

# Incidence of Arachnoid Cyst Cases in Kahramanmaraş and Retrospective Detailed Analysis of These Cases

## Kahramanmaraş İlinde Araknoid Kist Olgularının İnsidansı ve Bu Olguların Retrospektif Ayrıntılı Analizi

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### Özet

**Amaç:** Araknoid kistler nörogörüntülemenin yaygınlaşması nedeniyle sıkça karşılaştığımız iyi huylu lezyonlardır. Genellikle asemptomatik olmakla birlikte lokalizasyonu, boyutu ve BOS akımına etkisine göre çeşitli semptomlara sebep olabilmektedir. Semptomatik olması durumunda cerrahi girişim gerekebilmektedir. Çalışmamızda araknoid kistlerin insidansı, klinik bulguları, takip ve tedavi sürecindeki yönetimini olgularımız üzerinden literatür eşliğinde araştırmayı planladık.

**Gereç ve yöntemler:** Hastanemizde Ocak 2017 ve Aralık 2022 arasında 30.073 olgunun beyin manyetik rezonans görüntüleme (MRG)'leri incelenerek araknoid kist saptanan 751 olgu tespit edildi. Bu olguların demografik özellikleri, lokalizasyonu, boyutu, klinik semptomları, takip ve tedavi süreçleri incelendi.

**Bulgular:** Olguların 218'i (%29) 18 yaş ve altı, 533'ü (%71) 18 yaş üzeri olarak tespit edildi. On sekiz ve altı yaş grubu araknoid kist sıklığı %5.3, 18 yaş üzeri %2 olarak tespit edildi. Genel popülasyonda araknoid kist insidansı %2.5 olarak belirlendi. Cinsiyet dağılımında 351'i (%47) kadın, 400'ü (%53) erkekti. Erkek cinsiyette yaklaşık iki kat sıklık mevcuttu. Olguların lokalizasyonlarına göre dağılımı en sık olarak 330 (%44) posterior fossa, 226 Sylvian fissür (%30), 100 (%13) konveksite, 74 (%9.9) olguda birden fazla lokalizasyonda araknoid kist saptandı. 298 olgunun takip görüntülenmesi mevcuttu. Bu olguların takipleri sırasında anlamlı boyut artışı izlenmedi.

**Sonuç:** Araknoid kistler yapılan nörogörüntülemelerde yaygın olarak izlenmektedir. Araknoid kistlerin tanısı ve asemptomatik hastaların takibi konusunda fikir birliği olduğu düşünülmele birlikte semptomatik olguların tedavisi için ileri tetkiklerin kullanımının standardizasyonu ve uygun cerrahi tekniğin seçimi için daha büyük olgu serilerine ihtiyaç vardır.

**Anahtar kelimeler:** Araknoid kist, insidans, nörogörüntüleme, semptom

### Abstract

**Objective:** Arachnoid cysts are benign lesions frequently encountered owing to the widespread use of neuroimaging. Although they are usually asymptomatic, they can cause various symptoms depending on the location of the cyst, its size, and its effect on the flow of the CSF. If they are symptomatic, surgical intervention may be required. Herein, we aimed to investigate the incidence, clinical findings, follow-up, and management of arachnoid cysts in patients in the context of the literature.

**Material and methods:** Between January 2017 and December 2022, the brain magnetic resonance images (MRI) of 30073 patients were examined in our hospital; 751 patients with arachnoid cysts were identified. The demographic characteristics, cyst location and size, clinical symptoms, follow-up, and treatment processes of these patients were examined.

**Results:** Overall, 218 patients (29%) were aged  $\leq 18$  years, and 533 (71%) were aged  $>18$  years. The incidence of arachnoid cysts was 5.3% in the  $\leq 18$  years age group and 2% in the  $>18$  years age group. The incidence of arachnoid cysts in the general population was 2.5%. In terms of sex distribution, 351 patients (47%) were women and 400 patients (53%) were men, with the incidence of arachnoid cysts being two times more common in men than in women. The distribution of the cases according to localization revealed that arachnoid cysts were detected most commonly in the posterior fossa (n=330; 44%), Sylvian fissure (n=226; 30%), cerebral convexity (n=100; 13%), and more than one location (n=74; 9.9%). Data regarding follow-up imaging were available for 298 patients. No significant increase in the size of the cyst was observed during follow-up.

