INPLASY PROTOCOL

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None declared.

A systematic review of cost effectiveness of total knee replacement vs non-surgical management among 40 years and above population with knee osteoarthritis

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Review question / Objective: **Clinically, knee is the most common site of OA, followed by the hand and hip. The main research question is what are different costing methodologies used and its quality in studies related to cost effectiveness of TKR compared to non-surgical treatment procedures. Based on this review question, the following objectives are proposed: 1. To assess different methodologies, scope and quality of studies related to cost effectiveness of TKR compared to non-surgical management. 2. To synthesize evidence of TKR cost and compare the variations across different countries.**
Information sources: **All sources with information on TKR, economic evaluations and non-surgical management namely journals, handbooks, internet sources, published conference abstracts, thesis, and electronic databases will be searched extensively.**

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 09 September 2022 and was last updated on 09 September 2022 (registration number INPLASY202290044).

INTRODUCTION

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evidence of TKR cost and compare the variations across different countries.

Rationale: Osteoarthritis is a degenerative joint disease involving the cartilage and surrounding tissues and is the leading cause of disability worldwide among older adults. Globally, the prevalence of OA knee was estimated to be around 22.9% and in India, the prevalence was estimated to be 28.7%. The economic burden of the disease is quite huge. A study showed that the direct costs for OA patients were US$5294 per person per year in those aged over 65 years and $5704 in patients less than 65 years. This was estimated to be the double of those of non-OA patients. One-third of direct OA knee expenditures are attributed to medications, most of which goes to analgesics. Indirect costs of OA knee are high as well of around US$4603 per person annually, mainly due to work-related losses and home-care costs.

As OA knee is associated with high economic burden, which is mainly due to disability, comorbid disease conditions and the expense of treatment, it presents a major public health challenge. Hence, Total knee replacement (TKR) is considered one of the interventions to overcome the burden of OA knee. The number of TKRs being done to mitigate the burden of OA knee has also been increasing throughout the world. In the United States of America, in the year 2010, approximately 700,000 TKR surgeries were performed, and it's demand is predicted to grow to 3.8 million per annum by the year 2030.

TKR in developed countries costs around $50,000, however it is cheaper in developing countries. There is limited evidence on the economic burden of OA knee and the cost of TKR in India. There has been only one study conducted in India, which showed that TKR is cost-effective in the base case scenario with an ICER of ₹9789 ($132.3) per QALY. It also reported that cost-effectiveness is sensitive to changes in input variables, especially costs of OA knee and TKR. This was the first study to evaluate the economic benefit of TKR in the healthcare system in India.

Many developed countries have considered cost-effectiveness analysis as one of the methods for policy level decision making. However, in India, which have a number of health issues and limited government investment on health, are progressively preparing to include cost-effective analysis as a tool for decision making at policy level.

Given the emerging disease burden of osteoarthritis, it is of utmost importance to review the current literature regarding the impact of the prevailing cost trends on the health care policies associated with the intervention (TKR) for osteoarthritis. Hence, this paper aimed to perform a systematic review of economic evaluations/cost-effectiveness of TKR compared to non-surgical procedures that used different perspectives and different methods. The major objective of this study is to summarize the evidence on the core modelling specifications and procedures on the cost-effectiveness of TKR compared to non-surgical management. This systematic review also focused on reviewing all the studies related to cost-effectiveness, cost-benefit and cost utility of TKR intervention that used different perspectives. This synthesis of evidence will guide the methods and approaches for future studies in this domain.

Condition being studied: Osteoarthritis (OA) is a degenerative joint disease involving the cartilage and its surrounding tissues. OA can affect all joints, however knee, spine, hip, hands, feet and shoulder are the most frequently affected. It is the single most common cause of disability in older population. The major symptoms of OA include joint pain, stiffness and limitation of movement.

Hip and knee OA was ranked as the 11th highest contributor to disability and 38th highest in disability adjusted life years (DALYs) globally. The prevalence of OA knee increases with age and obesity and is more common in women. According to a study conducted by Bhandarkar et al. in Mumbai, the prevalence of OA knee increased from 3.31 in 2011 to 3.91 per hundred in 2014 and the overall yearly

prevalence was estimated to be 3.62 per hundred.

OA knee can be managed both surgically and non-surgically. TKR is a surgical procedure which is considered as the gold-standard treatment for OA knee and involves the replacement of the damaged knee joint with artificial joint or prosthesis.

METHODS

Search strategy: A literature search was performed on 4th June 2021 using the PubMed database by five authors (SK, JJ, NG, AA, SQ) and research articles published after 2010 were only included. The search term was formulated by five authors (SK, JJ, NG, AA, SQ) after conducting a thorough literature for relevant keyword identification. The outcome measures included were Quality of life (QoL), Quality Adjusted Life Years (QALY), Disability Adjusted Life Years (DALY), and Incremental Cost Effectiveness Ratio (ICER). The following electronic database will be used for the search of studies and the appropriate MeSH terms/ search strategies will be employed.

a. Cochrane Central Register of Controlled Trials (CENTRAL)
b. MEDLINE (PubMed)
c. HTA In repository
d. Google Scholar
e. CEA registry
f. INAHTA

The MESH terms for keywords of interest were identified and Boolean operators were used in conjunction to prepare the search parameter. The final search parameters used were:

