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Original Article

Study of Total Knee Arthroplasty in Iran: Implications for Health Managers and Policy Makers

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Abstract

Introduction: The infinite and increasing need for health service providers along with limited health sources has led to an increase in health costs and, consequently, the transfer of government resources from other social services to the health sector. One of the hospital services that has increased the costs in hospitals is total knee arthroplasty. Knee joint is one of the important joints of the body that is affected by various inflammatory and erosive diseases, which ultimately causes destruction of the articular cartilage and loss of proper joint function. Today, we are faced with an increasing demand for total knee arthroplasty. Knowledge of the distribution and extent of TKA provides the basis for health managers to design and implement interventions to reduce TKA surgery.

Methods: This study is a cross-sectional study. 14329 records of total knee arthroplasty patients in Iran were selected by census method in 2019-2021. The data collection tool in this study was a standard checklist. Data were analyzed by SPSS version 24 software using descriptive statistics.

Results: The mean age of the patients was 66.1 years. 81.31% of the patients were female. 87.4% of them lived in cities, 31.5% had supplementary insurance, and most of the patients (51.9%) had undergone total knee arthroplasty in private hospitals.

Discussion and Conclusion: The pattern of total knee arthroplasty in our country is similar to that of other countries; most surgeries are performed in private hospitals, which may generate induced demand. TKA is more prevalent in the urban population, and most people who have had surgery do not have supplementary insurance coverage, and the northern provinces have the highest TKA; thus, the attention of researchers and policy makers to the field of health in identifying and preventing the factors leading to knee replacement will make the demands for total knee arthroplasty reasonable.

Keywords: Arthroplasty, Epidemiology, Knee

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Introduction

The unlimited and growing need of health services consumers with the limited resources of the health system has led to increased health costs and, consequently, transfer of government resources from other social services to the health sector (1). One of the main causes of the increased costs in the health system is the increase in hospital costs (2, 3). One of the hospital services that has increased the costs and imposed burden on hospitals is knee arthroplasty (4).

Today, we are facing an increase in demand for total knee arthroplasty in countries (5, 6); estimates indicate that the demand for total knee arthroplasty will increase, so that by 2030, total knee arthroplasty will have increased in the United States 673%, UK 173%, and Wales 332% (6-8). In Iran, there are no statistics and information on the demand for total knee arthroplasty; failure to control the increasing demand for total knee arthroplasty will impose high costs on hospitals and the health care system (9).

Total knee arthroplasty (TKA) is a procedure

performed for advanced arthroplasty which reduces pain, improves function, and increases quality of life (10). Knee joint is one of the most important joints in the body that is affected by various inflammatory and erosive diseases, and ultimately causes destruction of articular cartilage and loss of joint function and deformation. Among the injuries, primary osteoarthritis and rheumatoid arthritis are the most common (11). Several factors cause this type of disease. One of these factors is stress which occurs during sports and recreational activities of daily living. Other factors are genetics, obesity and overweight because the knee bears the weight of each person with each step. Excess weight causes wear and tear of the knee joint. For reducing the prevalence and incidence of this disease or reduce the related pain, lifestyle change, exercise, dietary supplement, medication, injection, arthroscopy, cartilage replacement, osteotomy and total knee arthroplasty are helpful (4).

Today, about 2 percent of the population aged 55 years and older are disabled and need knee arthroplasty that increases with age. It is also estimated that women need arthroplasty twice as much as men (12). According to the mentioned points, the need for knee arthroplasty in Iran and other countries has been associated with increasing demand.

Due to the very high costs this surgery imposes on the Iranian health system, the aim of this study was to investigate the epidemiology of knee arthroplasty in Iran. It is hoped that the results of this study will help policymakers and economists to make important decisions.

