Research Article

Clinical Characteristics and Management of Adolescent Ovarian Cysts

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Abstract

Objective: To give clinical characteristic of ovarian cysts in adolescent patient and comprehend the delineation of the management protocol implemented in patients diagnosed with ovarian cysts

Methods: This study used a retrospective method conducted by reviewing patient medical records for 5 years. All data of outpatients and inpatients diagnosed with ovarian cysts from January 2018 to July 2023 aged 11-21 years were taken to be included in the study.

Results: A total of 56 adolescent patients were identified with ovarian cysts. We found most patients in adolescent age group 18-21 years (n=43), with a chief complaint of abdominal pain and the cyst was unilateral.

Conclusion: The patients exhibited a primary concern of pain, and the cyst was found to be located on one side only. Efforts to save the ovary were deemed vital owing to the relatively low probability of cyst malignancy. In this study also found that there was no correlation between clinical symtopms (abdominal pain, nausea and menstrual disorder) with size of cyst.

Keywords: adolescents, clinical characteristic, management, ovarian cyst.

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INTRODUCTION

Reproductive health concerns in Indonesia encompass a range of matters pertaining to the sexual and reproductive well-being of the population, including conditions such as ovarian cysts. Ovarian cysts are commonly regarded with apprehension by the general public, as they are considered a tumor that must be treated with surgery. In order to comprehend ovarian cysts, it is important to acquire knowledge on the formation process, the physiological aspects of the ovaries, as well as the visual evidence provided by ultrasonography (USG) diagnostic examinations.

Ovarian cysts frequently manifest in women during their reproductive phase. Adolescents are one of the age groups at risk for ovarian cysts. The prevalence of ovarian cysts identified during medical examinations is expected to rise due to the growing utilization and accessibility of USG in healthcare settings. According to previous studies, the prevalence of adnexal tumors among teenagers is estimated to be around 2.6 cases per 100,000 young girls aged less than 18 years old. [1,2]

The incidence of adnexal masses in adolescents is relatively rare, which can result in a lack of understanding of doctors and health workers in their management. Unnecessary surgery can impact the future fertility of patients. On the other hand, the presence of adnexal tumors in adolescents will cause a lot of anxiety in patients and families. The purpose of this research was to study the management of ovarian cysts in adolescents and observe the characteristics of

adolescents diagnosed with ovarian cysts.

Ovarian cysts refer to the identification of an enlarged ovary filled with fluid, which can be observed during surgical procedures, detected by imaging techniques, or diagnosed during clinical examinations. The cysts may exhibit either a unilocular or multilocular morphology, and their etiology can be attributed to physiological mechanisms, infection, benign neoplasms, malignant neoplasms, or metastatic lesions. The management of ovarian tumors in teenagers should be approached distinctively compared to that in maturity, with a focus on protecting the patient's ovaries and fertility.[1]

During the period of puberty, the ovaries exhibit heightened activity as the result of augmented release of gonadotropins. Consequently, the prevalence of ovarian cysts is higher within this age group. Whereas at the age of 5-9 years the frequency of cysts ≥ 1 cm is very low, illustrating the dormant status of the ovaries in childhood. The peak appearance of cysts are at the age of 15 years.[3]

Ovarian cysts can be classified into three main categories: functional cysts, benign tumors, and malignant tumors. The occurrence of functional cysts in pre-pubertal teenagers can be attributed to the lack of involution of the follicle, leading to the failure of its maturation into a corpus luteum. Functional cysts can be categorized into two distinct categories, namely follicular cysts and corpus luteum cysts. These two cysts differ based on pathogenesis and histological features.[4]

METHODS

This study used a retrospective method conducted by reviewing patient medical records. The Patients were enrolled after the clinical event of interest or exposure has occurred.[5] The medical record data obtained retrospectively for 5 years at PKU Muhammadiyah Gamping Hospital and Panembahan Senopati Bantul Hospital.

