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Predictors of self-reported knee osteoarthritis in community-dwelling older women in Japan: A cross-sectional and longitudinal cohort study

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ABSTRACT

Purpose: This study aimed to determine the predictors of knee osteoarthritis in community-dwelling elderly Japanese women.

Methods: In this prospective cohort study, The Tokyo Metropolitan Institute of Gerontology collected baseline data in 2008 and follow-up data in 2012 for participants from the Itabashi Ward of Tokyo, Japan. Participants were asked at each time point if they had been diagnosed with knee osteoarthritis. The baseline evaluation was conducted with 1289 community-dwelling women aged 75–85 years, of which 992 reported no history of knee osteoarthritis. The follow-up survey targeted these 992 participants; we obtained history of knee osteoarthritis from 867 of these participants. The baseline evaluation also included collection of anthropometric, fitness, hematologic, and lifestyle data.

Results: We performed logistic regression analysis of the cross-sectional data at baseline. Participants who reported fewer light exercise sessions (≤2–4 days/week) had lower odds ratios for history of self-reported knee osteoarthritis than those who reported more frequent exercise (≥5–6 days/week). Logistic regression analysis of the longitudinal data revealed that slow walking speed (< 65.22 m/min), low serum albumin levels (< 4.10 g/dL), and low frequency of soy product consumption (≤1 time per 2 days) at baseline resulted in higher odds ratios for incidence of self-reported knee osteoarthritis during the 4-year follow-up period.

Conclusions: The results suggest that slow walking speed, low serum albumin, and insufficient consumption of soy products are predictors for knee osteoarthritis in elderly Japanese women. These results could help in the design of knee osteoarthritis prevention programs for elderly women.

1. Introduction

Knee osteoarthritis is one of the leading causes of global disability (Cross et al., 2014). The condition is characterized by insufficient knee function, frictional wearing of the articular cartilages and/or the meniscuses, and deformation of the surrounding bones. Knee osteoarthrosis is often accompanied by joint pain and restricted joint movement; thus, it has a significant negative impact on health-related quality of life (Farr Ii, Miller, & Block, 2013).

The global age-standardized prevalence of knee osteoarthritis is estimated to be 3.8% (Cross et al., 2014). In Japan, a large-scale nationwide cohort study revealed a high prevalence of radiographic knee osteoarthritis in the elderly (age ≥60 years); Kellgren/Lawrence grade ≥2 osteoarthritis was reported to occur in 47.0% of men and 70.2% of women (Muraki et al., 2009). A 3.3-year follow-up study involving the same Japanese cohort showed that the rates of incident Kellgren/Lawrence grade ≥2 radiographic knee osteoarthritis were 6.9% in men and 11.9% in women (Muraki et al., 2012).

Many studies have been conducted to identify risk factors for the onset and progression of knee osteoarthritis. For example, a systematic review of 85 longitudinal cohort and/or case-control studies identified obesity, female sex, and older age as the main factors related to the

Abbreviations: SR-knee OA, self-reported knee osteoarthritis

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onset of primary knee osteoarthritis in older people (Blagojevic, Jinks, Jeffery, & Jordan, 2010). By disregarding invariable factors such as sex and age, we may be able to minimize the occurrence of knee osteoarthritis by controlling health status, such as by encouraging weight loss for individuals with obesity.

However, epidemiological research concerning the effects of motor function and lifestyle factors, such as exercise and diet, on the onset of knee osteoarthritis is lacking. Furthermore, hematological variables are often useful in predicting the probability of various diseases; however, their effects on the incidence and progression of knee osteoarthritis have not yet been well described. Additional cohort studies on the effects of these lifestyle and hematological variables will aid in the development of preventive programs for knee osteoarthritis.

This study aims to determine the predictors of knee osteoarthritis through cross-sectional and longitudinal analyses of a cohort of elderly Japanese women. We investigate how motor fitness, lifestyle, and hematological variables are related to the prevalence and incidence of self-reported knee osteoarthritis (SR-knee OA) in elderly Japanese women living in urban areas. The effects of variables related to locomotor function, leg muscle strength, physical activity, smoking, alcohol consumption, diet, and hematology on SR-knee OA are examined both cross-sectionally and longitudinally. Our goal is to provide valuable information for designing intervention programs for knee osteoarthritis in elderly women—a group who is at high risk for this disease.

