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Lumbar back pain as a problem in occupational medicine

RESEARCH PAPER

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ABSTRACT

Background

Lumbar back pain is the most prevalent occupational musculoskeletal disorder and the leading cause of disability globally. It causes a substantial socioeconomic burden through reduced productivity, absenteeism, and early retirement. It is a persistent challenge of occupational medicine due to its multifactorial nature.

Hypothesis

Physical and psychosocial occupational factors contribute to the development and chronicity of lumbar back pain among workers, and the implementation of ergonomic and behavioural interventions can effectively decrease this disease burden.

Aim

The aim of this thesis is to analyse current scientific evidence on the prevalence, risk factors, and preventive strategies of occupational lumbar back pain, with particular focus on the interaction between physical workload and psychosocial stressors, and to evaluate the effectiveness of ergonomic and behavioural interventions in reducing its burden among workers.

Material and methods

A narrative literature review was conducted using PubMed and Scopus databases to identify peer-reviewed studies published till 2024 addressing occupational lumbar back pain.

Conclusion

Evidence consistently shows that lumbar back pain arises from an interaction of physical and psychosocial factors. Physically demanding work, low job control, and organisational stress contribute to the prevalence and chronicity of lumbar back pain. Active, multidisciplinary interventions are most effective in reducing symptoms and improving work ability.

Keywords:

Lumbar back pain, occupational health, psychosocial stress, ergonomics, prevention.

KOPSAVILKUMS

Konteksts

Jostas daļas muguras sāpes ir visizplatītākā aroda muskuļu un skeleta slimība un galvenais invaliditātes cēlonis pasaulē. Tā rada ievērojamu sociālekonomisko slogu, samazinot darba produktivitāti, kavējot darbu un priekšlaicīgi aizejot pensijā. Tā ir pastāvīga aroda medicīnas problēma tās daudzfaktorālā rakstura dēļ.

Hipotēze

Fiziskie un psihosociālie aroda faktori veicina jostas daļas muguras sāpju attīstību un hronisku sāpju esamību darbinieku vidū; ergonomisku un uzvedības intervenču ieviešana var efektīvi samazināt šo slimības slogu.

Mērķis

Šī darba mērķis ir analizēt pašreizējos zinātniskos pierādījumus par aroda jostas daļas muguras sāpju izplatību, riska faktoriem un profilakses stratēģijām, īpašu uzmanību pievēršot mijiedarbībai starp fizisko slodzi un psihosociālajiem stresa faktoriem, un novērtēt ergonomisku un uzvedības intervenču efektivitāti ar to saistītā sloga mazināšanā darbiniekiem.

Materiāli un metodes

Izmantojot PubMed un Scopus datubāzes, tika veikta naratīvs literatūras apskats, lai identificētu recenzētus pētījumus, kas publicēti laikā līdz 2024. gadam par aroda jostas daļas muguras sāpēm.

Secinājums

Pierādījumi konsekventi liecina, ka jostas daļas muguras sāpes rodas fizisko un psihosociālo faktoru mijiedarbības rezultātā. Fiziski smags darbs, zema darba kontrole un organizatoriskais stress veicina jostasvietas muguras sāpju izplatību un hroniskumu. Aktīvas, daudznozaru intervences ir visefektīvākās simptomu mazināšanā un darbspēju uzlabošanā.

Atslēgvārdi: Jostasvietas muguras sāpes, arodslimību ārstēšana, psihosociālais stress, ergonomika, profilakse.

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1. INTRODUCTION

1.1. Background and topicality

Lumbar back pain (LBP) refers to pain localised in the lower back, below the costal margin and above the gluteal folds. In this thesis, the terms *lumbar back pain* and *low back pain* are used interchangeably, as they describe the same anatomical region and occupational health problem.

The World Health Organisation (WHO) recognises LBP as a leading cause of disability worldwide. Most people experience LBP at some point in their lives. Lumbar back pain causes a significant socioeconomic burden through productivity loss, work absenteeism and premature retirement.

Modern work environments exacerbate the problem by combining physical and psychosocial loads. Healthcare, construction, transportation, and material handling face high mechanical loads, and office workers' risk of LBP is heightened by static postures and psychosocial stress factors. The high prevalence of lumbar back pain and its impact on individuals and the economy make it a topical and significant issue in occupational medicine.

1.2. Scientific context and problem definition

Occupational lumbar back pain develops through a combined influence of biomechanical loading, psychosocial factors and individual features. Key physical risks include lifting, awkward postures and vibration. Recent studies have highlighted the effect of organisational and psychosocial conditions, like long working hours, low decision power and low managerial support, as an increased risk of occupational lumbar back pain and its chronicity.

Scientific literature often addresses physical and psychosocial factors separately, decreasing the effectiveness of prevention efforts. This thesis, therefore, focuses on both physical and psychosocial factors and their relationship to the prevalence and chronicity of occupational lumbar back pain.

1.3. Aim, hypothesis and objectives

The aim of this thesis is to analyse current scientific evidence on the prevalence, risk factors, and prevention of occupational lumbar back pain, focusing on the interaction between physical workload and psychosocial stressors, and to evaluate the effectiveness of ergonomic and behavioural interventions.

The hypothesis proposes that both physical and psychosocial occupational factors significantly contribute to the development and chronicity of lumbar back pain, and that integrated, active interventions can effectively reduce its burden among workers.

Objectives:

1. To describe the epidemiological and occupational significance of lumbar back pain
2. To identify the main physical, psychosocial and individual risk factors
3. To evaluate the effectiveness of preventative and rehabilitative strategies

1.4 Materials and methods

This thesis was conducted as a narrative literature review. Peer-reviewed studies published till 2024 were retrieved from PubMed and Scopus using the keywords *lumbar back pain*, *occupational risk factors*, *occupational medicine*, and *ergonomics*. Inclusion criteria required English-language studies examining the epidemiology, risk factors, or prevention of lumbar back pain in adult working populations. In total, 23 articles met these criteria.

