

# THE RELATIONSHIP BETWEEN THE INCIDENCE OF PRIMARY SEPTIC ARTHRITIS OF THE KNEE AND FLOURINE IN THE DRINKING WATER IN THE TURKISH CITY OF ISPARTA

## Original Article

### ISPARTA İL GENELİNDEKİ PRİMER DİZ SEPTİK ARTRİT SIKLIĞININ İÇME SUYUNDAKİ FLOR İLE OLAN İLİŞKİSİ

Halil Burc

*Suleyman Demirel University Medical Faculty,  
Department of Orthopaedics and  
Traumatology/ISPARTA*

Demir Demirci

*Van Education and Research Hospital Department of  
Orthopaedics and Traumatology./VAN*

Tolga Atay

*Suleyman Demirel University Medical Faculty,  
Department of Orthopaedics and  
Traumatology/ISPARTA*

Vecihi Kırdemir

*Suleyman Demirel University Medical Faculty,  
Department of Orthopaedics and  
Traumatology/ISPARTA*

Huseyin Yorgancıgil

*Suleyman Demirel University Medical Faculty,  
Department of Orthopaedics and  
Traumatology/ISPARTA*

## Corresponding Author

Halil BURC

*Suleyman Demirel University Medical Faculty,  
Department of Orthopaedics and Traumatology  
/ISPARTA  
e-mail: [halilburc@gmail.com](mailto:halilburc@gmail.com)*

## ABSTRACT

**Objectives:** Aim of the study is to evaluate incidence, characteristics and result of treatment due to primary knee septic arthritis in the city of Isparta.

**Methods:** The patients who admitted to hospital for primary knee septic arthritis, treated with arthroscopic debridement and culture positive (Newman Grade A) were included between 2010-2011. Demographic, clinical, hematological, microbiological datas and treatment methods were evaluated retrospectively.

**Results:** There were 17 culture positive patient out of 39. Mean age was 54,7 (10-89) years. When comorbidities were investigated 4 hypertension (HT), 3 diabetes mellitus (DM), 38 coronary artery disease (CAD), 28 chronic renal failure (CRF), 1 chronic obstructive pulmonary disease (COPD), 1 Behçet's Disease and 1 romatoid arthritis (RA) were found. The culture results were determined as 15 Staphylococcus aureus, 1 Serratia marcescens and 1 Brucella spp.

**Conclusions:** When the patients were investigated for a predisposing factor for septic arthritis, there was nothing for predisposing. We thought that high incidence of septic arthritis in this region is due to flouride concentration in tap water. There was high concentration of flouride (>1,5 mg/La) in tap water in past years. This concentration was lowered with municipal workout. Fluoride inhibit antibody formation and therefore supresses immunity.

We concluded that high incidence of septic arthritis in Isparta, especially age

over 50, is related to high flouride level in tap water at past years.

**Keywords:** *Septic Arthritis; Flouride; Arthroscopic Debridment.*

## ÖZET

**Amaç:** Çalışmamızın amacı, Isparta'da kliniğimize başvuran, primer diz septik artit olgularının insidansını, özelliklerini ve tedavi sonuçlarını incelemektir.

**Gereç Yöntem:** 2010-2011 tarihlerinde kliniğimize başvuran ve artroskopik debridman uygulanan kültür pozitif (Newman Grade A) primer diz septik artit vakaları dahil edildi. Hastaların demografik, klinik, hematolojik, mikrobiyolojik verileri ve uygulanan tedavi yöntemi retrospektif olarak incelendi.

**Bulgular:** Toplam 39 hastanın 17(%43,5)'sinin eklem sıvısında üreme oldu. Ortalama yaş 54,7 (10-89) idi. Komorbidite açısından hastaların, 4'ü hipertansiyon, 3'ü diabet, 38'i Koroner Arter Hastalığı, 28'i Kronik böbrek yetmezliği, 1'i Kronik obstrüktif akciğer hastalığı, 1'i Behçet ve 1'i romatoid artit idi. Üreme olan 17 hastanın 15'inde S.aureus, 1'inde Serratia marcescens ve 1'inde Brucella üredi.

