

Relative Risk of Knee Osteoarthritis in Women Carpet Weavers and Non-Carpet Weavers

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Abstract

Introduction: Osteoarthritis of the knee is a common disease that presents with knee pain, morning stiffness and limited knee joint motions. The aim of this study was to evaluate the relationship between jobs of carpet weavers with the traditional method and the incidence of knee osteoarthritis.

Materials and methods: In this historical cohort study, we compared 53 female carpet weavers and 50 female non-carpet weavers. The diagnostic criteria of the American College of Rheumatology were used for final evaluation.

Results: The incidence of knee osteoarthritis was 52.8% in carpet weavers group and 28% in non-carpet weavers group, respectively.

There was a significant relationship between the incidence of knee osteoarthritis and the kind of job ($p=0/0104$). The relative risk of the disease in the exposed group was 1.526 more than in the unexposed group. This ratio was statistically significant ($CI=1/13-3/15$).

The population attributable risk in this study was estimated 31.3% and the exposure attributable risk was estimated 47%.

There was not a significant relationship between knee osteoarthritis with daily work hours, the number of parturition, education level and BMI.

Conclusion: Carpet weavers and kneeling for long is one strong risk factor for knee osteoarthritis.

Probably, the type of sitting (kneeling) with recurrent stress to the joint is one of the risk factors for knee osteoarthritis. Our results suggest that changes in the type of sitting can effectively prevent or reduce the severity and the signs of osteoarthritis.

Keywords: Knee osteoarthritis; Women; Knee bending; Carpet weaving

Introduction

Osteoarthritis (OA), also known as degenerative joint disease, is the most common knee pathology in older people and the commonest reason for knee pain and disability in this age-group. Its high prevalence (In the United States will increase by 66-100% by 2020) and the leading cause of chronic disability in the elderly [1].

Joint vulnerability and joint loading are the two major factors contributing to the development of OA. There are two categories of repetitive joint use, occupational use and leisure time physical activities that cause knee OA [1].

The characteristic of knee OA is pain. Joint pain from knee OA is activity-related. Pain comes on either during or just after joint use and then gradually resolves [2]. Stiffness of the affected joint may be prominent, but morning stiffness is usually brief (< 30 min). Knee range of motion is restricted and associated with joint crepitation. Knee tenderness may be seen in physical examination. Joint effusion is not common [3].

Diagnosis of OA is based on clinical symptoms, physical examination and radiological findings. The radiologic hallmarks of osteoarthritis include decreased joint space, marginal osteophytosis, subchondral cyst formation, and subchondral sclerosis [4].

According to diagnostic criteria of the American College of Rheumatology (ACR), if knee pain occurs with osteophyte and at least 1 of 3: age > 50 years, joint stiffness < 30 minutes, and crepitation on

active motion of the knee, this diagnostic approach has 91 percent sensitivity and 86 percent specificity in diagnosis of knee OA [5].

A study was carried out by Dahaghin et al. [6] using a case-control method to evaluate the association between occupations, sports, life-long daily activities and knee OA. The results of this study showed that two activities of prolonged squatting and cycling were risk factors for knee OA.

Another study was carried out by Davatchi et al. [7], to study the prevalence of musculoskeletal complaints and disorders in a rural area in Iran. Degenerative joint diseases were detected in 20.5% of persons that 19.3% of them were suffering from knee OA.

In a descriptive study carried out by Zamai et al. [8], in 1000 patients complaining of knee pain, showed that 350 cases (35%) were suffering from knee OA. The most common radiological finding was joint space narrowing and osteophytes.

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In case-control study of Klusmann et al. [9], there were a significant correlation between obesity and kneeling/ squatting (OR: 2/52 in women, OR: 2/16 in men) with knee OA.

Since knee OA is the most common articular disease in humans especially women, we decided to detect the incidence of knee OA in the carpet-weaving women as a study on the correlation between job activities (including knee bending and squatting) and knee OA and compared it with non-carpet weaving women.

Methods

With the purpose of a study on the correlation between traditional method carpet weaving and knee OA in the carpet weaver women of Dena Township, 60 women (exposed with risk factor of carpet-weaving) were selected among the carpet weaver women, and 60 women as unexposed group were selected among the neighbors of exposed group for this study and the outcome (OA) in these women were studied.