1.5 Declaration of use of artificial intelligence

Parts of the refinement of the text have been done with AI assistance. AI was used for translation purposes, initial outlining and refining of language. All analyses, interpretations and conclusions are the author's own work.

1.6. Key words

Lumbar back pain, occupational health, psychosocial stress, ergonomics, prevention

2. LITERATURE REVIEW

2.1. Pathophysiological foundations of lumbar back pain

2.1.1. Anatomical structures and general aetiology

Lumbar back pain (LBP) can be clinically defined as discomfort felt in the lower region of the back, including the lumbar vertebrae, surrounding muscles, nerves, ligaments and associated other soft tissues. To understand how pain in this area develops, we must also understand the basic structure and function of the intervertebral discs. Intervertebral discs are key components in understanding lumbar back pain, as they function as cushions that buffer the spine against mechanical stress and allows the body to bend and twist. [10]

The natural progress of degeneration of intervertebral discs starts quite early, sometimes already in the second decade of life. Normal ageing causes structural deterioration that can lead to internal tearing and gradual changes in the disc material. [10] LBP commonly develops when these basic tissues are subjected to mechanical strain, accelerated degenerative changes or are influenced by individual factors.

2.1.2. Pain and injury mechanisms

In an occupational context, LBP can be grouped into clinical types based on the underlying source of pain. Non-specific musculoskeletal pain is the type of LBP most frequently diagnosed and can be defined as pain localised between the 12th ribs and the gluteal folds that occurs without any specific systemic disease or trauma being detected as the underlying cause. [20]

Structural degeneration is defined by identifiable damage to the spinal anatomy itself; this damage is often, but not always, permanent. Damage occurs when natural degenerative processes accelerate and cause specific failures, like a herniated disc. The structural failures are typically caused by biological factors, like age and genetics, in combination with chronic high mechanical load. [10]

Chronic lumbar back pain (CLBP) is diagnosed when pain lasts longer than three months. [18, 19] At the point of three months, the problem of back pain transforms from an anatomical issue into a biopsychosocial disorder. [1]

A severe functional consequence of structural lumbar pathology is sciatica (ischiatic pain). It is sometimes considered to be the most severe form of chronic back pain. Clinically, it is defined as pain that originates in the lower back but radiates down one or both legs, often below knee level. Sciatica is a specific neurological symptom that can indicate a structural pathology, like a herniated disc, that causes irritation or compression of the nerve root. General LBP often occurs without radiating pain; sciatica can be seen as a confirmation of structural pathology. Thus, it is often used as a criterion to select high-risk patients for secondary prevention and rehabilitation trials. [17]

Even though pain caused by fractures of the vertebral column is a possible reason for LBP and can develop into CLBP, it is not part of this review. Earlier back injury, fractures and spinal trauma are used as exclusion criteria in many of the studies included in this review. [8, 12, 17, 19, 22]

2.2. Epidemiology and occupational significance of lumbar back pain

Lumbar back pain is recognised as the most prevalent musculoskeletal disorder globally that affects workers across all occupational sectors [4, 7, 11, 15]. The World Health Organisation identifies back pain as the number one leading cause of disability, specifically using years lived with disability (YLDs) as a measurement, which holds true both in developed and developing countries. Back pain holds particular significance in occupational medicine due to its high prevalence and tendency to recur. Back pain causes productivity loss, absences and premature retirement resulting in significant socioeconomic consequences at the individual, business and national levels.

2.2.1. Prevalence

Multiple studies included in this literature review demonstrate that lumbar back pain affects approximately one-quarter to half of all working adults.

Luckhaupt et al. (2019) demonstrated in their nationally representative survey set in the United States that 26.4% of workers experienced low back pain in the three months preceding

the study, and of these people 40% thought this pain was work-related. More specifically, the highest prevalence of LBP was found in construction and extraction occupations. The prevalence of back pain in this group was 31.6%, and of occupational LPB was 12,3%. High rates were also found in other occupations that require frequent physical exertion. Prevalences in installation, maintenance and repair were 29.9% and in transport and material moving 29.3%. [13]

Similarly, an extensive Chinese study by Jia et al. (2022) studied over 20 000 employees using a modified epidemiological cross-sectional survey with a stratified cluster sampling method across multiple industries and found the annual incidence of low back pain to be overall 16.4%. The highest rates were found for workers in vegetable greenhouses (32.5%), toy manufacturing (27.3%), healthcare (25.3%) and animal husbandry (26.0%). [11]

Comparable prevalence figures were found in European populations. Similar findings were demonstrated in cohorts. Smedley et al (1997) found a one-year incidence of LBP to be 41% in a prospective cohort study of 961 female nurses in Britain. [20] A South American study by Cezar-Vaz et al. (2023) investigated back and neck pain in Brazilian healthcare workers through a cross-sectional study addressing 338 health professionals and demonstrated a prevalence of 64,5%. These findings were linked to high physical and psychosocial workload. [7]

Physically demanding occupations show high rates of lumbar back pain across included studies; this seems to hold true with different types of mechanical exposure. Ramandi (2018) studied 30 workers in a cross-sectional study design and reported 100% LBP prevalence and high disability and intensity scores in manual handling workers. This pain prevalence was attributed to repetitive lifting and awkward posture. Bovenzi (2009) found a similar prevalence of LBP in professional drivers, and this was attributed to prolonged seat vibration and constrained posture. These studies illustrate the effect of dynamic loading and static mechanical strain in the epidemiology of occupational lumbar back pain. [5, 16]

A study conducted by Matsugaki and Matsuda (2024) in Japan studied Chronic LBP among older workers in a prospective cohort study using internet survey data of workers aged 60-75 years. In their results, the authors reported 9% incidence of chronic LBP in the follow-up period. [14]

