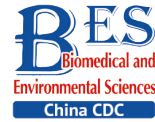


## Letter to the Editor



# Prevalence, Characteristics and Treatment of Knee Osteoarthritis in Urban Residents of Beijing, China: A Community-Based Cross-Sectional Study\*

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Knee osteoarthritis (KOA) is a common progressive joint disease with chronic pain and movement disorders as the main clinical features. It is a major public health problem worldwide and it imposes serious medical and economic burdens. KOA accounts for nearly four-fifths of the global Osteoarthritis burden and increases with rising obesity and age<sup>[1]</sup>. There are many reasons for the change in disease prevalence and risk factors, such as urbanization, lifestyle changes, population aging, and sex imbalances. The prevalence of symptomatic KOA in middle aged and older individuals in China is 8.1%<sup>[2]</sup>, and there is a rising trend. Patients with KOA require long-term treatment during the course of the disease and may receive a variety of drugs and non-drug interventions as a combined treatment<sup>[3]</sup>. Although Total Knee Arthroplasty (TKA) is usually the final choice, conservative treatment with or without drugs is usually the first-line intervention to avoid or delay surgery<sup>[4]</sup>. The use of nonsurgical therapies is often guided by differences in Chinese Medicine staging (CMS), based on the severity of the condition<sup>[5]</sup>. Therefore, it is necessary to study the characteristics and treatment status of KOA in urban residents in China. As an economic, cultural, political center, and first-tier city, Beijing has developed rapidly, and its urban, middle-aged, and elderly populations have exceeded the national average. Medical resources are more abundant, and diverse treatment methods can be utilized. Thus, the selection of the Beijing urban area as the survey object can better reflect the changes in urbanization on KOA. Currently, there are no large-scale epidemiological investigations or treatment status

analyses of urban residents in China.

This study was approved by the Scientific Research Ethics Committee of the Beijing University of Chinese Medicine Third Affiliated Hospital, approval number: BZYSY-2022KYKTPJ-04, and registered in the Chinese Clinical Trial Registry, registration number: ChiCTR2200062700. The study was led by the Beijing University of Chinese Medicine Third Affiliated Hospital. All streets in the Beijing urban area were selected from, using random cluster sampling. All residents (permanent residents, residents with formal household registration, or residence permits) of Hepingli Street in the Dongcheng District of Beijing were selected as the research objects. The study was conducted in cooperation with the Hepingli Street Office in the Dongcheng District of Beijing and the Hepingli Community Health Service Center in the Dongcheng District of Beijing. There are 20 communities on Hepingli Street, and the specific investigation work and community situation are shown in [Supplementary Figure S1](#) (available in [www.besjournal.com](http://www.besjournal.com)).

The survey covered the period from January 1, 2022, to June 30, 2022. The investigators of the Beijing University of Chinese Medicine Third Affiliated Hospital, medical workers of the community health service center or community health service station, and social workers of the Hepingli Subdistrict Office participated in the investigation. Investigators were responsible for recording information through outpatient, telephone, and visitation surveys, which includes general information, past history, and personal

doi: [10.3967/bes2024.045](https://doi.org/10.3967/bes2024.045)

\*This research was funded by the Capital Health Research and Development of Special Funds (NO: 2022-1-7032); and the High-level Talent Research Project of Beijing University of Chinese Medicine (NO2021-XJ-KYQD-001).

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history. Among them, three floors or above three floors were considered high floors. For patients who were diagnosed with knee osteoarthritis, clinical data, such as the visual analogue scale (VAS) and Kellgren-Lawrence grading (KLG) were recorded. Treatment status referred to the recommended items of the knee osteoarthritis diagnosis and treatment guidelines, including basic treatment, western medicine treatment, traditional Chinese medicine treatment, physical treatment, and surgical treatment. The diagnosis of KOA is based on the American College of Rheumatology (ACR) diagnostic criteria<sup>[6]</sup>, mainly based on the patient's clinical symptoms and signs, combined with imaging examinations for diagnosis. Knee osteoarthritis CMS was categorized into three stages<sup>[5]</sup>: 1) CMS I: mild pain, mainly including soreness, accompanied by lassitude, and inability to walk for a long time. 2) CMS II: moderate pain, mainly including vague pain, accompanied by soreness and weakness of the waist and knee, and aggravated by physical activity. 3) CMS III: severe pain, mainly including stabbing, distending, and scorching pain, accompanied by joint heaviness, aggravation with cold and alleviation with warmth.