Methods

This is a retrospective study performed using patient archive information from the Statistics Office of the Ministry of Health; 14329 patients who had undergone total knee arthroplasty from the beginning of 2019 to 22 July 2021 were enrolled. Patients whose data were incomplete or who performed an operation other than total knee arthroplasty were excluded from the study. In order to collect information, a researcher-made checklist containing 10 questions of age, gender, type and affiliation of hospital, province, specialty and education of the surgeon, year of surgery, length of stay, type of insurance, existence of supplementary insurance, and the patient's residence was used. The validity of the checklist was assessed by three experts in this field (health economics, health policy and health services management) and its reliability was assessed using Cronbach's alpha test (74%). The study was approved by Ethics Committee of Kerman University of Medical Sciences (IR.KMU.REC.1400.148). In order to determine the geographical distribution in the provinces of Iran, we used GIS software, and other research data were analyzed using inferential and descriptive statistical tests through SPSS software version 24.

Results

A total of 14,329 patients were admitted in public, private, charity, and non-public hospitals for total knee arthroplasty from the beginning of 2019 to 22 July 2021. The mean age of the patients was 66.1 years. The youngest person who had undergone total knee arthroplasty was 16 years old and the oldest was 97 years old. 81% of the patients were women. (Table 1)

The prevalence was highest among the age group of 60 and above and lowest in people in the age group of under 50 years (P=0.001). (Table 2)

People mostly referred to private hospitals for total knee arthroplasty (51.9%), followed by public (40.7%) and charity hospitals (6.5%). The rest were admitted in non-public hospitals including Armed Forces hospitals, social security hospitals, and hospitals affiliated with government centers other than the Ministry of Health. (Table 3)

Table 1: Frequency of Total knee arthroplasty (TKA) according to age and gender

Gender	Frequency	Percent	Mean age±SD
Men	2662	18.6	66.5±9.35
Women	11654	81.31	65.7±8.26
Missing	13	0.09	-
Total	14329	100	66.1

Table 2: The relationship between age and frequency of total knee arthroplasty

	OA Status	<50 years		50-59 years		60-69 years		70+ years		P value
		No	%	No	%	No	%	No	%	
	Age group	446	3.1	2527	17.6	6620	46.2	4736	33.1	0.001
Gender	Male	107	24	401	15.8	1160	17.5	996	21.1	0.001
	Female	339	76	2126	84.12	5460	82.5	3740	78.9	

Table 3: Frequency of total knee arthroplasty regarding the hospital admitted

Dependency Type	Frequency	Percent
Public Hospital	5825	40.7
Private Hospital	7442	51.9
Charity Hospital	938	6.5
Non-Public Hospital	124	0.9
Total	14329	100

Table 4: Frequency of total knee arthroplasty based on the background data

Variable	Frequency	Percent
Year		
2019	4538	31.7
2020	7177	50.1
2021	2614	18.2
Insurer		
Medical services insurance	7620	53.2
Social security insurance	5147	35.9
Armed Forces insurance	532	3.7
No insurance	284	2
Other insurance	746	5.2
Surgeon Specialty		
Orthopedic	10728	74.9
Fellowship of knee	538	3.8
Resident Orthopedic	596	4.2
Fellowship of hand	52	0.4
fellowship of Children orthopedic	76	0.5
Fellowship of Spinal	12	0.1
Unknown	2327	16.2
Supplementary insurance		
Yes	4510	31.5
No	9819	68.5
Urban/rural		
Urban	12522	87.4
Rural	1807	12.6

Table 5: Mean length of stay of patients who underwent total knee arthroplasty

LOS	Mean±SD	Max	Min
Los-Hour	96.35±74.9	745	25
Los-Day	4.01±3.12	31.04	1.04

The results of the study were reviewed for three years. Most patients had undergone arthroplasty (50.1%) in 2020 although we did not have the full data of 2021 and only for four months. Most people who had a total knee arthroplasty were covered by medical services insurance (53.2%), followed by social security insurance (35.9%). Two percent of the patients had no insurance. 8.9% of them had other insurances, and 4510 patients (31.5%) had supplementary insurance. The highest number of total knee arthroplasty was performed by orthopedic specialists (74.9%). Knee replacement surgery is more common in urban population than those living in rural areas (87.4 % were urban populations). (Table 4)

Another issue which was studied was the length of stay of patients in hospitals, which according to Table 5, the average hospital stay was 96.35 hours (4 days) with a maximum of 745 hours and a minimum length of 25 days. The reason for reporting the length of stay in the hospital in terms of hours, is that the Ministry of Health records the patients' length of stay in hours

The results of the study showed that most of the total knee arthroplasty was performed in the northern part of the country, so that Tehran province with 3075 cases, East Azerbaijan and Isfahan each with 1702 cases had the most total knee arthroplasty. (Table 6)

In the present study, in order to determine the distribution of total knee arthroplasty in the country, we used GIS software and showed that the TKA was performed variably throughout the country (Figure 1).