This is a historical cohort study. The target community study was all carpet weaving and non-carpet weaving women of Dena Township in the province of Kohgiluyeh & Boyer-Ahmad in south-west part of Iran.

The statistical community all qualified carpet weaving women of Dena township.

The research samples were carpet weaving and non-carpet weaving of Dena Township. By calculating 18% outbreak in the exposed group and 10% percent in the unexposed group, variance estimation of 5%, level of confidence interval 95% and ability of 80%, the total samples in each group was estimated to be equal to 60 cases.

A cluster method was used for selecting villages. Two villages were selected. Then in the villages 60 carpet weaver women were randomly selected in the age group of 45 to 60 years. The selected women would have at least 5 years of continuous or detached background of traditional method of carpet weaving (sitting or knee bending).

For the non-carpet weaving group 60 women were selected among the neighboring women. The information related to women including history and physical examination was carefully registered in the enclosed forms. Knee radiography (AP&Lateral views) of 103 women (exposed and unexposed) were done in S. Beheshti Hospital and reported by a radiologist.

17 women of the selected cases did not cooperate for radiography was excluded.

Exclusion criteria were including rheumatoid diseases, infectious arthritis, previous articular damage, old knee bones fractures and other articular abnormalities.

The data was collected by data registry forms and history taking method. Physical examination of the cases by physiatrist and knee radiographies were reported by radiologist.

For the final diagnosis of knee OA in this study, diagnostic criteria of ACR were used. Data were coded and entered in the computer and analyzed using SPSS software, copy 11, Minitab.

For the final analysis of data in this study, the Pearson's chi-squared test and relative risk estimation were used.

Results

53 women in the exposed group and 50 women in the unexposed

group participated in this study with an age-range of 45 to 60 years in each group. For final diagnosis of knee OA; the diagnostic criteria of ACR were used. The most common complaint of women in both exposed and unexposed groups was knee pain in 95 cases (92.2%) including 49 cases (92.4%) in the exposed group and 46 cases (92%) in the unexposed group. The most common physical finding was joint tenderness in 64.1% of total cases including 71.6% in the exposed group and 56% in the unexposed group.

The least complaint of patients in both exposed and unexposed groups was crepitation in 61 cases (59.2%) including 71.6% in exposed group and 46% in the unexposed group.

The most common radiological finding in exposed and unexposed groups was knee osteophyte in 44 cases (42.3%) including 28 cases (52.8%) in the exposed group and 16 cases (32%) in the unexposed group.

There were a significant correlation between age and level of knee OA in both groups ($df=2$, $X^2=17.714$, $P\text{-value}=0.000$). There were no significant correlation in both groups between BMI and knee OA ($df=1$, $X^2=1.481$, $P\text{-value}=0.173$). There were no significant correlation between daily working hours, level of education, and number of deliveries with knee OA.

Based on diagnostic criteria of ACR, there was knee OA in 42 total cases (40.8%) including 28 cases (52.8%) in the exposed group and 14 cases (28%) in the unexposed group (Table 1). With regard to the above table, knee OA in the total study population was 40.8% and the incidence in the carpet weaving and the non-carpet weaving women was 52.8% and 28%, respectively. Based on statistical tests ($\chi^2=6.57$, $df=1$, $p=0.0104$, 95% confidence interval for relative risk=1.13-3.15) there were a significant correlation between the incidence of knee OA and the exposed and un-exposed groups.

The relative risk of disease in the exposed group was 1.526 time the unexposed group and this ratio was statistically significant (CI: 1.13-3.15, $RR=1.526$).

The population attributed risk in this study was also estimated to be 31.3%, meaning that if we omit the exposure in the female community the incidence risk of consequences will reduce 31.3% in the female community. The exposure attributed risk in this study was estimated to be 47% meaning that if we omit the exposure in the carpet-weaving women, the incidence risk of consequences will reduce 47% in the carpet-weaving women.

Discussion

The present study was performed with the purpose of determining the relative risk of knee OA in carpet weaving women and to compare it with the non-carpet weaving women. There have been many studies in relation to risk factors of knee OA and to study the correlation between job and knee OA in different countries, that the results of which are different and sometimes paradoxical [6,8,9].