**Conclusion:** Arachnoid cysts are commonly observed during neuroimaging. Although there is a consensus regarding the diagnosis of arachnoid cysts and follow-up of asymptomatic patients, larger case series are warranted to standardize the use of advanced examinations for treating symptomatic patients and selecting appropriate surgical techniques.

**Keywords:** Arachnoid cyst, incidence, neuroimaging, symptom

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## INTRODUCTION

Arachnoid cysts are benign intra-arachnoid fluid collections that constitute ~1% of all intracranial space-occupying lesions (1). Richard Bright first provided a conclusive definition of this pathology in 1831 alongside autopsy findings (2). Arachnoid cysts are the most common intracranial cysts (3).

Arachnoid cysts are divided into primary and secondary arachnoid cysts. Primary arachnoid cysts are congenital and secondary arachnoid cysts are usually formed after trauma, hemorrhage, infection, or tumor (4).

Arachnoid cysts are diagnosed more frequently owing to the widespread use of neuroimaging via computed tomography (CT) and magnetic resonance imaging (MRI). The incidence of arachnoid cyst in the literature varies between 0.5% and 1.7% (5). Although arachnoid cysts are usually asymptomatic, symptoms may occur depending on the location and size of the cyst and its effects on the flow of the cerebrospinal fluid (CSF). Among these symptoms, headache, seizure, nausea, vomiting, and growth retardation are the most common (6). The localization of arachnoid cysts is mostly supratentorial. In this region, it is most commonly observed in the middle fossa (6).

Herein, we aimed to investigate the incidence of arachnoid cysts in our hospital owing to the limited number of studies on arachnoid cysts in the literature and the small number of cases. However, as there is no consensus in the literature regarding the follow-up and treatment process for such patients, we aimed to determine the age and sex distribution of patients with arachnoid cysts, location and size of the lesion, change in the size of the lesion in patients who were followed up, symptoms and their relationship with arachnoid cysts, preoperative and postoperative clinical status of patients who underwent surgical intervention, and comorbidities via a retrospective detailed analysis of these patients. We also compared the results of our study with those of previous studies.

## MATERIALS AND METHODS

The brain MRIs included in this study were taken between January 2017 and December 2022 at Kahramanmaraş Sütçü İmam University Hospital, the only tertiary care center in Kahramanmaraş, and were obtained from the electronic medical records system of the hospital. The radiology reports of these imaging studies were searched using the search engine and the term “arachnoid cyst,” and the reports that included the term were reviewed. After reviewing the reports of the cases, the images were evaluated. The patients who did not have a radiology report or those whose images could not be obtained were excluded from the study.

To examine the clinical information of the patients whose radiology reports and imaging studies were analyzed, their applications for brain MRI and discharge reports of previous admissions, if any, were accessed from the electronic medical record system of the hospital. Herein, all the patients with arachnoid cysts detected via brain MRI were included in the study without any age restriction criteria and the demographic characteristics, such as age and sex, of the patients were recorded. The electronic medical records of the patients were examined in detail in terms of clinical complaints, physical examination findings, new clinical findings in patients who were followed up, and indications for brain MRIs and comorbidities.

The localizations of arachnoid cysts in patients with more than one cyst were determined by examining the brain MRIs. The location of Sylvian cysts was divided into right and left hemispheres. The Galassi classification method was employed for classifying cysts located in the Sylvian fissure. The patients who underwent surgical intervention because of arachnoid cysts were identified. The preoperative complaints, examination findings, imaging studies, and additional investigations of these patients were evaluated together. The postoperative clinical status, postoperative imaging, and long-term follow-up of the patients were analyzed in terms of surgical complications.

