Section: Miscellaneous

Original Research Article

STUDY OF CLINICO RADIOLOGICAL CONCORDANCE IN PEDIATRIC DERMATOLOGY: IMPACT ON THERAPEUTIC DECISIONS

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ABSTRACT

Background: Pediatric dermatological conditions often present with overlapping clinical features, making accurate diagnosis challenging. Imaging modalities such as ultrasonography (USG), magnetic resonance imaging (MRI), and computed tomography (CT) provide complementary information that refines clinical impressions and guides therapeutic decisions. The aim is to evaluate the clinical utility of imaging in confirming dermatological diagnoses and influencing therapeutic strategies in pediatric patients.

Materials and Methods: This observational study included 100 children (<18 years) presenting with dermatological lesions. Clinical diagnosis was established using history, physical examination, pattern recognition, and scoring systems. Imaging was performed using USG, MRI, or CT depending on lesion type. Data were analyzed for demographic distribution, lesion type, clinico radiological concordance, and therapeutic decisions influenced by imaging.

Results: Clinical diagnosis was established in 80% of cases, while imaging confirmed or refined all 100. Overall concordance between clinical and imaging diagnoses was 80%, with discordance in 20%. The highest concordance was observed in melanoma (90%), followed by vascular malformations (85%), viral lesions (80%), chronic eczema (75%), and deep fungal infections (70%). Imaging influenced therapeutic decisions in all cases: biopsy site selection (20%), surgical excision planning (25%), systemic therapy initiation (15%), conservative management (30%), and advanced care referral (10%).

Conclusion: Imaging significantly enhances diagnostic accuracy in pediatric dermatology, particularly in complex lesions where clinical overlap exists. Beyond diagnosis, imaging decisively shapes therapeutic strategies, reduces misclassification, and prevents unnecessary interventions.

Keywords: Pediatric dermatology, ultrasonography.

INTRODUCTION

Pediatric dermatological conditions often present with overlapping clinical features, making accurate diagnosis challenging. While clinical examination remains the cornerstone of dermatology, imaging modalities such as ultrasonography (USG), magnetic resonance imaging (MRI), and computed tomography (CT) provide crucial complementary information. These techniques help delineate lesion morphology, depth, vascularity, and systemic involvement, thereby influencing therapeutic strategies.[1]

Cutaneous and subcutaneous lumps are frequently encountered in children and are usually benign. However, certain lesions such as vascular malformations, deep fungal infections, and melanoma require precise characterization to avoid misdiagnosis and inappropriate treatment. Ultrasonography, in particular, has become a key diagnostic tool for superficial soft tissue lesions. High-frequency probes enable detailed visualization

of skin architecture and lesion localization, enhancing diagnostic confidence and narrowing differential diagnoses.[2]

Recent innovations in pediatric imaging have expanded the scope of radiological evaluation, with MRI offering superior soft tissue contrast and CT providing valuable information on bone involvement. These modalities are especially useful in complex cases where clinical findings are inconclusive. Imaging not only confirms or refines diagnoses but also directly impacts therapeutic decisions, including biopsy site selection, surgical excision planning, initiation of systemic therapy, and avoidance of unnecessary interventions.[3]

The integration of imaging into pediatric dermatology practice has therefore become indispensable. By improving diagnostic accuracy and guiding individualized treatment, imaging contributes significantly to patient outcomes and reduces the burden of misdiagnosis. This study aims to evaluate the clinical utility of imaging findings in influencing therapeutic decisions among pediatric dermatology patients.

Aim

To evaluate the clinical utility of imaging modalities (Ultrasound, MRI, CT) in confirming dermatological diagnoses and guiding therapeutic decisions in pediatric patients.

Objectives

1. To analyze the demographic distribution of children undergoing imaging for dermatological conditions.
2. To compare clinical diagnoses with imaging findings across common lesion types.
3. To assess clinico-radiological concordance and discordance.
4. To determine the impact of imaging on therapeutic decision-making,
5. To establish the overall role of imaging in reducing diagnostic error and shaping individualized treatment strategies in pediatric dermatology.

