



# Factors Influencing Biomechanics during Pregnancy and Ergonomic Modifications to Alleviate Discomfort: A Descriptive Review

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## Abstract

This in-depth analysis covers the biomechanical changes that take place during pregnancy and the effectiveness of ergonomic therapies for reducing pain and enhancing maternal wellbeing. Significant physiological changes brought on by pregnancy affect many aspects of the body, including biomechanics. During pregnancy, the lower back and lumbopelvic region are particularly prone to pain and musculoskeletal problems. A variety of factors, including weight growth, hormone changes, ligament elasticity, and postural changes, affect how the body moves and put more strain on the musculoskeletal system. Pregnant workers' biomechanical stress at work is made worse by occupational factors like physical demands and poor ergonomics. Various ergonomic solutions have been recommended during pregnancy to reduce discomfort and improve biomechanics. These include auxiliary devices (such as pregnancy belts, support bands), activity adaptations, psychosocial support, workplace modifications (such as adjustable workstations, supportive seats), and education and communication to empower women with knowledge of ideal body mechanics. The use of these therapies throughout pregnancy can increase comfort, preserve musculoskeletal health, and promote general wellbeing. This study emphasises the numerous effects on pregnancy biomechanics and stresses the value of integrating and synthesising already available information. Healthcare professionals, companies, and individuals can significantly reduce discomfort and promote a healthier and more comfortable pregnant experience by implementing evidence-based ergonomic changes.

**Keywords:** Ergonomics; Pregnancy; Musculoskeletal Health; Ergonomic Modification

## Introduction

Pregnancy is a redefining phase of a woman's life during which there are notable physiological changes to promote foetal growth and development. Biomechanics is one of the many areas of the body that are impacted by these changes [1]. Pregnancy frequently causes changed biomechanics that result in pain and musculoskeletal problems, especially in the lower back and lumbopelvic region [2]. Promoting maternal well-being requires an understanding of the

elements that affect biomechanics during pregnancy and the implementation of appropriate ergonomic changes [1,3].

Pregnancy-related alterations in biomechanics are caused by a wide range of reasons. The lower back and lumbopelvic area are subjected to more stress as a result of weight gain and the redistribution of body mass [1,4]. Increased levels of relaxin are one hormonal shift that causes ligament laxity, which affects joint stability and may cause biomechanical abnormalities. Furthermore, pregnant

women change their posture to accommodate the expanding uterus. This frequently results in an increased anterior pelvic tilt and lumbar lordosis, which affect spinal alignment and load distribution [5].

The biomechanics of pregnancy are significantly influenced by occupational circumstances as well. The risk of musculoskeletal discomfort rises with physical demands such as lifting, standing, and repetitive jobs [1,2]. Pregnant workers' biomechanical stress at work is also exacerbated by inadequate support, rigid work schedules, and poor ergonomics [2,4]. These elements emphasise the requirement for interventions and changes to be made in order to lessen the negative consequences on maternal well-being [3,4].

Numerous ergonomic changes have been suggested as a solution to these issues in order to reduce discomfort and provide the best possible biomechanics throughout pregnancy. Women must be empowered to comprehend the significance of ergonomic adaptations, which requires education and understanding of the biomechanical changes that take place during pregnancy [3,6]. Pregnant employees require certain workplace accommodations, such as supportive seats and flexible workstations [4,7]. Supportive tools, including maternity belts and support bands, can give the lumbopelvic area additional support, easing pain and dispersing the stress on the lower back [3,7].

Adapting activity can assist regulate biomechanical stress and minimise overexertion [6,8]. These adaptations include good body mechanics and regular rest periods. Additionally, encouraging appropriate biomechanics and minimising stress-related pain depend on understanding the psychosocial elements of pregnancy and offering emotional support [6,8].

The dynamic time of pregnancy is marked by a number of physiological changes that have an impact on a woman's biomechanics. Discomfort and musculoskeletal problems, particularly in the lower back and lumbopelvic region, might result from these alterations. The wellbeing of pregnant women can be greatly enhanced by comprehending the elements influencing biomechanics during pregnancy and putting ergonomic changes into practise. This in-depth analysis looks at the multiple factors that affect a woman's biomechanics while she is pregnant and explores ergonomic treatments that have been proven to minimise pain. Despite the rising volume of research on ergonomic treatments and pregnant biomechanics, there is still a need to integrate and synthesise what is already known. This in-depth review explores the multifaceted impacts on pregnancy biomechanics in an effort to plug this gap.

## Factors Affecting Pregnancy Related Biomechanics

### Increased Weight and Changes to Centre of Gravity

Gaining weight during pregnancy is a normal process required for foetal growth. The lower back and lumbopelvic area may experience increased stress as a result of the redistribution of body mass and a forward shift in the centre of gravity [1].

### Ligament laxity and Hormonal Changes

Ligament laxity is a result of hormonal changes during pregnancy, including higher amounts of relaxin. Joint stability is affected by this increased laxity, which may result in biomechanical alterations including hypermobility and an increased risk of accidents.