The survey results show that there were 139,032 people in Hepingli Street, Dongcheng District, Beijing, with 71,239 males and 67,793 females. A total of 38,850 residents (aged  $\geq 40$ ) were included, including 16,536 males and 22,314 females aged 40–106. The total prevalence of KOA in urban residents of Beijing, China, is 8.0%, lower than the the global prevalence (16.0%)<sup>[7]</sup>, with 6.36% in males and 9.72% in females. The prevalence in people over 40 years old is 28.63%, which is higher than the global prevalence of people over 40 years old (22.9%)<sup>[7]</sup>, with 24.44% (4,531) in males and 32.45% (6,591) in females. A chi-square test was conducted on the factors related to KOA, which showed that there were significant differences between KOA and non-KOA patients in terms of sex, age, BMI, living environment, knee joint trauma history, KOA family history, osteoporosis history, drinking history, education, and occupation ( $P < 0.001$ ). There were no significant differences in smoking history ( $P > 0.05$ ). [Table 1](#) presents the results of the study.

Logistic regression analysis was conducted on the factors associated with KOA that showed a statistically significant difference. The results showed that the prevalence of KOA was significantly correlated with sex, age, BMI, living environment, knee joint trauma history, family history of KOA, osteoporosis history, drinking history, and

occupation ( $P < 0.001$ ), which were risk factors for KOA (odds ratio [OR]  $> 1$ ). There was a significant correlation between the prevalence of KOA and education ( $P < 0.001$ ), which was a protective factor against KOA (OR  $< 1$ ). The results are shown in [Figure 1](#), [Supplementary Table S1](#) (available in [www.besjournal.com](http://www.besjournal.com)).

Among the KOA patients, 991 (8.91%) were in CMS III, aged 40–102 years, 3,738 (33.61%) were in CMS II, aged 40–103 years, and 6,393 (57.48%) were in CMS I, aged 40–100 years. There were statistical differences in sex, age, BMI, and KLG in different stages. The results showed that CMS III was the highest, CMS II was the second highest, and CMS I was the lowest in terms of the proportion of female, average age, proportion of older individuals, BMI, and KLG, which were statistically significant ( $P < 0.001$ ). The results are shown in [Supplementary Table S2](#) (available in [www.besjournal.com](http://www.besjournal.com)).

Patients with KOA mainly use Chinese patent medicines for external use, with health education being the most common. Among them, the treatment methods of CMS III (the top five methods of frequency) were external use of Chinese patent medicine 67.10%, oral use of Chinese patent medicine 52.07%, health education 46.52%, weight management 32.80%, and external use of Chinese herbal medicine 29.47%. The main treatment methods of CMS II (the top five methods of frequency) are Chinese patent medicine for external use (70.33%), health education (54.87%), cupping (40.56%), physical therapy (39.35%), and exercise (33.63%). The main treatment methods of CMS I (the top five methods of frequency) are health education 66.87%, Chinese patent medicine 49.19%, traditional exercises 38.60%, exercise 31.53%, and cupping 20.77%. Details are presented in [Table 2](#).

Unlike other countries, Chinese patent medicine is widely used throughout the course of the disease, and its clinical efficacy has been recognized by international scholars. In addition, Chinese herbal medicine, acupuncture, and cupping also play a significant role in controlling symptoms. In terms of improving muscle function around the knee joint, the curative effect of traditional exercises, such as Tai Chi and Baduanjin, are superior to quadriceps femoris exercise, which can significantly improve knee joint pain, body function, and quality of life<sup>[8]</sup>. International guidelines also provide a clear explanation for the application of traditional medicines in KOA, including traditional Chinese medicine<sup>[9]</sup>. In recent years, the importance of health education has been emphasized. Studies

