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ORIGINAL ARTICLE

The frequency and risk factors associated with the development of knee and hip osteoarthritis of the intact limb after unilateral lower limb amputation at PIPOS Bannu.

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ABSTRACT… Objective: To determine the frequency and risk factors associated with the development of osteoarthritis of the knee and hip joints of the intact limbs after unilateral amputation of the lower extremities with PIPOS Bannu. **Study Design:** Cross Sectional. **Setting:** Pakistan Institute for Prosthetics and Orthotics (PIPOS). **Period:** June 2019 to November 2019. **Material & Methods:** The presence of osteoarthritis (OA) was determined by a standardized questionnaire, primarily based on laboratory tests/physical examination. Participants were evaluated by experts who diagnosed symptomatic hip and knee OA using a structured questionnaire and standardized joint tests based on American College of Rheumatology (ACR) clinical standards. Individuals who tested positive were tested by a rheumatologist, who checked for the presence of clinical ACR criteria to confirm the diagnosis. **Results:** A total of 150 patients were included in the study. Data is analyzed by SPSS 21. The average age of the patients was 38.12 ± 14.82 years. Of the total of 150 patients, 131 (87.3%) were male and 19 (12.7%) were female. According to the degree of amputation, 79.3% (n = 119) patients were traumatic and 20.7% (n = 31) were non-traumatic limbs. The incidence of knee osteoarthritis is 9.3% (9.3% for men and 0.0% for women) and 4.0% for hip osteoarthritis (2.7% for men and 1.3% for women), both in hip and knee osteoarthritis. 2.7% (2.0% for men and 0.7% for women). **Conclusion:** According to this study, traumatic and non-traumatic lower limb amputees are more likely to develop knee and hip osteoarthritis in the intact lower limb. Demographics and patient characteristics are major risk factors for osteoarthritis.

Key words: Amputation, ACR, Lower Limb, Osteoarthritis, Traumatic.

INTRODUCTION

Amputation is a treatment / surgical procedure performed by orthopedic surgeons, vascular and well-known trauma surgeons to remove irreversible and useless frame parts after trauma or contamination. In developing countries, amputation is considered more difficult due to poor management and delays that result in secondary musculoskeletal conditions.[1] Disconnection rates vary from country to country in terms of demographic, socio-economic, and scientific choices. Consistent with previous studies, trauma and tumors are the most important threat to amputation of the lower extremities.[2] Most patients with amputated lower legs were found to have no psychological problems such as despair or fear. Some of them develop secondary musculoskeletal disorders such as osteoarthritis, osteoporosis, and low back pain due to abnormal gait.[3]

Compared to the general population, patients with unilateral lower leg amputation are more likely to have an increased secondary musculoskeletal condition, such as osteoarthritis of the intact limb. During the gait assessment, patients with lower limb amputations concentrate on the intact limb rather than the limb prosthesis. This asymmetry of gait can lead to knee pain and regressive adaptation of intact facets.[4] In addition, the fact

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that the prosthesis has a smaller kick, longer stride time, longer swing time, and shorter standing time than the intact limb causes an asymmetric gait test with the amputated prosthesis. In addition, the asymmetric gait pattern in amputation of the lower leg is due to pain, weakness, and instability in the prosthesis of the limb, causing greater stress on the intact side of the limb.[5,6] The main dream of post-cutting relief is to properly fit the prosthesis and use it fairly for self-sufficiency and for improving livelihood and achieving employment.[7]

MATERIAL & METHODS

The descriptive section underwent PIPOS Bannu for 6 months and enrolled 150 patients. Research study is approved by ethical committee under serial No. DIR/KMU-AS&RB/FR/001006. Patient samples were calculated by OpenEpi using non-probability convenience sampling. Data was collected by structured questionnaire. Lequesne questionnaire along with standardized collaborative examination based on the American College of Rheumatology (ACR) was used for the presence of OA. Data were analyzed by SPSS 21 and descriptive analysis were recorded.

