rates, 0–10%.[11] The hypothesis that hard labor in low income countries may directly correlate with higher rates of acute LBP can is therefore not supported by recent publications from the region of Africa.[12] In contrast, higher income countries appear to have higher rates of acute LBP, which may due to older patient populations, higher rates of obesity, greater availability of treating physicians, and/or higher symptom reporting, although these are all debatable.

3.2. Cost of acute LBP

Acute LBP has a high economic impact, and there are multiple studies evaluating the financial ramifications of back-associated disease

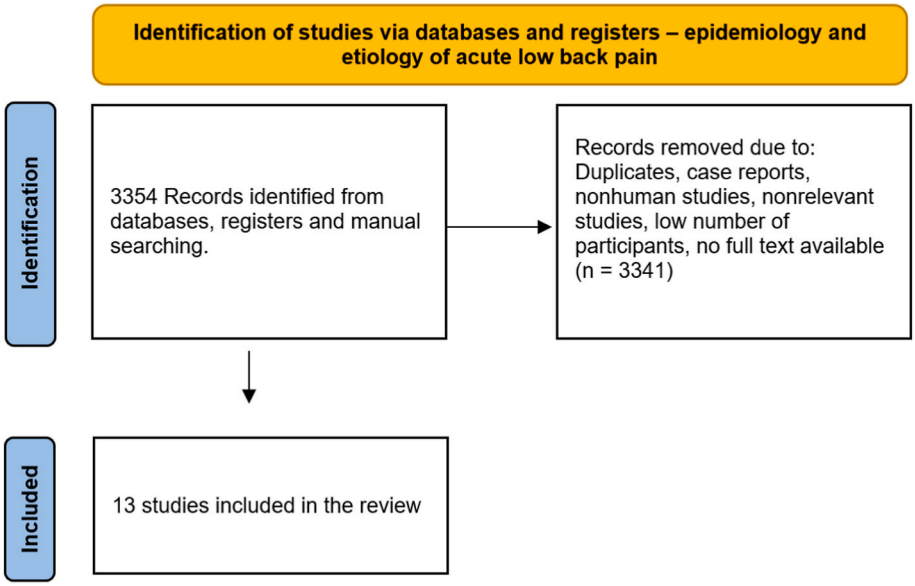

Fig. 1. Prisma Chart for literature search on epidemiology and etiology of acute low back pain.

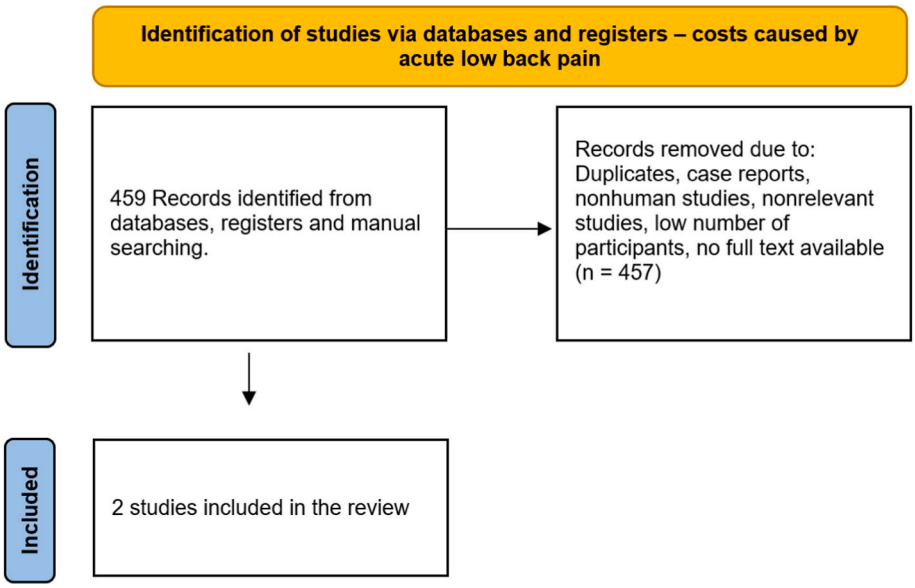

Fig. 2. Prisma Chart for literature search on costs of acute low back pain.