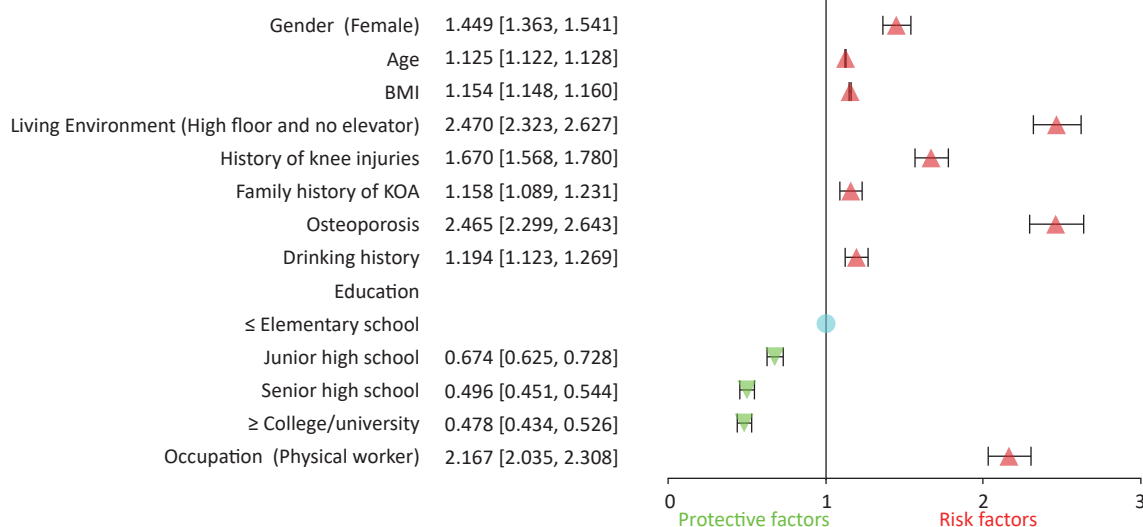
**Table 1.** Characteristics of respondents by status of KOA and non-KOA groups

Variables	Residents (aged ≥ 40)		KOA		Non-KOA		P
	n = 38,850	Percent (%)	n = 11,122	Percent (%)	n = 27,728	Percent (%)	
Gender							
Male	18,536	47.71	4,531	40.74	14,005	50.51	< 0.001
Female	20,314	52.29	6,591	59.26	13,723	49.49	
Age, years							
40–49	18,127	46.66	754	6.77	17,373	62.66	< 0.001
50–59	7,716	19.86	1,218	10.95	6,498	23.43	
60–69	4,630	11.92	2,828	25.43	1,802	6.50	
70–79	4,297	11.06	3,017	27.13	1,280	4.62	
≥ 80	4,080	10.50	3,305	29.72	775	2.79	
BMI (kg/m <sup>2</sup> )							
< 18.5	3,243	8.35	827	7.43	2,416	8.71	< 0.001
18.5–23.9	19,948	51.35	4,216	37.91	15,732	56.74	
24.0–27.9	12,899	33.20	4,562	41.02	8,337	30.07	
> 28.0	2,760	7.10	1,517	13.64	1,243	4.48	
Living Environment							
High floor and no elevator	17,169	44.19	6,685	60.11	10,484	37.81	< 0.001
Lower floor or elevator	21,681	55.81	4,437	39.89	17,244	62.19	
History of knee injuries							
Yes	13,001	33.46	4,675	42.03	8,326	30.03	< 0.001
No	25,849	66.54	6,447	57.97	19,402	69.97	
Family history of KOA							
Yes	16,536	42.56	5,015	45.09	11,521	41.55	< 0.001
No	22,314	57.44	6,107	54.91	16,207	58.45	
Osteoporosis							
Yes	8,414	21.66	3,823	34.37	4,591	16.56	< 0.001
No	30,436	78.34	7,299	65.63	23,137	83.44	
Smoking history							
Yes	23,981	61.73	6,925	62.26	17,056	61.51	0.168
No	14,869	38.27	4,197	37.74	10,672	38.49	
Drinking history							
Yes	20,555	52.91	6,228	56.00	14,327	51.67	< 0.001
No	18,295	47.09	4,894	44.00	13,401	48.33	
Education							
≤ Elementary school	9,357	24.08	3,541	31.84	5,816	20.98	< 0.001
Junior high school	14,775	38.03	4,261	38.31	10,514	37.91	
Senior high school	7,581	19.51	1,728	15.54	5,853	21.11	
≥ College/university	7,137	18.37	1,592	14.31	5,545	20.00	
Occupation							
Physical worker	21,208	54.59	7,516	67.58	13,692	49.38	< 0.001
Non-physical worker	17,642	45.41	3,606	32.42	14,036	50.62	