The Lequesne index questionnaire (LIQ) contained sociodemographic profiles including age, sex, level of amputation, time since amputation, and reason of amputation have been included for data collection. Lequesne index questionnaire became used to fulfill the American college of rheumatology (ACR) criteria for diagnosis. ACR criteria used for knee and hip joint osteoarthritis (OA) the usage of history, a physical exam for affirmation which is just like diagnosis OA with plain x-ray, records, and physical exam.[8]

RESULTS

Of the 150, 131 were male and 19 were female (Figure-1). The average age of the patients was 38 years. Considering the degree of amputation, 110 patients had lower limbs. Depending on the type of amputation, 119 patients were traumatized and 31 were not traumatized. (Table-I)

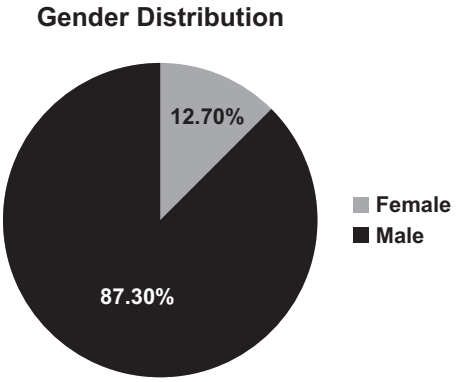

Figure-1

Variable	N=150
Level of amputation	
Transtibial	110(73.3%)
Transfemoral	32(21.7%)
Knee disarticulation	08(5.3%)
Type of Amputation	
Traumatic	119(79.3%)
Non traumatic	31(20.7%)

Table-I. Showing level and type of amputation among participants

Relationship of risk factors with or without OA

Relationship of gender with or without OA:
A total of 150 patients, 110 males (73.3%) and 16 females (10.7%) had a P-value of 0.179. Among them knee OA found to be prevalent in males 14(9.3%).
Relationship of age with or without hip OA
A total of 150 patients were analyzed, 6 (4.0%) of participants with an average age of 41.67 ± 15.08 years were affected by hip OA, and 144 (96.0%) of participants with an average age of 37.97 ± 14.84 was not affected.
Relationship of age with or without knee OA
A total of 14 (9.3%) participants with an average age of 45.36 ± 12.51 years were affected by knee OA. The average age of 136 (90.7%) participants was 37.38 ± 14.88 years were normal.
Relationship of age with or without knee & hip OA
Of the 150 participants, 146 (97.3%) with an average age of 37.95.25 ± 14.78 years had no hip pain. On the other hand, 4 participants (2.7%) with an average age of 44.25 ± 17.09 years and a p-value of 0.404 were affected by OA of the ipsilateral hip and knee joints of the intact limbs.

Relationship of gender by level of amputation with or without knee OA
Relationship of gender by level of amputation with knee OA
Of the total of 94 (62.7%) participants, only 13 (8.7%) were affected by knee osteoarthritis (OA). Similarly, in men with thigh amputations, only one (0.7%) had knee osteoarthritis. Gender ratio according to the degree of amputation with or without hip OA The following results show that the total number of men in the lower limbs was 94 (62.7%), of which 90 (60.0%) had no complaints of hip pain and 4 (2.7%) had hip-OA on the healthy side. Similarly, in women with lower leg amputations, only two (1.3%) patients were affected by hip OA. Gender ratio depending on the degree of amputation with or without hip and knee osteoarthritis The results show that the total number of men with lower leg amputations was 94 (62.7%), of which 91 (60.0%) did not complain of pain and 3 (2.0%) complained of OA in both the hip and knee side. Similarly, women with knee disarticulation 1 (0.7%) had both hip and knee OA on the intact side of the limb.

Relationship of time since amputation with or without OA
Relationship of time since amputation with or without knee OA
Of the 150 samples, 14 (9.35%) of participants with an average age of 22.0 ± 14.81 years were affected by knee OA compared to the time after amputation.
Relationship of time since amputation with or without hip OA
The results show that a total of 6 (4.0%) participants with p value of 0.631 were affected by hip OA compared to the time since amputation.
Relationship of time since amputation with or without hip & knee OA
After analysis, the results showed that a total of 4 participants (2.7%) were affected by both knee and hip OA and had a p-value of 0.043 over time.

