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Breast Ultrasound in Childhood and Adolescence in Ibadan, Nigeria: Imaging Findings and Correlation of BI-RADS with Histopathology

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Abstract

Background: Breast masses in children are relatively uncommon when compared with adults but are overwhelmingly benign. Ultrasound is the most accessible and safest means of imaging breast masses in this age group.

Objectives: To describe ultrasound findings and evaluate the relationship between Breast Imaging Reporting and Data System (BI-RADS) category and histology reports in paediatric and adolescent breast presentations.

Methods: A retrospective review of 43 paediatric and adolescent breast ultrasound cases referred to the Radiology Department at the University College Hospital, Ibadan, Nigeria, over 10 years (2006-2015) was conducted. Age, body mass index (BMI), prior breast disease, BI-RADS classification, and histopathology results were extracted from the departmental records.

Results: The Children were aged 8–18 years (mean: 16.13 years), with 72.1% being older than 15 years. BMI was normal for most (81.4%) children. Most lesions were benign or negative on BI-RADS assessment, while 3 cases (7.0%) were categorised as highly suggestive of malignancy; all the cases were histologically confirmed. BI-RADS category showed a strong association with malignancy ($\chi^2 = 43.00$, $p < 0.001$), with malignancy occurring only in the highest of the six categories. No significant associations were found between malignancy and age ($p = 0.559$) or BMI ($p = 0.598$), although slightly higher values of BI-RADS were observed in malignant cases.

Conclusions: Breast lesions in Nigerian children and adolescents are predominantly benign. BI-RADS demonstrated strong predictive value for malignancy in this study. Few children who require imaging for further assessment of breast masses should be promptly referred.

Keywords: *Adolescent Breast Disease, Breast masses, Breast imaging, BI-RADS, Malignancy Ultrasonography.*

Introduction

Paediatric breast masses are relatively rare, and most are benign.¹ Nonetheless, the finding of a breast mass can be disconcerting to patients and

their families.^{2, 3} The spectrum of breast disease in the paediatric age group is different from that in adults. Most are either secondary to normal developmental changes or neoplastic processes

with relatively benign behaviour. Breast disorders occurring in childhood and adolescence range from congenital conditions to neonatal infections and from benign disorders, such as fibroadenoma in females and gynecomastia in males to rhabdomyosarcoma.¹⁻³

Although there are limited studies on breast diseases in childhood and adolescence due to how relatively rare these conditions are, different studies have put the incidence of breast lesions between 0.1% and 3.25%.^{4,5} Benign breast lesions are the most commonly occurring breast diseases in this age group, with fibroadenoma accounting for between 80% and 95% of breast diseases in this group.⁴⁻⁶ Malignant breast disease in childhood and adolescence is exceedingly rare, constituting 0.02% of breast cancers in childhood and adolescence,⁷ and making up less than 0.1% of all breast cancer cases,^{5,8} with most being a metastasis rather than a primary breast cancer.⁹

Benign paediatric breast masses can be due to causes such as infection (mastitis and abscesses), vascular masses (infantile haemangioma), lymphatic masses (lymph node and lymphangioma), neuronal mass, trauma (haematoma, fat necrosis, and foreign body), pregnancy (galactocoele and lactating adenoma), cystic lesions (cysts and Montgomery cysts), infantile mammary duct ectasia, fibroepithelial lesions (fibroadenoma, phyllodes tumor, and cellular fibroepithelial lesion), papillary lesions (papilloma and juvenile papillomatosis) and pseudoangiomatous stromal hyperplasia. On the other hand, malignant childhood breast diseases include primary breast cancer and metastasis.^{4,9}

Breast Imaging Reporting and Data System (BI-RADS) is a system used to standardise the order of reporting and classifying breast tissue density. The 5th BI-RADS edition — introduced in 2013 — is now the most frequently used tool for classifying breast imaging reports, with some of its classes requiring further ultrasound or

histologic confirmation.^{10, 11} In recent times, there is increasing awareness about breast cancer; therefore, a breast lump in a child or adolescent often alarms both the parent and the child.¹² However, because breast diseases in childhood are rarely malignant (less than 0.1% of all breast cancer and 0.02% of breast cancer in persons less than 19 years of age),^{5,7,8} a significant proportion of children and adolescents with breast diseases require only clinical examination and reassurance.^{1,4,6} Physical examination and targeted history (including family history) are essential for appropriate patient management. The diagnosis and treatment must be tailored towards avoiding damage to the developing breast tissue, which can result in hypoplasia or aplasia.⁸ Important factors that may aid evaluation of breast diseases include the duration of the mass, associated pain or other symptoms, whether the mass affects one breast or both, how rapidly the mass is growing, and any family history of breast disease.⁸