Table 6: Frequency distribution of total knee arthroplasty according to provinces

Province	Frequency	Percent
East Azerbaijan	1702	11.9
West Azerbaijan	463	3.2
Ardabil	268	1.9
Isfahan	1702	11.9
Alborz	161	1.1
Ilam	235	1.6
Bushehr	3	0.001
Tehran	3075	21.5
Chaharmahal and Bakhtiari	89	0.6
South Khorasan	20	0.1
Razavi Khorasan	1302	9.1
North Khorasan	276	1.9
Khuzestan	113	0.8
Zanjan	230	1.6
Semnan	161	1.1
Sistan and Baluchestan	12	0.1
Fars	294	2.1
Qazvin	63	0.4
Qom	285	2.0
Kurdistan	100	0.7
Kerman	287	2.0
Kermanshah	284	2.0
Kohgiluyeh and Boyer-Ahmad	7	0.002
Golestan	143	1.0
Gilan	1396	9.7
Lorestan	47	0.3
Mazandaran	440	3.1
Markazi	289	2.0
Hormozgan	39	0.3
Hamadan	217	1.5
Yazd	626	4.4
Total	14329	100.0

Discussion

According to this study, the prevalence of total knee arthroplasty for Iranian patients is more common in the group aged over 48 years than other age groups, which is consistent with other studies and the global prevalence of total knee arthroplasty (13-17). In the present study, the mean age of the patients was 66.1 years, showing that with increasing age, the demand for knee replacement surgery increases. Likewise, Ghazisaeed et al. (2018) found a significant relationship between the age and demand for total knee arthroplasty (14) Also, Zeinali et al. (2016) reported the mean age of 65.3 years for patients who underwent knee arthroplasty (15). The results of the study by Pal et al. (2016) in Kenya are consistent with those of the present study. They performed the study on four age groups of under 50 years, 50 to 59 years, 60 to 69 years, and over 70 years. The results of the study showed that 19.2% of people under 50 years of age, 30.7% of people aged 50 to 59 years, 39.7% of people 60 to 69 years old, and 54.1% of people over 70 years old had knee osteoarthritis and needed total knee arthroplasty (17).

In our study, 81.3% of the patients who had undergone total knee arthroplasty were women, which is consistent with previous studies (13, 15-20). Kerrigan et al. (2005) in their study in Italy showed that women's demand for total knee arthroplasty was higher than men due to their unique lifestyle and wearing shoes with heels higher than 1.5 inches (3.81 cm) (19). Also, Paul et al. (2016) in India showed that women were more likely than men to have total knee arthroplasty, and demand for women over 45 years old was higher because of hormonal changes and the onset of menopause (17).

The present study showed that most total knee arthroplasty were performed in private hospitals (51.9%). Because knee arthroplasty is a luxury

