

Evaluating the Biomechanical Changes in Lower back Region among the Patients with Post-Traumatic Injuries around the Knee Joint: A Protocol for a Systematic Review

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Abstract

Knee joints which are most commonly injured body part and knee joint injuries constitute a significant percentage of injuries in both professional and recreational sportsmen. Reduction in the range of knee joint motion leads to increased pelvic motion and a change in kinematic interaction impact on lumbar spine mobility and stability, and can cause pain and dysfunction in the lower back region. Therefore, the above stated reasons highlight the need of analyzing the spine biomechanically. So, that a new physiotherapeutic assessment and treatment approach can be developed in future to prevent permanent adaptive changes in the posture in patients with knee injuries. This systematic review protocol has been conducted by two independent reviewers who searched the articles using electronic search for publications in several databases: Google Scholar, Index Copernicus, JSTOR, Pubmed/Medline, ScienceDirect, Scopus and Web of Science. After applying the selection criteria, study papers published between the years 2001 to 2020 have been selected. Studies of human participants of any age having injuries around knee joint have been eligible, and there was no restriction on type of injuries. All the study papers will be analyzed using Modified Downs and Black scale and scores will be awarded for the items selected on a 27 point scale. This review has collected secondary data only; hence no ethical approval was required. The results of this review protocol will provide evidence regarding changes in lower back region in patients with injuries around knee and this information will be useful in planning for rehabilitation in knee and around knee injury.

Keywords: Lower back region; Knee Injuries.

Introduction

Musculoskeletal injuries are the most common type of sports and other physical activity injuries, which account for 80 percent of injuries¹. Knee joints which are most commonly injured body part and knee joint injuries constitute a significant percentage of injuries in both professional and recreational sportsmen². Physical activity plays a significant role in preserving health and well-being for individuals of all ages and has been responsible for decreasing

health risks and body mass index, and increasing physical competency and social interaction³. But, physical activity often carries a risk of injury, which can jeopardize physical, psychological, social, financial, and economic well-being of an individual. Participation in sports and other physical activities by young adults is seen as a significant risk factor for knee injury⁴.

Knee joint is the most commonly injured joint in adolescent athletes, in USA, with an estimated 2.5 million injuries per year⁵. Such type of injury usually involves costly surgery and extensive rehabilitation. A knee injury can affect physical activity and physical capacities temporarily and to some extent permanently⁶. Furthermore, while knee injuries may have an economic impact on injured persons, they also pose a burden on the health care system⁷. Human body is a collection of

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numerous segments and all of the body's segments work together in a closed cinematic chain and if there is some change in the configuration of one segment then is responsible, directly or indirectly, for making compensatory adjustments in the neighboring segments and joints. Compensatory changes in the pelvis and other lower extremity joints occur in response to the changes in the knee joint⁸. Reduction in the range of knee joint motion leads to increased pelvic motion and a change in kinematic interaction impact on lumbar spine mobility and stability, and can cause pain and dysfunction in the lower back region⁹.

In a closed kinetic chain the body acts together and any alteration in movement at one joint influences movement at other joints. Ground reaction forces act through the linkages of the feet, knees and legs into the spine and pelvis. Distortions in spinal regions and pelvis are caused by altered knee joint biomechanics¹⁰. The association between low back pain or conditions and knee pain can be explained through different factors. A closed kinetic relationship exists between the lumbar spine and knee joint and any dysfunction in knee Even the lumbar region may contribute to compensation, joint instability and pain either in one region even both¹¹. Understanding this relationship between the biomechanical deviations in the knee joint and its consequences on the posture and loading of the spinal cord will improve the effectiveness of case management.

Directing the physiotherapists' attention to evaluate and analyze the patient's complete body posture and not just focusing his entire attention on the symptomatic area is only important, as changes in knee posture can produce long-term effects in both the spinal and pelvic regions¹². If these changes are neglected then symptoms may be referred to other parts due to failure in the knee to properly diagnose the underlying. However to our knowledge, there is scarcity of literature which has focused towards finding out the biomechanical changes in the lumbar spine among patients with injuries around the knee. Therefore, the above stated reason highlights the need of analyzing the lower back biomechanically. So, that a new strategy can be established in future to prevent permanent adaptive posture changes with respect to lower back region changes in patients with knee injuries. This systematic review will help to establish a relationship between knee injuries and biomechanical changes in the lower back region.

Objectives

The primary objective of the review will be to evaluate systematically the biomechanical changes in lower back region among patients with post-traumatic knee injuries.

Key Review Question

1. What is the impact of injuries around the knee on lower back region?

P= Adult patients with knee injuries and around knee injuries will be included

I= No intervention based study will be included in the review

C=any comparator will be included in the review

O=any measure of outcome related to assessment of lower back region will be carried out

S= any kind of setting in any area/country

Secondary Review Questions

1. What precautions and contraindications need to be taken into account while evaluating the changes in lower back region in patients with post-traumatic knee injuries?