Previous research from Uyo reported an increased incidence of breast diseases with increasing age.⁷ In addition, the significant distress that could be associated with breast lumps in a child and the paucity of literature on childhood and adolescent breast diseases^{4,6,8} suggest that more research in this unique population needs to be conducted to assess the incidence, types and outcomes of breast diseases. Therefore, this study aimed to describe the pattern and outcomes of breast diseases in children and adolescents presenting at the University College Hospital, Ibadan, to add to the existing body of literature on breast diseases in childhood and adolescence.

Materials

Study design

This descriptive, retrospective study was conducted at the Department of Radiology,

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University College Hospital, Ibadan, Nigeria.
The study spanned from 2006 to 2015.

Study population

Children and adolescents (≤ 18 years) who presented with breast swellings or related complaints and were referred for breast ultrasonography were included in the study.

Data collection

Documented patient history, including age, presenting complaints, prior breast conditions, and relevant family history, as well as clinical breast examination records, were extracted from the breast ultrasound records as well as the Breast Imaging Reporting and Data System (BI-RADS) assessment records.

Body Mass Index (BMI) was calculated by dividing the participant's weight in kilograms by the square of their height in meters (kg/m^2). Following standard World Health Organisation (WHO) guidelines, participants were classified into four distinct groups based on their BMI: Underweight ($< 18.5 \text{ kg/m}^2$), Normal weight ($18.5 - 24.9 \text{ kg/m}^2$), Overweight ($25.0 - 29.9 \text{ kg/m}^2$), and Obese ($\geq 30.0 \text{ kg/m}^2$).

Breast imaging was performed on the cohort of participants using a GE Voluson E ultrasound machine (GE USA Ltd, 2006) equipped with a 4–10MHz linear transducer. Both breasts were systematically scanned using B-mode ultrasound with a linear probe for detailed evaluation of any lesions or asymmetries. Sonographic features recorded included lesion type (solid, cystic, or complex), size, location, shape, margins, and echogenicity. Colour Doppler was used as indicated to evaluate vascularity.

The findings were reported using the American College of Radiology (ACR) Breast Imaging Reporting and Data System (BI-RADS) lexicon, fifth edition, and each examination was assigned a final BI-RADS assessment category as follows: BI-RADS 0 (incomplete study); BI-RADS 1

(negative); BI-RADS 2 (benign); BI-RADS 3 (probably benign); BI-RADS 4 (suspicious); BI-RADS 5 (highly suggestive of malignancy).

When suspicious findings were identified (BI-RADS 4 or 5), we performed minimally invasive procedures, including ultrasound-guided core needle biopsy. We processed and analysed biopsy specimens histologically according to standard pathology protocols.

Statistical analysis

All archived ultrasound images and documented findings were extracted and entered into SPSS version 27 (IBM Corp., Armonk, NY, USA) for statistical analysis. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were calculated. Associations between BI-RADS category and malignancy status were evaluated using Chi-Square tests, and differences in age and BMI between the malignancy statuses were tested using Student's t-tests. Statistical significance was defined as $p < 0.05$.

Ethical considerations

Ethical approval for the study was waived as the study was retrospective and involved the review of existing clinical records. Informed consent and assent had earlier been obtained from the parents or carers and the children, where possible, before breast ultrasound was performed as per departmental protocol.

Results

A total of 43 clinical and ultrasound records were studied. The participants ranged in age from 8 to 18 years, with a mean age of 16.1 years (Figure 1). Most of the study population were older than 15 years (72.1%), followed by those aged 13–15 years (23.3%) and those 12 years or younger (4.7%). Most participants (81.4%) were within the normal BMI range, with 4.7% underweight, 9.3% overweight, and 4.7%

classified as obese. The mean BMI was 21.5 kg/m².

