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section

Long term outcome of total knee replacement in patients with osteoarthritis a prospective observational study

Md. Alinoor, Mohammed Ramzanul Karim Khan, Moyeen Ahmed Ferdous, Md. Ibrahim Miah, Md. Motiur Rahaman, Sharif Md. Musa, AKM Latiful Bari, Jamal Uddin Ahmed, Mohammad Faroque Eastiak, Ahsan Majid, Mahamud Mannan, Md. Kamruzzaman and Mohammad Moshir Rahman

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Abstract

Osteoarthritis is not an immediate lethal disease by itself but has led to rise in global years lived with disability. Over the past one decade the indication for knee replacement has increased tremendously. Cases of arthritis who have undergone total knee replacement (TKR) in past one decade were collected from the medical record department and were studied thoroughly on the age, gender, along with its association with other diseases to find out its risk factors. This is primarily a record-based study was carried out at Department of Orthopedic Surgery, BSMMU, Dhaka, Bangladesh from January 2022 to December 2023. Cases were taken from the medical record department. A total of 146 cases were studied. Each of the cases were studied in terms of age, gender, type of deformity, as well the associated co-morbid conditions to know the significant risk factors. Statistical analysis was done to find if there is any significant association between the above parameters and osteoarthritis (OA). The commonest indication for TKR was found to be OA. There was a strong positive correlation between increased number of cases and rising year trend (r 0.934). A strong positive correlation was also found between - (1) Increase in OA cases and female sex (r 0.998) and male sex (r 0.9822). (2) Increase number of OA cases with age (r 0.994). (3) OA and varus deformity (r 0.991, $p < 0.0001$); rheumatoid arthritis (RA) and valgus deformity (r 0.570, p 0.0475). (4) Hypertension and OA cases undergoing TKR ($p < 0.0001$, r 0.9843). (5) We also found an association between OA and past history of hysterectomy in patients who had undertaken TKR (r 0.9843). The most common indication for TKR is osteoarthritis and increased frequency of TKR in the recent years. Higher female: male ration in terms of OA cases undergoing TKR. Frequency of OA in middle age (41-60) has been gradually declining due to improvement of medical interventions. Thus, necessary interventions should be taken to decrease the incidence of OA cases and provide a better living i.e. a life free of disabilities, which is the need of the moment. This can benefit the society as well as the country in terms of economics in the long term.

Keywords: Arthritis, Osteoarthritis, Rheumatoid, Valgus, Varus

Introduction

Although osteoarthritis itself is not a fatal disease, it is associated with an increased number of years spent with disability worldwide. Indications for knee replacement have increased significantly in the past decade, primarily to improve overall function of a knee that was painful prior to surgery. Positive outcomes of total knee replacement include reduced pain, improved functional mobility, and realignment of the knee. However, there is little data from trials of TKR as a treatment modality or studies comparing it with other interventions. Nevertheless, the Patient Outcomes Research Team (PORT) report has proven that TKR is highly effective in improving disability and pain scores^[1], which is the reason for the increasing use and implementation of TKR. Osteoarthritis (OA) of the knee is one of the most common bone diseases. However, there is limited data on the Bangladeshi population, especially on knee arthritis and knee replacement. Osteoarthritis is a degenerative joint disease in which the homeostasis between destruction of articular cartilage and regeneration of new

Corresponding Author:
Md. Alinoor
Assistant Professor, Department
of Orthopedic Surgery, BSMMU,
Dhaka, Bangladesh

bone at the edges of the joint surface is disturbed [2, 3]. In addition, there is hypertrophy of the bone at the edges, subchondral sclerosis, and many biochemical and morphological changes in the synovium and joint capsule [4, 5]. Regardless of the cause, matrix and cartilage degeneration occurs, resulting in active chondrocyte replication and increased biosynthesis [6]. This results in an equilibrium state, called compensated OA, where both repair and degeneration are in balance [7]. After several years, this balance is disrupted, resulting in capsule thickening, subchondral bone cyst formation and sclerosis, fibrous cartilage detachment, labral osteophyte formation, synovial hypertrophy, and uneven bone contour [8, 9]. The radiological criteria of the Kellen and Lawrence scale are based on an overall severity score ranging from 0 to 4 and refer to reduced joint space, the presence of joint body laxity, subchondral sclerosis, and bone deformity [10]. Other features such as effusion, osteophytes and subchondral cysts, joint alignment and subluxation have also been noted [11, 12]. During old age there is oxidative damage, thinning of cartilage, muscle weakening, reduction in proprioception, decline in tissue homeostasis leading to an inadequate response to stress or joint injury and resultant joint destruction, loss of cartilage, thinning of capsule and altered contour of bone [6]. The other known risk factors are obesity, valgus and Varus deformity of the knee, intra articular fractures and trauma, rheumatoid arthritis, syringomyelia, neurological disease like diabetes, occupation involving excessive use of knee joint, smoking, hormonal imbalances, emotional stress, osteoporosis, improper postural habits [7].