Group	Number	Positive	Negative	Test criterion
Exposed	53	28	25	Chi2=6.57 df=1 P=0.0104
		52.8%	47.2%	
Unexposed	50	14	36	RR= 1.526(CI: 1.13-3.15)
		28%	72%	
Total	103	42	61	
		40.8%	59.2%	

Table 1: Comparison of correlation between frequency distribution of knee OA in the studied women according to group.

In the present study, the incidence level of knee OA in the studied women was 40.8% including 52.8% in the carpet-weaving women and 28% in the non-carpet-weaving women. Statistically there were significant correlations between the two groups of women and the incidence level of knee OA ($p=0.0104$). The relative risk of disease in the carpet weaving women was 1.526 time non-carpet weaving women, and this ratio was statistically significant ($CI=1.13-3.15$). The obtained results are matched with the results of studies conducted by Dahaghin et al. [6], Klusmann et al. [9] and Vrezas et al. [10] and also are matched with the systematic review of Matzel et al. [11] that there is a strong positive correlation between the jobs that necessitate knee bending (kneeling) and knee OA.

In this study there was a significant correlation between the incidence of level of knee OA and age in the two groups of carpet-weaving women ($p=0.000$) and non-carpet weaving women ($p=0.042$). Also in the studies of Zamai et al. [8] and Vrezas et al. [10] such results were obtained.

In the study of Zhang and Jordan [12], factors such as old age, female gender, obesity, knee injury, repetitive use of joints, bone density, muscle weakness, and joint laxity all play roles in the development of joint osteoarthritis, particularly in the weight-bearing joints.

In this study there was no significant correlation between the incidence of knee OA and BMI in the both exposed and non-exposed groups ($p>0.05$). The obtained result was not matched with the result of studies by Zamai et al. [8], Klusmann et al. [9] and Vrezas et al. [10]. In a study by Yoshimura et al. [13] overweight in the past was taken into account as a risk factor for knee OA in women. The reason of non-matching is perhaps the low number of samples and no highness of BMI in both groups, because of similar economic conditions.

In this study there was no significant correlation between the incidence of knee OA and daily hours of carpet-weaving which is not matched with the study by Yoshimura et al. [13].

The reason for this difference has probably been the occupation of carpet-weaving women in similar and heavy jobs during the hours that they were not weaning carpets which was similar to non-carpet weaving woman.

No significant correlation was found between the incidence of knee OA and number of deliveries in both exposed and unexposed women which is not matched with the study of Jorgensen et al. [14]. The reason for no difference in the above mentioned group of women is that there was no meaningful correlation between the numbers of deliveries among them.

Also in this study no significant correlation was found between the incidence of knee OA and level of education in both exposed and unexposed groups which is not matched with the study by Jorgensen et al. [14]. The level of education in the two above mentioned groups of women was also not significant which justifies the difference.

The most common radiological finding in the studied women of both groups was osteophyte of knee joint which was found in 42.3% women including 52.8% in the exposed group and 32% in the unexposed group. This result is not matched with the results obtained in the study conducted by Zamai et al. [8].

Data suggest that the presence or absence of a definite osteophyte read on a weight-bearing radiograph is the best method of definite knee OA for epidemiologic studies. Assessment of joint space narrowing might be better used in evaluating the disease severity [3]. In the study of Kijowski et al. [15], osteophyte formation is the most typical feature

of knee OA is developed before joint space narrowing and is the most common finding in patients suffering from early stages of osteoarthritis. Moreover, the radiological appearance of osteophytes perhaps more accurately predicts knee pain than joint space narrowing [16].

In the study of Classens et al. [17], there is a high discordance between clinical and radiological findings of knee OA. In another study which encompassed a wide age range (19-92years) found that 53% of current knee pain sufferers had radiographic knee OA [18].

In this study, it was found that the incidence of knee OA in carpet weaving women is more than non-carpet weavers and kneeling and repeated stress to the knees of carpet-weaving women is one of the contributing factors in the patients suffering from OA. This result is match with klusmann et al. [9] study that supports a dose-response relationship between kneeling/squatting and symptomatic knee OA in men and, for the first time, in women.

Since the incidence of knee OA in women is more than men, therefore more attention to diagnosis of the disease leads to providing the health level of women.

Conclusion

Carpet-weaving women with recurrent stress to knee (kneeling/squatting) are prone to develop knee osteoarthritis. Our results suggest that changes in the type of sitting can effectively prevent or reduce the severity and the signs of osteoarthritis.

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