

Prevalence of Baker's Cyst among Female Patients with Knee Osteoarthritis, an Ultrasonographic Study, in Egypt

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Abstract

Background: Baker's cyst (BC) represents a bursa between the gastrocnemius and semimembranosus tendons which is communicating with the knee joint synovial covering that typically appears as swelling in the popliteal fossa.

Objectives: The current study was conducted to estimate the prevalence of Baker's cyst, and its relation to ultrasound detected knee effusion, and hyaline cartilage degeneration among osteoarthritic female patients and to investigate some risk factors associated with presence of baker cyst.

Subjects and Methods: A cross sectional hospital-based survey conducted was conducted through 2016. The total number of patients included in the study was 1568 with a mean age of (55.54 ± 2.86 years) and range (45 - 68 years). The data was collected through an questionnaire from all participants over a period of one year (through 2016).

Results: Baker cyst was diagnosed by ultrasound procedure in 203 of (1568) osteoarthritic patients with a prevalence of 12.9%. The prevalence of baker cyst markedly increased with the duration of osteoarthritis and represented by 14.8% if the disease duration is 5 years or more compared to 10.3% if the duration is less than 5 years. The baker cyst was more prevalent among patient with severe obesity (21.7%). The baker cyst was significantly higher among patients with large effusion (61.4%) compared to (30.6%) and (21.7%) among those with moderate and mild effusion respectively.

Conclusion: Baker's cysts are a common ultrasonographic finding in knees with osteoarthritis. Presence of baker cyst were significantly associated with; duration of osteoarthritis, severe obesity, severe femoral hyaline cartilage degeneration, and large effusion.

Keywords: Prevalence; Baker Cyst; Knee Osteoarthritis; Ultrasonographic Study

Introduction

Knee osteoarthritis (KOA) is characterized by pain and limitation of knee joint range of motion with subsequent disability especially in elderly subjects. Pain is the most common clinical presentation of KOA, which typically exacerbates by mechanical movements and usually relieved by rest [1]. Away from Pain which is the chief complain in KOA, the development of functional decline, physical functional limitation and disability represent the major challenge in the management of KOA [2].

Baker's cyst (BC) represents a bursa between the gastrocnemius and semimembranosus tendons which is communicating with the knee joint synovial covering that typically appears as swelling in the popliteal fossa [3,4].

The presence of BC is associated with functional limitation in KOA and its leakage can cause pseudo-thrombophlebitis or cellulitis [5-7]. Pressure by large BC can cause deep venous thrombosis and even distal ischemia [8-10].

That's why looking for presence of BC and its frequency in patients with KOA could be of clinical and prognostic value in such cases. Previous studies looked for the BC has been shown a wide difference in its frequency, with different methodology for imaging detection MRI, US or scintigraphy, and different population. With the development of ultrasound and its significant implications in musculoskeletal system, BC detection with US considered sensitive, simple, reliable, and cost effective technique [3,5,11,12].

Depending on the reliability, the relatively low cost of US and the large number we have in our hospital; all of these factors give us the chance to study the prevalence of BC and possible risk factors related to its development in a large number of homogenous patients from Egypt, all with confirmed diagnosis of KOA, under the same treatment protocol, and all were female to have a similar anatomical and functional characteristics.

In the current study, we investigate the frequency of BC among Egyptian patients with established KOA, depending on US and its ability to evaluate the overall parameters of the knee joint.

Objective

The current study was conducted to estimate the prevalence of Baker's cyst and its relation to US finding of knee effusion and hyaline cartilage degeneration among osteoarthritic female patients and to investigate some risk factors associated with presence of baker cyst.

Subjects and Methods

Study design and setting: The current study was based on a cross sectional hospital-based survey, conducted among female patients with knee osteoarthritis presenting at outpatient rheumatology clinics of AL-AZHAR University Hospitals. Egypt through 2016.

Inclusion criteria

- Female patients
- Primary Knee OA diagnosed according to: American College of Rheumatology Radiologic Criteria for Knee Osteoarthritis [13].
- On regular treatment by analgesics, or NSAIDS either topical or systemic.

Exclusion criteria

- Recent Knee trauma or intra-articular procedures.
- Previous knee surgery.

- Patients with chronic systemic diseases that could affect patient functional ability; e.g renal, liver, cardiac impairment, or neurological disorder.
- Inflammatory joint diseases, as rheumatoid arthritis, crystal arthritis, and spondyloarthropathy.