All data of inpatients and/or outpatients diagnosed with ovarian cysts from January 2018 to July 2023 aged 11-21 years were taken to be included in the study. The patients with multiple visits only counted as once. The following variables data were obtained, such as age, body mass index (BMI), presenting symptom(s) (nausea and/or vomiting, abdominal pain, palpable mass and changes in menstrual cycle). The results of the ultrasound examination included size and bilaterality and the management of the cyst. The preliminary diagnoses made by other physicians, and surgeons, also the pathology anatomic results, were recorded.

To select samples, we used total sampling with inclusion criterias, such as patients with adolescent age (after menarche until age ≤21 years), diagnosed with ovarian cysts, undergoing health care (inpatient and/or outpatient) between 2018 to 2023, and had complete medical record. Whereas the exclusion criterias for the samples studied, such as patients catagorized as childern or have not yet menarche (<9 years old), age >21 years and had incomplete medical record.

We divided the age of group into three catagories based on Sarwono theories of the stages of development, namely; early adolescence (age 11-14 years), middle adolescence (age 15-17 years) ,and late adolescence (age 18-21 years).[6] Cyst size is classified into two size categories, which are cysts <5 cm and ≥5 cm.

The descriptive analysis was conducted on the gathered data to evaluate the distributional clinical characteristics of adolescents with ovarian cysts and identify the frequently reported clinical symptoms experienced by patients. Furthermore, we also examined the management of ovarian cysts in teenage patients at PKU Muhammadiyah Gamping Hospital and Panembahan Senopati Bantul Hospital, D.I. Yogyakarta Province. This study included both descriptive analysis and the Chi Square test to examine the relationship between two variables. Data analysis of Chi Square test and Fisher Exact's Test used the help of SPSS software version 25 for Windows software. The results of data processing obtained a value of p> with a confidence level used of 95% (= 0.05). This study has been approved by the Ethical Committee of PKU Muhammadiyah Gamping No. 121/KEP-PKU/VI/2023.

RESULTS

The medical record data for the last 5 years (2018-2023) obtained 56 patients with ovarian cysts in adolescents, with complaints of pain found in 44 patients. Most adolescent cyst patients presenting at the hospital were classified as late adolescents (18-21 years old), 43 patients in total, while the youngest age of the patients seen for inpatient and outpatient was 13 years old.

Table 1. Clinical Characteristics of Patiens

Characteristic	Frequency (n)	Percentage (%)
Cyst size (cm)		
<5	27	48
≥5	29	52
Total	56	100
Age (years)		
11-14	4	7
15-17	9	16
18-21	43	77
Total	56	100
Laterality		
Bilateral	5	9
Not bilateral	51	91
Total	56	100
BMI		
Normal	51	91
Obesity	5	9
Total	56	100

Table 1 shows the clinical characteristics of ovarian cyst patients in both hospitals, most of the cysts were unilateral with a total of 51 cases (91%). Obesity was found in 5 adolescent patients. In both hospital settings, a total of 27 patients (48%) were seen to have cyst diameters less than 5 cm, whereas 29 patients (52%) were found to have cyst sizes equal to or more than 5 cm. Several researchers have categorized the size of cysts into distinct groups. For instance, one study proposed a classification system consisting of three categories.[3] The other study similarly split cysts into three different sizes.[7] In this particular study, the size of cysts was classified into two categories: cysts measuring less than 5 cm and 5 cm or more, because the limited number of this study and to avoid dividing cells with a smaller frequency.

Table 2. Clinical Symptoms of Ovarian Cysts in Adolescent

Symptoms		Frequency (n)	Percentage (%)
Abdominal pain	Yes	42	75
	No	14	25
Total		56	100
Menstrual disorders	Yes	20	36
	No	36	64
Total		56	100
Nausea and vomiting	Yes	10	18
	No	46	82
Total		56	100

Patients who were presented with the main complaint of abdominal pain were found in 42 out of 56 patients (75%). While for patients who experienced menstrual disorders, such as oligomenorrhea, irregular menstrual cycles, irregular bleeding, to amenorrhea occurred in 20 out of 56 patients (36%). Patients with symptoms of nausea and vomiting occurred in 10 out of 56 patients (18%). In very large cysts, patients complained of palpable cysts' masses.