The articles selected from the search findings for the key review question has been reviewed to answer the secondary review question. Selected articles will be investigated for additional information:

2. What challenges will be faced by the therapist while evaluating the changes in lower back region in patients with post-traumatic knee injuries?

Methods

This is a protocol for systematic review.

Participants

Inclusion and Exclusion Criteria

Studies will be involved only human participants of any age with injuries around knee. There will be no restriction on unilateral or bilateral involvement of knee for selection the subjects. Both the genders i.e. males and females will be included. Studies involving animals as participants will be excluded from the review. Studies with patients suffering with other acute/chronic serious illness will be excluded from the study. Studies involving mentally challenged or psychosocially unfit patients will also been excluded in this review.

Studies without interventions will be included in the systematic review.

Type of Studies

All cross-sectional studies evaluating the impact of knee injuries and injuries around the knee on changes of lower back region will be included in this review, including feasibility studies, pilot studies, experimental studies and quasi-experimental studies. RCTs, review articles, editorials, case studies, qualitative studies, animal studies and study protocols will be excluded.

Outcome Measures

Outcomes measures for evaluation of biomechanics to monitor the motions of lower back region, forces acting on lower back region with validated tools for functional assessment and spinal load assessment should be used at least once in the studies will be included.

Language

We will only consider full text articles published in English.

Search strategy for identification of relevant studies

A comprehensive search will be conducted at the central library of Swami Vivekanand Subharti University (SVSU) and library of Subharti College of Physiotherapy, Meerut during the period of 6-9 months. All bibliographic databases of published research papers which will easily accessible been assessed. All databases included will be searched and all the papers published from 2001 to till 2020 will be included. The electronic database will be included Google Scholar, Index Copernicus, JSTOR, Pubmed/Medline, ScienceDirect, Scopus and Web of Science.

Study Records

All the searched results will be merged using reference management software 'Mendeley'. The result of electronic searches will also be saved to the researcher's account on PUBMED. The principal investigator/researcher has created a shared folder on 'Google drive' to encourage and facilitate collaboration among reviewers and to make it accessible by all the researchers. The physical backup will be maintained by keeping the printed

copies of summaries of all the screened articles.

Data Extraction

Data from included studies will be extracted using a standardized data extraction form. Two reviewers, both physiotherapists; will search the databases independently and screen the titles and abstracts for eligibility. The searched titles and abstracts will be examined carefully and irrelevant reports removed. The full text of selected potentially relevant articles will be obtained; multiple articles of the same study on different database will be linked to minimize the duplication. Both the reviewers will thoroughly assess full text articles to check their compliance in accordance with the inclusion and exclusion criteria. The data analysis/ synthesis of the articles meeting the eligibility criteria will be done by the first reviewer. The reviewer has also searched the references for articles manually to include in data extraction.

Quality of Evidence

A narrative synthesis of the selected studies from the search findings will be provided due to the likely heterogeneity of the outcome measures. Patient's population and outcome measures will be described in a narrative summary. Information on adherence to the protocol, resources used, compliance monitoring and expenditure will be extracted from the selected studies, if available.

Novelty

Many studies have been carried on measuring the changes in spine among the patients with various musculoskeletal disorders. However, no research has been carried out on the evaluation of biomechanical changes in lower lumbar spine in patients with post-traumatic knee injuries.

Discussion

This will be the first study of experimental evidence relevant to evaluating the biomechanical changes in lower back region among the patients with post traumatic injuries around the knee joint, as far as we are aware. This study will provide an answer to the question about the impact of post traumatic injuries of knee around the knee on the loading and functions of lower back region. This has been provided the information on the safety precautions taken during the procedure to avoid adverse events. Subsequent review of the evaluation information

published in the included literature should include previously inaccessible information on evaluation elements as to whether such elements are related to evidence of substantial benefits and whether best practices can be determined for assessing the loading and functions of the lower back region in post-traumatic knee injuries.

Relevant details on safety measures considered addressing the risk of adverse effects during the evaluation of lower back region in terms of its loading and functions among the patients with post-traumatic injuries around the knee joint have been highlighted. Where information on this evaluation was available that was relevant in low-income countries for patients with post-traumatic knee injuries, the authors has been compiled evidence-informed guidance for the safe use of physiotherapy evaluation in these settings.

Conclusion

In this review protocol, new biomechanical assessment strategy for spinal loading in lower lumbar region among the patients with injuries around the knee will be proposed. The assessment will be based on biomechanical outcomes regarding the function and loading measures of the lower back region in patients with post traumatic injuries around the knee joint. Assessment format of function and loading will be formulated for determining the changes in lower lumbar spine due to gait abnormalities among the patients with post traumatic injuries around the knee joint. Furthermore, this review protocol will be very helpful to carry out the systematic review and meta-analysis on the evaluation of biomechanical changes in the lower back region among the patients with post traumatic injuries around the knee joint.

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