**Sonuç:** Çalışmamıza dahil olan hastalar incelendiğinde septik artrite predispozan olacak bir neden bulunamamıştır. Biz septik artritin bu bölgede bu kadar sık olmasını flor'a bağlı olduğunu düşünüyoruz. Isparta içme suyunda önceden standart değerleri aşan (>1,5 mg/La) florür değerleri bulunmaktaydı. Belediyenin yaptığı çalışmaları ile düşürülmüştür. Flor antikor oluşumunu inhibe ederek bağışıklık sistemini bozar.

Septik artritin Isparta ilindeki yüksek insidansının ve özellikle de 50 yaş üzerinde görülmesinin, geçmişte bu bölgedeki içme suyundaki yüksek flor oranına bağlı olabileceğini düşünüyoruz.

**Anahtar Kelime:** *Septik artit; flor; artroskopik debridman.*

## INTRODUCTION

Septic arthritis is an emergency condition with high morbidity. If it is not treated, it causes irreversible function loss in the joint and rapid destruction. In the general population, rates of primary septic arthritis have been reported as approximately 2-10 per 100000, with increasing incidence in at-risk patients and following surgical procedures (1-2).

Mortality rates in bacterial arthritis are between 10% and 30% in adults, although it is hard to identify whether from underlying disease, infection, or comorbidity of the patient associated with sequelae (3). The morbidity of septic arthritis is extremely high with decreased joint function in 50% of cases (4,5). In spite of the developments in antimicrobial treatment, hospital care and other treatments, there has been no fundamental change in morbidity and mortality rates in the last 20-30 years (6). The aim of this study was to analyse the incidence, features and treatment results of primary septic arthritis of the knee in patients who presented at the emergency service in Isparta, Turkey, were consulted by the orthopedic clinic and had not been treated previously.

## MATERIAL AND METHOD

This retrospective study comprised 39 patients with culture positive for primary septic arthritis of the knee, to whom arthroscopic debridement was applied in the orthopedic clinic between 2010-2011.

Only cases with bacteria reproduction in the synovial fluid classified as Newman Grade A were included in the study. Those with Newman Grade B reproduced in a culture taken from another part of the body, culture negative and Newman Grade C with a clinical diagnosis of septic arthritis were excluded from the study.

For all the patients who presented with suspicion of septic arthritis, a record was

made of age, sex, education, antibiotic use, systemic disease, alcohol and cigarette use and chronic medication.

Temperature, white blood cell (WBC) count, erythrocyte sedimentation rate (ESR) and C reactive protein (CRP) values on presentation were recorded.

Intra-articular puncture fluid taken from all the patients were sent to the laboratory for direct inspection and culture. Synovial fluid biochemical examination was not required as all the materials were purulent.

Arthroscopy and drainage were applied to cases which had positive results from direct inspection together with clinical symptoms of septic arthritis symptoms. Washout of the joint was applied and synovial fluid taken during the operation was again sent for culture.

## RESULTS

In 17 (43.5%) of the 39 patients who underwent surgical arthroscopy for septic arthritis, bacterial reproduction was determined in the synovial fluid. These 17 patients were 11 (64.7%) males and 6 (35.3%) females with a mean age of 54.7 years (range, 10-89 years). Data of study group was detailed in **table 1**.

**Table 1:** Data of the study group.

Sex	Culture results	Hospitalization period(day)	Education	Preop antibiotic usage	Comorbidity	Alcohol/Cigarette	Chronic medication
F	S.aureus	9	Elementary school	-	HT	-	Tarka
M	S.aureus	21	Elementary school	-	-	Cigarette	Xanax
M	S.aureus	9	Elementary school	-	-	-	-
F	S.aureus	8	Elementary school	-	DM,CRF	-	Insulin
F	Serratia marcescens	1	Elementary school	Teikoplamin, Ampicilin, Rifampisin	DM	-	Dropia
F	S.aureus	10	Elementary school	-	-	-	-
M	S.aureus	6	High School	-	-	-	-
M	Brucella spp	12	Elementary school	-	DM,CAD	-	Beloc, Aspirin, Diamicon
F	S.aureus	11	Elementary school	-	CAD,HT	-	Coraspin, Beloc
M	S.aureus	5	Elementary school	-	Behçet hast.	-	Kolşisin
M	S.aureus	17	Elementary school	-	HT,CAD, COPD	Cigarette	Teokap, Xatral, Symbicat, Diltizem
M	S.aureus	5	High School	-	Lung CA	-	Gemzer, Cisplatin
M	S.aureus	6	Elementary school	-	-	-	-
F	S.aureus	15	Elementary school	-	CRF,HT	-	Norvasc, Ferrosanol, Antepsin
M	S.aureus	17	Elementary school	-	-	Cigarette	-
M	S.aureus	9	Elementary school	-	-	-	-
F	S.aureus	10	Elementary school	-	-	-	-

The culture results were determined as 15 (88.12%) *Staphylococcus aureus*, 1(5.8%) *Serratia marcescens* and 1 (5.8%) *Brucella* spp.

