

The epidemiology of patellofemoral disorders in adulthood: a review of routine general practice morbidity recording

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Aim: To describe the annual consultation prevalence of different patellofemoral disorders across the adult life span. **Background:** The knee is the second most common site for musculoskeletal pain. Evidence from sports injury and orthopaedic settings suggests that patellofemoral disorders constitute a significant proportion of knee pain cases, but we have no evidence from general practice – the setting where most patellofemoral problems will present and be dealt with – of the prevalence of consultations for these problems in the different age groups. **Methods:** Age- and gender-stratified annual person consulting prevalence rates (APCPRs) for patellofemoral disorders were calculated using 2006 data from the ‘Consultations in Primary Care Archive’ (CiPCA) – a fully audited database of continuous morbidity recording used by the general practitioners (GPs) in eight general practices in North Staffordshire. **Findings:** A total of 57 555 >15-year-olds were registered with the eight general practices in 2006; 1782 made a knee-related consultation, of which 303 (one-in-six) were coded as patellofemoral disorders (APCPR, 53 per 10 000 persons), suggesting that GPs consider a significant proportion of adult knee pain consulters to have patellofemoral disorders. Twelve patellofemoral disorders diagnosed by the GPs were identified. The non-specific diagnosis of ‘anterior knee pain’ (AKP) was by far the most common (APCPR, 37.2/10 000). Other more specific diagnoses were rare by contrast, suggesting that specific patellofemoral disorders are rarely diagnosed in general practice (consultation prevalences, in order of most prevalent first: bursitis (7.8/10 000), patellofemoral osteoarthritis (2.3/10 000); APCPRs for the remaining nine diagnoses ranged between 0 and 1.6/10 000). However, the use of alternative less anatomically specific diagnostic codes, such as for ‘knee pain’, may mean that our estimate of one-in-six is an underestimate of GPs’ true attribution rates to patellofemoral joint disorders of people consulting them with knee pain. AKP was seen equally commonly by GPs across all age strata, contradicting the received wisdom that AKP problems are most common among younger adults.

Key words: anterior knee pain; consultation prevalence; epidemiology; general practice; patellofemoral disorders; primary care

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Introduction

After low back pain, the knee is the second most common site for musculoskeletal pain in

adulthood in the United Kingdom (Urwin *et al.*, 1998; McAlindon, 1999; Peat *et al.*, 2001). Patellofemoral joint (PFJ) disorders, presenting as anterior knee pain (AKP), are recognised to be a major component of knee pain cases seen in sports injury and orthopaedic outpatient clinics (Devereaux and Lachmann, 1984; Stanitski, 1993; Luhmann *et al.*, 2008), and specialists from these fields consider

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there to be many different treatments that are specific to the particular causes of patellofemoral pain (Juhn, 1999; Fulkerson *et al.*, 2004; Post, 2005; Witvrouw *et al.*, 2005; Fagan and Delahunt, 2008). Yet, there is an almost total absence of evidence on whether PFJ disorders are diagnosed and treated in general practice, despite the fact that knee pain problems are one of the most common reasons for people consulting their GPs (van der Waal *et al.*, 2006; Royal College of General Practitioners' Birmingham Research Unit, 2007). This study aimed to explore the extent to which GPs make PFJ-specific diagnoses, what these diagnoses are, and whether they are more commonly made in certain genders and age groups than in others.

Methods

Annual age-stratified person consulting prevalence rates for patellofemoral disorders were calculated using 2006 data from the 'Consultations in Primary Care Archive' (CiPCA) – a fully audited computerised database of continuous morbidity recording used by the general practitioners (GPs) in eight general practices in North Staffordshire (Jordan *et al.*, 2007) (ethical approval for CiPCA was granted by the North Staffordshire Research Ethics Committee [LREC Ref. No.03/04]). This was done in the following way. First, we identified all musculoskeletal knee-related Read codes, using the list generated by Jordan *et al.* (2010). Second, we excluded all non-diagnostic codes (ie, those that were used to indicate a clinical process, such as the ordering of X-rays or referral to secondary care). Third, we selected all those codes that related specifically to patellofemoral disorders and categorised these on the basis of presumed underlying pathophysiology (Table 1).