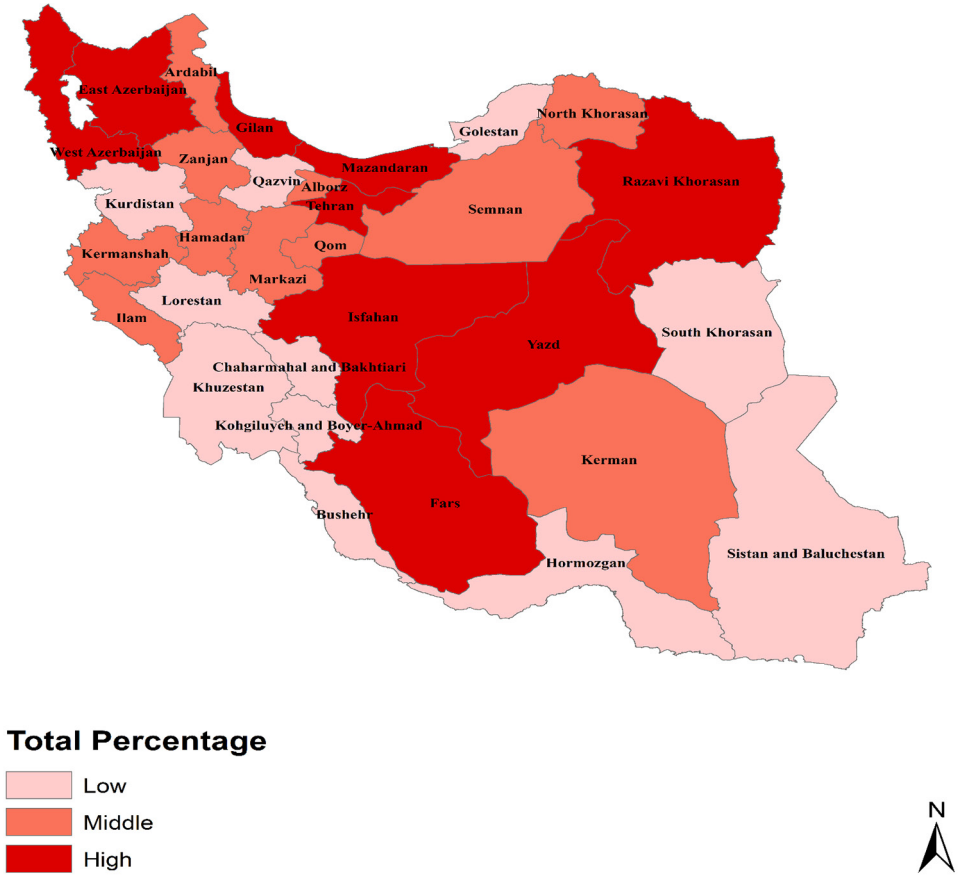

Figure 1: Distribution of total knee arthroplasty in Iran

and expensive medical procedure, patients tend to perform it in private centers. Other findings of the study showed that the demand for total knee arthroplasty among the urban population was higher than the rural population, which might be explained by healthy lifestyle and dietary habits of rural residents. In contrast, a study by Kirkhorn et al. (2003) in the United States showed that villagers were more likely to develop osteoarthritis of the knee due to the lifestyle and occupation of villagers, villagers were more likely to be affected by agriculture, and the risk of knee osteoarthritis was high demand for total knee arthroplasty (21).

The results of the present study also showed that the type of basic insurance of patients was effective in the demand for total knee arthroplasty. Additionally, the minority of the studied population were covered by supplementary insurance, and 68.5% of patients who had total knee arthroplasty did not have supplementary insurance. The demand for total knee arthroplasty in the Iran provinces varied a lot, so that the provinces of Tehran, Azerbaijan-Sharghi and Isfahan had the highest demand for total knee arthroplasty, and Bushehr and Kohkiluyeh and Boyer-Ahmad provinces had the lowest demand for total knee arthroplasty. TKA was more prevalent in the urban population, which is due to the specific lifestyle in the urban population. Most surgeries are performed by orthopedic specialists, which indicates that the total knee arthroplasty is general surgery. The length of stay in the hospital was four days, the maximum stay was 31 days and the minimum stay was 1 day, which varied according to the type of hospital. Due to the fact that most surgeries are performed in private hospitals (51.9%), an increasing demand might arise for total knee arthroplasty. Knowledge of the distribution and extent of TKA provides the basis for health managers to design and implement interventions to reduce TKA surgery.

Conclusion

The present study examined the epidemiology of total knee arthroplasty in Iran. The results of the study show that today we are facing an increasing demand for total knee arthroplasty in Iran and the world. Because total knee arthroplasty is an expensive procedure and surgery with limited resources of the health system, it is recommended that researchers should identify the factors influencing the incidence of the diseases that leads to the demand for total knee arthroplasty. Policymakers and managers are recommended to take action to prevent diseases that

lead to knee arthroplasty and rationalize the demand for total knee arthroplasty.

One of the limitations of the study was that there were no parallel databases and we could not check the accuracy of the information and the secondary data available in the Ministry of Health was used.

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Conflict of Interest: None declared.

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