In this study, 5 cases of bilateral cysts were obtained, with details of 4 cysts measuring ≥10 cm in diameter, 1 cyst <5 cm. When looking at the cases in detail, there was 1 endometriosis cyst that was performed open surgery, 2 cases had not been treated at the time of data collection, 1 simple monocular cyst was laparoscopically treated, and the small cyst was treated with progesterone therapy to treat menstrual disorders. Of these five cases, the body weight in 2 patients was classified as obese.

According to the data presented in **table 2**, it is evident that pain emerges as the primary concern reported by patients, as indicated, where the prevalence of pain was recorded at 30%. This study observed a prevalence of abdominal pain in 75% of patients who were included in the study population consisting of individuals diagnosed with ovarian cysts. It is noteworthy that the primary motivation for seeking medical attention among these patients was the presence of pain symptoms.

Based on the medical record data, it has been observed that certain patients seeking treatment at the obstetrics and gynecology clinic had a prior medical history involving treatment from other departments. These treatments included receiving care from a pediatrician for abdominal pain disorders, undergoing treatment from urology for a diagnosed urinary tract infection (UTI), and receiving treatment from general surgery for appendicitis. The most prevalent symptom experienced by patients was abdominal pain.

Table 3. Management of Ovarian Cysts in Adolescents

Cyst Management	Cyst Size (cm)	Frequency (n)	%
Operation	<5	9	16
	≥5	16	29
No Operation	<5	18	32
	≥5	13	23
Total		56	100

Table 3 showed a preference for conservative care, particularly in cases with tiny cysts measuring less than 5 cm in size. Within this investigation, a total of 31 individuals (55%) of the sample did not undergo surgical intervention. In the interim, the aggregate number of individuals who received surgical intervention was 25 patients (45%). The present investigation focused on the surgical intervention of small-sized cysts that were associated with acute abdominal pains, specifically with confirmed cases of appendicitis and cyst torsion.

In addition, 13 individuals with cysts above a diameter of 5 cm were subjected to non-operative treatment. Among these cases, 3 were identified as giant ovarian cysts and referred to other hospitals, with a notable size of 30 cm. All the individuals who underwent surgical procedures had benign cysts. Out of the total of 23 surgical procedures conducted, it was observed that only one patient exhibited the presence of atypical proliferative borderline mucinosum. It has been observed in a study that the majority of ovarian cysts in adolescents are benign, with less than 10% exhibiting malignancy.[8]

Table 4. Association between Clinical Symptoms and Cyst Size at PKU Muhammadiyah Gamping Hospital and Panembahan Senopati Bantul Hospital

Clinical symptoms		Cysts size		Total	*P-value*
		<5 cm	≥5 cm		
Abdominal pain	Yes	21	21	42	0.643*
	No	6	8		
				14	
Total		27	29	56	
Menstrual disorder	Yes	10	10	20	0.842*
	No	17	19	36	
Total		27	29	56	
Nausea and	Yes	4	6	10	0.731*
vomitting	No	23	23	46	
Total		27	29	56	

Note: **Fisher's Exact Test*

This study used Chi Square test with a significant level of 5% to determine the relationship between clinical symptoms and types of cysts at PKU Muhammadiyah Gamping Hospital and Panembahan Senopati Bantul Hospital. Two variables in this study, which are abdominal pain and menstrual disorders met the requirements of the chi square test, while for the nausea vomiting variable there was 1 cell that had a frequency of less than 5, hence it did not meet the requirements and used the Fisher Exact's Test instead. The results of cross tabulation and statistical tests of the relationship between clinical symptoms and measures at PKU Muhammadiyah Gamping Hospital and Panembahan Senopati Bantul Hospital can be seen in table 4.

It can be concluded that H0 is accepted and H1 is rejected, which means that there is no significant relationship between clinical symptoms and cyst size at PKU Muhammadiyah Gamping Hospital and Panembahan Senopati Bantul Hospital.