Fourth, we discounted repeated consultations by individuals given Read codes for the same patellofemoral disorders, in order to give an annual persons consulting prevalence rate. Fifth, we calculated the rate of consultation per 10 000 population for each diagnostic category. Finally, in order to determine whether some of these diagnostic Read codes are used more commonly for one gender than the other or in some age groups than in others, we stratified these consultation rates both by gender and by five 15-year age bands from the age of 15 years. To contextualise

Table 1 Proposed categorisation of Read-coded consultations for patellofemoral disorders

Patellofemoral disorders	Number of corresponding Read codes
Patellofemoral osteoarthritis	1
Anterior knee pain	2
Osteochondritis	3
Patellar maltracking/subluxation/dislocation	22
Other patella	9
Patellofemoral disorder	2
Traction enthesopathies	2
Chondromalacia	1
Fractures/fracture dislocations of the patella	20
Patellar tendonitis	3
Pre- or infra-patellar bursitis	10
Patellar tendon rupture	2

Read codes/terms are available as an online appendix.

our results, we calculated prevalence estimates for consultations coded as knee osteoarthritis (OA; based on eight Read codes and excluding those specifically labelled as patellofemoral OA) for comparison, since OA is the most common joint disease (The National Collaborating Centre for Chronic Conditions) and a common cause of GP consultation (McCormick *et al.*, 1995). In order to assist in interpretation of the results and due to the variable numbers of people consulting between categories, we calculated 95% CI (using the `-ci` command with the binomial option in Stata 9.2).

Results

Of the 57 555 individuals aged ≥ 15 years registered with the eight general practices in 2006, 1782 made a knee-related consultation, of which 303 (17%) were coded as patellofemoral disorders, giving an annual persons consulting prevalence rate for PFJ disorders of 53 per 10 000 persons. Age- and gender-stratified person consultation rates for all PFJ disorders are given in Table 2. Generally, the prevalence rates (expressed as a proportion of persons registered with the GP practices in each age and gender stratum) did not differ greatly between the different strata. Two possible exceptions to this are worthy of note: in both the 30–44 and the ≥ 75 years age groups, there appear to be

Table 2 Number of persons registered with the general practices and persons' consultation prevalence rates by age and gender strata

Age band (years)	Gender	Number of persons registered	Number of persons consulting with PFJ disorder	Persons consulting prevalence rate (per 10 000)
Total sample (≥ 15)	Female and male	57 555	303	52.6
	Female only	29 611	154	52.0
	Male only	27 944	149	53.3
15–29	Female and male	12 248	73	59.6
	Female only	6062	37	61.0
	Male only	6186	36	58.2
30–44	Female and male	14 588	62	42.5
	Female only	7209	27	37.5
	Male only	7379	35	47.4
45–59	Female and male	14 270	80	56.1
	Female only	7198	41	57.0
	Male only	7072	39	55.1
60–74	Female and male	10 598	61	57.6
	Female only	5545	31	55.9
	Male only	5053	30	59.4
≥ 75	Female and male	5851	27	46.1
	Female only	3597	18	50.0
	Male only	2254	9	39.9

PFJ = Patellofemoral joint.

fewer person consultations. In the 30–44 years age group, this seems to be particularly the case among female consulters, whereas, in the ≥ 75 age group, it is the male consulters who seem to be especially infrequent.