MATERIALS AND METHODS

This observational study was conducted on 100 pediatric patients presenting with dermatological lesions at a tertiary care hospital. Children aged <5 to 18 years were enrolled after obtaining informed consent from parents or guardians.

Inclusion Criteria

1. Pediatric patients (<18 years) with clinically suspected dermatological lesions requiring imaging.
2. Cases where clinical diagnosis was uncertain or where imaging was indicated for confirmation, lesion characterization, or therapeutic planning.

Exclusion Criteria

1. Patients with incomplete clinical records.
2. Children with contraindications to MRI or CT imaging.
3. Cases where parental consent for imaging was not obtained.

Clinical Diagnosis Criteria

Clinical diagnosis was established by dermatologists based on a combination of:

- History: onset, duration, progression, systemic symptoms, and family history.
- Physical examination: lesion morphology (macule, papule, nodule, plaque), distribution, color, surface changes, and associated systemic signs.
- Pattern recognition: vascular lesions identified by blanching and compressibility; fungal infections suspected with scaling, induration, or sinus tracts; melanoma suspected in pigmented lesions with asymmetry, irregular borders, color variation, and rapid growth; eczema diagnosed by chronic pruritic patches with lichenification; viral lesions suspected by grouped vesicles, warts, or molluscum-like morphology.
- Clinical scoring systems: where applicable, dermatological indices such as ABCD criteria for pigmented lesions and clinical severity scores for eczema were applied.

These clinical impressions were recorded as provisional diagnoses before imaging.

Imaging Procedure

1. Ultrasonography (USG): performed as the first-line modality for superficial lesions, using high-frequency probes (7–15 MHz) to assess lesion depth, vascularity, and tissue involvement.
2. Magnetic Resonance Imaging (MRI): employed for vascular malformations and melanoma to evaluate lesion extent, tissue infiltration, and systemic spread.
3. Computed Tomography (CT): reserved for suspected deep fungal infections and cases with bone involvement, providing detailed information on calcification and osseous changes.

Data Collection

Demographic details, clinical diagnosis, imaging findings, and therapeutic decisions influenced by imaging were systematically recorded. Data were tabulated into four categories: demographic distribution, lesion type distribution, clinico-radiological concordance, and therapeutic decisions influenced by imaging.

Statistical Analysis

Descriptive statistics were applied to calculate frequencies and percentages. Concordance and discordance rates between clinical and imaging diagnoses were expressed as percentages. The therapeutic impact of imaging was analyzed by categorizing decisions into biopsy guidance, surgical planning, systemic therapy initiation, conservative management, and advanced care referral.

RESULTS

Table 1: Demographic Variables

Sr No	Age (Years)	Male n (%)	Group B n (%)	Total N (%)
1	<5	14 (14%)	11 (11%)	25 (25%)
2	5 to 10	17 (17%)	13 (13%)	30 (30%)
3	11 to 15	15 (15%)	13 (13%)	28 (28%)
4	16 to 18	9 (9%)	8 (8%)	17 (17%)
Total N (%)		55 (55 %)	45 (45 %)	100 (100 %)

The study included 100 pediatric patients distributed across four age groups. The largest proportion was between 5–10 years (30%), followed by 11–15 years (28%), children under 5 years (25%), and adolescents aged 16–18 years (17%). Gender distribution showed a slight male predominance, with 55 boys (55%) compared to 45 girls (45%). This balanced representation across age and gender groups provides a reliable basis for analyzing imaging utility in pediatric dermatology.

Table 2: Lesion Type

Sr No	Lesion Type	Clinical n (%)	Imaging (USG, MRI, CT)n (%)
1	Vascular malformations	17 (85%)	20 (20%)
2	Deep fungal infections	11 (70%)	15 (15%)
3	Melanoma	9 (90%)	10 (10%)
4	Chronic eczema	19 (75%)	25 (25%)
5	Viral lesions	24 (80%)	30 (30%)
6	Other	20 (20 %)	0 (0 %)
Total N (%)		80 (80%)	100 (100 %)

