

Ethnicity may be a risk modifier for knee osteoarthritis

Evaluation of: Wright NC, Kershner Riggs G, Lisse JR, Chen Z: Self-reported osteoarthritis, ethnicity, body mass index, and other associated risk factors in postmenopausal women – results from the Women's Health Initiative. *J. Am. Geriatr. Soc.* 56(9), 1736–1743 (2008). Participants in the Women's Health Initiative were examined for risk factors for physician-diagnosed osteoarthritis (OA), including ethnicity. This study compared 82,795 women without OA with 63,600 women with OA, including 85% white, 9.4% African-American, 3.3% Hispanic, 1.9% Asian and 0.5% American Indian women. Age and body mass index were the strongest risk factors for disease. The distribution of risk factors varied between ethnic groups, being lowest in non-Hispanic white women. Stratification according to ethnicity was performed and the data were examined for interaction. The odds of OA in the highest body mass index category were higher in African-American women (odds ratio [OR]: 3.31; 95% confidence interval [CI]: 2.79–3.91) and American Indian women (OR: 4.22; 95% CI: 1.82–9.77) compared with non-Hispanic white women (OR: 2.71; 95% CI: 2.52–2.92). These findings suggest that the effect of risk factors for OA may differ according to ethnic group. If confirmed in studies incorporating a structural end point, this may have ramifications for the implementation of preventive strategies.

KEYWORDS: ethnicity, physician-diagnosed osteoarthritis, risk factors

Osteoarthritis (OA) is the most prevalent form of arthritis in the world [1,2]. It is likely that OA is not a single disease, but the final common pathway of the joint's response to a variety of insults and environmental exposures, resulting in the pathological entity of OA [3]. Although the pathological changes are not contentious, many of those with knee pain do not have underlying OA [4,5]. Few population-based studies have used clinical and radiographic criteria. In the USA, the most recent of these was the National Health and Nutrition Examination Survey III, performed more than a decade ago (1990–1994) [6]. It is unlikely that a similar study will be performed in the near future.

To overcome this and obtain prevalence estimates in a less invasive fashion, other approaches have been explored using questionnaires to identify OA, including self-reported OA and physician-diagnosed OA [7–9]. These used different case definitions, often relating to the duration, frequency or intensity of pain [10]. How closely these clinical definitions were associated with structural change varied with the severity of radiographic disease. For example, the ACR clinical criteria for knee OA were found to be more sensitive with increased severity of radiographic disease [11]. Ideally, a non-invasive 'core' case definition of disease would

be developed to capture those with disease, enabling administration to large populations without the risks associated with radiation exposure [9,12].

The impact of OA relates to its symptoms and how these affect function and disability, which drive societal costs of disease. The prevalence of OA is expected to rise with the obesity epidemic [13]. There is also a trend of increasing workforce participation beyond the age of 65 years [14]. Given that obesity increases disability [15], as well as the complexity and cost of therapy associated with OA [16], the convergence of these factors will magnify the burden of OA on society. Projections of disease prevalence are important for health services planning. The need to identify risk factors for OA and its progression is urgent in order to develop cost-effective public health interventions to reduce the associated disease burden.

In the USA, there are documented discrepancies between the rate of joint replacement for OA in different racial and ethnic groups, such that the rate of joint replacement surgery is higher in Caucasians compared with African-Americans and Hispanics [17–19]. It is unlikely that these discrepancies relate to differences in disease prevalence, with data suggesting that African-American women are at higher risk of

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knee OA than Caucasian women [20,21]. Thus, identifying factors underlying this inequity may inform public health interventions in this area.

Methods

A cross-sectional study was performed within the Women's Health Initiative [1]. The Women's Health Initiative is a large study incorporating an observational arm ($n = 92,971$) and a clinical trial ($n = 68,838$), designed to investigate risk factors and preventive strategies for heart disease, osteoporotic fracture, and breast and colorectal cancer fractures in postmenopausal women.

At baseline, physician-diagnosed OA was determined by asking participants: 'Did your doctor ever tell you that you have arthritis?' Nonresponders were excluded. Those who said 'no' were placed in the non-OA referent group ($n = 83,954$). Those who responded 'yes' were asked about the type of arthritis. Those who answered 'OA', 'other' or 'don't know' were classified as cases with OA ($n = 64,550$). Those with rheumatoid arthritis or who did not answer this question were excluded. Information regarding other types of arthritis was obtained separately (e.g., systemic lupus erythematosus and Crohn's disease).

Data relating to covariates were collected, including ethnicity (American Indian, Asian or Pacific Islander, African-American, Hispanic, White or other), body mass index (BMI), income, insurance status, educational status, alcohol intake, smoking status (never, past or current), frequency and intensity of physical activity, diabetes and use of postmenopausal hormonal replacement therapy and antihypertensive therapy.

Results

The investigators first compared the characteristics of those with and without OA, and determined that those with self-reported physician-defined OA were older, heavier, less well educated, less physically active and had lower income.