Categories with no individuals consulting in three out of the five age strata were discounted from further analyses. These were 'osteochondritis' (zero persons consulting in the study period), 'maltracking/subluxation/dislocation' ($n = 7$), 'other patella' ($n = 1$), 'patellofemoral disorder' ($n = 1$), 'traction enthesopathies' ($n = 9$), 'fractures/ fracture dislocations' ($n = 5$) and 'patellar tendon rupture' ($n = 1$). Age-stratified persons consulting prevalence rates (per 10 000 individuals) for the remaining patellofemoral disorders are given in Figure 1, together with the comparator, knee OA. In view of similar prevalence rates across the genders and the relatively small numbers within each age–sex stratum, we present the prevalence rates for males and females combined.

'AKP' was by far the most common category of patellofemoral disorders recorded by GPs (persons consulting prevalence rate per 10 000 = 37.2), accounting for 12% of all knee-related consulters and 71% of all persons consulting and diagnosed with a patellofemoral disorder. Contrary to

expectations, the consultation prevalence rate of AKP was relatively constant across the entire adult age range. 'Bursitis' was the next most common (persons consulting prevalence rate per 10 000 = 7.8), with prevalence rates again broadly similar across all ages. Cases of GP-diagnosed chondromalacia and patella tendonitis were rare and appeared mainly in adolescents and younger adults. In contrast to knee OA, there were few cases specifically diagnosed as PFJ OA ($n = 13$), with the majority occurring in adults aged ≥ 60 years.

Discussion

We estimate that one in six adults in the UK consulting general practice for a knee problem will be clinically suspected or diagnosed as having a patellofemoral disorder. Generally speaking, the overall persons consulting prevalence rate of patellofemoral disorders appears to be fairly consistent across the age and gender strata. The possible exceptions to this are the 30–44 years age group, where fewer women, in particular, were ascribed consultation codes for patellofemoral disorders, and the ≥ 75 years age group, where markedly fewer

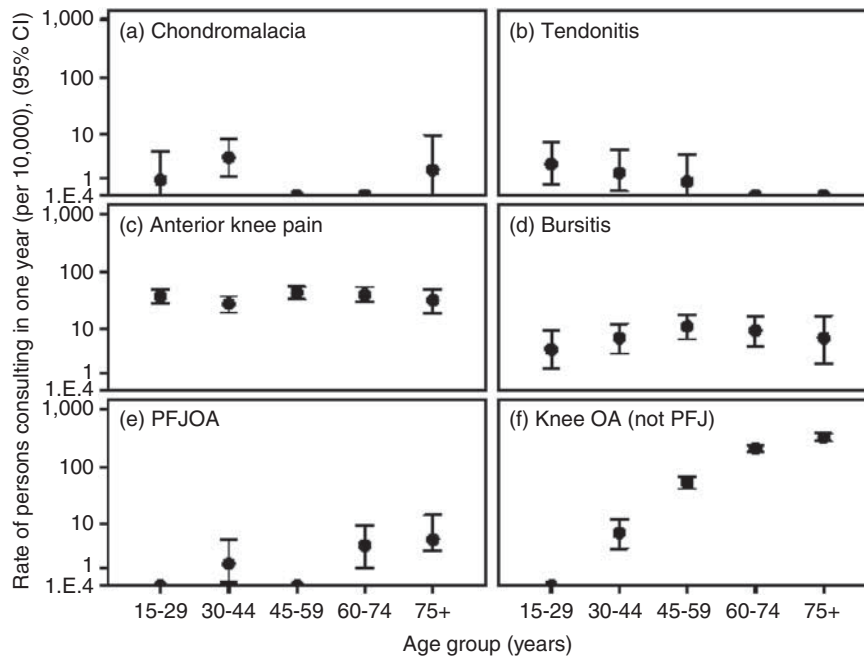


Figure 1 Annual persons consulting prevalence rates for patellofemoral disorders by age band, with knee osteoarthritis (not patellofemoral) for comparison (y axis is logarithmic scale)

men were ascribed these consultation codes. Before jumping to hypothesise what might be the cause of these exceptions, it is worthwhile noting that the numbers involved here are so small, particularly in the case of the ≥ 75 years age group, that these variations may be random in nature.

