

Osteoarthritis and Cartilage



Review

The prevalence of patellofemoral osteoarthritis: a systematic review and meta-analysis



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SUMMARY

Objective: To determine the prevalence of radiographic patellofemoral osteoarthritis (OA) from population- and symptom-based cohorts and to evaluate if knee pain, physical function and quality of life (QOL) differ between people with isolated patellofemoral OA, isolated tibiofemoral OA and combined patellofemoral and tibiofemoral OA.

Method: Terms associated with “patellofemoral OA”, “prevalence” and “clinical features” were used to search Medline, EMBASE, CINAHL, SCOPUS, AMED and Web of Science databases with no language restriction from inception to August 2014. Two independent reviewers screened papers for eligibility. Studies were included if they reported prevalence of compartmental patterns of radiographic knee OA in population- or symptom-based cohorts. Studies were excluded if they evaluated a targeted sample (e.g., occupation-specific participants) or repeated already reported data from the same cohorts. Point prevalence estimates of patellofemoral OA were extracted from eligible studies, pooled and quantitatively analysed. A critical appraisal tool was used to evaluate methodological quality.

Results: The search yielded 1891 records. The inclusion criteria were met by 32 studies. The crude prevalence of patellofemoral OA was 25% in the population-based cohorts (aged >20 years) and 39% in the symptom-based cohorts (aged >30 years). Eight studies reported knee pain, physical function and QOL in people with different compartmental disease; however no significant differences were found.

Conclusion: These findings confirm the substantial prevalence of patellofemoral OA, demonstrating the need to specifically consider the patellofemoral joint in knee OA research and clinical settings.

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Introduction

Osteoarthritis (OA) is a major health problem worldwide, affecting the large lower extremity weight bearing joints of the knee and hip^{1,2}. A previous meta-analysis identified an overall prevalence of radiographic knee OA to be 35% that increases with age³. These findings are based on the presence of OA in any compartment of the knee³. Until recently, research has focused on understanding “general” knee OA or tibiofemoral OA. However, the impact and role of the patellofemoral joint in knee OA symptoms

are becoming more recognized. A literature review has reported that the patellofemoral and tibiofemoral joints exhibit different structural, pathomechanical and clinical characteristics, resulting in different patterns of risk factors⁴. There is evidence that crepitation, anterior knee pain, and difficulty during stair ambulation are more frequently associated with patellofemoral OA, rather than tibiofemoral OA^{5,6}. Risk factors such as activities that increase load on the patellofemoral joint (descending stairs, squatting), quadriceps weakness, and patella malalignment increase the likelihood of developing patellofemoral OA⁶. These risk factors can be used to design specifically tailored interventions to prevent incidence and progression of disease.

Despite emerging evidence of the important role that the patellofemoral joint plays in knee OA, the prevalence of patellofemoral OA has not been established with a systematic review. Current systematic reviews involving patellofemoral OA primarily focus on evaluating diagnostic imaging techniques⁷, as well as surgical and non-surgical interventions⁸. Thus, the primary aim of

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this systematic review and meta-analysis was to determine the prevalence of patellofemoral OA. There were two different types of studies that were used for this systematic review: studies that recruited participants in the community through random or convenience sampling that were representative of the population (population-based cohorts) and studies that recruited participants with knee pain (symptom-based cohorts). The secondary aim was to investigate whether pain, physical function and quality of life (QOL) differ between people with isolated patellofemoral, isolated tibiofemoral, and combined patellofemoral and tibiofemoral OA.

Materials and methods

Registration and ethics

The protocol for this systematic review and meta-analysis was registered with the PROSPERO International prospective register for systematic reviews (ID: CRD42014010357). This project was exempt from the local University Ethical Review Board as published data was pooled and used to determine the prevalence of patellofemoral OA.

Search strategy

Computerised searches of Medline, EMBASE, CINAHL, SCOPUS, AMED and Web of Science All Databases (Web of Science Core Collection, BIOSIS Previews, CABI: CAB Abstracts, Current Contents Connect, MEDLINE, SciELO Citation Index) were conducted from each database inception date to the first week of January 2016. The terms associated with “patellofemoral”, “OA”, “prevalence”, and “clinical features” were explored as key terms and MeSH headings ([Appendix](#)). There were no language, gender or age limits.