Relationship of OA with cause of amputation
From 150 samples, 28 (18.7%) participants were non-traumatic and 98 (65.3%) were traumatic limb amputations. Of the non-traumatic patients, one knee OA (0.7%), one hip OA (0.7%), and one knee and hip OA (0.7%) were affected. During that time, 98 (65.3%) of traumatic participants were unaffected by OA, of which 5 (3.3%) were affected by hip OA and 13 (8.7%) were affected by knee OA. Similarly, 3 (2.0%) patients had ipsilateral hip and knee OA with a p-value of 0.604. (Table-II)

DISCUSSION

The main objective of this study is to determine the incidence/frequency of hip and knee osteoarthritis of intact limbs in traumatic and non-traumatic limb amputations, including amputation, time elapsed since amputation, age, and gender. The study was carried out by Razzaq et al in 2013 was concluded that the main cause for amputation in 99% of cases was trauma followed by tumors (1%). In current studied result shown that trauma in 119(79.3%) of the cases was the main cause of amputation followed by non-traumatic amputation 31(20.7%).[9]

The average age of patients in the current study was 38.12 ± 14.82 years, and the age of subjects ranged from 18 to 77 years. The average age of patients in previous studies was 54.5 ± 13.1 years, and the age of subjects was between 20 and 85 years.[10] In a previous study, the overall prevalence of knee osteoarthritis was 27% (male 28.3%, female 22.2%) and hip osteoarthritis 14% (male 15.3%, female 11.1%). This was higher than the general population (knee OA male 1.58%, female 1.33%, hip OA male 1.13%, female 0.98%, age adjusted). No significant association was found between the prevalence of osteoarthritis and the degree of amputation, the time elapsed since amputation, mobility, or age.[11]

Variable			OA (n=150)		
Type of Injury		Knee OA	Hip OA	Knee & Hip OA	P-Value
Traumatic	98(65.3%)	13(8.7%)	5(3.3%)	3(2.0%)	0.604
Non-traumatic	28(18.7%)	1(0.7%)	1(0.7%)	1(0.7%)	

Table-II. Relationship of OA with cause of amputation

In the current study, the incidence of knee OA was 9.3% (9.3% for men, 0.0% for women), 4.0% for hip OA (2.7% for men, 1.3% for women), and 2.7% for both hips and knees. OA (2.0% for men, 0.7% for women). Previous findings have shown that there is no major association between OA prevalence and amputation levels, time at which amputation was determined, mobility, and age.[11]

As our current research results show, there is a strong relationship exists age between the frequency of osteoarthritis and the degree of amputation, the time elapsed since amputation, and age-based gender. The mean age of the patients in current studied, objects with mean age of time since amputation was 45.36±12.51 years have a strong relationship with knee OA (P-value= 0.05). Similarly, objects with their mean age of time since amputation were22.00±14.81 years have a strong relationship with knee OA (P-value= 0.000). while participant with their mean age of time since amputation were 22.50±9.84years have a strong relationship with development of both the hip & knee OA (0.043).

Previous studies have defined a nasty unilateral amputation that tends to spread osteoarthritis (OA) within the contralateral intact lower limb.[11] This study showed that a p-value of 0.604 did not significantly improve osteoarthritis in traumatic amputees compared to non-traumatic amputees. A total of 24 (16.3%) suffered from osteoarthritis, 21 (14.2%) became traumatic, and 3 (2.0%) became non-traumatic, with significant differences between the groups.[11] According to a systematic review, patients with unilateral amputations are at multiple risk of developing osteoarthritis (OA) in the knee joints of healthy legs. A significant reduction in the prevalence of OA was seen in amputees compared to the control group. Amputees with osteoarthritis are significantly younger than patients with osteoarthritis in the control group.[12]

In addition, current research results show that patients with varying degrees of amputation (lower, upper, and knee disarticulations) did not increase the risk of developing osteoarthritis (OA) in the knee and hip joints of healthy legs. No significant difference was found between osteoarthritis and the degree of amputation.