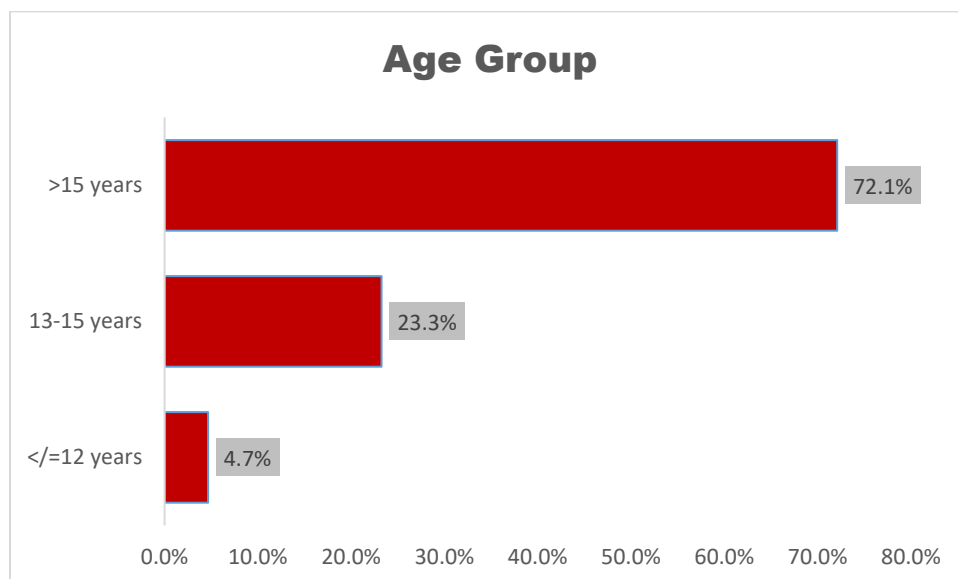


Figure 1: Age group distribution of the study population

The BI-RADS assessments were as follows: BI-RADS-0 in 6 (14.0%), BI-RADS-1 in 15 (34.9%), BI-RADS-2 in 16 (37.2%), BI-RADS-3 in 3 (7%), and BI-RADS-5 in 3 (7%). There was no case of BI-RADS-4. Those with BI-RADS-5

were confirmed by histology (Figures 2 and 3). There was no prior history of breast disease in 33 (6.7%) participants, while 10 (23.3) had a previous history of breast disease.

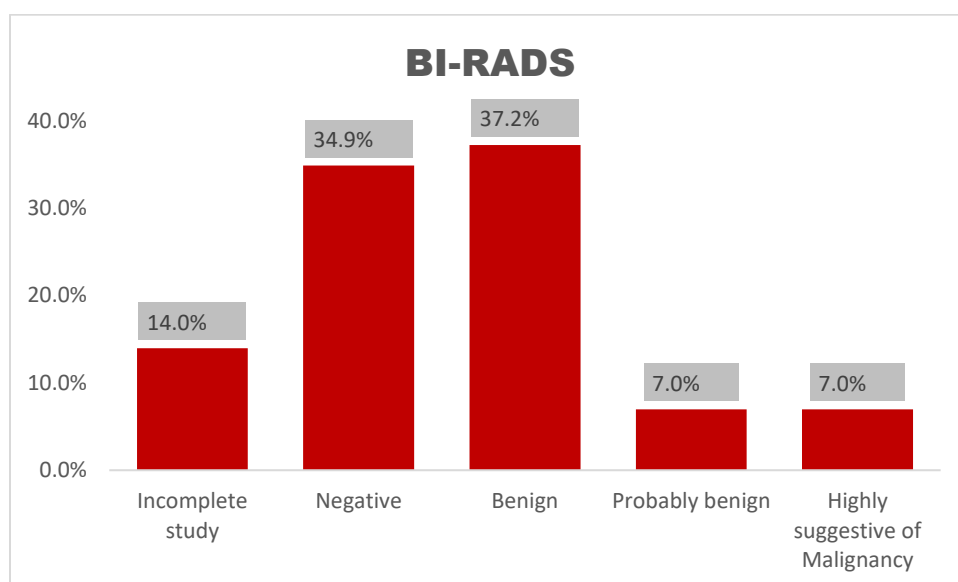


Figure 2: Distribution of the study participants according to BI-RADS categorisation

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There was a statistically significant association between BI-RADS categories and malignancy status of disease (Table I). All malignant cases occurred exclusively in the BI-RADS category 5 ($\chi^2 = 43.00$, $p < 0.001$). No malignancies were detected in the incomplete, negative, benign, or probably benign categories, indicating that higher BI-RADS scores were significantly associated with malignancy.

There were no significant differences in the age or BMI between malignant and non-malignant breast disease groups (Table II). Although those with malignancy had slightly higher mean age

(16.7 vs. 16.1 years) and BMI (22.6 vs. 21.5 kg/m²), neither difference reached statistical significance. Descriptive patterns across BI-RADS categories (Table III) showed that participants in the malignancy group had moderately higher age and BMI compared to most other categories. The “probably benign” group had the lowest mean age and BMI, while the benign group showed the highest overall BMI. Although not statistically significant, these trends suggest that malignancy tended to occur in slightly older participants with relatively higher BMI values compared to other BI-RADS groups.