Study selection

Two independent reviewers (SK, EP) screened titles and abstracts of studies identified by the searches. Titles and abstracts of studies were included if they reported the prevalence of OA in the patellofemoral, as well as the tibiofemoral (medial and lateral) compartments. Predetermined inclusion and exclusion criteria were used at this stage of screening ([Appendix](#)). As radiography remains the gold standard for OA diagnosis⁹, studies were only included if they reported prevalence of radiographically confirmed OA in the patellofemoral joint or individual compartments of the knee in population-based and symptom-based cohorts. Population-based cohorts were defined as those with participants that were representative of the population (e.g., random sampling or convenience sampling from the community). Symptom-based cohorts were those that recruited people with knee pain at inclusion. Patellofemoral OA was defined as radiographic diagnosis of OA in the patellofemoral joint. Studies selected for full text review were independently evaluated by two reviewers (SK, MS). A third reviewer (EP) was consulted in case of disagreements.

Assessment of quality

Two reviewers (SK, MF) independently assessed methodological quality and reporting using the Critical Appraisal tool developed by Loney et al.¹⁰. This tool was developed to appraise prevalence studies³ and consists of eight criteria, resulting in a score ranging from 0 to 8.

Data extraction

The following study methodology, participant characteristics and prevalence data were extracted: geographic location of study,

cohort size, participant inclusion and exclusion criteria, recruitment procedure, method of reporting prevalence, gender distribution, mean age and range, mean body mass index (BMI), OA definition, and the prevalence of the different compartmental patterns of knee OA. For the secondary aim, any reported measures of knee pain, physical function and QOL were extracted.

Statistical analysis

Prevalence was defined as “the number of cases of a disease in a population, divided by the population number”¹¹. Point prevalence and 95% confidence intervals (CIs) were calculated using the Comprehensive Meta-Analysis Software (Version 3.0, Biostat Inc., USA). Since the methods of reporting prevalence varied, studies were grouped into those that reported prevalence in people and those that reported in knees. Studies were further grouped into studies using population or community-based samples and those recruiting people with knee pain (symptom-based cohorts). Additional subgroup analyses for gender, geographic region, compartmental patterns of OA (isolated patellofemoral OA or combined tibiofemoral and patellofemoral OA) and the definition of radiographic OA (osteophytes and/or joint space narrowing (JSN)) were conducted. We used a random effects model to pool prevalence estimates due to variations in cohort as well as study methodology and characteristics.

Heterogeneity between studies was determined using the I^2 statistic. An I^2 of 0–40% indicates low heterogeneity, 30–60% indicates moderate heterogeneity, 50–90% indicates substantial heterogeneity and 75–100% indicates high heterogeneity¹².

The significance of heterogeneity across studies was measured using the Q statistic, testing the null hypothesis that all studies share a common effect size. A P-value less than 0.05 indicated statistically significant heterogeneity. The I^2 and Q statistics were also calculated using the Comprehensive Meta-Analysis Software.

Results

The database searches generated 4572 records and we identified 1891 unique records. After screening abstracts and titles, 128 full text articles were assessed for eligibility and 35 studies met the inclusion criteria ([Fig. 1](#)). A further three studies were excluded during data extraction because of inadequate reporting of data ($n = 1$), duplication ($n = 1$) and no eligible outcomes ($n = 1$). Therefore, 32 studies (18,194 participants) were available for meta-analysis.

Study characteristics

Of the 32 included studies, 22 (68%, 11,370 participants) reported the number of people with patellofemoral OA ([Table I](#)) and 10 (31%, 6709 participants) reported the number of knees ([Table II](#)). Eleven studies (32%, 6487 participants) evaluated population-based cohorts while 21 (68%) evaluated symptom-based cohorts (11,592 participants). Amongst the studies that evaluated population-based cohorts, the recruitment methods varied from studies that recruited from family doctor, general practice or primary care clinic registers (four studies) to studies that used random digit dialing (one study) and door-to-door interviews (one study). Fourteen (44%, 11,274 participants) studies specifically reported the prevalence of isolated patellofemoral OA or the different compartmental patterns of knee OA. With the exception of three studies, most of the selected studies used lateral and/or skyline (axial/sunrise) radiographic views for the assessment of the patellofemoral joint. The remaining three studies did not explicitly outline which radiographic view was used; however, standardised

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