DISCUSSION

Clinical Characteristics and Symtomps of Ovarian Cysts in Adolescents

We observed a higher prevalence of ovarian cysts among individuals in the adolescent age group, specifically those aged 18-21 years, with a majority of 76%. A cohort study examined 1009 children between the ages of 5-18, the researchers observed that 132 individuals (13.1%) had cysts with a diameter of at least 1cm. The incidence of these cysts was relatively low during infancy, but peaked during adolescence, particularly around the age of 15 years, with ovarian cysts being the most prevalent. The heightened activity of the ovaries during puberty may be attributed to the augmented release of gonadotropins.[3]

We found ovarian cysts were more common in the adolescent age group of 18- 21 years. It is most likely that the patients came to the hospital at a later stage. This is supported by data with the discovery of cysts >10 cm in 11 adolescents, and 3 of them are giant ovarian cysts that have a cyst size of 30 cm.[3] Ovarian cysts in children and adolescents are more commonly found unilateral in both hospitals. Similar result was shown in a previous study, that ovarian cysts in adolescents are often found in a unilateral form.[3]

Ovarian cysts have the potential to be asymptomatic and are often discovered inadvertently. However, in certain instances, they can give rise to symptoms such as abdominal pain, the presence of a palpable mass, as well as nausea and vomiting.[2] Abdominal pain can arise due to several factors such as cyst hemorrhage, cyst torsion, and ovarian cyst rupture.1

In addition, the prevalence of cyst torsion among adolescents was shown to vary between 7% and 10%.[7] This study observed a total of four patients who experienced cyst torsion, accounting for a prevalence rate of 7%. The experience of pain in cysts is not only attributed to torsion or rupture but it is also influenced by the outcomes of anatomical pathology associated with the

development of endometriosis. Despite their modest size, chocolate cysts have the potential to cause pain. In contrast, monocular simple cysts, despite their considerable dimensions, typically do not elicit pain.

We found abdominal pains and irregular menstrual cycles were not associated with the cyst size. These two variables have been tested through the Chi Square Test using the SPSS version 25 application. While clinical disorders in the form of abdominal pain are the most frequent complaints felt by patients with adolescent ovarian cysts. This led the patients to come to the hospital and see the departments of pediatrics, urology and ob-gyn.

Differential Diagnoses of Ovarian Cysts in Adolescents

Differential diagnoses in adolescents with pelvic pain are appendicitis, urinary tract infection (UTI), cholecystitis, gastro enteritis, ovarian cyst, ectopic pregnancy, hydrosalping, PID, kidney stones.[9] Some patients also had medical records of having visited several other departments before finally consulting with the ob-gyn and some had similar diagnoses. Although most patients from both hospitals experienced abdominal pain, the pain was not significantly correlated with cyst size, as shown in table 4. The size of the cyst did not make patients complain of pain.

In post pubertal adolescents cysts cases arise due to ovulation failure, or persistent ovarian follicles.[2,7] If ovulation does not occur, follicular cysts can continue to grow under hormonal stimulation and can sometimes grow to a large size. Cysts growing from the *corpus luteum* can grow up to 6 cm in size. If the cyst ruptures, it can cause significant bleeding.[9]

In patients with functional cysts, the cysts will resolve on their own. In a study of *pre-menarche* girls with abdominal pain, the incidence of follicular cyst rupture was found to be 1.8-15%, and the incidence increased with age. Simple cyst rupture is a frequent finding during laparoscopic acute abdominal procedures in adolescents and often does not require intervention. A conservative approach is taken for asymptomatic simple cysts 5-7 cm in size. A follow-up ultrasound is done once a year.