Table I: Association between BI-RADS assessment and confirmed malignancy

Malignancy					
Variable	No	Yes	Total	χ^2	p-value
	n = 40 (%)	n = 3 (%)	n = 43 (%)		
BI-RADS					
Incomplete study	6 (15.0)	-	6 (14.0)	43.0	<0.001
Negative	15 (37.5)	-	15 (34.9)		
Benign	16 (40.0)	-	16 (37.2)		
Probably benign	3 (7.5)	-	3 (7.0)		
Highly suggestive of a malignancy	-	3 (100.0)	3 (7.0)		

Table II: Association between mean age and BMI and malignancy status

Variable	Malignancy status		t-test	p-value
	No Mean (SD)	Yes Mean (SD)		
Age	16.13 (1.67)	16.67 (2.31)	-0.59	0.559
BMI	21.53 (3.13)	22.63 (3.18)	-0.531	0.598

Because of the very limited number of malignant cases (n = 3), a statistically feasible mathematical predictive formula using age and BMI could not be generated. However, evaluating the diagnostic accuracy of the sonographic assessments yielded excellent predictive values: BI-RADS 5 classification showed a 100% Positive Predictive

Value (PPV) for malignancy, while BI-RADS categories 1 through 3 showed a 100% Negative Predictive Value (NPV) among participants.

Discussion

This study focused on breast masses found in children and adolescents referred to the Radiology Department at the University College Hospital for breast ultrasound scans over 10

years. The age and BMI distribution of participants in this study align with established patterns in paediatric breast imaging, although the concentration of cases among older adolescents reflects a different referral profile than that described by Harth *et al.*¹²

Table III: Descriptive Analysis of BI-RADS by Age and BMI

	BI-RADS classes	Number of Subjects	Mean	Standard Deviation
Age	Incomplete	6	17	0.894
	Negative	15	16.2	1.821
	Benign	16	16.06	1.528
	Probably Benign	3	14.33	2.082
	Highly suggestive of Malignancy	3	16.67	2.309
	Total	43	16.16	1.689
BMI	Incomplete	6	21.23	1.498
	Negative	15	20.04	1.966
	Benign	16	23.38	3.809
	Probably Benign	3	19.67	0.404
	Highly suggestive of Malignancy	3	22.63	3.179
	Total	43	21.6	3.109



Figure 3: Breast Ultrasound Scan showing A) Benign and B) Malignant masses

Ai) A 14-year-old girl with lesions in both breasts: a solitary circumscribed oval hypoechoic mass in the left breast and Aii) a bilobed isoechoic mass in parallel orientation in the right breast, with benign features – Fibroadenomas.

B) An 18-year-old with an irregular hypoechoic mass in her right breast with spiculated margins, posterior shadowing and suspicious features for malignancy.

In the present study, most of the participants were older than 15 years, suggesting that breast-related concerns in this setting tend to arise later in adolescence. This contrasts with the bimodal age peaks previously identified by Harth *et al.*¹² In the latter study, many female referrals occurred in

infants (4 weeks to 1 year) and in children aged 6–9 years, primarily due to premature or asymmetric breast development. The predominance of late-adolescent presentations in the present study may, therefore, indicate a patient population more likely driven by palpable

masses, cosmetic concerns, or hormonal maturation rather than early developmental variants such as premature thelarche.

Consistent with previous research, most breast disease cases were benign, reflecting typical entities such as fibroadenomas and simple cysts, which are known to account for most breast masses in children and adolescents.¹³ Only three cases were histologically malignant, contrasting with Olarinoye-Akorede *et al.*,⁸ who found no malignancies. This difference likely reflects variations in study design and participant demographics. Notably, the present study spanned a significantly longer duration (ten years versus two years) and included a larger sample ($n = 43$ versus $n = 25$), which inherently increases the statistical likelihood of detecting rare malignant presentations. Furthermore, the participants skewed older (mean age 16.1 years, with 72.1% older than 15 years) compared to their population (mean age 14.8 years, including infants), which may influence the underlying pathological profile presenting to a tertiary radiology department. This, however, still reaffirms that malignancy in this age group is extremely rare, yet clinically significant when encountered. Although infrequent, such malignancies warrant careful and prompt evaluation, particularly when ultrasound features suggest BI-RADS 4–5 classifications or when lesions exhibit rapid growth or atypical morphology.