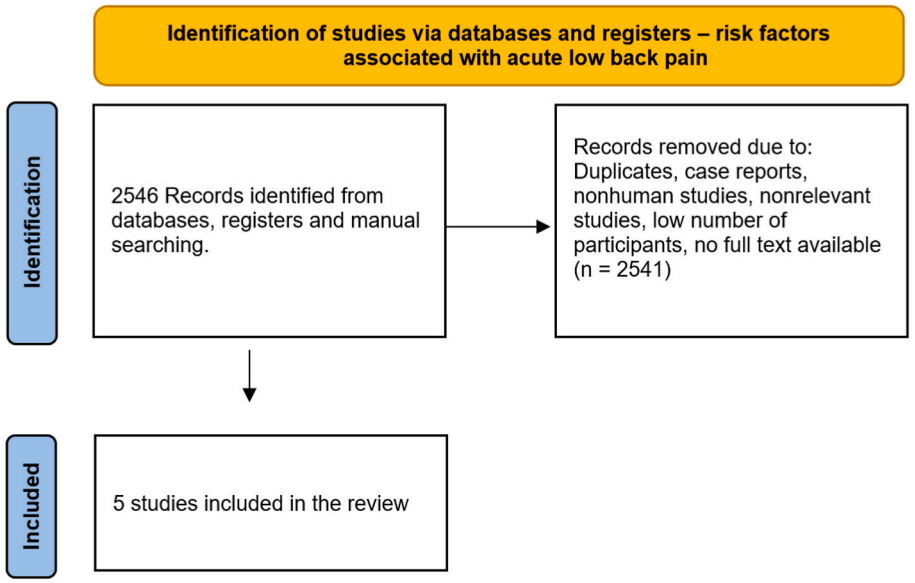

Fig. 3. Prisma Chart for literature search on risk factors associated with acute low back pain.

throughout the world.[13] As an example in the western world, a study from Spain reported an annual direct cost of 8.9 billion Euros due to acute LBP, accounting for 0.68% of the Spanish Gross Domestic Product. Indirect costs, including from work absenteeism, were estimated at an additional 75% of direct costs.[14] In this study, the average Spanish spine surgery cost 1200 Euros, while in Germany the average spine surgery was reported to cost 7000 Euros.[15] Exact data from lower income countries are more difficult to acquire, but LBP is believed to be considerably costly in these countries as well.[16]

3.3. Risk factors associated with acute LBP

There is mixed data in the literature regarding the association of a variety of risk factors with acute LBP including inactivity, obesity, smoking, physical and repetitive labor, poor posture, and psychosocial factors.[17] In one study, obesity was associated with a higher risk of acute LBP,[18] but another study of medical personnel did not confirm this finding.[19] A comprehensive review found that, in contrast to chronic LBP, acute LBP was not clearly related to occupational physical activity.[20] Further reviews addressed sedentary lifestyle, smoking, and coffee consumption as potential risk factors for low back pain. There was no conclusive evidence that patients with LBP were less active than healthy individuals. The review emphasizes the challenges in deriving a solid conclusion from the literature, particularly given the heterogeneous definitions of acute versus chronic LBP across multiple studies.[21] In summary, in contrast to chronic or recurrent LBP, the risk factors for acute LBP are not well defined.

3.4. Prevention of acute LBP becoming chronic LBP

A comprehensive review and meta-analysis including 30,850 patients from 21 RCTs published in *JAMA Internal Medicine* in 2016 found moderate evidence for risk reduction by exercise. A higher educational level, particularly when combined with exercise, showed strong