In another systematic review, 56% of patients suffering from low back pain, radiographic signs and symptoms of healthy knee arthritis were detected in 35% of patients compared with clinical signs in 33%. Clinical signs and symptoms of hip osteoarthritis were found in 15% of amputees on the prosthesis side and 20% on the healthy side. 87% of patients showed reduced bone mineral density in the hip prosthesis, and all amputees showed muscular atrophy of the residual limb.[13]

Young military personnel with traumatic unilateral lower limb amputation may be at increased risk of developing knee osteoarthritis (OA). Finally, the current literature supports the fact that young military service workers with traumatic unilateral amputation of the lower extremities may be at increased risk of increasing knee OA compared to non-amputated individuals. Injured military workers at a young age have a long-life expectancy and require extensive rehabilitation programs to prevent or delay the progression of knee OA.[14]

Current study findings show that patients with traumatic unilateral amputations of the lower extremities do not have an increased risk of developing knee and hip osteoarthritis compared to non-traumatic unilateral amputations of the lower extremities. A total of 24 (16.3%) participants were affected by OA in their intact lower extremities, of which 21 (14.2%) were traumatic and 3 (2.0%) were non-traumatic were affected by OA.

Similarly, in other studies, gait asymmetry and widespread stress on the intact limb, and knee pain in the intact limb are common in the clinic, resulting in long-term prosthetic wearer joint deformity. It has been suggested to increase the incidence of arthritis. Differences in amputation levels confirmed that 46% with transtibial amputation had symptoms of knee pain compared to 75% of transfemoral amputation.[15]

Our current study concluded, the comparison

of time since amputation due to osteoarthritis showed that patient with their mean age was 22.00±14.81 years were more likely to develop knee OA in their intact lower limb at a P-Value of 0.000. the study also shows that patient with prolong used of prosthesis with their mean age were 22.50±9.84 years was susceptible for both hip and knee osteoarthritis at a P-value of 0.043. This may suggest that patients who have been using the prosthesis for a long time are more likely to develop osteoarthritis of the knee and hip joints in the intact lower extremities.

In addition, Norver et al. The study concluded that 16.1% of patients with transtibial and transfemoral amputation reported symptoms of osteoarthritis, compared to 11.7% of patients without amputation. In addition, the prevalence of knee pain in unamputated subjects was 20.3% instead of 36.4 and 50.0% in subjects with transtibial amputation or transfemoral amputation respectively. The results show that a unilateral transtibial amputee has less pressure on the amputee side and stresses the boom on the intact side. This increases the risk of skeletal deformity in the form of osteoarthritis and resulting in secondary disability.[16]

From the results of current studied, concluded that 13(8.7%) (P-value=0.214) of the subjects with transtibial amputation was affected with knee OA and 1(0.7%) (P-value=0.214) of the subjects with transfemoral amputation. Similarly, only 6(4.0%) (P-value=0.321) of the participants with transtibial amputation was affected with hip osteoarthritis. While 3(2.0%) and 1(0.7%) (P-value=0.145) of the subjects with transtibial and knee disarticulation respectively was complained of both hip and knee OA. It means there is no significant difference between osteoarthritis and level of amputation.

The results indicate that force asymmetry in unilateral transtibial amputees indicates moderate relationship with risk of osteoarthritis and may be a useful method for assessing the walking ability and rehabilitation needs of population.[17] Osteoarthritis has been found to be more severe in the contralateral limb than in the residual limb of amputated people. The prevalence of osteoarthritis is of increasing concern, especially for those who have lived for a long time with amputation. In addition, the integrity of an intact limb can be compromised if the amputated person cannot learn to use the prosthesis properly and to support the weight evenly between the prosthesis and the intact limb. Regardless of this, people with amputations are at risk of increasing osteoarthritis of the knee and / or hip on the uninjured side of the amputation. Patients currently being studied for lower limb amputation were at increased risk of developing OA in the knee and ipsilateral knee and hip joints, especially for those who had had long-term amputations.[18]

CONCLUSION

The study concluded that traumatic and non-traumatic amputees were more prone to knee and hip osteoarthritis in the intact leg. Demographics and patient characteristics are major risk factors for osteoarthritis.

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2	Shafqat Ullah Jan	Analysis and interpretation of the data, Drafting of the article.	Shafqat
3	Muhammad Hashim	Critical revision of the article for important intellectual content, Statistical expertise.	Hashim
4	Shehla Gul	Final approval and guarantor of the article.	