### Statistical Analysis

Continuous data were analyzed using SPSS 28.0 package program. Kolmogorov–Smirnov and Shapiro–Wilk tests were used to investigate whether there was a difference between the distribution of continuous data and normal distribution. Mann–Whitney U test was used for paired-group comparisons of non-normally distributed data, and Kruskal–Wallis H test was used for three-group comparisons. Linear regression method was preferred to establish a cause-effect relationship between two continuous variables. A value of  $p < .05$  was considered statistically significant.

## RESULTS

In total, 30073 patients who underwent brain MRI between January 2017 and December 2022 at Sütçü İmam University, Faculty of Medicine were identified and included in the study. Of these patients, 18448 were women and 11625 were men. Of the patients, 4109 were aged  $\leq 18$  years and 25964 were aged  $> 18$  years. Arachnoid cysts were detected in 751 patients. The incidence of arachnoid cyst was 2.5%, with a prevalence of 3.4% in men and 1.9% in women.

When patients with arachnoid cysts were analyzed according to age groups, 218 (29%) were aged  $\leq 18$  years

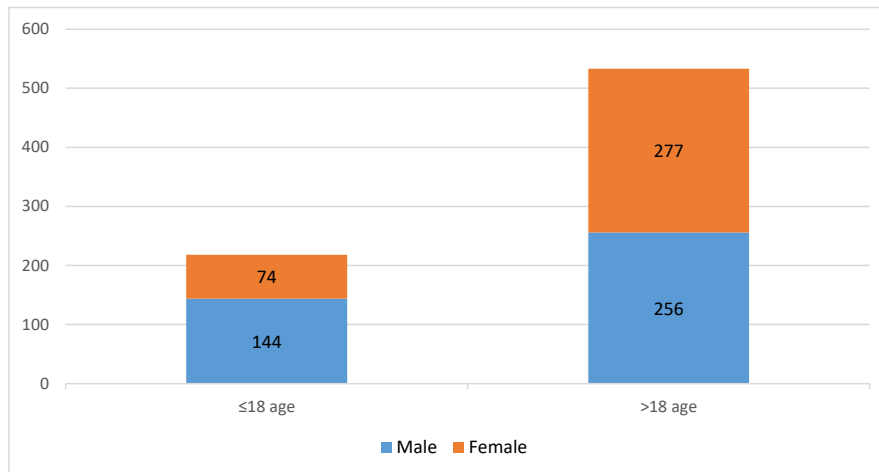
and 533 (71%) were aged >18 years. The incidences of arachnoid cysts in the ≤18 and >18 years age groups were 5.3% and 2%, respectively.

In terms of sex, 351 (47%) women and 400 (53%) men had arachnoid cysts. In total, 144 patients aged ≤18 years were men and 74 were women, while 256 patients aged >18 years were men and 277 were women. When all the patients were compared according to sex, the frequency of arachnoid cysts was found to be approximately two times higher in men than in women. The age and sex distribution of the cases are shown in **Figure 1**.

When we examined the distribution of arachnoid cysts according to localization, the most common localizations were posterior fossa (n=330; 44%), Sylvian fissure (n=226; 30%), and cerebral convexity (n=100; 13%) cases. In addition, 65 patients (9%) had arachnoid cysts in 2 locations, 8 patients had cysts in 3 locations, 4 patients had cysts in the interhemispheric fissures, 7 pa-

tients had cysts in the quadrigeminal cisterns, 6 patients had cysts in the intraventricular septum, 2 patients had cysts in the ambient cisterns, 1 patient had cysts in the occipital region, 2 patients had cysts in the hippocampus, and 1 patient had cysts in 4 locations. The localization of the arachnoid cysts is shown in **Table 1**. The patients with arachnoid cysts in more than one location are shown in **Table 2**.