Global data consistently show the universal nature of the disease burden of lumbar back pain while also highlighting the significant differences depending on work type. LBP was found to affect roughly one-quarter to one-third of adults across large global worker samples. Additionally, in the studies covered in this review, the US general working population was

estimated to have a prevalence of LBP at 26.4% in a 3-month window. Higher rates were shown in Latin American primary healthcare workers, where the prevalence of LBP was found to be 64,5%. When examining new case development, the annual incidence of LBP in a large Chinese cohort was reported to be 16.4%, while in a specific nursing population, it was higher at 41%. These numbers confirm that LBP remains one of the leading musculoskeletal issues worldwide, affecting workers globally. Additionally, it affirms that peak rates consistently link to physically demanding and high-risk occupational sectors, a finding that will be examined expansively in this review. [1-4]

2.2.2. Incidence of recurrence

While prevalence describes how widespread lumbar back pain (LBP) is in the given timeframe, its incidence shows the development of new cases and recurrence, the return of symptoms. Thus, incidence and recurrence describe how these symptoms develop or return despite treatment. A large portion of workers who experience an initial episode of low back pain will have recurrent or chronic symptoms; this finding is supported in numerous longitudinal and cohort studies. [1, 4, 14, 17, 20, 21]

Recurrence of LBP within one year after the first episode is very common, and recovery is often incomplete. Studies conducted in healthcare and in industrial settings show that the incidence of new and repeated back pain remains high even after interventions. [17, 20] Studies conducted over several years have demonstrated the role of physical and psychosocial strain in predicting the development and chronicity of musculoskeletal disorders, including lumbar back pain. Repeated heavy lifting, extended awkward postures and even low job control are shown to significantly increase the likelihood of chronicity and recurrence of LBP. [1]

The relationship between cumulative exposure and pain recurrence has also been confirmed. Workers performing repetitive lifting tasks have higher rates of recurring back pain, stress and fatigue, compared to their counterparts with lower repetition and physical demands. It is shown that repeated mechanical loading both causes and maintains lumbar back pain over time. [4]

Long-term progression of lumbar back pain was also studied in office workers. Sihawong et al. studied office workers in Thailand to identify predictors for chronicity of neck and LBP in a one-year prospective cohort study of 669 workers. Among participants with baseline LBP, 26.7% developed chronic symptoms during follow-up. The clearest indicators for chronicity were a history of previous LBP and higher initial pain intensity. The findings of

this study suggest that the development of chronic pain is driven by cumulative factors rather than solely by mechanical exposures. [19]

Further investigation into chronic pain in office workers, carried out by Channak et al. (2024), highlighted the recurrence of chronic pain even after recovery, in a secondary analysis of a randomised controlled trial (RCT) with a six-month follow-up. The recurrence rate for neck and low back pain was reported to be as high as 75% in the control group over a six-month period. A high recurrence rate shows the need for continuous preventive strategies, especially for workers who have already experienced an LBP episode. [8]

Another factor that seems to influence the chronicity of lumbar back pain is the interaction between age and long-term occupational strains. A 9% incidence of chronic low back pain was reported in older Japanese workers, even though the inclusion criteria excluded anyone with chronic LBP at baseline. This finding puts the incidence at a slightly lower level than other studies included in this review. The study indicates that older workers are vulnerable to chronic pain, but the determinants are more complex than age alone and come from a combination of long-term physical workload, reduced muscular recovery and prolonged exposure to biomechanical strain. [14]

Additionally, to physical workload, psychosocial strain influences the persistence and recurrence of lumbar back pain. It is shown that work conditions are associated with the development of chronic lumbar back pain. These conditions include low job control, high psychological demands and poor workplace support. [19] Workers in poor psychosocial work environments have been shown to have a higher risk of musculoskeletal disorders, which reflects the interaction between psychosocial strain and physical workload. [1] In the healthcare environment, psychosocial workload and mental strain were shown to amplify the effect of physical strain on the chronicity of pain. [7]

Psychosocial predictors of chronic musculoskeletal pain were examined in a Swedish study by Sundberg et al. (2020) conducted in a population of nurses as a longitudinal cohort study over 11-15 years, using the Longitudinal Analysis of Nursing Education (LANE) study cohorts. The study found that low social support and high demands at work were predictors of the incidence of persistent LBP. Nurses working in psychosocially demanding workplaces in the first one, two and three years of their careers had an increased relative risk of 1.36, 2.08 and 2.82 for developing back pain later in life. This confirms that psychosocial stressors can have an independent effect on the chronicity of back pain. [21]

When combining these results, it is seen that lumbar back pain is not a self-limiting occupational problem. One episode of occupational lumbar back pain is shown to correlate with

recurrence, and for a minority of workers to also progress to chronic lumbar back pain. Persistent lumbar back pain is influenced by a complex interaction between physical strain and psychosocial stress; other factors also play a significant role in determining long-term outcomes. [1, 6, 7, 19, 21]

2.2.3. Occupational and socioeconomic impact of lumbar back pain

Occupational and socioeconomic consequences of lumbar back pain are widespread, affecting workers, employers and society. These effects arise from the high prevalence and its disabling effects. Lumbar back pain contributes to reduced productivity, absences and early retirement. In a US population-based survey (National Health Interview Survey, 2015), 16,9% of workers affected by low back pain missed at least one day of work, and respectively 6,1% had stopped working, changed jobs or done other significant job changes, during a three-month period. Back pain was also identified as the leading musculoskeletal self-reported cause of limited work ability. [13]

Worldwide, back pain is one of the leading causes of disability adjusted life years and years lived with disability. In a Chinese nationwide survey (modified epidemiological cross-sectional survey), it was identified that workers with chronic pain had 1.189 times increased likelihood of missing work compared to people without pain symptoms. This finding was from a two-wave longitudinal study over six years. [11]