Study sample

Al-Azhar University Hospital contains 2 outpatient rheumatology clinics (Al-Hussein University hospital clinic and El-Sayed Galal University hospital clinic). The both clinic were included in the study. All female patients with knee osteoarthritis attended the both clinic for follow up and met the inclusion criteria were asked to be included in the study and the only 1568 patients accepted. Oral consent was obtained from every participant before taking place in the study with nearly 95% response rate

Data Collection

The data was collected through an interview questionnaire from all participants. The questionnaire used in the study was prepared by the researcher himself and included questions on demographic factors, causes, as well as questions on risk factors associated with the presence of baker cyst. Field survey was conducted after obtaining approval from hospital authority and Research Ethical Committee. The data was collected through one year 2016. The field work took 2 days/week for every clinic. The average number of female patient interviewed per day was 5-10 and the time needed to complete the questionnaire was 9 - 12 minutes.

All patients were subjected to clinical history taking, examination, and body mass index measurement.

Ultrasonography: was performed using a scanner with a multifrequency 12L linear array transducer (General electric Systems; LOGIQU-E). Ultrasound techniques were used for all patients included in the study. Knee was assessed for the following items in both sides:

- **Femoral hyaline cartilage:** Assessed from anterior suprapetellar with maximum flexion of the knee, and normally appears as anechoic structure. Losses of cartilage thickness graded to mild, moderate, and sever. Mild: decreasing the thickness of the cartilage < 50%, moderate: decreasing the thickness of the cartilage > 50%, but under 100%, and sever 100% focal loss of cartilage thickness [14,15].
- **Effusion:** Assessed from anterior with the knee flexed 40 degree, and appears as anechoic intraarticular shadow that is displaceable and compressible, graded from no effusion to mild, moderate, and sever [15].
- **Baker's cyst:** Assessed for the presence and absence from the back of the knee with patient prone and knee extended by examining the posteromedial aspect of the knee. BC appears as a thin hypoechoic space delimited by echoic borders corresponding to the tissue-fluid interface. Anatomically present between the medial head of gastrocnemius and the semimembranosus muscles [16].

Data analysis: Data were entered, organized, tabulated and analyzed using the standard computer program SPSS version 21. Quantitative data were expressed as Mean \pm SD, while qualitative data were expressed as frequency and percent. Student t-test was used to measure the difference between means of two quantitative groups, while Chi square (χ^2) was used to assess the relationship between two qualitative variables, with the significant level set at 0.05.

Results

The current study included 1568 female patient with knee osteoarthritis with a mean age of (55.54 \pm 2.86 years) and range (45 - 68 years). Baker cyst was diagnosed by ultrasound procedure in 203 of (1568) osteoarthritic patients with a prevalence of 12.9%, figure 1.

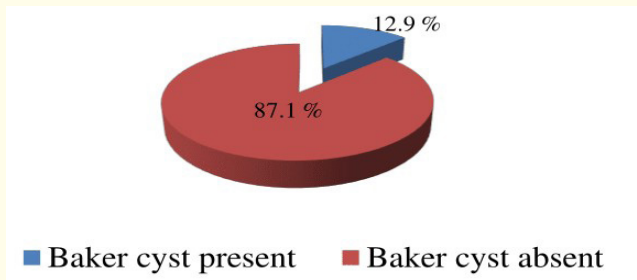


Figure 1: Prevalence of baker cyst among osteoarthritic patients.

Baker cyst was commonly prevalent in the left knee (6.3%) than in the right (2.7%), figure 2.

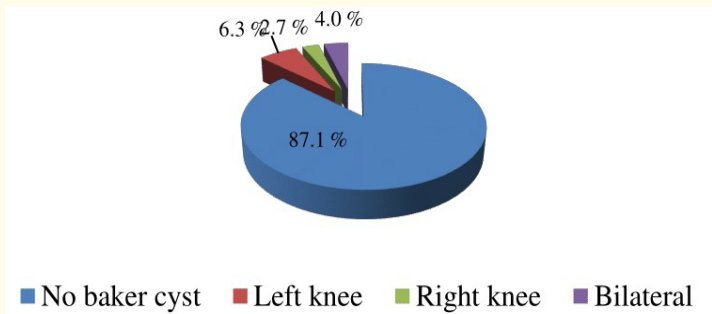


Figure 2: Distribution of baker cyst according knee involved.