Herein, 453 patients had no follow-up images, while 298 patients had 2 or more images. No significant change in dimensions was found in the patients whose follow-up images was evaluated. The clinical history of the patients was evaluated. Presenting complaints and indications for brain MRI were analyzed. The complaints of patients at the time of admission could not be obtained in 45 cases. Of the patients, 536 (71.4%) presented to the hospital with headache, 43 (5.7%) with seizures, 40 (5.3%) with dizziness, 20 (2.7%) with numbness, 16 (2.1%) with forgetfulness, 13 (1.7%) with



**Figure 1.** Age and sex distribution

**Table 1.** Distribution according to arachnoid cyst localization

Localization	Number of cases	%
Posterior fossa	330	44
Sylvian fissure	226	30
Cerebral convexity	100	13.3
Other	30	4
Multiple locations	65	8.7

**Table 2.** Arachnoid cysts with multiple localization

Number of localizations	Number of cases	%
2	65	87.8
3	8	10.8
4	1	1.4

syncope, 11 (1.5%) with nausea and vomiting, 7 (0.9%) with tremors, 4 with motor deficits, 4 with growth retardation, 4 with increased head circumference, 2 with ataxic gait, 1 with tinnitus, 1 with speech disorder, and 1 with psychiatric symptoms.

Surgical procedures were performed in six patients. Five patients were aged  $\leq 18$  years and one was in the  $>18$  years group. In terms of sex distribution, five patients were men and one was a woman. Four patients had Galassi type 3 arachnoid cyst, one had type 2 cyst, and the one had an arachnoid cyst located in the quadrigeminal cistern. When the surgical indications of the patients were analyzed, two underwent surgery for hydrocephalus, three underwent surgery for accompanying signs of increased intracranial pressure (ICP), and one underwent surgery for complaints of growth retardation and speech disorder. A cystoperitoneal shunt was placed in three patients and a ventriculoperitoneal shunt was placed in two patient. In one patient, hematoma was drained owing to spontaneous subdural hematoma.

## DISCUSSION

Arachnoid cysts are benign mass lesions, usually congenital in origin, containing CSF-like substance and surrounded by an arachnoid-like membrane. These common lesions are often detected incidentally owing to the increased use of neuroimaging. The exact etiology and natural history of these lesions are not well defined. Therefore, to the best of our knowledge, optimal treatment guidelines are yet to be established. Most cases are asymptomatic and may remain asymptomatic for life. In some cases, there is an increase in the size of the lesion, while in a very few cases, it may spontaneously resolve. Surgical treatment may be required in symptomatic patients with enlarging cysts or in those with bleeding and obstructive hydrocephalus (7). The patients who were detected to have arachnoid cysts in our university hospital, which is the only tertiary care hospital in the Eastern Mediterranean region serving a population of  $\sim 2$  million, with patients presenting from the surrounding provinces of Osmaniye, Adiyaman, Şanlıurfa, and Antakya, were mostly asymptomatic. Arachnoid cysts in these patients were detected incidentally during the investigation of another etiology. The need for urgent surgical intervention because of progression in the cyst size, obstructive hydrocephalus, and hemorrhage was found in very few patients. The first comprehensive study on the prevalence of arachnoid cysts was conducted by Becker *et al.* who assessed the brain CT scans of 27187 patients, reporting a prevalence of arachnoid cysts of 0.32% (8). Al-Holou *et al.* repeated their study on the prevalence of arachnoid cysts involving adults. The study included 47417 patients

who underwent brain MRI between 1997 and 2009. In this series, arachnoid cysts were found in 661 patients and the prevalence was reported as 1.4%. In this series, arachnoid cysts were found in 356 (1.8%) of 20327 men and 305 (1.1%) of 28090 women (9).