### Postural Alterations

To accommodate the expanding uterus, pregnant women frequently adopt new postural alterations. These adaptations can affect spinal alignment and load distribution, and they include a greater anterior tilt of the pelvis and lumbar lordships [5].

### Physical Requirements and Workplace Factors

The biomechanics of pregnancy are significantly influenced by occupational circumstances. Musculoskeletal discomfort can be made more likely by physical demands including lifting, standing, and repetitive work. Biomechanical stress is also exacerbated by inadequate support, rigid work schedules, and poor ergonomic procedures [2].

## Ergonomic Measures to Mitigate Pain

### Knowledge and Communication

It is crucial to inform expectant mothers about the biomechanical changes that take place during pregnancy. Women are empowered to comprehend the significance of ergonomic adjustments in minimising discomfort and maintaining musculoskeletal health when given information on optimal body mechanics, posture, and lifting techniques [3].

### Modifications to the Workplace

To meet the needs of pregnant employees, ergonomic adjustments must be made in the workplace. Comfort can be improved and ideal biomechanics encouraged by

using adjustable workstations, supportive seats, and other equipment that reduces physical strain [4].

### Auxiliary Devices

Pregnancy belts or support bands can give the lumbopelvic region additional support, lowering pain and the strain on the lower back. These tools assist in preserving correct alignment and reducing biomechanical stress [7].

### Modifications to Activities and Rest Periods

To effectively manage biomechanical stress during pregnancy, activity adjustments and the regular inclusion of rest periods are crucial. To lessen musculoskeletal stress, pregnant women should be urged to adapt their activity, refrain from extended standing or sitting, and alternate between different positions. Additionally, fostering a positive work environment that allows for sufficient rest periods and employing a balanced approach to workload management can assist prevent excessive fatigue and pain [6].

### Psychosocial Assistance

Promoting ideal biomechanics requires understanding the psychosocial components of pregnancy and offering emotional support. Numerous stressors can arise during pregnancy, and stress management is crucial for maintaining good musculoskeletal health. By lowering mental and emotional strain, which can emerge as physical discomfort, the provision of stress management strategies, encouraging a healthy work-life balance, and granting access to support networks might indirectly affect biomechanics [8].

### Pregnancy outcomes and Ergonomics

Several research papers have examined the impact of ergonomic stressors on pregnancy outcomes, particularly in relation to the risk of abortion.

- **Ergonomic Stressors among Pregnant Healthcare Workers:** This study emphasizes the impact of ergonomic stressors on pregnancy outcomes among healthcare workers. Factors such as heavy lifting, prolonged standing, and inadequate support can increase the risk of abortion [9].
- **2. Ergonomic Demands and Fetal Loss in Women in Welding and Electrical Trades:** This Canadian cohort study investigates the association between ergonomic demands in welding and electrical trades and the risk of fetal loss. Exposure to physical stressors, such as lifting heavy objects or working in awkward postures, was found to be linked to an increased risk of abortion [10].
- **Provisional Recommended Weight Limits for Manual**

**Lifting During Pregnancy:** This research focuses on the recommended weight limits for manual lifting during pregnancy. It suggests that exceeding these limits can impose excessive strain on the body, leading to complications and potentially increasing the risk of abortion [11].

- **Design and Development of Ergonomic Workstation for Pregnant Workers in Readymade Garment Industry:** This study addresses the importance of designing ergonomic workstations for pregnant workers in the readymade garment industry. Inadequate support, prolonged standing, and repetitive tasks without proper ergonomics can contribute to increased physical stress, discomfort, and potential risks, including the risk of abortion [12].

These studies collectively highlight the significance of addressing ergonomic stressors during pregnancy to mitigate the risk of abortion. Implementing appropriate safety practices, such as providing proper support, minimizing heavy lifting, and ensuring ergonomic workstations, can contribute to a safer and healthier working environment for pregnant women.

### Ergonomic Actionables

- **Provide adequate support to pregnant healthcare workers:** Pregnant healthcare workers face physical stressors that can increase the risk of adverse pregnancy outcomes. Implementing measures such as reducing heavy lifting, ensuring appropriate rest breaks, and providing ergonomic equipment can help mitigate these stressors [9].
- **Enhance safety measures in welding and electrical trades:** Pregnant women working in these trades are exposed to physical stressors that can have detrimental effects on pregnancy. Implementing appropriate safety measures, such as minimizing exposure to hazardous substances, ensuring proper ventilation, and providing protective equipment, can help reduce the risk of fetal loss [10].
- **Adhere to recommended weight limits for manual lifting:** Manual lifting during pregnancy can pose a risk to both the pregnant woman and the fetus. Following recommended weight limits and providing assistance or mechanical aids for lifting heavy objects can help prevent excessive physical strain and potential complications [11].
- **Design ergonomic workstations for pregnant workers in the garment industry:** The design of workstations can significantly impact the comfort and well-being of pregnant workers. Implementing ergonomic principles, such as adjustable seating, appropriate workstation height, and proper support for the lower back, can help alleviate physical stress and

reduce the risk of adverse pregnancy outcomes [12].

By incorporating these actionable changes, employers can create a safer and more supportive working environment for pregnant women. These changes prioritize the well-being of pregnant workers, reduce physical stressors, and promote optimal working conditions, ultimately contributing to the prevention of abortion and miscarriage.