Methodology

This is primarily a record-based study was carried out at

Department of Orthopedic Surgery, BSMMU, Dhaka, Bangladesh from January 2022 to December 2023. Cases were taken from the medical record department. A total of 146 cases were studied. Each of the cases were studied in terms of age, gender, type of deformity, as well the associated co-morbid conditions to know the significant risk factors. Statistical analysis was done to find if there is any significant association between the above parameters and osteoarthritis (OA).

The diagnosis of osteoarthritis was based on clinical history and radiological (x ray knee) findings. Rheumatoid arthritis was diagnosed from clinical history, radiological finding (x ray knee), and rheumatoid factor. Cases of ankylosing spondylitis were defined from case history, x ray knee. Traumatic arthritis cases were those giving past history of trauma. Diagnoses of post infective arthritis was made from history of fever, pain and discharge from the knee joint, raised total and differential WBC counts, culture sensitivity result of the discharge. Statistical analysis was done according to graph pad prism SPSS version 6.05. Analyses was done using chi square test, student paired t test, one-way ANOVA (non-parametric) and Karl Pearson product moment. Values below $p \leq 0.05$ were considered significant, $p \leq 0.01$ very significant and $p \leq 0.0001$ very highly significant.

Results

The commonest indication for TKR was OA with 94.5%, RA (Rheumatoid Arthritis) ranked the second with 5.5%. Others were ankylosing spondylitis, traumatic arthritis, and post infective arthritis with overall frequency together of 0.54%.

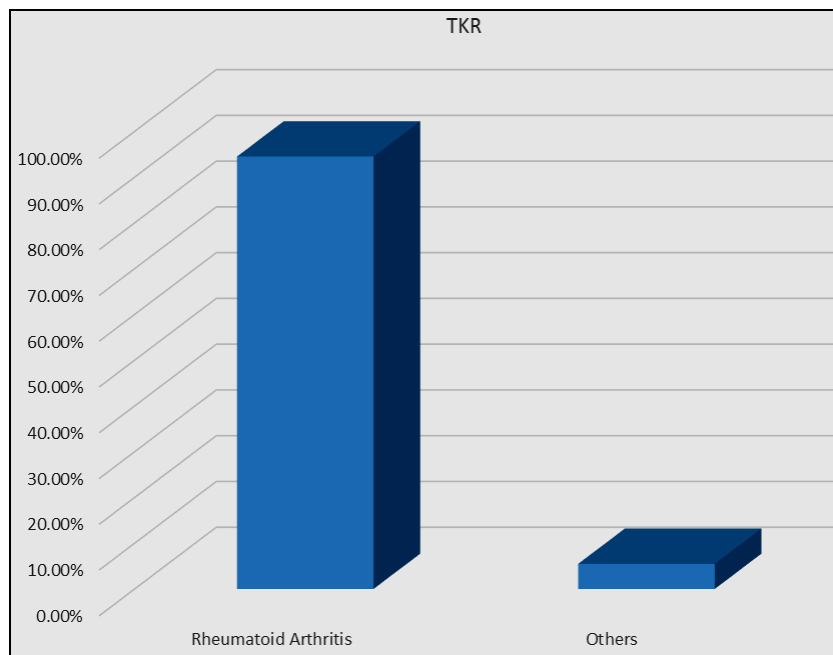


Fig 1: Indication for TKR

The above pie chart denotes the percentage of OA, RA and Others (ankylosing spondylitis, traumatic arthritis, and post infective arthritis) cases in patients undergoing TKR in past 02 years. The frequency with which TKR was done for OA has gone up to 6.8 times, while that of RA went up 4 times. Statistically it showed that there was a strong positive correlation (r 0.934) between increased number of cases of OA and the rising year trend, with no much correlation with RA cases.