Multiple studies in this review have studied the effect of lumbar back pain on work performance and function. Employees who experience high physical and psychosocial demands were found to be 1.8 times more likely to develop musculoskeletal disorders. This increase was also linked to a higher number of missed workdays. [1]

In a study considering primary healthcare workers in Brazil, 56% reported neck or low back pain, and 42% had difficulty completing their daily tasks because of discomfort. Productivity loss was estimated to be 4.6 workdays per month per affected worker. [7]

A Danish prospective cohort study in the nursing population (longitudinal cohort study applying an exposure matrix based on electromyography (EMG) and trunk flexion measurements) showed that lower biomechanical exposure during patient transfers leads to lower intensity of LBP at 1 year. Lower biomechanical exposure was associated with reduced short-term sick leave as well. The incidence of back-injury was not significantly different between high and low exposure groups. It suggests that lowering daily transfer load has an effect on symptom severity and short-term sick leave rather than the acute risk of injury. [23]

The socioeconomic effects of lumbar back pain extend beyond performance and sick leave. Chronic pain is a common factor that leads to early retirement and reduced life quality. [14] Significantly lower life satisfaction scores and higher levels of psychological distress were reported with persistent musculoskeletal symptoms by Afrasian et al. (2023) in Australian workers. [1]

A combination of physical workload and psychosocial strain of a job increases the total economic impact of lumbar back pain. Work involving repetitive lifting, long working hours, in combination with low decision authority and high demands, was found to have higher rates of back pain and longer work absences. [7] 70-80% of the cost related to LBP was found to come from indirect expenses like productivity loss and compensation payments. [13]

Overall, studies consistently show that lumbar back pain is a cause for reduced work capacity, work absences and economic loss in multiple occupational sectors. [1, 7, 13, 23]

2.3. Occupational risk factors of lumbar back pain

Work-related lumbar back pain is caused by a mix of physical, psychosocial and individual factors. This has been extensively studied in multiple occupational groups, in the context of this review, for example, healthcare, industrial, transportation and office workers. These studies demonstrate the effect of both physical and psychosocial working conditions on the development and chronicity of LBP. [1, 5, 6]

2.3.1 Physical and biomechanical factors

The majority of included studies identify physical workload as one of the central risk factors for developing lumbar back pain. Lifting, bending, twisting and maintaining awkward postures increase spinal loading and pressure on the intravertebral discs. [20] Among Chinese industry workers, lifting loads over 5 kg and prolonged working in the same position caused an adjusted odds ratio of 1.078 and 1.401, respectively, in the reported incidence of low back pain. [11]

Similar results were observed in healthcare, where the biggest risk factors were manual patient handling and repositioning, which were the most physically challenging tasks. The study shows that frequent patient transfer and static positions substantially increase the mechanical

loading on the lumbar spine. This mechanical loading is seen as a predictor for the onset of back pain among hospital workers. [23]

Lifting as a risk factor was also studied by Bláfoss et al. (2024) in a Danish study. This was a prospective cohort study of 85 warehouse workers who provided objective daily lifting loads and daily self-reported symptoms. The study used objective daily lifting load categories. Higher cumulative lifting loads were associated with higher LBP intensity, stress and fatigue. [4]

The association between lifting and LBP was also confirmed in a prospective cohort in the US. This was a Cox proportional hazards regression study following 258 workers over 4.5 years, where job physical exposures were individually measured. It was shown that workers with higher calculated lifting indexes were significantly more likely to have the need for medical care for back pain within 18 months. This evaluation was made using the NIOSH Lifting equation and confirmed the predictive value of biomechanical load assessment. [9]

Another well-documented biomechanical risk factor is whole-body vibration. Among professional drivers, prolonged vibration, in addition to constrained posture, was associated with an increased risk of LBP. Research by Bovenzi (2009) showed that the highest vibration loads caused an incidence rate of 2.17 for LBP when compared to minimal exposure to vibration. This means that drivers were over twice as likely to develop LBP over time. [5] Additionally, in a newer study by Bovenzi & Schust (2021), using a prospective cohort design, risk assessments were made with internal lumbar force metrics (force-based doses) to compare predictive validity against external acceleration methods (acceleration-based doses). The results of the study showed that internal lumbar forces have more predictive power on LBP outcomes than external acceleration methods. The study suggested that integrated total force over the exposure time would be the best metric to predict the health effects on the lumbar spine. All in all, this means that instead of measuring external acceleration, measuring internal, cumulative mechanical dose is needed to predict with the best accuracy. [6]

Other physically demanding jobs show similar risk factors. Repetitive lifting and static awkward postures were identified as a key risk factor for lumbar strain among manual material-handling workers. Additionally, it was found that the average LBP Intensity was 68.8 ± 17.8 (classified as disabling pain) and the Low Back Pain Disability Index (LBPDI) average was 41.3 ± 17.1 (classified as severe). This indicates a definitive relationship between repetitive loads and the resulting high severity and functional disability.[16]

Studying Korean firefighters provided an extreme example to illustrate the effect of prolonged physical strain. It was found that field work characterised by physical labour, lifting,

and awkward postures can accelerate the rate of lumbar intervertebral disc degeneration. This effect was found specifically at the L4-L5 level. This finding suggests prolonged high physical load as a risk factor for causing chronic pain and even chronic structural damage. [10]

2.3.2. Psychosocial and organisational factors

Psychological and organisational factors have been concluded to contribute to the risk and persistence of lumbar back pain in multiple occupational groups. Conditions like low decision-making power, insufficient managerial support, time pressure, and lack of recognition have been shown to increase workers' vulnerability to musculoskeletal symptoms. British nurses were studied, and an increased risk of LBP was linked to manual transfer of patients between bed and chair and a history of frequent low mood. These risks remained after accounting for other potential confounders, supporting the idea that both mechanical exposure and individual factors affect symptom onset.[20]