2. Materials and methods

2.1. Design

In this 4-year prospective cohort study, we examined the relationship between the baseline characteristics of the participants and the simultaneous history of SR-knee OA (cross-sectional analysis), as well as between the baseline characteristics and the incidence of SR-knee OA over the following 4 years (longitudinal analysis). Twenty-four independent variables were selected for both the cross-sectional and longitudinal analyses, including knee extension strength, usual walking speed, blood concentration of albumin, creatinine, HbA1C, β2-microglobulin, 25-OH vitamin D, frequency of leaving the home, strolling, light exercises, regular exercises and sports, alcohol consumption, smoking, and the frequency of consumption of seafood, meat, egg, milk, soy products, colored vegetables, seaweed, potatoes, fruits, oils, and fats. The dependent variables were the history of SR-knee OA at baseline (cross-sectional analyses) and the incidence of SR-knee OA over the 4 years following baseline (longitudinal analysis). Of the 296 participants with a history of SR-knee OA at baseline, as many as 272 (91.9%) had symptoms of this condition at baseline, whereas 17 (5.7%) subjects had recovered, and 7 (2.4%) provided no answer. Therefore, we considered a history of SR-knee OA at baseline to indicate present illness. Age, body mass index, and number of self-reported diseases were used as control variables in the logistic regression analyses for both the cross-sectional and longitudinal analyses.

2.2. Setting

The data were collected at The Tokyo Metropolitan Institute of Gerontology in Itabashi ward, Tokyo, Japan. This institute has conducted physical/medical examinations for several hundred community-dwelling elderly people every year for study purposes. This study used data from the 2008 (baseline) and 2012 (follow-up) examinations, which were conducted for a single cohort.

2.3. Participants

The study participants were community-dwelling elderly women. In 2008, an invitation letter for the baseline examination was sent to 10,948 women who were born between October 1, 1923 and November 30, 1933 and lived in the southeastern area of Itabashi ward, Tokyo. Of the 1670 respondents who were willing to participate, 1289 attended the baseline examination conducted at the Tokyo Metropolitan Institute of Gerontology from October 15 to November 3, 2008. A total of 1288 participants (age range: 75–85 years, mean age ± standard deviation [SD] = 78.51 ± 2.690 years) were included in the cross-sectional analyses. One participant lacked baseline information about knee osteoarthritis and was excluded.

The participants in the longitudinal analyses provided both baseline and follow-up data on their history of SR-knee OA. The follow-up survey was conducted in 2012 for the same cohort of the people who attended the baseline examination. In 2012, we sent an invitation letter for the follow-up examination to the subjects who participated in the baseline examination. Of the 992 participants without a history of SR-knee OA at baseline, 952 participated in the follow-up examination. In total, there were 437 participants in the on-site examinations (conducted from October 22–31, 2012) and 515 respondents to the mail/telephone surveys (conducted in December 2012). Forty subjects were lost to follow-up because of death (n = 12) or unknown reasons (n = 28). Of the 952 participants, 867 provided with information about their history of SR-knee OA (437 on-site participants and 430 mail/telephone respondents); these subjects were included in the longitudinal analyses. The subjects' ages ranged from 75 to 85 years (mean ± SD = 78.36 ± 2.696 years). Fig. 1 presents a flowchart of the subjects' selection process.

Participants' rights were strictly protected throughout the study. Participants' data were only used if they provided written informed consent. The study protocol was approved by the Ethics Committee of the Tokyo Metropolitan Institute of Gerontology. All participants, including those who refused to provide their data for study purposes, received a feedback letter explaining their health status about 2 months after participation in the examinations.

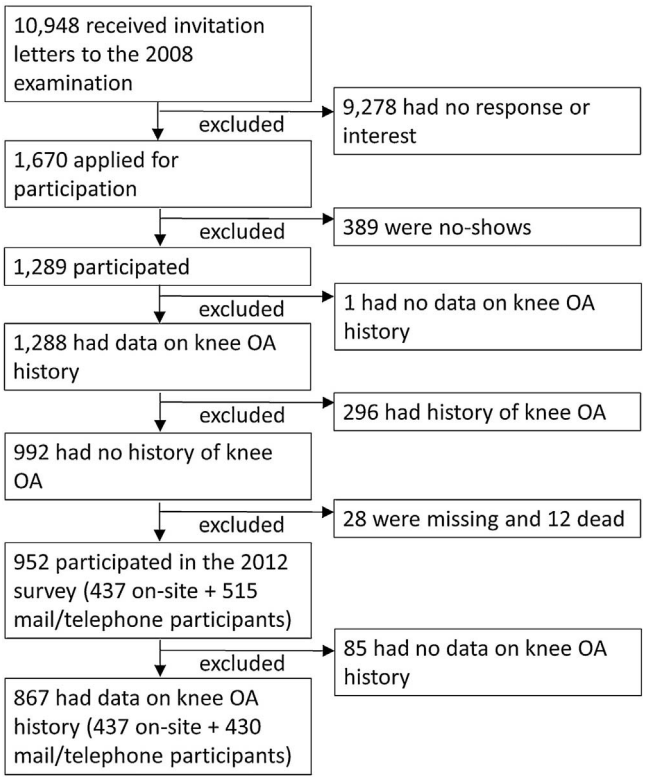

Fig. 1. Flowchart of the selection process for the 1288 subjects included in the cross-sectional analyses and the 867 subjects included in the longitudinal analyses.