The odds of OA development due to established risk factors for disease were examined in a multivariate model, both in the total population as well as in the five ethnic groups. Increased risk of OA was seen with higher BMI (BMI ≥ 40 kg/m²; odds ratio [OR]: 2.80; 95% confidence interval [CI]: 2.63–2.99) compared with women with a lower BMI (BMI < 25 kg/m²) and use of diabetic medications (OR: 1.23; 95% CI: 1.16–1.31). Higher education level, income and higher levels of physical activity

(highest category OR: 0.81; 95% CI: 0.78–0.85; compared with lowest category) were protective. In the adjusted model, antihypertensive medication use was associated with a greater risk of OA (OR: 1.38; 95% CI: 1.34–1.41).

The risk of OA varied with ethnic group. Asian women had lower odds of having OA than non-Hispanic white women (OR: 0.6; 95% CI: 0.55–0.64). African-American women had greater odds of developing OA (OR: 1.11; 95% CI: 1.07–1.15) than non-Hispanic white women, although this was no longer significant in the adjusted model. Native American women had slightly greater odds of developing OA than non-Hispanic white women (OR: 1.15; 95% CI: 0.96–1.38).

To further explore reasons for differences between the ethnic groups, the distribution of risk factors was examined and was noted to be uneven across the different ethnic groups. The authors examined for interaction. A significant interaction was noted between ethnic group and BMI category, such that American Indian (OR: 4.22; 95% CI: 1.82–9.77) and African-American (OR: 3.31; 95% CI: 2.79–3.91) women in the highest BMI category were at higher risk of OA than non-Hispanic white women (OR: 2.71; 95% CI: 2.52–2.92). The use of antihypertensive medications was also associated with a differential risk of OA, being higher in American Indian women (OR: 2.18; 95% CI: 1.47–3.47) than in Asian (OR: 1.28; 95% CI: 1.09–1.51) and white (OR: 1.38; 95% CI: 1.35–1.42) women.

Discussion

There has been limited research into the role ethnicity plays in the prevalence of OA [17,20,21]. However, existing research has identified an increased risk of OA in African-Americans, especially in women [20,21], using a combined clinical and radiographic end point [20,21]. The current study, using a relatively soft end point, physician-diagnosed arthritis, confirms this finding and extends the observation into other ethnic groups. The use of physician-diagnosed OA, as defined by the investigators, behaves as the clinical and radiographic current gold standard for the diagnosis of OA, being associated with age and BMI, established risk factors for this disease.

Thus, this study may aid our understanding of how ethnicity relates to the risk of OA. It suggests that BMI may be relatively more important in African-Americans than in non-Hispanic white women. This difference was not explained by

differences in the distribution of other potential risk factors examined (age, education, income, insurance status, physical activity, alcohol, smoking status, diabetes and hypertensive therapy, and postmenopausal hormonal therapy). Depression was not accounted for.

Whilst this is an interesting finding, a number of caveats need to be considered. This was a cross-sectional study, so only association and not causation may be examined. Whilst OA, as defined by the authors, appeared to behave as expected, other studies have suggested that this definition tends to misclassify participants, and may underestimate the prevalence of disease [9]. It is likely to be associated with a bias, in that physician-defined arthritis may be more common in those with greater health-seeking behavior. Whilst using insurance status as a proxy for this, it is unlikely to capture this dimension fully: it could have been further investigated by examining other markers of health-seeking behavior such as colonoscopy rate, frequency of general practice attendance and so on. Although this study aims to examine differences in the risk of OA according to ethnicity, the investigators have not incorporated pain or functional status into their definition, or examined whether these are perceived similarly in different ethnic groups. There is evidence that pain perception and health perception varies according to

ethnicity [22,23]. It is likely that this will affect the accuracy of the definition of OA used in the different ethnic groups.

Future perspective

These data raise the hypothesis that the risk of OA related to obesity may be higher in different ethnic groups. This has potential public health significance – if further studies using a harder endpoint (clinical and radiographic/MRI structural change) confirmed this finding, this would help informed implementation of preventive strategies in different ethnic groups to maximize impact. Current large ongoing investigations, such as the Osteoarthritis Initiative, have the potential to extend this investigation [101]. Investigation aimed at understanding the pathogenesis of OA that may lead to effective primary preventive strategies are critical if we are to reduce the burden of this disease.

Financial & competing interests disclosure

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Executive summary

- Participants in the Women's Health Initiative were examined for risk factors for physician-diagnosed osteoarthritis (OA), including ethnicity.
- Physician-diagnosed OA was associated with increased age and body mass index, with differences in risk across the ethnic groups studied.
- The effect of body mass index was stronger in African-American and American Indian women, compared with non-Hispanic white women.
- These data support the need for further investigation into the role of ethnicity in the risk of OA using harder outcomes, incorporating structural change. If these findings are confirmed, this may enable the development of more informed future preventive strategies for OA.

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Website

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