In another study conducted in a healthcare environment, it was found that long shifts, understaffing and emotionally demanding work amplify physical and psychosocial risk factors. Among the group of Chinese nurses studied, those reporting high psychological distress and poor workplace communication had significantly lower preventative capacity and higher back pain prevalence. [12] Findings about Brazilian primary healthcare workers reflect similar findings. It was found that neck and back pain and difficulties performing daily tasks were partly affected by emotional exhaustion and organisational pressure. [7]

There is strong evidence linking psychosocial factors to the incidence of LBP. Garg et al. (2013) studied seeking medical care for LBP; when this factor is used as the outcome instead of pure incidence of LBP, the predictive power of psychosocial factors is lower. Perceived social support and psychosomatic complaints were studied in relation to LBP in this study. The findings were that these factors were associated with developing a generic LBP episode, but the factors were not statistically significant in predicting workers seeking medical care for LBP. This can be taken as a suggestion that the threshold to seeking treatment is more influenced by mechanical exposure and pain intensity rather than psychosocial factors. [9]

Psychosocial risk factors also interact with physical risk factors across other occupational sectors. Office workers with high psychological job demands were found to be more likely to report recurring back pain even when ergonomic conditions were satisfactory. [19]

The organisational climate was studied in an Australian study, a two-wave longitudinal study over six years. The study showed that employees working in companies with reportedly poor communication and limited commitment to employee well-being were almost twice as likely to develop musculoskeletal problems. This supports the thought that organisational decisions and climate can directly affect employees' physical health. [1]

Combining these studies shows that work environments that have high job demands and limited employee support tend to show higher rates of LBP. It is also shown that workplaces with effective communication and well-structured workloads have lower symptom incidence and lower recurrence rates.

2.3.3. Individual and demographic risk factors

Individual and demographic factors are all seen to influence the rate and susceptibility of lumbar back pain. The most consistent documented risk factor for the recurrence and chronicity of low back pain is an earlier history of back pain symptoms. Multiple studies in this review confirm this risk in multiple occupational groups. In British nurses, the history of back pain was found to be the strongest predictor for new LBP episodes.[20] In Thai office workers, a history of LBP was also identified as a predictor for developing chronic LBP.[19] Additionally, in the Swedish marine trainee population, individuals with a prior history of back pain were 2.5 times more likely to experience a new LBP episode during intensive training. [15]

In multiple studies, age and physical condition have also been found to be risk factors for LBP. Within a population of older Japanese workers that was studied, the incidence of chronic LBP was found to be 9%. This finding suggests the possible effect of reduced muscle recovery and prolonged exposure as contributors to the chronicity of LBP. [14] Age was also identified as a risk factor in a study about Thai office workers. This same study identified high BMI and a history of LBP as risk factors for low back pain. Additionally, regular exercise was found to be a proactive factor. [19]

The influence of physiological status and lifestyle habits creates an additional dimension to understanding individual susceptibility. Individual anthropometric and metabolic factors have been found to be strong predictors of LBP risk and chronicity. High body mass index (BMI) is a well-recognised risk factor for musculoskeletal pain. [16, 19] Similarly, LBP and disability index scores among manual workers showed a strong statistical relationship with

increasing BMI, meaning that both scores were significantly higher in obese workers when compared to those in the “normal” weight categories. [16]

In a large cohort of older workers, metabolic and lifestyle factors were studied in relation to vulnerability to pain development. In this study, multiple metabolic and lifestyle factors were associated with chronic LBP incidence. The risk figures were calculated using the Adjusted Odds Ratio (aOR), which means the probability was purified by statistically removing the influence of other factors like age and job type. The results showed that poor sleep habits (aOR: 1.66) made these individuals 1.66 times more likely to develop chronic LBP. Additionally, it was found that poor eating habits (aOR: 1.44) meant these workers were 1.44 times more likely to develop chronic LBP, and no physical activity (aOR: 1.45) indicated they were 1.45 times more likely to develop chronic LBP. These findings suggest that LBP could be deeply connected to a myriad of other health issues. [14]

In the context of individual risk, we must also investigate gender differences. It has been shown that LBP prevalence and severity are heavily influenced by biological, occupational and social factors alike. Studies show consistently that LBP is more common in female workers. [11] This pattern was also displayed across the U.S. workforce. [13] This elevated risk can partially be attributed to gender-concentrated exposure in specific fields. Studies that focus on demanding healthcare professions rely overwhelmingly on female nurses, which can suggest that there is a high concentration of women in these physically and psychosocially challenging roles in healthcare. [12, 20]

It is argued by Cezar-Vaz et al. (2023) in their study that the increased susceptibility in women is not only anatomical but also tied to the disproportionate total workload. Female workers were found to be 40% more likely to report LBP than their male counterparts in this healthcare study. Cezar-Vaz et al. talk about how the total burden is often increased by non-occupational stress like domestic work, which can amplify the pain. [7] Additionally, this burden is exacerbated by structural vulnerability. Younger men tend to face high structural risks, but being female is specifically associated with chronic musculoskeletal pain and the fact that structural damage speeds up after menopause. [1] As a counterpoint, occupations with extreme physical demands often show male dominance, such as in the Korean firefighter field group that consists of 81% men. Thus, gender seems to be a fundamental factor that affects both exposure risk and chronic outcomes of lumbar back pain in occupational environments.