This study largely reflects the patient population in the Eastern Mediterranean region, wherein the prevalence of arachnoid cysts of the general population was 2.5, 5.3% in patients aged  $\leq 18$  years and 2% in patients aged  $>18$  years. On examining the relevant literature, the prevalence of arachnoid cysts was higher in our study for the general population and age groups. In a case series of adult patients with arachnoid cysts, Al-Holou *et al.* reported that the cyst was located in the middle fossa in 237 (34%) patients, retrocerebellar region in 232 (33%) patients, cerebral convexity in 98 (14%) patients, and cerebellopontine corner in 48 (7%) patients (8). Although the most commonly reported localization is the middle fossa, the incidence of the localization of arachnoid cysts in the posterior fossa was 44% in our study. We believe that multifactorial causes, in which environmental causes are also at the forefront, should be considered in addition to genetic characteristics of individuals in our region. The fact that the population in our region in general is socioeconomically behind than other regions and that it is one of the main centers receiving migration from northern Syria may have negative repercussions on prenatal maternal nutrition and consequently on the development of neural tissues and brain meninges in fetal life. The presence of Turkey's largest Afşin-Elbistan thermal power plant in our region, and the fact that this may have negative effects on pregnant women, is another issue that should be emphasized.

The treatment of arachnoid cyst remains unclear. Because of the fact that the cyst size remains constant in the majority of cases, most patients are asymptomatic. In addition, surgical morbidity is high, and thus, conservative treatment and follow-up of patients through brain CTs or brain MRIs are recommended. During the follow-up of patients with asymptomatic arachnoid cysts, cases that spontaneously resolve without surgical intervention have been reported (10,11). Although there is considerable controversy regarding the indications for the surgical treatment of asymptomatic arachnoid cysts, a review of the literature reveals that there is a consensus regarding the surgical treatment of symptomatic arachnoid cysts causing seizures, hydrocephalus, increased ICP, neurologic impairment, and complications with hemorrhage in the cyst or subdural space (12-16). Some authors, who are in the minority, have stated that all arachnoid cysts cause a mass effect and potentially compress the surrounding adjacent brain structures even if they are asymptomatic and should

be treated surgically to avoid the risks of cyst rupture and intracystic or subdural hemorrhage (14-15). In addition to these results, the relationship between these symptoms and arachnoid cyst should be evaluated in detail and objective criteria should be used to decide surgical treatment (17).

The aim of surgical treatment for arachnoid cysts is to establish a connection between the cyst and the anatomical corridors of CSF or to place a shunt through the cyst or ventricle to other spaces where CSF can be absorbed. Surgical techniques for the treatment of arachnoid cysts include microsurgical excision, cysto-peritoneal shunt, endoscopic ventriculocystostomy or ventriculocisternostomy, stereotactic cystoventricular shunting, and stereotactic intracavitary irradiation. However, there is still no clarity regarding the selection of the most appropriate approach among these (17).

In conclusion, we suggest that advanced imaging methods, electroencephalography (EEG), video EEG, single photon emission CT, neuropsychiatric evaluation, and genetic tests, if necessary, should be planned in appropriate patients along with the necessary anamnesis, physical examination, and laboratory findings for patients diagnosed with arachnoid cysts, especially in symptomatic patients for whom surgical intervention is undecided, and objective data should be used in the surgical decision of these patients.

In terms of the surgical technique to be applied, we suggest that the most appropriate surgical technique should be decided by evaluating the size and localization of the arachnoid cyst, its relationship with the cisterns, presence of hydrocephalus, experience of the surgeon, and additional comorbidities of the patient.

Herein, we aimed to determine the incidence of arachnoid cysts in our region as there are very few studies in the literature. As the only tertiary care hospital in the Eastern Mediterranean region, serving a population of ~2 million people, the data were obtained retrospectively by reviewing a large number of patients. When the literature was analyzed, our study ranked second among the studies with a large number of cases in the literature, involving 30073 cases.

Such incidence studies can be conducted separately for all regions in our country. With multicenter studies in which the data are combined, the true incidence of arachnoid cysts in our country can finally be revealed. Whether the approach modalities, follow-up, and treatment principles of these lesions are different between regions should be the main subject of future studies and priority should be given to establishing a nationwide consensus, especially in surgical indications and surgical techniques.

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**Ethical approval:** This study was approved by the Kahramanmaraş Sütçü İmam University Scientific Research Ethics Committee dated 29.11.2022 and numbered 06. International Helsinki principles were followed in the study.

**Contribution Declaration:** This study is thesis of the corresponding author.

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