Table 1: Mean of OA cases subjected to TKR-gender difference

Males	15.6±9.24
Females	53.1±30.66

The frequency with which males were subjected to TKR for OA went up to 8 times and females went up to 6.5 times. The total male and female number of cases of OA was 22.8% and 72.12% respectively. On comparing the gender difference, we noticed that there was a rising incidence of both males and

females with OA ultimately undergoing TKR, however the ratio of female: males have always remained higher i.e. 15:53 and the overall incidence in females and males being 22.8% and 72.12% respectively. Considering the different age group this ratio was 1:4 in young age, nearly 11:20 in middle age while in old age the approximate ratio was 4:13.

Table 2: Mean of OA cases undergoing TKR age differences

21-40 years	35.8±4.04
41-60 years	54.58±5.01
61-80 years	68.35±5.39

There has been statistically significant age difference in number of OA cases undergoing TKR in using one-way ANOVA (non-parametric test) ($p < 0.0001$). Also, it was found that there was a significantly strong association between increase numbers of OA cases with age ($r = 0.994$). Another noticeable feature was, the frequency in old age increased from 43.7% to 59.8% while in middle age it decreased from 56% to 35.04%. The above bar graph denotes the association of different deformities (Varus, Valgus, Varus+ flexion, flexion) in OA and RA in TKR undergoing patients. The percentage of Varus deformity in TKR undergoing patient

was 89.8% (mean 61.70 ± 35.57) in OA cases and 37.5% in RA, while valgus deformity was 5.24% cases in OA and 52.5% in RA (mean 2.625 ± 2.20). There has been a strong correlation between OA and Varus deformity with ($r = 0.991$, $p < 0.0001$) while a strong positive correlation between RA and valgus deformity ($r = 0.570$, $p = 0.0475$) using chi square test.

The frequency of hypertension as a coexisting disease with OA in TKR undergoing patients was 85.29%. The percentage of hypertension among OA undergoing TKR in 21-40 age group was approximately 28% while it was 73.22% in 41-60 and 84.23% in 61-80 and this association was statistically significant with $p < 0.0001$. About (mean of 53.1 ± 30.66) females who had undergone TKR with OA, 13.20% had of hysterectomy being done with reason not known. Interestingly this correlation between OA and hysterectomy was also significant ($r = 0.668$). With respect to diabetes being the coexisting disease with OA, there has been strong positive association between ($r = 0.971$). It has been noted that the frequency was 26.05% in OA and 25% in RA. The percentage has increased from 25% to 26.27% in OA patients undergoing TKR.

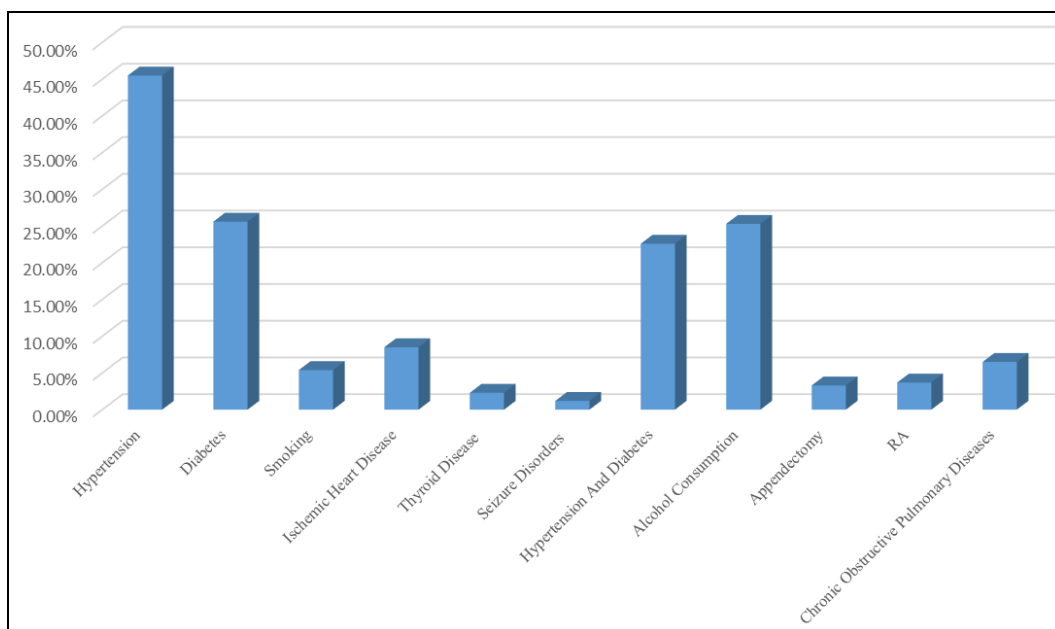


Fig 2: Co-morbid condition

Alcohol consumption was noticed among 25.3% patients. And r value between OA and alcohol consumption cases 0.9253. Smoking prevalence was comparatively less, around 5.4% in patients with OA, while about 22.6% of the patients had both hypertension and diabetes. Other coexisting diseases that were noted with OA cases who had undertaken TKR were respiratory diseases like bronchial asthma and other chronic obstructive pulmonary diseases (6.5%), ischaemic heart disease (8.5%), associated RA (3.7%), Appendectomy (3.3%), Thyroid Disease (2.3%), and Seizure disorders (1.2%).