### The EU Directive 92/85/EEC on Pregnant Workers

In the European Union (EU), there are legislative measures in place to safeguard the health and safety of pregnant workers, with a particular emphasis on addressing ergonomic factors. The EU Directive 92/85/EEC on Pregnant Workers is a key regulation that outlines specific requirements to ensure the well-being of pregnant employees.

According to this directive, employers have a responsibility to conduct thorough assessments of the workplace to identify and mitigate any potential ergonomic hazards that could pose risks to the physical well-being of pregnant workers. These hazards may include factors such as awkward postures, repetitive movements, or excessive physical exertion that can lead to musculoskeletal strain.

The legislation also emphasizes the importance of providing comprehensive information, training, and guidance to pregnant workers regarding the potential ergonomic risks present in their working environment. Employers are encouraged to educate employees on proper ergonomics principles, including techniques for safe lifting, maintaining optimal posture, and utilizing ergonomic equipment or adjustments to minimize physical stress.

Furthermore, employers are obliged to make reasonable accommodations to the working conditions and tasks of pregnant workers, taking into account their specific ergonomic needs. This may involve providing ergonomic workstations with adjustable features, ergonomic seating options that promote proper alignment and support, and allowing for regular rest breaks to prevent excessive physical strain.

By adhering to these ergonomic guidelines and regulations, employers in the EU can effectively protect pregnant workers from the potential adverse effects of ergonomic stressors, ensuring their physical well-being and reducing the risk of musculoskeletal discomfort or injuries during pregnancy.

It is important to note that specific legislation and guidelines regarding ergonomics for pregnant workers may

vary among EU member states. It is advisable to consult the relevant national regulations and guidelines for detailed information on ergonomics and the protection of pregnant workers in a specific country.

### Limitations

The heterogeneity of participant characteristics, the absence of long-term follow-up studies, variations in the quality and relevance of the included papers, the limited scope of the included research papers, the possibility of variability in study methodologies, the presence of publication bias, and these limitations round out the review's drawbacks. It is important to be aware of these limitations so that the results may be interpreted in a balanced way and so that future study can focus on areas that need to be strengthened. Future research can address these drawbacks and improve the rigour and applicability of the evidence base in the area of ergonomics for pregnancy, offering more thorough and trustworthy recommendations for those seeking to optimise ergonomic interventions during pregnancy as well as for healthcare professionals and individuals in general.

### Future Scope

Future studies in physiotherapy may concentrate on investigating the effects of interventions on particular populations, contrasting various approaches, looking at the best timing and duration, encouraging multidisciplinary collaboration, evaluating feasibility and implementation, and assessing the efficacy of educational initiatives. These areas of study would improve pregnancy-related ergonomics and health security, which would be advantageous to pregnant women's wellbeing and musculoskeletal health.

### Six Important Lessons from the Perspective of Ergonomics

- Weight gain and altered centre of gravity: Pregnancy-related weight gain and the ensuing shift in the centre of gravity can put more strain on the lower back and pelvic area, which may cause discomfort and musculoskeletal problems [1].
- Ligament elasticity and hormonal changes: Ligament elasticity and joint instability can be brought on by hormonal changes during pregnancy, including higher levels of relaxin. According to Yadav, et al. this may lead to biomechanical alterations like hypermobility that could raise the risk of accidents.
- Postural adaptations: To accommodate the expanding uterus, pregnant women frequently adopt postural modifications. These modifications, such as a greater anterior pelvic tilt and lumbar lordosis, might affect the load and alignment of the spine.

- Occupational variables: Pregnant women's biomechanics are significantly influenced by occupational factors. Musculoskeletal discomfort can be made more likely by physical demands like lifting, standing, and repeating chores. Biomechanical stress can also be exacerbated by inadequate support, rigid work schedules, and inadequate ergonomic procedures [2].
- Education and awareness: It's crucial to educate pregnant women about the biomechanical changes that take place during pregnancy. Their discomfort can be decreased and their musculoskeletal health can be preserved by arming them with knowledge about good body mechanics, posture, and lifting techniques [3].
- Workplace adjustments: Making adjustments to the workplace's ergonomics can help pregnant employees. Comfort and productivity can be increased by modifying workstations, offering supportive seats, and installing technology designed to alleviate physical strain.

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### Conclusion

Women may experience discomfort and musculoskeletal problems as a result of pregnancy-related biomechanical changes. Healthcare providers, businesses, and individuals can considerably reduce discomfort and enhance the wellbeing of pregnant women by recognising the elements impacting biomechanics during pregnancy and putting evidence-based ergonomic adjustments into practise. Pregnancy-related biomechanics are influenced by a variety of factors, including weight increase and altered centre of gravity, hormone changes and ligament laxity, postural adjustments, and occupational factors. Effective methods for treating biomechanical stress include ergonomic alterations such as education and awareness, workplace adaptations, supportive equipment, activity modifications, and psychological support. The whole experience of pregnant women can be improved, and a healthier and more comfortable pregnancy can be promoted, by healthcare professionals incorporating these strategies.

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