Risk Factors and Treatments of Non-specific Low Back Pain

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Abstract. Non-specific low back pain (NSLBP) is one kind of low back pain (LBP) that most commonly happened and causes a great amount of disability and recurrence, putting a heavy burden on the medical system. However, research about mechanisms, risk factors, and treatment of NSLBP is still limited. This study discusses the mechanism and risk factors of LBP in detail and analyzes physical, biopsychosocial, invasive, and pharmacological treatments of NLBP. Results show that many intrinsic and extrinsic factors influence NLBP. Age, gender, and obesity degree are intrinsic factors. A sedentary lifestyle, smoking, heavy lifting, long-time driving, stress, and fear-avoidance beliefs are extrinsic factors. Effective physical treatments include pilates, core stability, and hip muscle strengthening exercises. Biopsychosocial treatments such as psychologically informed practice, are also considered an evolutionary treatment method. Surgery, radiofrequency denervation, and acupuncture are also should be considered if other invasive therapies are ineffective. Muscle relaxants and nonsteroidal anti-inflammatory drugs are strongly recommended for acute or sub-acute LBP.

Keywords: risk factors, treatments, non-specific low back pain

1. Introduction

LBP covers many types of pain, such as nociceptive, neuropathic, and non-specific [1]. Among these, non-specific low back pain (NSLBP) is one kind of LBP that most commonly happened [1]. It is a symptom caused without any known specific pathological factors, which brings challenges to diagnosis and treatment.

LBP shows a high incidence and recurrence, and also causes many disabilities, which could put a heavy burden on society. According to a 2012 cross-sectional study in the emergency setting in the United States, about 1.39 people among 1,000 people per year could get LBP and 65% of patients got sustained pain at home [2].

After all, these factors could cost a lot to individuals and also health-providing systems. There are still many controversies about the effective treatment of NSLBP and improper methods could even lead to a worse situation (e.g. recurrence, low emission rates, increasing costs). However, there is still limited research about NSLBP. This study aims to focus on mechanisms, risk factors, and treatment of NSLBP.

2. Mechanism

Considering that NLBP does not have any pathoanatomical causes, the main focus of assessment and treatment is pain and recurrence. Thus, it's meaningful to look more into the pain mechanism.

Decreased brain gray matter and impaired cognitive function are related to chronic pain. A study compared healthy people and patients with chronic low back pain (CLBP) by observing the thickness of brain gray matter through MRI [3]. It found that patients with CLBP have thinner left dorsolateral prefrontal cortex (DLPFC) compared with healthy people. Surprisingly, these patients reported reduced pain and disability after 6 months of pharmacological treatment for pain with the increased thickness of DLPFC. It is assumed that the assessment of LBP treatment outcome could depend on the thickness of brain tissue by MRI.

A systematic review of NSLBP shows that the multifidus ad paraspinal muscles indicate atrophy in CLBP [4], so therapists could consider the structural changes of lumber muscles when diagnosing or treating CLBP.

Except for local muscular problems, decreased hip joint motion, decreased hip muscle strength, and reduced core stability could also lead to NLBP.To be more specific, the limitation of hip range of motion (ROM), could contribute to the compensatory excessive lumbar spine rotation [5]. As shown in a study based on 50 populations with LBP, researchers observed that patients with LBP had less internal hip ROM compared to people without LBP [6].

3. Risk factors

Many intrinsic and extrinsic factors have been evaluated as associated factors for LBP. Getting comprehensive knowledge about risk factors could improve the effectiveness of prevention. For instance, over lifting at work increase the risk of NSLBP [1], so therapists could give occupational instruction, such as changing the working load or using tools, to decrease the occurrence of LBP. There are lots of studies targeted at different groups which show that risk factors of NSLBP are various, so therapists may need to make personal prevention plans in clinical settings.

3.1. Intrinsic factors

Age, gender, and obesity degree are important intrinsic factors in LBP.

The argument of the impact of age on LBP is different. Some researchers argue that people with old age show a high prevalence of getting LBP compared to junior, which may be caused by age-related pain processing degeneration. The low sensitivity of pain could reduce the elderly's awareness and reporting of pain, leading to undiagnosed and severe pain [7]. However, a recent study shows that younger adults are the most affected group, mainly because of their long-time and daily physical exercise [8].

Female has been proven to be a high-risk group for LBP[7],[8]. Female has a lower threshold and increased sensitivity to pain [9], which means that the severity of LBP could be perceived more by a female. Furthermore, due to the different sex hormones, Postmenopausal women are more likely to get LBP. What's more, compared with boys, school-aged girls have a higher prevalence to get LBP which is more likely due to female hormone fluctuation and menstruation [10].