Discussion

Improvements in physical function tended to be greater in patients with severe radiographic knee disease and less in those who had pain in other joints to begin with. Crunching noise when climbing stairs, chronic pain and swelling: If knee osteoarthritis really bothers you, surgery should be

considered. Knee replacement is a possibility, but not immediately, at least. There is no cure for knee osteoarthritis (KOA), and patients usually live with the disease for about 30 years. Most of the common treatments aim to relieve short-term symptoms with little consideration of long-term risks. Patients with thinning cartilage but no bone-to-bone contact should not undergo knee replacement except in rare cases. The most common reasons are severe pain and degree of disability, radiological findings, and patient consent to TKA [10]. This is due to the high cost of surgery, patient awareness and literacy as well as access to facilities, which can combine financial security and support. However, although this is consistent with the opinion of orthopedic surgeons, data on the need for patients to undergo TKA is unclear. In the present study, the most common indication for TKR was OA with a frequency of 93.58%, followed by RA with a highly significant correlation. The reason for the recent increase in the frequency of TKR surgery compared to the past may be

people's increasing awareness of its benefits. On comparing the gender difference, we noticed that there was a rising incidence of both males and females with OA ultimately undergoing TKR, however the ratio of female: males has always remained higher i.e. 15:53 and the overall incidence in females and males being 22.8% and 72.12% respectively. A study on risk factors of knee OA found women to be higher in terms of prevalence of OA as compared to men (65.7% vs. 34.3% respectively) [13]. While another study also had the same result reporting female-to-male ratios to be between 1.5:1 and 4:1 [7]. Prevalence of osteoarthritis is reported to increase in females during perimenopausal age and remains high throughout menopause as compared to males suggesting that OA is hormonally based [14]. Studies have proved a protective effect of oestrogen or hormone replacement therapy (HRT) on radiographic knee and hip OA or progression to joint replacement [7]. Another study has also proved the beneficial effect of oestrogen in OA [15], another study on women health project Melbourne also supported the same [16]. An analysis of the ROAD study, conducted in Japan, demonstrated that occupations involving squatting or kneeling more than 2h per day resulted in an approximately two-fold increased risk of moderate to severe OA [17]. It was found that men had more occupational knee bending compared to women (40% vs. 23.9%) [13] and this suggests that between 5% to 20% of all symptomatic knee OA may result from occupations involving repetitive knee use [7, 17]. In the present study we noted that the prevalence of OA cases increased with increase in age. In a cross-sectional study in Dharwad, it was observed that the percentage of people with osteoarthritis increased as the age increases [13]. Older people are found to have rapid radiological progression due to the reasons explained above [18]. It was also found that there was a percent decrease in prevalence from 56% to 35.04% in the middle age. This could be due to increased awareness and early interventions and also improvement in the medical interventions available. The frequency of hypertension as a coexisting disease with OA in TKR undergoing patients was 85.29%. The percentage of hypertension among OA undergoing TKR in 21-40 age group was approximately 28% while it was 73.22% in 41-60 and 84.23% in 61-80 and this association was statistically significant with $p < 0.0001$. About (mean of 53.1 ± 30.66) females who had undergone TKR with OA, 13.20% had of hysterectomy being done with reason not known. This could be due to venous occlusion, stasis or micro emboli leading to episodic reduction in blood flow through small vessels within the subchondral bone ultimately leading to the degenerative changes [7]. There is evidence that there is significant association between hypertension and OA OR = 3.02 (1.51-6.06). A ROAD study proved association of knee osteoarthritis with the accumulation of metabolic risk factors such as overweight, hypertension, dyslipidemia, and impaired glucose tolerance [19]. COX-2 is integrally involved in renal homeostasis, selective COX-2 inhibitors are associated with negative effects on kidney function similar to those seen with NSAIDs as electrolyte disturbances, oedema and hypertension have been correlated with the use of both drug classes [20]. The adverse effect of all NSAIDs and COX-2 inhibitors on blood pressure may have the most clinical significance in the elderly, in whom the prevalence of arthritis, hypertension, and NSAID use is high [21] or we could hypothesize that some antihypertensive drug can have osteoarthritis as the side effect. Alcohol consumption was noticed among 25.3% patients. And r value between OA and alcohol consumption cases 0.9253. Smoking prevalence was comparatively less,