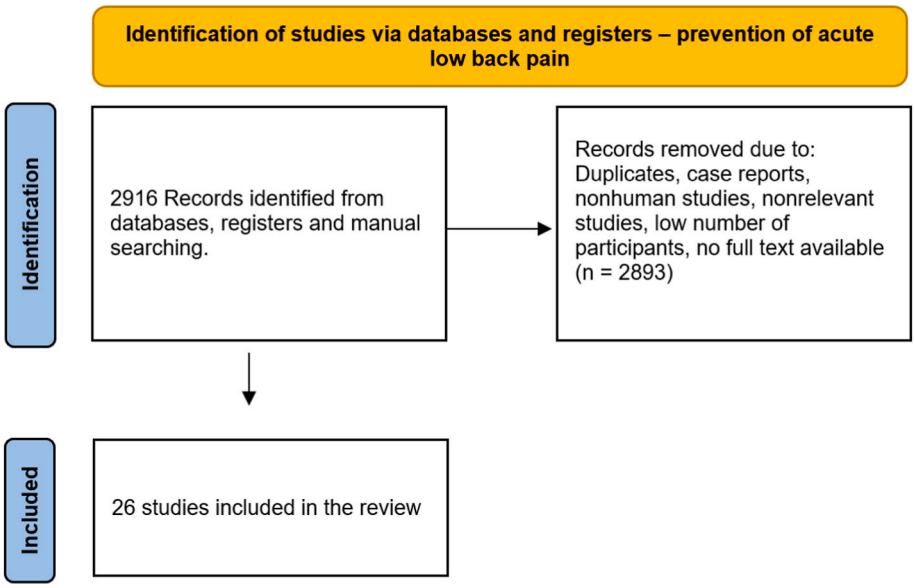

Fig. 4. Prisma Chart for literature search on prevention of acute low back pain.

evidence for preventing acute LBP from turning into chronic LBP.[22] Another review did not find a significant effect of psychological interventions on the prevention of onset of cute LBP or the "chronification" of acute LBP, although this was limited by small sample size due to only three relevant studies.[23]

4. WFNS spine committee recommendations

Taking this data together, the WFNS Spine Committee members voted on and produced the following five consensus statements on epidemiology, etiology, and prevention of acute LBP. Voting responses are shown in Table 1. The most relevant literature is summarized in Table 2.

(1) : Although there is limited recent data, one-year prevalence of acute LBP is reported to be up to 11%–38%, with lifetime prevalence up to 40%.
(2) : There is significant heterogeneity in the prevalence and incidence of acute LBP, with higher frequency in high income countries.
(3) : Multiple studies show significant direct and indirect costs for acute LBP treatment across the developed and developing world.
(4) : In contrast to chronic and recurrent back pain, risk factors for acute LBP are not well defined.
(5) : Exercise and higher educational status are associated with lower likelihood that acute LBP will become chronic.

5. Conclusion

In conclusion, this paper presents the results of a systematic review and the WFNS Spine Committee's consensus statements on the epidemiology, etiology, and prevention of acute low back pain. This study adds to the literature in that it represents, to the best of our knowledge, the most recent review on this topic. With the international composition of the WFNS committee, we also focus on global circumstances and aspects of LBP care that are unique to the developing world. The prevalence and incidence of acute LBP are very high worldwide and appear to be greater in high-income countries, as compared to developing regions. The costs associated with treatment of acute LBP are high throughout the world, both in terms of direct medical costs and indirect costs related to work absenteeism. Several risk factors, including physical inactivity, obesity, smoking, physical labor, and psychocial factors may be associated with acute LBP, but evidence is mixed and not as well-defined as for chronic or recurrent LBP. Regular exercise and higher education level may reduce the likelihood of acute low back pain becoming chronic. Further, high-quality research is needed to better understand the risk factors associated with the development of acute LBP and to develop more effective prevention measures to improve the care for acute LBP patients worldwide.

Table 1
Final voting of the consensus meeting on epidemiology and prevention of acute lumbar back pain.

Statement	Voting
Statement 1: Although there is limited recent data, one-year prevalence of acute LBP is reported to be up to 11%–38%, with lifetime prevalence up to 40%.	60% strongly agree 30% agree 10% somewhat agree
Statement 2: There is significant heterogeneity in the prevalence and incidence of acute LBP, with higher frequency in high income countries.	60% strongly agree 20% agree 10% somewhat agree 10% disagree
Statement 3: Multiple studies show significant direct and indirect costs for acute LBP treatment across the developed and developing world.	60% strongly agree 40% agree
Statement 4: In contrast to chronic and recurrent back pain, risk factors for acute LBP are not well defined.	44.4% strongly agree 44.4% agree 11.1% somewhat agree
Statement 5: Exercise and higher educational status are associated with lower likelihood that acute LBP will become chronic.	40% strongly agree 60% agree

Table 2
Relevant literature on epidemiology and prevention of acute lumbar back pain.