Moreover, a strong association was observed between BI-RADS category and malignancy. This emphasised the reliability of BI-RADS descriptors in Paediatric imaging. Despite BI-RADS being developed primarily for adult breast assessment, multiple studies have demonstrated its usefulness and accuracy in stratifying risk in the paediatric population as well.^{14,15} Thus, the confinement of all malignancies to the highest BI-RADS category supports the application of BI-

RADS as a standardised framework for reporting, communication, and management planning even in younger patients.

In contrast to BI-RADS category, no significant difference was found between the age or BMI of the two malignancy statuses. This aligns with prior evidence indicating that neither anthropometric measurements nor pubertal status reliably predicts malignant breast pathology in younger cohorts.¹⁵ The underlying biological reason for this is that paediatric breast pathology is predominantly driven by developmental, congenital, or sporadic genetic anomalies. This contrasts sharply with adult breast malignancies, which are heavily influenced by cumulative metabolic and hormonal factors, such as prolonged oestrogen exposure associated with increasing age and higher BMI. This pathophysiological distinction perfectly aligns with the findings in the present study, explaining why routine anthropometric parameters like age and BMI hold no significant predictive value for malignancy in this younger age group. Although descriptive patterns suggested slightly higher mean age and BMI in the malignancy group, these variations did not reach statistical significance and may reflect the very low number of malignant cases rather than a true biological association.¹⁶

Ultrasound remains the preferred first-line imaging modality for evaluating breast symptoms in younger patients, given its safety, accessibility, and superior ability to differentiate cystic from solid masses without ionising radiation. The literature widely supports the limited role of mammography in this age group due to the density of developing breast tissue and radiation concerns.¹⁷ MRI may be considered when ultrasound findings are inconclusive or when additional tissue characterisation is required, particularly in complex, deep, or multifocal lesions.¹⁸ In summary, these imaging modalities allow for a tailored, patient-focused diagnostic

approach that balances diagnostic accuracy with safety.

From a public health perspective, establishing that paediatric breast masses are overwhelmingly benign supports Sustainable Development Goal (SDG)-3 (Good Health and Well-being) by providing evidence to reduce parental anxiety and avoid unnecessary surgical biopsies. The School Health Programme (SHP) is vital for achieving this goal at the community level. The SHP promotes optimal breast health by educating students on normal pubertal development, performing routine clinical screenings, and providing direct referral pathways for safe, ultrasound-based evaluations when true masses are identified.

Limitations

First, the retrospective design limited control over data completeness and uniformity of documentation. To mitigate this, strict inclusion criteria were applied, ensuring only cases with complete, verifiable sonographic and histopathologic records were included in the final analysis. Although the study period spanned nearly a decade, only 43 cases were valid for analysis after data cleaning, reducing statistical power and limiting the ability to draw strong conclusions about rare outcomes such as malignancy. Additionally, the very small number of malignant lesions restricted the use of advanced statistical models such as logistic regression. To reduce the effect of this limitation, conclusions drawn regarding the malignant cases were deliberately kept conservative, focusing on descriptive predictive values rather than attempting to overstate statistical associations. Finally, the single-centre nature of the study may limit generalizability to broader paediatric populations with different demographic or referral patterns.

Conclusion

Breast disorders in childhood and adolescence are predominantly benign, with malignancy constituting a small but clinically significant minority. Ultrasonography remains the first-line imaging modality, offering safe, accurate, and radiation-free evaluation of breast pathology in this population. The strong correlation between BI-RADS category and malignancy in this study supports continued use of BI-RADS terminology for structured reporting in paediatric cases. With the possibility of increasing incidence with increasing age, future research incorporating larger multicenter cohorts is recommended to ascertain incidence, refine predictive models and validate the role of quantitative sonographic parameters in early detection and risk assessment of paediatric breast malignancies.

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Conflicts of Interest: None declared.

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References

1. Kaneda HJ, Mack J, Kasales CJ, Schetter S. Paediatric and adolescent breast masses: A review of pathophysiology, imaging, diagnosis, and treatment. *Am J Roentgenol* 2013;200:W204–12. <https://doi.org/10.2214/AJR.12.9560>.
2. Ademuyiwa AO, Lawal AO, Anunobi CC, Bode CO. Discrete Breast Masses in Female Children and Adolescents: Is there a Place for Non-operative Management by Pediatric Surgeons? *J Adv Med Med Res* 2015;9(8):1-7.