The findings revealed that the effusion was commonly prevalent in the examined knees as it is present in 504 knees out of 3136 knees examined. The effusion was more reported in the right knee (17.9%) among osteoarthritic patients compared to 14.2% in the left knee. While the large effusion was commonly prevalent in the left knee (2.0%), than in the right (1.6%), figure 3 and figure 4.

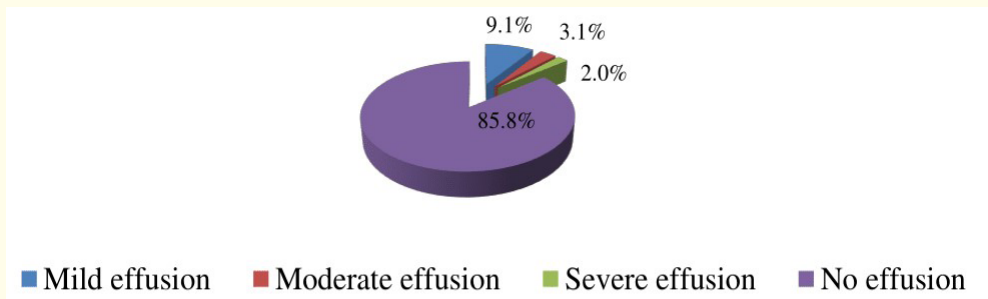


Figure 3: Prevalence of effusion grades in the left knee among osteoarthritic patients.

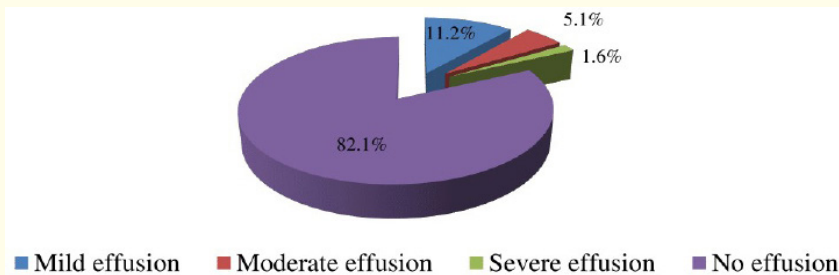


Figure 4: Prevalence of effusion grades in the right knee among osteoarthritic patients.

In the left knee the prevalence of baker cyst was significantly higher among patients with severe femoral hyaline cartilage degeneration (41.3%), compared to (16.7%) and (11.0%) among those with moderate and mild condition respectively. Similar findings was observed in the right knee, table 1.

Femoral hyaline cartilage loss		Osteoarthritic patients (n. = 1568)				Total	χ ²	P value	df
		Patients with baker cyst (n. = 203)		Patients with no baker cyst (n. = 1365)					
		No.	%	No.	%				
Left knee	Mild	137	11.0	1103	89.0	1240	40.2*	< 0.05	3
	Moderate	47	16.7	235	83.3				
	Severe	19	41.3	27	58.7				
Right knee	Mild	127	10.1	1131	89.9	1258	68.9*	< 0.05	3
	Moderate	56	20.9	212	79.1				
	Severe	20	47.6	22	52.4				

Table 1: Relationship between femoral hyaline cartilage degeneration and presence of baker cyst.

* Statistically significant differences

The mean duration from onset of osteoarthritis symptoms was 4.7 ± 1.3 years. The prevalence of baker cyst markedly increased with the duration of osteoarthritis and represented by 14.8% if the disease duration is 5 years or more compared to 10.3% if the duration is less than 5 years, table 2.

Age	Osteoarthritic patients (n. = 1568)		T test	P value
	Patient with baker cyst (n.=203)	Patient with no baker cyst (n. = 1365)		
	Mean ± SD	Mean ± SD		
Age (year)	55.7 ± 3.1	55.5 ± 2.8	0.80	> 0.05

Table 2: Relationship between age and presence of baker cyst.

The table shows that, there was no statistically significant differences between age and presence of baker cyst ($t = 0.80, P > 0.05$), table 3.

Duration of osteoarthritis	Osteoarthritic patients (n. = 1568)				Total	χ^2	P value	Df
	Patient with baker cyst (n. = 203)		Patient with no baker cyst (n.=1365)					
	No.	%	No.	%				
Less than 5 years	67	10.3	580	89.7	647	6.56*	< 0.05	1
5 years or more	136	14.8	785	85.2	921			

Table 3: Relationship between duration of osteoarthritis and presence of baker cyst.