2.3.4. The combined impact of psychosocial and physical risk factors

As it has been seen earlier in this review, the investigation into lumbar back pain establishes that exposure to physical factors and psychosocial strain are frequently intertwined; this relationship between the factors creates a greater risk than either factor on its own. Integrated analysis by Afrasian et al. found that organisational and emotional stressors were not just consequences of pain but actively contributed to the physical progression of the disease. [1]

Studies have consistently demonstrated the compounding of exposure, which often leads to increased biomechanical vulnerability. For instance, a study confirmed that when senior management failed to prioritise employee health (deficient psychosocial safety climate), it directly led to low worker autonomy, meaning staff had little influence or control over how they performed their tasks or managed their time. This, in turn, demonstrated that a lack of mental resources can lead to biomechanical vulnerability and thus increase the rate of LBP. [1]

Additionally, multiple studies in this material confirmed that psychological distress can translate into physical injury. These investigations confirmed that prolonged psychosocial stress resulted in increased muscle tension and fatigue. [4, 21] Chronic physical stress was shown to increase load on spinal tissues and to have a negative effect on circulation that is needed for recovery. [21] The impact of stress was particularly strong in roles with high emotional demands, for example, primary healthcare. In these roles, mental stress was shown to accelerate the chronicity of pain when combined with existing physical demands. [7] Strong interaction between psychosocial and physical factors was also shown in the Chinese industry, where organisational factors like fast work pace, staff shortage and excessive overtime were identified to heighten the risk of LBP. [11]

2.4. Prevention and management of occupational lumbar back pain

Occupational lumbar back pain can be reduced and managed by a combination of ergonomic, behavioural and organisational measures. Studies included in this review show that the best effect is reached by targeting both physical and psychosocial risk factors.

2.4.1. Ergonomic approaches

Ergonomic programs reduce spinal stress by redesigning work tasks, improving worker posture and providing more suitable equipment. Addressing the source of mechanical loading programs reduces daily strain on the lumbar spine and prevents recurrence of LBP.

Tsuboi et al. (2021) studied an “active rest” program that included two active rest 10-minute rest sessions per workday that consisted of walking and light stretching, in a stepped-wedge cluster randomised controlled trial (SW-CRT) over 16 weeks. Additionally, workstations were provided with sit-stand desks and workers were educated about posture and movement. After a twelve-week period, the study failed to confirm the effectiveness of active rest in improving low back pain (LBP), which was attributed to low adherence. [22]

One specific ergonomic intervention was studied in office workers by Channak et al. (2024). The study was investigating a dynamic seat cushion that was designed to encourage shifts in posture, in a secondary analysis of a randomised controlled trial (RCT) with a six-month follow-up. The effect of the intervention on recurrence was not statistically conclusive because of the small sample size, but the intervention significantly shortened the recovery time from neck and low back pain. Participants using a dynamic seat cushion were found to have a median recovery duration of one month, while recovery time in the control group had a median of three months. This study shows that ergonomic aids that promote dynamic sitting can lengthen symptom-free periods and help with faster recovery. [8]

More effective results were found in a six-month study on rehabilitation nurses. A brief ergonomic workshop and safe-handling training were conducted in the workplace as a cohort study with a 6-month follow-up period. During the follow-up period, self-reported occupational back pain decreased by 6.5%. Nurses who attended both interventions and self-reported consistent use of learned knowledge were found to be twice as likely to remain pain-free compared to partial participants. [2]

On a similar topic, Liu et al. (2023) studied Chinese nurses to evaluate their behaviour, attitude and knowledge towards occupational LBP prevention in a multicentre cross-sectional study across eight hospitals and five provinces. The study demonstrated a gap between awareness and implementation of LBP management. This study was made using a prevention capacity score. The score was highest in nurses who had received ergonomic training or had a lot of work experience. Younger age and working over 40 hours per week are related to poorer

prevention habits. While this study has its focus on ergonomic awareness, it is noted that long working hours and general fatigue influence the application of knowledge; this finding will be expanded upon in the next section.[12]

2.4.2. Educational and behavioural interventions

As established in the previous section, educational programs are part of the prevention of LBP in the workplace. Behavioural and educational programs also aim to change workers' attitudes, habits, and self-management skills.

Liu et al. (2023) found that despite high awareness of back-pain prevention principles, the majority of participants struggled to translate the knowledge to their daily work life. Long working hours and high perceived stress at work were identified as barriers to change in behaviour. Management support and peer support were found to be associated with better preventative habits. These findings emphasise the need for practical reinforcement of theoretical knowledge. [12]

In a Brazilian study, psychological education and stress management interventions were linked to improved back-pain outcomes. Emotional exhaustion, low autonomy and organisational pressures were identified as contributors to musculoskeletal symptoms. It was found that encouragement of open communication and support from supervisors caused a lower reported incidence of pain. This supports the claim that emotional well-being is a key factor in the success of physical prevention programs. [7]

A study focusing on non-pharmacological methods for managing chronic LBP (CLBP) in industrial workers found significant success through nurse-led behavioural interventions. The study used a quasi-experimental design with pre- and post-tests on 100 workers divided into study and control groups. Interventions in the study involved teaching relaxation techniques (deep breathing, guided imagery, progressive relaxation) in addition to education about body mechanics. After the intervention period, the workers were reported to have a significant improvement in their Quality of Working Life scores. The mean score rose from 72% pre-intervention to 93.3% post-intervention. Additionally, pain intensity and disability levels decreased dramatically. These findings support the effect of psychological and behavioural strategies in the restoration of function and improvement of quality of life in chronic pain sufferers. [18]

These studies, in combination, demonstrate that behavioural and educational strategies have the greatest success in a supportive workplace. While education can raise awareness,

support and organisational involvement are needed for sustainable change in behaviour and, thus, better outcomes.

2.4.3. Integrated and multidisciplinary programs

Integrated and multidisciplinary approaches aim to combine ergonomic, behavioural and organisational measures to address lumbar back pain and its disease burden.