- <https://doi.org/10.9734/BJMMR/2015/17514>.
3. Umanah IN, Akhiwu W, Ojo OS. Breast tumours of adolescents in an African population. *Afr J Paediatr Surg* 2010;7:78–80. <https://doi.org/10.4103/0189-6725.62849>.
4. Sosnowska-Sienkiewicz P, Januszkiewicz-Lewandowska D, Mańkowski P. Benign and malignant breast lesions in children and adolescents - diagnostic and therapeutic approach. *Front Pediatr* 2024 23;12:1417050. <https://doi.org/10.3389/fped.2024.1417050>.
5. Hassan N, Idaewor P, Rasheed N, Saad Abdalla Al-Zawi A. Paediatric and Adolescent Breast Cancer: A Narrative Review. *Cureus*. 2023;15(11):e48983. <https://doi.org/10.7759/cureus.48983>.
6. Mubarak F, Malick A, Sattar AK. Breast development and disorders in children and adolescents. *Curr Probl Pediatr Adolesc Health Care* 2023;53(7):101441.
7. Nwafor CC, Umeh KU, Etuk EB, Eziagu UB, Kudamnya IJ, Ekwo E. Clinicopathological pattern of breast lesions in children and adolescents. *Afr Health Sci* 2023;23(3):228. <https://dx.doi.org/10.4314/ahs.v23i3.28>.
8. Olarinoye-Akorede SA, Ibinaiye PO, Suleiman LB. Ultrasonographic review of pediatric breast masses among Nigerian children in a tertiary hospital. *Afr J Paediatr Surg* 2020;17(3&4):54-58. https://doi.org/10.4103/ajps.AJPS_57_17.
9. Harper LK, Simmons CL, Woodard GA, Solanki MH, Bhatt AA. Pictorial Review of Common and Uncommon Pediatric Breast Lesions. *Radiographics* 2023;43(1):e220117. <https://doi.org/10.1148/rg.220117>.
10. Merjane V, Perin DMP, Bacha PMGE, Miranda BMM, Bitencourt AGV, Iared W. Breast Imaging Reporting and Data System (BI-RADS®): A success history and particularities of its use in Brazil. *Rev Bras Ginecol Obstet* 2024;46:e-rbgo6. <https://doi.org/10.61622/rbgo/2024AR06>.
11. Bodewes FTH, van Asselt AA, Dorrius MD, Greuter MJW, de Bock GH. Mammographic breast density and the risk of breast cancer: A systematic review and meta-analysis. *The Breast* 2022;66:62-68. <https://doi.org/10.1016/j.breast.2022.09.007>.
12. Harth S, Behrens C, Roller FC, Alzen GFP, Krombach GA. Breast Ultrasonography: Findings in Pediatric Patients. *Ultraschall Med* 2017;38(5):500-07. <https://doi.org/10.1055/s-0041-108010>.
13. Koning JL, Davenport KP, Poole PS, Kruk PG, Grabowski JE. BI-RADS classification in 51 excised palpable paediatric breast masses. *J Pediatr Surg* 2015;50(10):1746–50. <https://doi.org/10.1016/j.jpedsurg.2015.02.062>.
14. Davis J, Liang J, Roh A, Kittrell L, Petterson M, Winton L, *et al*. BI-RADS ultrasound classification in paediatric and adolescent patients overestimates likelihood of malignancy. *J Pediatr Surg* 2021;56(5):1000–3. <https://doi.org/10.1016/j.jpedsurg.2020.12.025>.
15. Baltrak YA, Söğüt SE, Varlıklı O. Approach to paediatric breast masses in accompaniment with current literature. *J Contemp Med* 2022;12(2):355–8. <https://doi.org/10.16899/jcm.930896>.
16. He G, Shen N, Zhao L, Liu X, Zhang C. Primary breast malignancy in children and adolescents: A population-based study. *Breast J* 2024;2024:2919922. <https://doi.org/10.1155/tbj/2919922>.
17. Perry N, Broeders M, de Wolf C, Törnberg S, Holland R, von Karsa L. European guidelines for quality assurance in breast cancer screening and diagnosis. Fourth edition--summary document. *Ann Oncol* 2008;19(4):614-22. <https://doi.org/10.1093/annonc/mdm481>.
18. Jones KN. Imaging of the adolescent breast. *Semin Plast Surg* 2013;27(1):29–35. <https://doi.org/10.1055/s-0033-1343994>.