Although the symptom code of 'AKP' is fairly commonly used by GPs across the age range of adolescents and adults consulting with knee problems, diagnoses of the specific patellofemoral disorders that may underlie such pain are not. While the term 'AKP' is clearly preferable in most circumstances to the historically oft-misused and misleading diagnosis of chondromalacia patellae (Fulkerson *et al.*, 2004; Grelsamer, 2005; Pihlajamaki *et al.*, 2010), it has to be borne in mind that it may cover a whole raft of pathological causes (one authority lists 26 possibilities [Macnicol, 1995]) that may require very different treatment approaches, both conservative and surgical.

As previously stated, there is a striking absence of evidence in the literature on the basic epidemiology of most patellofemoral disorders. AKP was found in this study to be the most commonly used

'diagnostic' code. One study from the United States attempted to quantify referrals for AKP from physicians to a primary care sports medicine clinic associated with a large managed care system (Butcher *et al.*, 1996). The majority of these referrals were from family practice clinic providers, which included physicians, physician assistants and nurse practitioners. This study reported that out of 1857 patient contacts, 10.6% were for chronic AKP (Butcher *et al.*, 1996). While these data can hint at the scale of the problem, they cannot give a true picture of consultation prevalence at the primary care level. Van Middelkoop *et al.* (2008) selected active sportspeople and non-athletes from their cohort of knee pain consulters in primary care, which was spread across 40 different GPs in the south-western Netherlands (van Middelkoop *et al.*, 2008). They found that 11.0% of these individuals were given a working diagnosis of 'patellofemoral pain syndrome' by their GP, compared with 12.0% given a Read Code for 'AKP' in the current analysis.

Published data regarding the prevalence of the other less-commonly used non-OA patellofemoral disorders in people with knee pain are

similarly sparse. In their study of knee pain and radiographic OA in participants drawn from Veterans Affairs medical centres and the community, Hill *et al.* (2003) found that prepatellar and superficial infrapatellar bursitis were present in 12% of participants with knee pain and radiographic OA. One Chinese study of the comparative prevalence rates of chondromalacia among college students from a gymnastics department and students from a non-gymnastic department found the prevalence of chondromalacia patellae among the non-gymnasts to be 6% (although it should be made clear that their definition of chondromalacia patellae was akin to what is more commonly described as 'AKP' or 'patellofemoral pain syndrome', the diagnosis being arrived at on the basis of a clinical examination by a surgeon; Zhang *et al.*, 2003). The use of Read codes for these diagnoses was found to be uncommon in our review of consultation data: only 2.5% of per person knee-related consultations in 2006 were given one of the diagnostic codes pertaining to bursitis; the percentage for chondromalacia patellae was 0.4.

Patellofemoral OA, as a clinical entity, has attracted attention in recent years (Arendt, 2005; Donell and Glasgow, 2007; Hinman and Crossley, 2007; Kalichman *et al.*, 2007; Becker *et al.*, 2008; Crossley *et al.*, 2009; Duncan *et al.*, 2009; Neuman *et al.*, 2009). Cross-sectional community-based research studies suggest that structural changes consistent with OA may be more common in the PFJ than in the tibiofemoral joint (Lanyon *et al.*, 1998; Duncan *et al.*, 2006; Szebenyi *et al.*, 2006), and are likely to be an important source of symptoms in knee OA (Hunter *et al.*, 2003; Englund and Lohmander, 2005; Kornaat *et al.*, 2006; Duncan *et al.*, 2009). Indeed, one of these showed that approximately a quarter of >50-year-olds who had experienced some knee pain in the past year had isolated patellofemoral OA in at least one of their knees (Duncan *et al.*, 2006). Therefore, it may seem strange that, while the annual incidence of new consultations for symptomatic knee OA has been estimated to be 0.5% (or 50 per 10,000 individuals) of adults >55 years in the general population (Peat *et al.*, 2001), the annual per person consultation rate for patellofemoral OA in the same age group should be as low as seven per 10,000, according to our review of general practice consultation data. This disparity