A strong example of this approach is a Finnish study by Rantonen et al. (2018). This study compared three secondary prevention interventions for employees with non-acute LBP: progressive exercises (Physio), self-care advice (Advice), and multidisciplinary rehabilitation (Rehab) in a randomised controlled trial (RCT) comparing three intervention groups against a natural course control group. Active interventions (Physio and Rehab) significantly reduced physical impairment and increased health-related quality of life at the two-year follow-up period when compared to the control group. It was also found that self-care advice had no effectiveness, compared to the control group. This demonstrated that self-management is an ineffective and insufficient tool for managing LBP. [17]

Afrasian et al. (2023) also show the value of integrating psychosocial and physical interventions in preventing LBP, even though it is not an interventional study. The study demonstrated the effect of combined exposure to high physical workload and poor psychosocial environment as factors for increased risk of future musculoskeletal disorders in a two-wave longitudinal study over six years. This supports the idea that occupational health programs should include both physical and psychosocial interventions. [1]

A model for integrated management was described by Ammendolia et al. (2009) as they designed a return-to-work (RTW) program for occupational LBP using an intervention mapping (IM) approach to develop a five-step program design. This study was merely about the design and did not test effectiveness. The program suggests case management, with ergonomic task analysis and mandatory workplace meetings and strategies to address psychosocial barriers. Model confirms that successful return to work is dependent on multifaceted coordination between the worker, healthcare providers and workplace supervisors. [3]

All in all, these studies highlight that programs that combine ergonomic redesign, educational training, and psychosocial support have higher success rates than any of these programs on their own. Integrated programs reduce pain and absence and improve work ability. [1, 3, 17]

2.4.4. The challenge of implementation and adherence

As established earlier, research has confirmed that the failure of ergonomic programs often stems from low adherence rather than the programs not being scientifically sound. This can be demonstrated by studies that were able to confirm effectiveness in improving LBP among office workers despite testing a proven exercise regimen. The failure was thought to be a direct result of poor user follow-through, as the median adherence was 28.6%. This could show that a lack of compliance can make highly effective methods useless. [22]

Liu et al. argued that adherence failure seems to result from a fundamental gap between workers' knowledge and their capacity to execute preventative behaviours. One multicentre study found that the correct knowledge rate about workplace factors influencing LBP risk was 2.78% for nurses. This proved that general awareness campaigns are inadequate to provide change in the workplace. [12] Additionally, a Finnish study showed that self-care advice provided by a physician didn’t cause any reduction in symptoms compared to the control group. This can be taken as an indication of low adherence as well, but of course, that cannot be proven at this point. [17]

Psychosocial factors influence adherence as well. High perceived stress and long working hours acted as functional barriers to the success of interventions. These practical workplace conditions have been found to actively diminish workers' capacity to maintain preventative actions. [12] Additionally, it was found that the inability to comply with safety protocols was compounded by perception among workers in healthcare, where workers attributed over 50% of their work-related injuries to inadequate instruction and staffing. [23]

Ultimately, sustained adherence is shown to be an organisational rather than individual problem in terms of occupational interventions. Long-term behavioural compliance was found to be strongly associated with active management and support, as well as positive peer support. [12] Additionally, poor organisational climate was proven to be a contributor to a higher risk of musculoskeletal diseases. [1] We can conclude that for program success, there is a need for change in workplace culture towards removing functional barriers and possibly rewarding preventative behaviour. [3]

2.5. Synthesis

The comprehensive analysis of the listed literature shows a consistent pattern of lumbar back pain globally and illustrates its role as one of the leading causes of occupational disability worldwide. The cross-continental studies demonstrate high variability in rates of LBP within regions. What holds true consistently is that peak rates are universally found in physically and psychosocially demanding sectors. [7, 11, 13]

Across occupational groups, there are several risk factors that consistently appear to be the most defining factors. A prior history of back pain remains the most influential factor in determining low back pain prognosis. Mechanical overload, high vibration exposure and repetitive strain are repeatedly shown to contribute to degenerative changes. Psychosocial and organisational stressors are also associated with the onset and progression of pain across multiple studies. [1, 4-6, 10, 20, 21]

Active rehabilitation and physiotherapy programmes are shown to effectively reduce pain and disability compared to self-care advice and control groups, but their study effectiveness is often influenced by poor adherence. High workloads, staff shortages, and work-related stress often prevent consistent participation. Altogether, the evidence defines the main occupational factors contributing to lumbar back pain and forms the basis for further discussion of their implications and prevention. [12, 17, 22]

3. DISCUSSION

This literature review's aim was to analyse current scientific evidence relating to prevalence, risk factors and preventative strategies of occupational lumbar back pain. The goal was to specifically have an emphasis on the interaction between physical workload and psychosocial stressors. Additionally, it aimed to evaluate the effectiveness of some ergonomic and non-pharmacological interventions. The findings do support the hypothesis that physical and psychosocial occupational factors contribute to the development and chronicity of lumbar back pain among workers, and implementation of ergonomic and behavioural interventions can effectively decrease this disease burden. By combining epidemiological, biomechanical and psychosocial scientific research, this review can offer a combined viewpoint into how occupational factors combine to affect the onset and chronicity of LBP. The discussion below synthesises these findings in relation to the research aim, summarising current knowledge, identifying limitations, and outlining future directions.

Chosen studies, from multiple countries, confirmed that LBP is one of the most common and most disabling occupational health problems globally. As studies were selected from across the globe, it was possible to see that even though prevalence and incidence were varied around the world, the highest prevalence and incidence were found in physically and psychosocially taxing fields, regardless of location or economic context. In the reviewed studies, high prevalence was seen, especially among healthcare workers, construction workers, and manual material handling workers. Still, occupational back pain seems to be a problem in all fields covered in these studies. The results show that occupational lumbar back pain is not a local or field-specific issue, but rather a global occupational health challenge, complicated by chronicity and recurrence. This challenge leads to a significant decrease in productivity and long-lasting disability.