Body mass index(BMI) and high-fat percentage (%FAT) are also intrinsic risk factors of LBP. Hashimoto and his colleagues [11] conducted a survey about the relationship between obesity and LBP and it turns out that the relationship between %FAT and persistent LBP is significantly positive. So does the BMI.

In all, when assessing LBP patients in clinical settings, it's meaningful to take age, sex, and degree of obesity into consideration and also make treatment to prevent recurrence based on these risk factors.

3.2. Extrinsic factors

A sedentary lifestyle, smoking, heavy lifting, and long-time driving could lead to a more severe LBP [8]. In a Japanese study, anxiety and low satisfaction with work and daily life are significantly related to the development of disability of CLBP [12]. Also, an unqualified working environment could also increase the occurrence of LBP. One study focused on computer workers with LBP in China shows that not having a computer monitor in front could be a high-risk factor for LBP. In addition, cold office temperatures also lead to a high prevalence of LBP [13]. These relative studies focus more on

self-reported questionnaires rather than physical tests, which might not be valid enough to show the correlation between the severity of LBP and these extrinsic factors. However, poor working conditions, low life satisfaction, and bad lifestyle should still be considered risk factors.

In a study with a physical test of muscle strength and lumbar curve degree, awkward back posture, perceived exertion, and improper arm position could lead to the recurrence of LBP. Psychological distress, especially fear-avoidance beliefs, could also increase the risk of LBP [8]. The stress and fear-avoidance beliefs could reduce the confidence in accomplishing the specific activity and then lead to the atrophy of targeted muscles and also immobilization of joints, which is also a risk factor for LBP.

4. Treatments

4.2. Physical therapies

Physical therapies include exercise and manual therapy. Exercise treatments for LBP mainly include pilates, core stability, and hip muscle strengthening exercises.

Pilates method is a mind and body exercise, focusing on alignment of body posture. To be more understandable, it maintains spine curvatures and symmetrical weight-bearing of the feet in a standing position. As mentioned in risk factors, people at high risk of LBP are often involved in some awkward postures, strenuous arm positions, and poor mental health, so pilates could allow full adjustment of posture, relaxation of tensed muscles, and relieve mental stress.

Core stability exercise (CSE) and hip muscle stretching exercise (HSE) are also proven beneficial to LBP. A randomized control trial shows that CSE and HSE significantly reduce the disability and pain severity of patients with NLBP. The core muscle includes the posterior paraspinal and gluteals, the anterior abdominals, the superior diaphragm, and the inferior pelvic floor and hip girdle musculature. It holds the whole body and plays an important role in motor control. One group of Korean scholars researched the effectiveness of stabilization exercises on NLBP patients and proved the significance of stability training. The exercise includes protocols to improve stability of the spine and change motor control and then recruit deep core muscle in the back and abdomen with bracing, such as abdominal bracing, quadruped leg lift, heel slides lift, bridging, and quadruped arm lifts [5].

Aquatic and aerobic exercises are also beneficial for the relief of LBP. Irandoust et.al conducted research on the effectiveness of aquatic exercise on the man with LBP and aged above 65 years old. It turns out that the trunk muscle mass increased significantly and all obesity variables decreased greatly. Furthermore, the severity of LBP is also reduced. Such types of exercise are more suitable for elderly people compared to specific muscle training, which may be more intensive and stressful.

Besides exercise therapy, manual therapy is also effective at pain relief. A meta-analysis in the recent 5 years conveys that stabilization exercises improved pain and disability compared with general exercise, but manual therapy has the same effect as stabilization exercises [14].

The therapies mentioned before are mainly for CLBP, but some of them may be ineffective in acute or sub-acute LBP. For those who have acute or sub-acute LBP, patient education can provide reassurance in the long term. Reassurance is essential to daily medical practice, which could remove the concerns and fears about illness. On some occasions, patients may seek improper interventions when they are concerned or worried about illness. Thus, reassurance was recommended by the guidelines for the management of LBP. Another treatment for acute or sub-acute LBP is resting in bed, whose frequency is still under controversy. Bed rest is not recommended for CLBP, but is meant for acute or sub-acute settings. One study shows that frequent, short, standing rest breaks may help to relieve symptoms of LBP. However, short rest breaks are a temporary solution because pain development still sustains, even with frequent rest breaks [15].