**Note.** KOA, Knee osteoarthritis; BMI, Body Mass Index.

have shown that self-management may help to improve pain, knee function, stiffness, swelling, mental health, and quality of life in KOA patients<sup>[10]</sup>. The course of KOA is as long as decades. Through

imaging examinations, it can be intuitively observed that the knee joint constantly deteriorates and is aggravated. However, the reason for the patient's visit is usually pain. Pain relief during treatment is



**Figure 1.** Characteristics of KOA in Chinese urban residents. KOA, Knee osteoarthritis.

**Table 2.** Treatment of knee osteoarthritis in different stages

Treatment	CMS III		CMS II		CMS I	
	n = 991	Percent (%)	n = 3,738	Percent (%)	n = 6,393	Percent (%)
Health Education	461	46.52	2,051	54.87	4,275	66.87
Weight Management	325	32.80	1,004	26.86	1,051	16.44
Exercise	62	6.26	1,257	33.63	2,016	31.53
Oral Western Medicine	150	15.14	279	7.46	210	3.28
Western Medicine for External Use	216	21.80	415	11.10	245	3.83
Intra-Articular Injection	121	12.21	251	6.71	451	7.05
Physical Therapy	178	17.96	1,471	39.35	1,204	18.83
Surgery	93	9.38	225	6.02	272	4.25
Traditional Exercises	71	7.16	451	12.07	2,468	38.60
Oral Chinese Herbal Medicine	213	21.49	278	7.44	256	4.00
Oral Chinese Patent Medicine	516	52.07	852	22.79	517	8.09
Chinese Herbal Medicine for External Use	292	29.47	482	12.89	225	3.52
Chinese Patent Medicine for External Use	665	67.10	2,629	70.33	3,145	49.19
Acupuncture	234	23.61	1,061	28.38	828	12.95
Moxibustion	55	5.55	513	13.72	426	6.66
Needle Knife	78	7.87	462	12.36	328	5.13
Cupping	162	16.35	1,516	40.56	1,328	20.77
Pricking Cupping	78	7.87	273	7.30	241	3.77
Manipulation	43	4.34	326	8.72	432	6.76

**Note.** CMS, Chinese Medicine staging.

important. However, for patients with high KLG, the effect of drug treatment is poor; therefore, clinical symptoms and imaging grading should be comprehensively considered.

Depending on the severity of pain, patients with CMS III choose 4–5 treatment methods simultaneously, and patients with CMS II and CMS I choose 2–3 treatment methods simultaneously. There were significant differences in the choice of treatment between the different stages ( $P < 0.001$ ). The results are shown in [Supplementary Table S3](#) (available in [www.besjournal.com](http://www.besjournal.com)). The combined application of multiple treatment methods can better alleviate clinical symptoms, and the more severe clinical symptoms are selected.

Our study had some limitations. First, although the survey population was nearly 140,000, we conducted a census on only one street. The regional economy and medical resources are superior, but there are many old urban areas, which may have biased environmental impact factors. Second, based on the sixth census and the health records of community health service centers and stations, permanent residents were investigated. The floating population was not considered in this study. Considering that the floating population consisted mainly of young and middle-aged individuals, there may have been some additional bias towards the effects of age.

In summary, the prevalence of KOA in urban residents in Beijing, China was 8.0%, which is lower than the global level. The prevalence was related to female sex, advanced age, obesity, living environment, and occupation. Old age and obesity are important factors that affect KOA progression. Patented Chinese medicines are widely used for drug treatment and traditional exercises are more widely used in exercise rehabilitation.

**Acknowledgements** We thank all the staff who participated in the survey at the Hepingli Street Office in Dongcheng District of Beijing and the Hepingli Community Health Service Center in Dongcheng District of Beijing.

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Received: September 17, 2023;

Accepted: January 23, 2024

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