The central finding of this review was that the onset and chronicity of occupational lumbar back pain are dependent on the relationship between physical strain and psychosocial stress. Measuring physical strain and load has become more implicitly studied, and studies are moving from subjective measurements towards objective biomechanical measures. Bovenzi and Schust (2021) showed that studying internal lumbar forces gives a more accurate prediction of the chronicity of LBP than using external vibration measurements. Additionally, Jang et al. (2016) showed biological evidence of repeated mechanical exposure accelerating intravertebral disc deterioration, which shows one of the structural pathways to occupational lumbar back

pain. These results highlight how long-lasting mechanical strain can cause structural damage and chronic pain. [6, 10]

Psychosocial factors compound and intensify mechanical vulnerability. Afrasian et al. (2023) showed that workers with low decision power, low organisational support and poor psychosocial environment are more exposed to inadequate and awkward working positions and high workloads. Workers under constant pressure lack control of their tasks, and this leads to increased physical strain and risk. Additionally, lifestyle factors like poor sleep quality cause increased susceptibility to chronic pain. These results show that low back pain is a multifactorial disease influenced by physical strain, psychosocial stress and individual factors. The factors and their relationship to each other create a combination that corresponds to the biopsychosocial model of musculoskeletal disorders.

Studying preventative methods showed that success in these measures requires integrated systems and long-lasting strategies. Randomised control trials showed that multidisciplinary rehabilitation and physiotherapy exercise programs significantly reduce pain, compared to a self-care advice-only program. Similarly, nurse-led relaxation and coping technique interventions increased workers' life quality and working ability. These findings highlight that physical and psychosocial factors need to be considered for effective management and prevention of occupational lumbar back pain. [17, 18]

Although the efficacy of active interventions has been shown in workplaces, their use has remained low. The most difficult challenge has been noted to be the lack of commitment and adherence. Tsuboi et al. (2021) noted that “active rest” programs did not significantly decrease symptoms because of low adherence. Additionally, it has been pointed out across this material that long working hours, heavy workload and fatigue inhibited people from participating in preventative actions. This shows that the long-term success of interventions is partially dependent on organisational culture and support from management. Responsibility for occupational health is shared between the worker and management. Organisational factors like staff resources, division of tasks and psychosocial support must be considered before it is realistic to expect change in individual behaviour. These findings strengthen the common occupational medicine finding that organisational changes cause more long-lasting effects compared to personal action. [1, 3, 12, 22]

Some important limitations became evident from the reviewed literature. The most significant restriction relates to the fact that only a limited number of studies aim to study the influence of organisational actions on lumbar back pain. Even though the effect of psychosocial factors is well known, there is not much evidence of the impact of structural organisational

changes on occupational lumbar back pain. Most of the evidence for the effect of reducing workload intensity and improving the psychosocial safety environment is still based on correlation in the reviewed literature. Additionally, in most of the reviewed studies, the follow-up periods were short, and adherence timelines were not studied sufficiently. Early improvements were seen in many interventions, but results diminished with time and because of workload and psychological stress. More studies on how to implement preventative measures over a longer timeline are needed to see if it is possible to improve these outcomes by using incentive-based methods, continuing guidance, or including ergonomic interventions in daily work.

By recognising these limitations, it is possible to come up with sustainable approaches to decrease the effect of lumbar back pain in occupational medicine.

In summary, the reviewed studies and extracted evidence validate both the aim and the hypothesis. Occupational lumbar back pain is a global problem in occupational medicine that is caused by a combination of physical workload, psychosocial factors, organisational factors and individual factors. Active multidisciplinary behavioural and ergonomical interventions can alleviate pain and decrease disability, but the success of interventions is dependent on organisational support and long-lasting adherence. If interventions were successful in these facets, it could be possible to decrease the burden of occupational lumbar back pain for workers as well as the socio-economic burden.

4. CONCLUSION

The aim of this thesis was to analyse current scientific evidence on the prevalence, risk factors, and preventive strategies of occupational lumbar back pain (LBP), with a particular focus on the interaction between physical workload and psychosocial stressors, and to evaluate the effectiveness of ergonomic and behavioural interventions. The findings of the reviewed literature confirmed the hypothesis that both physical and psychosocial occupational factors contribute significantly to the development and chronicity of lumbar back pain and that only integrated, active interventions are effective in reducing its burden.

The analysis of literature showed that lumbar back pain is a leading cause of disability that affects workers across multiple occupational sectors. High physical load, repeated lifting, awkward working postures and exposure to vibration are central biomechanical risk factors. At the same time, psychosocial and organisational aspects, like low decision power and low support from management and high emotional demands, increased the prevalence and chronicity of lumbar back pain. This intertwined relationship between these factors highlights the biopsychosocial character of lumbar back pain, where physical load, organisational environment and individual susceptibility together define the burden and cost of the disease.

The included interventional studies showed that active and multifactorial strategies are more effective than passive self-care programs at decreasing disability and increasing work ability. The long-lasting effect of these strategies is limited because of low adherence and organisational barriers. Review highlights that sustained effect on lumbar back pain requires a change in individual behaviour, organisational commitment and adequate resources.

The most notable limitation was the low number of high-quality studies that study organisational approaches and long-term adherence. This leads to observations about the psychosocial environment and its effect, which is mostly correlative, not causative. This can be addressed in future studies.

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Declaration

I, Mirka-Maija Kristiina Paavola, certify that this Research Paper on the topic

„ Jostas daļas sāpes kā arodmedicīnas problēma ”

(Title of the Research Paper in Latvian)

„ Lumbar back pain as a problem in occupational medicine ”

(Title of the Research Paper in English)

is my own independent research. All other sources of data, definitions and quotations in my Research Paper are referenced accordingly. The text of this Research Paper has never been submitted in any way to any other National Examination Commission for evaluation in its entirety or parts, and has never been published in its entirety.

_____ /Mirka-Maija Kristiina Paavola/

(Student’s signature) (Name, surname)

28/10/2025.