((("arthroplasty, replacement, knee"[MeSH Terms] OR ("arthroplasty"[All Fields] AND "replacement"[All Fields] AND "knee"[All Fields]) OR "knee replacement arthroplasty"[All Fields] OR ("total"[All Fields] AND "knee"[All Fields] AND "arthroplasty"[All Fields]) OR "total knee arthroplasty"[All Fields]) AND ("cost benefit analysis"[MeSH Terms] OR ("cost benefit"[All Fields] AND "analysis"[All Fields]) OR "cost benefit analysis"[All Fields] OR ("cost"[All Fields] AND "effectiveness"[All Fields]) OR "cost effectiveness"[All Fields])) OR ((("arthroplasty, replacement, knee"[MeSH Terms] OR ("arthroplasty"[All Fields] AND "replacement"[All Fields] AND "knee"[All Fields]) OR "knee replacement arthroplasty"[All Fields] OR ("total"[All Fields] AND "knee"[All Fields] AND "arthroplasty"[All Fields]) OR "total knee arthroplasty"[All Fields]) AND ("quality adjusted life years"[MeSH Terms] OR ("quality adjusted"[All Fields] AND "life"[All Fields] AND "years"[All Fields]) OR "quality adjusted life years"[All Fields] OR "qaly"[All Fields])).

Participant or population: In persons 40 years of age and older, osteoarthritis is more common, according to a WHO report. Both male and female patients with OA knee will be in cluded. According to existing literature, total knee replacement (TKR) is the preferred management for patients with Kellgren Lawrence (KL) grade II OA. Patients with osteoarthritis knee at all grades of Kellgren-Lawrence will be included in the review.

Intervention: All Total Knee Replacement techniques, including the constraint, cruciate retention, and posterior stabilising procedures, will be taken into consideration for the review. Total knee replacement has a high patient satisfaction rate and improves quality of life while being cost-effective in addressing OA symptoms. TKR is carried out to enhance the patient's functionality, rectify deformity, preserve mobility balance, and relieve knee pain. It has been shown to be an efficient method for reducing OA knee-related pain and other symptoms. In western nations including Spain, Russia, the United Kingdom, the United States, and Australia, it is a widely used surgical technique. Studies evaluating bilateral total knee replacement and revision TKR will not be included in the review.

Comparator: National Health System Resource Centre (NHSRC) report suggests non-surgical management as the primary choice of treatment for patients with osteoarthritis over any surgical treatments. The common non-surgical managements of choice for osteoarthritis knee include

pharmacological and non-pharmacological measures.

Study designs to be included: Studies that report trial based and model-based study designs will be included. Trial based studies will include Randomized Control Studies (RCT), cohort studies, and cross-sectional studies and model-based studies which include cost utility, cost benefit, cost minimisation and cost effectiveness analyses.

Eligibility criteria: All studies conducted from the year 1996 to 2021 will be included in the review. Studies with Total Knee Arthroplasty as the intervention and all studies with economic evaluation methodologies will be taken into consideration as the inclusion criteria. Studies with bilateral simultaneous TKR, unilateral TKR and revision TKR will be excluded. Studies with comparators other than non-surgical management will also be excluded. Studies that do not report cost and quality metric will not be included. Studies which are incomplete, without full texts in English, commentaries, letters to editor, protocols, and systematic literature reviews will also be excluded.

Information sources: All sources with information on TKR, economic evaluations and non-surgical management namely journals, handbooks, internet sources, published conference abstracts, thesis, and electronic databases will be searched extensively.

Main outcome(s): Studies suggest that TKR is not just cost effective but also improves QALY. Studies with societal perspective suggest that TKR is a better intervention from a societal perspective.

Additional outcome(s): Nil.

Data management: The studies included in systematic review will be imported into RAYYAN software. After primary and secondary screening, the studies to be included for systematic review will be finalized. A data extraction framework will be developed for extracting data based on the criteria such as authors name, year, study location, type of model, perspective, direct cost of TKR and non-surgical management, ICER values, QALYs and study findings. The information collected will be summarized into a matrix created on MS- Excel.

Quality assessment / Risk of bias analysis: Quality assessment of the studies will be carried out using the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) checklist. This tool will assess the validity of the methods and the transparency in reporting the results of the included studies. Studies will be assigned "Yes (Y)" if the information is completely reported, "Part (P)" if partially reported and "No (N)" if not reported. Scoring will be given for each item of all the studies. Score of 1 will be assigned for each item if it is "Yes", 0.5 if it is "Part" and 0 if it is "No". The percentage will be calculated after the exclusion of "Not Applicable" item. Studies that scored 75% or more will be categorized as of good quality, 60 to 75% as moderate quality and <60% as poor.

Strategy of data synthesis: A narrative synthesis of the studies will be conducted to summarize the findings. Additionally, the cost information obtained from the studies will be converted into a single currency using the purchasing power parity (PPP) approach in order to determine the variation in TKR intervention costs between countries.

Subgroup analysis: Nil.

Sensitivity analysis: Nil.

Language restriction: Only studies with English language will be selected for this review.

Country(ies) involved: India.

Keywords: Cost utility analysis; Knee osteoarthritis; Total Knee replacement; Non-surgical management; Markov Model.

Dissemination plans: The results of this study would be published in a peer-

reviewed indexed journal. The findings from the systematic review would be communicated to the Department of Health Research as a part of the Health Technology Assessment Report on the cost-utility of total knee replacement for osteoarthritis knee patients.

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