Authors	Year	Study type	Objective	Level of evidence	Number of studies included	Number of patients included	Main Result	Conclusion
Carey et al.	1996	Survey	Prevalence of LBP and correlates of care-seeking	III	/	458	7,6% of adults had acute back pain in the last year, more than 60% did not seek medical care. Care sought by patients with longer duration of pain, more severe pain and sciatia.	Acute LBP is very common, most patients don't seek medical care.
Manchikanti et al.	2014	Review	assess the prevalence of LBP and the influence of comorbid factors and costs	III	Unclear	/	Prevalence of LBP increases in the USA and has a great economic impact.	Prevalence of LBP increases
Hoy et al.	2010	Review	incidence of low back pain, age of onset and remission	III	12	unclear	1 year incidence of people who have any episode of low back pain (i.e., first-ever or recurrent) ranged from 1.5% to 36%. Remission at 1 year was measured in two studies and ranged from 54% to 90%.	LBP is common, mostly resolves within 1 year.
Alonso-García et al.	2020	National sample of Spanish population of 2017	Assessment of annual costs	III	/	/	Prevalence of LBP was 17.1% for men and 24.5% for women, and increased with age, low educational status, higher body mass index, and was associated with less physical activity, and lower self-perceived health. Total 8954.6 million Euros, 74.5% indirect costs, 0.68% of Spanish Gross Domestic Product	Direct costs (consultations-general practitioner, specialist and emergency departments-, diagnostic tests, hospitalizations, physiotherapy, psychologist, and medication consumption) vs. indirect costs (absenteeism and presenteeism), with indirect costs being higher than direct costs.
Juniper et al.	2009	Literature review	review the literature on the epidemiological and economic burden and treatment of chronic low back pain (CLBP) in France, Germany, Italy, Spain and the UK	III	23	unclear	Annual direct costs of low back pain in Germany: more than 7000€ per person. Work absenteeism accounted for 75% of the total per-patient cost of low back pain in Germany. General population prevalence estimates for CLBP: 5.91% (Italy) and 6.3–11.1% (UK).	High costs of LBP, mostly indirect costs by work absenteeism.
Volinn	1997	Review	Comparison of incidence of LBP in low-/middle- vs high-income countries	IIa	16	unclear	Low back pain rates are reported to be far higher in high-income countries than in the rural population of low-income countries.	Real or artificial difference in prevalence of LBP?
Griffin	2012	Review	Evaluation of coffee consumption, sedentary lifestyle and cigarette smoking in relation to LBP	IIa	7	Unclear	No significant difference in the physical activity level of adult men (SMD = −0.34, 95% CI = −1.32 to 0.65) and women (SMD = 0.16, 95% CI = −1.23 to 1.55) with chronic LBP in comparison to healthy controls. Studies indicate that elderly patients with chronic low back pain are less	No conclusive evidence that patients with chronic low back pain are less active than healthy individuals.

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Table 2 (*continued*)

Authors	Year	Study type	Objective	Level of evidence	Number of studies included	Number of patients included	Main Result	Conclusion
							active than healthy controls (SMD = −0.26, CI = −0.44 to −0.08, P = 0.005).	
Roffey et al.	2013	Review	Relation between obesity and LBP	IIa	15	Unclear	9–76% of patients with LBP were obese. OR for LBP in patients with BMI ≥30 was 1.05–16.73. Non-obese patients with lumbar disc herniations showed significantly higher number of improvements in primary outcome measures (i.e., physical function, bodily pain, disability) than obese patients in both operative and non-operative treatment.	Suggestion of a postive relationship between obesity and LBP.
Steffens et al.	2016	Review	effectiveness of interventions for prevention of LBP	IIb	23 published reports on 21 different randomized clinical trials	30,850	Moderate-quality evidence that exercise combined with education reduces the risk of an episode of LBP (0.55 [0.41–0.74]) and low-quality evidence of no effect on sick leave (0.74 [0.44–1.26]). Low- to very low-quality evidence suggested that exercise alone may reduce the risk of both an LBP episode (0.65 [0.50–0.86]) and use of sick leave (0.22 [0.06–0.76]). For education alone, there was moderate- to very low-quality evidence of no effect on LBP (1.03 [0.83–1.27]) or sick leave (0.87 [0.47–1.60]) Low- to very low-quality evidence that back belts or shoe insoles do not reduce the risk of LBP episodes.	Risk reduction for LBP by exercise (moderate), exercise + education (strong effect)
Levi et al.	2017	Retrospective cohort study	determine if a history of severe episodic low back pain (LBP) correlates with positive discography	III	/	39	Using the discography findings as the gold standard diagnosis and the history of episodic low back pain as the diagnostic test, the sensitivity is 58% (95% CI = 41–75%) and the specificity is 88% (95% CI = 65–100%).	A positive history of severe episodic low back pain may indicate that a patient's LBP is discogenic.
Urits et al.	2019	Review	Comprehensive review of low back pain and discuss associated pathophysiology, diagnosis, and treatment. No new question.	III	Unclear	None	No new findings	Multiple causes for LBP: discogenic, myofascial, degeneration of the facet joints, spinal canal stenosis, sacroiliac joint pain, more rare causes: fibromyalgia, piriformis syndrome, hip osteoarthritis, tumor, infection,