Management of Ovarian Cysts in Adolescents

Cysts that persist or increase in size are not functional cysts and should be referred to the pediatric and adolescent gynecology clinic for further management. Simple cysts less than 5 cm in size do not require follow-up unless the child has not yet menarche.[8] The cysts with diameter less than 3 cm does not require follow-up. Meanwhile, cysts with diameter of 5-7 cm, ultrasound monitoring is carried out in 3 months, or laparoscopic surgery is suggested if it causes symptoms.[7] Apart from accessing the size of the cyst ultrasonography can be used as a follow-up tool because the ultrasonography image that indicates malignancy has high sensitivity.[10]

There were 16 patients with a cyst size of more than 5 cm who did not undergo surgery. A conservative approach was chosen, as follicular cysts and corpus luteum cysts resolve in more than 90% of cases. Resolution of functional cysts as large as 7.5 x 8 cm can occur within 4.5 weeks. Larger cysts take longer up to 3 months.[9] The length of observation is debated, some recommend 2-3 months or 2-3 menstrual cycles, others recommend longer. The risk of torsion during the observation period for large cysts is a consideration for active treatment. The actions encompassed in this context are aspiration, fenestration, and cystectomy.

We also found that cysts larger than 5 cm in size were not operated on as conservative treatment was planned. Patients and/or their guardians did not agree to surgery. Some were referred to the oncology department for further diagnosis due to significant cysts with suspicion of *malignancy*. Meanwhile, patients with endometriosis received medical therapy. Additionally, there were patients who had received a diagnosis and had an action plan established, but they did not follow up with a subsequent visit to the hospital, resulting in a lack of action being taken.

The incidence of ovarian cysts malignancy in adolescents is very low. [1,11] In this research, 24 adolescent patients who underwent surgery were found to have 1 patient with atypical proliferative borderline mucinosum. Management of adolescents with borderline ovarian tumors, surgery was performed with the preservation of reproductive function.

The study data showed that 23 out of 56 patients (41%) received surgery, especially in adolescent patients who had a cyst size ≥5 cm. The decision to perform surgery is based on the results of the physical examination, laboratory tests and USG results of the patient.[2] Cysts that do not disappear within 2-3 months of observation, and cysts that are >8 cm in size are also indications for surgery. As a consideration

surgery can reduce AMH levels.[12,13]

Surgery in adolescents should be performed by gynecologists with laparoscopic and cystectomy skills. It was not recommended to take oophorectomy. A review of 25 years' experience during 1996-2021, for management in neonates, children and adolescent ovarian masses found that all procedures (120) managed completed in laparoscopy without conversion in open surgery.[11]

Endometriomas and dermoid cysts are often bilateral, and maintaining healthy ovarian tissue is very important. There were 5 patients with bilateral cysts, 8 patients with endometriosis cysts and 4 patients with cyst torsion (3 cases of dextral torsion, 1 dcase of sinistral ovarian torsion). Cyst torsion was more common on the right side, possibly due to the sigmoid colon on the left side which restricts movement compared to the caecum on the right side, which allows more movement, in addition to a slightly longer mesosalping.[7]

In torsion cysts, doctors traditionally exercise necrotic tissue. However, one study showed that ovarian function returns to normal in 88% to 100% of cases treated conservatively.[2] While in this study, patients with ovarian torsion cases still received traditional laparotomy oophorectomy. Emergency surgery are needed to prevent more extensive tissue damage and save the ovary by performing a cyst detorsion. This is also followed by cyst drainage with or without cystectomy.[7]

Although the ovary appears with blue-black color and necrotic, it will improve after detorsion. There are concerns about the risk of thromboembolism after untwisting cyst. However, in a large retrospective study, there was no basis for this concern. Cystectomy becomes difficult in this condition due to the fragile tissue. Furthermore, it could be overcome by performing re-surgery at intervals. Indocyanin Green (ICG) enhance-fluorescence can make better visualization of excision and check ovary vascularization after detorsion. [11]

In some studies, oophorectomy is not recommended due to the low risk of subsequent ovarian torsion, and the low risk of malignancy. While gonadopexy (oophoropexy) after detorsion may be considered. It is also recommended that the action be carried out by shortening the mesovarian lig. However, there is no evidence that this reduces recurrence or torsion of the contralateral ovary.[7]

In a retrospective study of 155 cases published in 2010, 58% underwent oophorectomy, and 26% underwent cystectomy.[14] This trend changed in a 2019 study, of 245 cases of ovarian torsion, laparoscopic surgery was performed and 95% retained the ovary.[15]

CONCLUSIONS

We found 56 adolescents with ovarian cysts, most of them were in the aged of 18-21 years old. The patients' primary concern was abdominal pain, and the majority of ovarian cyst in both hospitals was unilateral, also found that there was no correlation between clinical symptoms (abdominal pain, nausea and menstrual disorder) with size of cyst. Attempts to preserve the ovary were necessary due to the low chance of cyst malignancy. For future study, we suggest that larger sample size should be conducted, particularly if the statistical test was involved.