* Statistically significant differences

There was statistically significant association between obesity grades and baker cyst ($\chi^2_4= 13.5, P < 0.05$), baker cyst was more prevalent among patient with severe obesity (21.7%), table 4.

Obesity	Osteoarthritic patients (n. = 1568)				Total	χ^2	P value	Df
	Patient with baker cyst (n. = 203)		Patient with no baker cyst (n. = 1365)					
	No.	%	No.	%				
Normal weight	6	12.2	43	87.8	49	13.5*	< 0.05	4
Over weight	13	9.8	120	90.2	133			
Mild obesity	59	12.9	399	87.1	458			
Moderate obesity	89	11.7	673	88.3	762			
Severe obesity	36	21.7	130	78.3	166			

Table 4: Relationship between obesity grades among osteoarthritic patient and presence of baker cyst.

* Statistically significant differences

In the left knee, the findings revealed that, there was statistically significant association between knee effusion and presence of baker cyst ($\chi^2_3= 96.1, P < 0.05$), baker cyst was significantly higher among patients with large effusion (61.4%) compared to (30.6%) and (21.7%) among those with moderate and mild effusion respectively. Similar findings were observed in the right knee where the baker cyst was commonly prevalent among patients with large effusion (52.2%), table 5.

Knee effusion		Osteoarthritic patients (n. = 1568)				Total	χ^2	P value	df
		Patient with baker cyst (n. = 203)		Patient with no baker cyst (n. = 1365)					
		No.	%	No.	%				
Left knee	No effusion	138	10.3	1207	89.7	1345	96.1*	< 0.05	3
	Mild effusion	31	21.7	112	78.3	143			
	Moderate effusion	15	30.6	34	69.4	49			
	large effusion	19	61.4	12	38.7	31			
Right knee	No effusion	135	10.5	1152	89.5	1287	61.0*	< 0.05	3
	Mild effusion	33	18.8	143	81.3	176			
	Moderate effusion	22	27.5	58	72.5	80			
	large effusion	13	52.2	12	48.0	25			

Table 5: Relationship between knee effusion among osteoarthritic patients and presence of baker cyst.

* Statistically significant differences

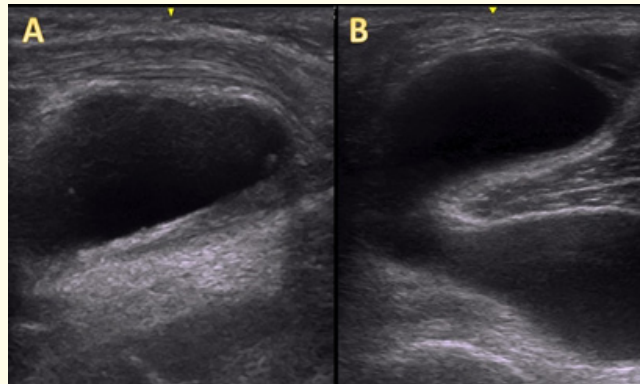


Figure 5: An ultrasound image of Bakers cyst, A: long axis, B: short Axis.

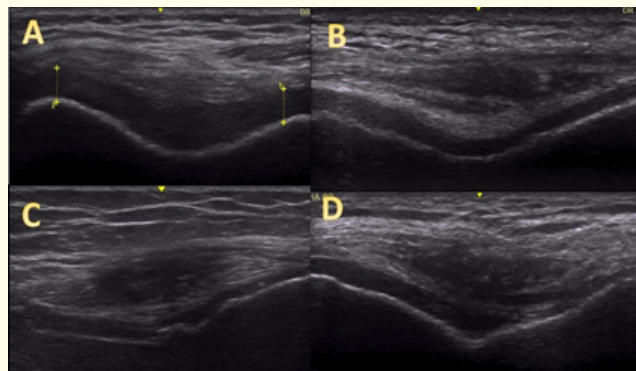


Figure 6: An ultrasound image of femoral hyaline cartilage, A: normal, B: mild, C: moderate, D: sever loss of hyaline cartilage.