around 5.4% in patients with OA, while about 22.6% of the patients had both hypertension and diabetes. On comparing diabetes and OA prevalence the correlation between them was very strong. A study performed involving rats stated that there was a higher incidence of osteoarthritis noticed in type 2DM rats as compared to controls along with Cysts formation at the junction of the articular cartilage and subchondral bone [22]. There is evidence of biological link existing between bone loss at subchondral bone plate in knee OA and hypertension and T2DM [22]. Chronic heavy drinking, particularly during adolescence and the young adult years, can tremendously decrease bone quality and may increase osteoporosis risk [23]. Also, the effects of heavy alcohol use on bone cannot be reversed, even if alcohol consumption is terminated [24]. Other coexisting diseases that were noted with OA cases who had undertaken TKR were respiratory diseases like bronchial asthma and other chronic obstructive pulmonary diseases (6.5%), ischaemic heart disease (8.5%), associated RA (3.7%), Appendectomy (3.3%), Thyroid Disease (2.3%), and Seizure disorders (1.2%). The overall percentage of OA cases with hysterectomy were found to be 13.20% with an increase. This can be explained in either of two ways 1) due to higher prevalence OA in the perimenopausal group and the incidence of hysterectomy being high in perimenopausal age 2) there is association between hysterectomy and OA and hysterectomy being one of the risk factor. A study on effect of hysterectomy on bone has claimed that hysterectomy is associated with decreased bone mineral density [25, 26]. In significance to this, as stated above there is a strong correlation between osteoporosis and osteoarthritis [27, 28]. Thus, this can be one of the reason to explain the higher association between hysterectomy and OA as what we found in the present study.

Conclusion

The most common indication for knee extension surgery is osteoarthritis, and the frequency of knee extension surgery has increased in recent years. There is a higher ratio of women to men with OA cases undergoing knee extension surgery. The incidence of OA in middle-aged people (41-60 years old) is gradually decreasing due to improved medical interventions. Diabetes is a risk factor for OA, but more studies are needed to prove this. Hysterectomy may be one of the risk factors for developing OA, but more studies are needed to prove this. There is a strong association between alcohol and OA. Alcohol may also be one of the risk factors for osteoarthritis, but it needs to be studied thoroughly. Therefore, necessary steps should be taken to reduce the incidence of OA cases and provide a better life, free from disabilities, which is urgently needed at present. This can benefit both society and the country economically in the long run.

Conflict of Interest

Not available

Financial Support

Not available

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Author Detail's

Md. Alinoor

Assistant Professor, Department of Orthopedic Surgery, BSMMU, Dhaka, Bangladesh

Mohammed Ramzanul Karim Khan

Assistant Professor, Department of Orthopedic Surgery, BSMMU, Dhaka, Bangladesh

Moyeen Ahmed Ferdous

Assistant Professor, Department of Orthopedic Surgery, BSMMU, Dhaka, Bangladesh

Md. Ibrahim Miah

Assistant Professor, Department of Orthopedic Surgery, BSMMU, Dhaka, Bangladesh

Md. Motiur Rahaman

Assistant Professor, Department of Orthopedic Surgery, BSMMU, Dhaka, Bangladesh

Sharif Md. Musa

Assistant Professor, Department of Orthopedic Surgery, BSMMU, Dhaka, Bangladesh

AKM Latiful Bari

Assistant Professor, Department of Orthopedic Surgery, BSMMU, Dhaka, Bangladesh

Jamal Uddin Ahmed

Assistant Professor, Department of Orthopedic Surgery,
BSMMU, Dhaka, Bangladesh

Mohammad Faroque Eastiak

Assistant Professor, Department of Orthopedic Surgery,
BSMMU, Dhaka, Bangladesh

Ahsan Majid

Assistant Professor, Department of General Surgery,
BSMMU, Dhaka, Bangladesh

Mahamud Mannan

Assistant Professor, Department of Orthopedic Surgery,
BSMMU, Dhaka, Bangladesh

Md. Kamruzzaman

Registrar, (Orthopedics), Ibn Sina Medical College hospital,
Dhaka, Bangladesh

Mohammad Moshiur Rahman

Assistant Professor, Department of Orthopedic Surgery,
BSMMU, Dhaka, Bangladesh

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