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REFERENCES

1. Heo SH, Kim JW, Shin SS, Jeong SI, Lim HS, Choi YD, et al. Review of ovarian tumors in children and adolescents: Radiologic - pathologic correlation. Radiographics. 2014;34(7):2039–55.
2. Zolton JR, Maseelall PB. Evaluation of ovarian cysts in adolescents. Open J Obstet Gynecol. 2013;03(07):12–6.
3. Emeksiz HC, Derinöz O, Akkoyun EB, Pınarlı FG, Bideci A. Age-specific frequencies and characteristics of ovarian cysts in children and adolescents. JCRPE J Clin Res Pediatr Endocrinol. 2017;9(1):58–62.
4. Hoffman BL, Schorge JO, Shaffer JI, Halvorson LM, Bradshaw KD, Cunningham FG. Williams Gynecology. Second Ed. New York:. The MacGraw-Hill Companies. 2012.
5. Powell JT, Sweeting MJ. Retrospective studies. Eur J Vasc Endovasc Surg. 2015;50(5):675. http://dx.doi.org/10.1016/j.ejvs.2015.07.005
6. Sarwono SW. Psikologi Remaja. Revision E. Rajawali Pers. 2010:344 .
7. Potdar N, Pillai RN, Oppenheimer CA. Management of ovarian cysts in children and adolescents. Obstet Gynaecol. 2020;22(2):107–14.
8. Ritchie AJ, Mahony FO, Garden A. Guideline for the management of ovarian cysts in children and adolescents. Br Soc Pediatr Adolesc Gynacol. 2017;(June):1–9.
9. Brandt ML, Helmrath MA. Ovarian cysts in infants and children. Semin Pediatr Surg. 2005;14(2):78–85.

10. Wigin C, Andrijono A. A Simple Ultrasound Examination as Diagnostic Tool for Malignant Ovarian Tumor. Indones J Obstet Gynecol. 2017;4(4): 222-6. **DOI**: https://doi.org/10.32771/inajog.v4i4
11. Ciro E, Vincenzo C, Mariapina C, Fulvia DC, Vincenzo B, Giorgia E, et al. Review of a 25-Year Experience in the Management of Ovarian Masses in Neonates, Children and Adolescents: From Laparoscopy to Robotics and Indocyanine Green Fluorescence Technology. Children. 2022;9(8).
12. Budipramana E, Abdullah N, Tessy T. Anti Müllerian Hormone Level in Laparoscopic Cystectomy Kadar Anti Müllerian Hormon pada Laparoskopi Kistektomi. Indones J Obs Gynecol. 2016;4(4):203-7. DOI: https://doi.org/10.32771/inajog.v4i4.449
13. Sahabuddin R, Abdullah N, Manoe IM. Anti Müllerian Hormone (AMH) Level as Ovarian Reserve Marker before and after Cystectomy Laparotomy. Indones J Obstet Gynecol. 2017;5(1): 30–4. DOI: https://doi.org/10.32771/inajog.v5i1.462
14. Hernon M, McKenna J, Busby G, Sanders C, Garden A. The histology and management of ovarian cysts found in children and adolescents presenting to a children's hospital from 1991 to 2007: A call for more paediatric gynaecologists. BJOG Int J Obstet Gynaecol. 2010;117(2):181–4.
15. Adeyemi-Fowode O, Lin EG, Syed F, Sangi-Haghpeykar H, Zhu H, Dietrich JE. Adnexal Torsion in Children and Adolescents: A Retrospective Review of 245 Cases at a Single Institution. J Pediatr Adolesc Gynecol. 2019;32(1):64–9. https://doi.org/10.1016/j.jpag.2018.07.003