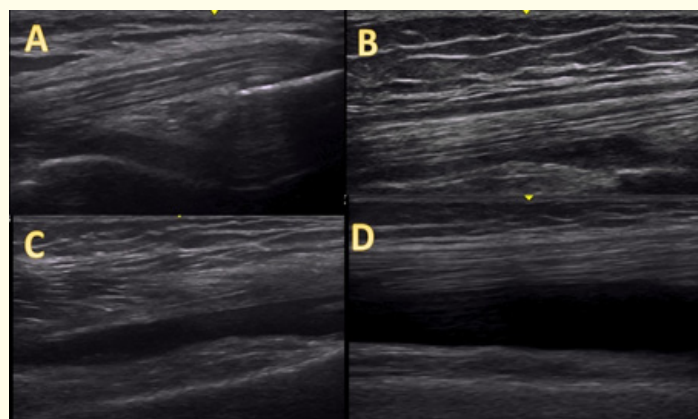


Figure 7: An ultrasound image of knee effusion, A: normal, B: mild, C: moderate, D: large effusion.

Discussion

Knee osteoarthritis (KOA) is the most frequent form of arthritis affecting the knee with subsequent significant impact on patient functional ability. Knee osteoarthritis (KOA) also represent the most frequent knee disorder that linked to baker cyst (BC) and the increased pain and disability with the presence of baker cyst in such cases necessitates looking for the frequency of baker cyst and possible risk factors associated with its development [5,17,18,19].

Among all these widely different results they all represent baker cyst as a common problem in knee osteoarthritis, and from our side in country with about 90 million populations we decided to conduct our study over a very large number patients as a trial to actually present the baker cyst prevalence among our study sample.

In the current study, we looked for the prevalence of baker cyst among 1568 Egyptian female patients with established diagnosis of knee osteoarthritis, using ultrasound as useful significant tool for defining the baker cyst. According to our results prevalence of baker cyst was 12.9%, among female patients with knee osteoarthritis, in the left knee (6.3%) in the right (2.7%), and in bilateral sides (4%).

Our results represent baker cyst as a common problem that is associated with knee osteoarthritis. This finding is supported by Naredo., *et al.*, Fem., *et al.*, Chiou., *et al.*, and Dimitrios., *et al.* as they reported a common presence of baker cyst in knee osteoarthritis, and in the other hands we all agreed about the usefulness of ultrasound in the diagnosis and detection of baker cyst [12,16,20,21].

More in depth finding of ultrasound assessment of knee osteoarthritis, is the hyaline femoral cartilage (HFC) which considered as a representative for the degree of knee osteoarthritis. Our results shows hyaline femoral cartilage as an important factor for the development of baker cyst, as higher prevalence of baker cyst 41.3% were encountered among patients with severe hyaline femoral cartilage loss in comparison to mild and moderate hyaline femoral cartilage loss, were baker cyst was 11% and 16.7% respectively.

So according to our results the severity of knee osteoarthritis is associated with higher frequencies of baker cyst development, which is supported by Bevers., *et al.* as they reported a positive relation between baker cyst and the degree and symptoms of knee osteoarthritis [22].

Knee effusion has been Longley presumed as the cause of baker cyst by its positive effect on intra articular pressure with subsequent posterior diffusion of the synovial fluid in to the potential space of baker cyst [23-26].

In the current study knee effusion was found in 16%, 504 of the examined knees, with positive association between its presence and the baker cyst in both sides. Furthermore, large effusions were more associated higher frequencies of baker cyst than mild and moderate effusions. Similar association also reported by Naredo., *et al* and Chiou., *et al.* which support our results [12,16].

Away from the ultrasound parameters obesity and disease duration were a risk factors significantly associated with baker cyst occurrence, which can be explained by the disease progression as both usually associated with more progressive disease, and obesity associated with increased intra articular pressure which can predispose to posterior diffusion of synovial fluid to baker cyst, in agreement with others [27,28].

The limitation of our study includes the lack of comparison of ultrasound results to standard magnetic resonance imaging (MRI) for diagnostic accuracy of ultrasound, but for these large number of patients the use of MRI will be very expensive, plus the multiple recent growing evidence for validity and reliability of ultrasound for detection of baker cyst, with comparable sensitivity to MRI can excuse this limitation [29].

Conclusion

Baker's cysts are a common ultrasonographic finding in knees with chronic osteoarthritis. The factors significantly associated with presence of baker cyst were; increase in the duration of osteoarthritis, presence of severe obesity, severe femoral hyaline cartilage degeneration, and large effusion.

Recommendations

Based on our findings the following are recommended; Ultrasound assessment should be included in the evaluation of knee osteoarthritis. Efficient management of knee effusion and Obesity can reduce the risk of baker cyst development in knee osteoarthritis.

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