4.3. Biopsychosocial treatments

People with CLBP have a high prevalence of sleep disturbance and depression, which leads to considering biopsychosocial treatment for CLBP [16]. According to the latest review posted in 2022, psychological interventions have the most positive effect when combined with physiotherapy, pain

education programs, and behavioral therapy [16]. Main & George recommended an approach termed "psychologically informed practice", involving cognitive-behavioral approaches and physical therapies to reduce unnecessary pain-related activity limitations [17]. More specifically, traditional physical therapy was narrowly based on biomedical therapy and traditional psychological treatment was only for mental illness. Combining the two could help physical therapists consider other psychosocial factors and then be more effective in preventing the development of pain-related physical limitations.

Nijis et.al mentions that central sensitization is a part of the central pain mechanism during the treatment. This treatment therapy is aimed to modify the central nervous system to reduce sensitivity and change pain memories in people with CLBP [18]. Furthermore, musculoskeletal therapists could combine pain neuroscience education with exercise therapy to help patients avoid the fear of pain and increase their confidence in accomplishing exercise. For example, before treating a patient with CLBP, the therapist should provide intensive pain neuroscience education to make the patient understand the neuroscience education message. After the patient understands that pain comes from the brain and has less threatening perceptions about pain, the therapist could start goal-setting and cognition-targeted therapy, which could include various types of exercise interventions, such as motor control training.

4.4. Invasive treatments

Though there is a declining trend of recommendation of surgery, surgical options should be considered for patients who still suffered from persistent LBP after rehabilitation or pain control [15].

Radiofrequency (RF) denervation is one kind of invasive treatment for CLBP. The mechanism of RF is that an active electrode sends a current to a ground plate. When the tissue is completed by the circuit, an electrical field is created. This electrical field and the resulting ionic motion contribute to the dissipation of frictional heat in the local pathological tissue. RF is still controversial, although many studies have proved its efficacy in reducing LBP.

Acupuncture is recommended because of its low side effects and low costs. This complementary therapy is using thin needles to insert into specific points of muscles to treat various health conditions, such as pain. According to Mu's review, acupuncture shows little significant effects on short-term treatment but is effective in curing pain compared with no therapy method.

4.5. Pharmacological therapies

According to one treatment guideline for low back pain, muscle relaxants and NSAIDs are strongly recommended for acute or sub-acute LBP [15]. Nonsteroidal anti-inflammatory drugs (NSAIDs) act to produce analgesia and then work to control pain. Due to its fewer side effects, NSAIDs have become the first choice to treat LBP. Muscle relaxation includes many kinds of drugs and different mechanisms. Antispasmodics, one kind of muscle relaxation acting on the central nervous system, are used to decrease muscle spasms related to conditions causing pain, such as LBP. However, there are also many side effects, such as headache, vomiting, dizziness, nausea, blurred vision, and overuse[19]. Thus, it should be considered carefully when prescribing.

Besides NSAIDs and skeletal muscle relaxants, opioids are also effective to treat LBP [20]. According to a clinical review in 2015, opioids have positive effects on chronic low back pain, and opioid prescribing has increased trending worldwide [20]. However, opioids could lead to dependence on drugs, so some guideline synopsis shows the low recommendation of opioids. It is said that opioids should only be considered when other treatments, such as exercise therapy and NSAIDs therapy, have failed and after considering their risks and benefits.

In recent years, the treatment of NLBP focuses more on psychological and physical therapies, self-management, and some kinds of complementary medicine. Meanwhile, the treatment puts less emphasis on invasive treatments, such as surgical therapy. However, regarding patients' personal history, it is essential to conduct individual treatment and conduct plans based on patients' desires.

5. Conclusion

This study discusses the mechanism and risk factors of LBP in detail and analyzes physical, psychological, invasive, and pharmacological treatments of NLBP.

There are many intrinsic and extrinsic factors impacting NLBP. Age, gender, and obesity degree are intrinsic factors. A sedentary lifestyle, smoking, heavy lifting, and long-time driving as well as stress and fear-avoidance beliefs are extrinsic factors.

There are many treatments related to LBP. Physical treatment includes pilates, core stability, and hip muscle strengthening exercises. Psychological treatment, such as psychologically informed practice, is also considered an evolutionary treatment method. Surgery, radiofrequency (RF) denervation and acupuncture are also effective invasive treatments. Muscle relaxants and nonsteroidal anti-inflammatory drugs are strongly recommended for sub-acute or acute LBP while opioids have a low recommendation for LBP according to some guidelines.

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