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Table 2 (*continued*)

Authors	Year	Study type	Objective	Level of evidence	Number of studies included	Number of patients included	Main Result	Conclusion
								aortic aneurysm, sickle cell crisis, and retroperitoneal mass etc.
Suri et al.	2013	Cohort study	determine whether the presence and extent of severe lumbar facet joint osteoarthritis (OA) are associated with back pain in older adults		/	252	Severe facet joint OA was more common in participants with back pain than those without (63.2% vs 46.7%; P = 0.03). In multivariable analyses, presence of any severe facet joint OA remained significantly associated with back pain (odds ratio (OR) 2.15 [95% confidence interval (CI) 1.13–4.08]). Each additional joint with severe OA conferred greater odds of back pain [OR per joint 1.20 (95% CI 1.02–1.41)]	Positive association between facet OA and LBP. The more joints are affected, the greater the pain.
Cohen et al.	2012	Review	provide an evidence-based framework that outlines patient selection and treatment options for facet joint pain, including steroid injections and radiofrequency denervation	III	10 on efficacy of facet joint radiofrequency denervation for facetogenic pain 9 on intra-articular steroid injections for relief of facetogenic pain	472 on efficacy of facet joint radiofrequency denervation for facetogenic pain 603 on intra-articular steroid injections for relief of facetogenic pain	No studies have evaluated non-interventional treatments for confirmed facetogenic pain, but data from studies in non-specific back pain suggest a modest, short-term beneficial effect for pharmacotherapy and some non- traditional treatments. Trials of intra-articular steroid injections for lumbar and cervical facet joint pain have yielded disappointing results, but evidence suggests that a subpopulation of patients with acute inflammation derive intermediate-term benefit from this therapy. Radiofrequency denervation provides some benefit for up to a year in approximately 60% of individuals.	Facet joints account for 30 % of all causes of backpain. NOT exaggerated by Valsalva manoeuvre or coughing.
Wilke et al.	2017	Review	Assess the role of the lumbar fascia in LBP	III	10 histological studies in vivo studies unclear	Unclear	The lumbar fascia has dense nociceptive afferents. Three different mechanisms: - (1) microinjuries irritating nociceptive nerve endings in the LF may directly induce back pain - (2) tissue restructuration, for example, following microinjury, immobility, or chronic overloading, may compromise proprioceptive signalling, which by itself could decrease the pain threshold by means of an activity-	LF has a nociceptive neural capacity and therefore can be the cause of pain in some patients with LBP.

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Table 2 (*continued*)

Authors	Year	Study type	Objective	Level of evidence	Number of studies included	Number of patients included	Main Result	Conclusion
							dependent sensitization of wide dynamic range neurons; - (3) nociceptive input from other tissues innervated by the same spinal segment could elicit an increased sensitivity in the LF.	
Bron et Dommerholt	2012	review of literature	Discuss etiology of myofascial trigger points	III	unclear	unclear	Best available evidence supports that myofascial trigger points develop after muscle straining. Several potential mechanisms may play a role: - eccentric overload - submaximal sustained - (sub)-maximal concentric contractions A key factor is local ischemia → leads to a lowered pH and subsequent release of inflammatory mediators in the muscle	Myofascial pain might be a very common cause of LBP and should be consideren as an important factor in all LBP individuals

Ethics approval and consent to participate

Not applicable.

Availability of data and materials

The raw data supporting the conclusions of this manuscript will be made available by the authors, without undue reservation, to any qualified researcher.

CRediT authorship contribution statement

Joachim Oertel: Writing – review & editing, Formal analysis, Data curation, Conceptualization. **Salman Sharif:** Writing – review & editing, Conceptualization. **Corinna Zygourakis:** Conceptualization, Writing – original draft, Writing – review & editing. **Christoph Sippl:** Writing – original draft, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Abbreviations

WFNS	World Federation of Neurosurgical Societies
MRI	Magnetic resonance imaging
CT	Computer tomography
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses

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