may well be a reflection of the differential use of alternative diagnostic codes for a presenting problem by different GPs. Alternative codes often differ in the extent to which they are symptom-descriptive or patho-anatomic; hence, for instance, a diagnostic label of 'knee pain', 'OA of the knee' or 'patellofemoral OA' variously may be given for the older adult consulting with the same knee problem. Whether a GP uses one code or another is likely to vary from GP to GP (Jordan *et al.*, 2006) and may be both a reflection of the extent to which they are confident in or comfortable with the diagnosis and also, at least in part, a matter of habit (Jordan *et al.*, 2006).

This study used data from the CIPCA. GPs involved in this project undergo regular cycles of training, assessment and feedback in the quality of their computerised morbidity coding (Porcheret *et al.*, 2004; Jordan *et al.*, 2004; Jordan *et al.*, 2007). Over 90% of doctor contacts in these practices are given a morbidity code (Porcheret *et al.*, 2004). Such routine general practice consultation data constitute an important epidemiological resources that have the capacity to tell us much about consultation behaviour. However, it clearly has limitations when seeking information on the occurrence of specific patellofemoral disorders across the life course due to the fact that it captures only those complaints presented to, recognised and coded by the GP.

Use of only one year of consultation data resulted in small numbers of observations, which were insufficient for quantitative analysis. While expanding the period of consultation (eg, to five years) would enable more precise estimates to be made, and for the age-related pattern to be more clearly discerned, the overall conclusion – that the diagnosis of specific patellofemoral disorders is rare in general practice – would not be expected to change.

Our findings imply that 'de novo' population studies are needed to describe the occurrence of patellofemoral disorders in the general population. The implications for clinical practice are less clear. It appears that specific patellofemoral disorders are not being diagnosed in general practice. But does this matter? In an article about the taxonomical confusion of terminologies for patellofemoral conditions, Grelsamer (2005) suggests that basket diagnoses, such as 'AKP', should be abandoned in favour of diagnoses that are

more specific to the source of a patient's pain. To our mind, the answer to the question 'Does this matter?' depends on three factors: 1) The GPs' capacity to diagnose specific patellofemoral disorders without the aid of sophisticated imaging techniques or arthroscopic examination. Authorities suggest that it is the clinical history taking and physical examination, rather than such techniques, that is central to the accurate diagnosis of patellofemoral disorders (LaBella, 2004; Brukner *et al.*, 2007). 2) The extent to which these disorders need treating because they will not get better without intervention. Recent evidence, contrary to the traditional view of AKP problems being essentially benign and self-limiting (Sandow and Goodfellow, 1985), suggests that symptoms may persist for many years into adulthood (Stathopulu and Baildam, 2003) and may even pre-date the development of patellofemoral OA in later life (Utting *et al.*, 2005). 3) The existence of effective treatments specific to the particular patellofemoral diagnoses. Experts in the field are clear that there are many different treatments, conservative and otherwise, that are specific to the particular causes of patellofemoral pain (Juhn, 1999; Fulkerson *et al.*, 2004; Post, 2005; Witvrouw *et al.*, 2005; Fagan and Delahunt, 2008), although the true efficacy of many of these treatments has yet to be proven. The lack of certainty about these three factors leaves this question unanswered.

Conclusion

To the best of our knowledge, this is the first study to produce population prevalence rates for various patellofemoral disorders across the life course. These data suggest that a significant proportion of adults with knee pain consulting in primary care in the UK are considered by their GPs to have disorders of the PFJ. Routine general practice morbidity recording has clear limitations in its ability to describe the epidemiology of patellofemoral disorders. Population-based studies are needed to fill this evidence gap.

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