On first presentation, the mean temperature was 38.4° (range, 37.2° - 39.6°).

Physical examination in the emergency service revealed knee panacula in 15(88%) patients, knee rubor in 5 (29%) patients, and increased temperature in the knee in 14(82%) patients. None of the patients had any symptoms of gastrointestinal, genitourinary, or respiratory system disease. Two patients had had influenza two weeks previously.

None of the patients had undergone any intra-articular injection or surgical intervention. In the history, there were no insect stings or penetrating wounds.

Comorbidities were determined as hypertension in 4(23.5%) patients, diabetes in 3(17.6%), coronary artery disease in 3(17.6%), chronic kidney failure in 2 (11.7%) COPD in 1(5.8%), Behcet's disease in 1 (5.8%) ,lung cancer in 1(5.8%) and,cigarette smoking in 2(11.7%) patients.

Results of WBC, CRP and ESR are listed at **table 2**.

	Before Treatment WBC	After Treatment WBC	Before Treatment ESR	After Treatment ESR	Before Treatment CRP
1	8.6	7.2	39	45	6.2
2	11.6	10.4	41	7	69
3	12.6	10.2	88	80	146
4	13	5.6	88.7	28.7	71
5	13.8	6	125	75	193
6	16.6	8.1	86	46	146
7	14.3	7.4	87	55	179
8	12.4	5.7	30	34	42
9	14.3	7.1	87	55	179
10	11.6	8.4			23.5
11	14	8.4	41	11.2	61.7
12	17.9	7.6	88.4	95	82.4
13	7.6	8.2	11	20	27
14	10.6	6.8	69	80	205
15	12	9.9	41	83	103
16	10.4	9.4	75	70	17.2
17	17.1	13.8	93		204

**Table 2:** Results of laboratory.

Treatment of ampicillin+sulbactam 4x1 gr IV was started postoperatively for all patients.

IV antibiotherapy was started according to the results of the synovial fluid culture in consultation with the hospital infection committee (the former sentence mentioned differently). The patients were discharged after the IV antibiotherapy with a decrease in temperature, decreased leukocytes and CRP and with reduced pain. Mean hospital stay was 10 days (range, 1-21 days).

## DISCUSSION

In the general population, primary septic arthritis has been reported as approximately 2-10 per 100000, with increased incidence in at-risk patients and following surgical procedures (1-2). In 10-20% of septic arthritis patients, blood and synovial flood culture may be negative (7-8). In the current study, 22(56.4%) of 39 patients were diagnosed with septic arthritis but there was no bacteria reproduction.

Between the January 2010 and January 2011, 39 of 22344 total presentations at the emergency service were diagnosed clinically with primary septic arthritis of the knee and arthroscopic surgical drainage was applied to these patients. In the taken culture, reproduction was seen in 17(43.5%) patients. According to the 2010 population census, Isparta has a population of 448298, therefore the rate of primary septic arthritis of the knee in Isparta is indicated as 8.6 per 100000.

The most common etiological agent in adults is *S.aureus* (37-65%), although this can vary depending on geographical distribution and comorbidities (9,10,11). In the current study, the most common etiological agent was determined as *S.aureus*.

None of the patients had any symptoms of gastrointestinal, genitourinary, or respiratory system disease. Two patients had had influenza two weeks previously.

None of the patients had undergone any intra-articular injection or surgical intervention. In the anamnesis, there were no insect stings or penetrating wounds.

In rheumatoid arthritis patients, the frequency of *S. aureus* has been reported as higher than 75% (12).

Comorbidities, especially rheumatoid diseases, were not considered to have made any noticeable difference in the patient group of the current study. Studies showed that one of the region of endemic fluorosis is Turkish Lake District (13,14,15). The high rate of septic arthritis seen in this region is thought to be due to flourine.

Fluorine is stored mainly in the bones, where it increases the density and changes the internal architecture, making it osteoporotic and thus more prone to fractures. Fluorine consumption by human beings increases the general cancer death rate, disrupts the synthesis of collagen and leads to the breakdown of collagen in bone, tendon, muscle, skin, cartilage, lungs, kidney and the trachea, causing disruptive effects on various tissues in the body. It inhibits antibody formation, disturbs the immune system and makes children prone to malignancy. Fluorine has been categorized as a protoplasmic poison and any additional ingestion of fluoride by children is undesirable (13).

Research has proved the negative effects of flourine on the immune system. In many studies, it has been indicated that white blood cells decrease in people who live in high fluorine areas (14).

Previous high rates of flourine (>1.5 mg/La) in the water supply network in Isparta, exceeding the standard rates for drinking water, have now been reduced with the collaboration of the municipal authority (15).

It is thought that the high incidence of septic arthritis in Isparta, especially in individuals aged over 50 years may be

associated with the high rate of flourine previously found in this region.

## CONFLICT OF INTEREST POLICY

The authors declare that there was no conflict of interest in the preparation or at any stage of this study.

## REFERENCES

- 1)Cooper C, Cawley MI. Bacterial arthritis in an English health district: A 10 year review. *Ann Rheum Dis* 1986; 4: 458-63.
- 2)Kaandorp CJ, Dinant HJ, van de Laar MA, Moens HJ, Prins AP, Dijkmans BA. Incidence and source of native and prosthetic joint infection: A community based prospective survey. *Ann Rheum Dis* 1997; 56: 470-5.
- 3)Nolla JM, Gomez-Vaquero C, Fiter J, Mateo L, Juanola X, Rodriguez-Moreno J, et al. Pyarthrosis in patients with rheumatoid arthritis: A detailed analysis of 10 cases and literature review. *Semin Arthritis Rheum* 2000; 30: 121-6.
- 4)Goldenberg DL, Reed JI. Bacterial arthritis. *N Engl J Med* 1985; 312: 764-71.
- 5)Kaandorp CJE, Krijnen P, Moens HJB, Habbema JD, van Schaardenburg D. The outcome of bacterial arthritis: A prospective community-based study. *Arthritis Rheum* 1997; 40: 884-92.
- 6)Garcia-De La Torre I. Advances in the management of septic arthritis. *Rheum Dis Clin North Am* 2003; 29: 61-75.
- 7)Puechal X. Whipple disease and arthritis. *Curr Opin Rheumatol* 2001; 13: 74-9.
- 8)Stere Ac. Diagnosis and treatment of Lyme arthritis. *Med Clin North Am* 1997; 81: 179-94.
- 9)Kaandorp CJ, Dinant HJ, van de Laar MA, Moens HJ, Prins AP, Dijkmans BA. Incidence and source of native and prosthetic joint infection: A community based prospective survey. *Ann Rheum Dis* 1997; 56: 470-5.
- 10)Dubost JJ, Soubrier M, De Champs C, Ristori JM, Bussiere JL, Sauvezie B. No changes in the distribution of organisms responsible for septic arthritis over a 20 year period. *Ann Rheum Dis* 2002; 61: 267-9.
- 11)Ryan MJ, Kavanagh R, Wall PG, Hazleman BL. Bacterial joint infections in England and Wales: Analysis of bacterial isolates over a four year period. *Br J Rheumatol* 1997; 36: 370-3.

12)Goldenberg DL. *Infectious arthritis complicating rheumatoid arthritis and other chronic rheumatic disorders. Arthritis Rheum* 1989; 32: 496-502.

13)Ergun HS, Rüssel-Sinn HA, Baysu N, Dündar Y. *Studies on the fluoride contents in water and soil, urine, bone, and theeth of sheep and urine of human from eastern and western parts of Turkey. Dtsch.Tierarztl.Wschr.* 1987; 94:416-420.

14)Kır E. *Isparta ili içme suyu kaynaklarında nitrat, fosfat ve florür dağılımı. (Yüksek Lisans Tezi) Süleyman Demirel Üniversitesi, Fen Bilimleri Enstitüsü, Kimya Bölümü.* 1996.

15)Savas S, Cetin M, Akdogan M, Heybeli N. *Endemic fluorosis in Turkish patients:relationship with knee osteoarthritis. Rheumatol Int* 2001; 21:30-35.