Clinically, 80% of cases were initially labeled based on dermatological examination, while imaging confirmed or refined diagnoses in all 100 cases. Vascular malformations were clinically suspected in 17 children but imaging confirmed 20 cases, highlighting its role in detecting additional lesions. Similarly, deep fungal infections were clinically identified in 11 cases but imaging revealed 15, underscoring the importance of CT/MRI in uncovering deeper involvement. Melanoma showed high concordance, with 9 clinical diagnoses and 10 confirmed radiologically. Chronic eczema and viral lesions also demonstrated higher detection rates on imaging (25 and 30 cases respectively) compared to clinical suspicion (19 and 24 cases). Interestingly, 20 cases clinically labeled as “other” were not supported radiologically, emphasizing the corrective role of imaging.

Table 3: Clinico-Radiological Concordance

Sr No	Lesion Type	Concordance n (%)	Discordance n (%)	% Concordance
1	Vascular malformations	17 (85%)	3 (15%)	85%
2	Deep fungal infections	11 (70%)	4 (30%)	70%
3	Melanoma	9 (90%)	1 (10%)	90%
4	Chronic eczema	19 (75%)	6 (25%)	75%
5	Viral lesions	24 (80%)	6 (20%)	80%
Total N (%)		80 (80%)	20 (20%)	80%

Overall concordance between clinical and imaging diagnoses was 80%, with discordance in 20% of cases. The highest concordance was observed in melanoma (90%), followed by vascular malformations (85%), viral lesions (80%), chronic eczema (75%), and deep fungal infections (70%). Discordant cases represented mislabeling at the clinical level, where imaging corrected or refined the diagnosis. This highlights imaging as a decisive tool in reducing diagnostic error, particularly in fungal infections and chronic eczema where clinical overlap with other dermatoses is common.

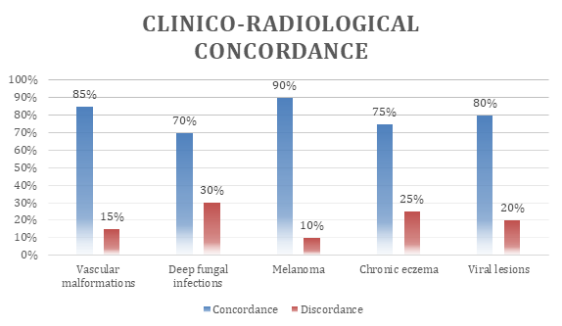

Figure 1: Clinico Radiological Concordance

Table 4: Therapeutic Decision Influenced by Imaging

Sr No	Therapeutic Decision Influenced by Imaging	N	%
1	Biopsy site selection	20	20 %
2	Surgical excision planning	25	25 %

3	Systemic therapy initiation (antifungal/antiviral)	15	15 %
4	Conservative management (avoiding surgery)	30	30 %
5	advanced care referral	10	10 %
Total N (%)		100	100 %

Imaging findings directly influenced therapeutic decisions in all 100 cases. In 20% of patients, imaging guided biopsy site selection, ensuring representative sampling. Surgical excision planning was impacted in 25% of cases, particularly vascular malformations and melanoma where lesion depth and extent were critical. Systemic therapy initiation (antifungal or antiviral) was prompted in 15% of cases based on imaging evidence of deeper or disseminated disease. Importantly, imaging prevented unnecessary surgery in 30% of children by supporting conservative management. In 10% of cases, advanced care referral was necessitated, reflecting imaging's role in identifying severe or systemic involvement. Collectively, these findings demonstrate that imaging not only validates clinical impressions but also shapes individualized therapeutic strategies.

DISCUSSION

The present study highlights the significant role of imaging in pediatric dermatology, with an overall concordance rate of 80% between clinical and radiological diagnoses. This is notably higher than the concordance reported in a cohort analysis of skin and soft tissue infections, where radiology dermatology agreement was only 36.5%, with MRI showing the highest concordance at 68.4% while CT and USG were under 25%.[4] The higher concordance in our study may be attributed to the structured use of imaging modalities tailored to lesion type—MRI for vascular malformations and melanoma, CT for deep fungal infections, and USG for eczema and viral lesions. For vascular malformations, our concordance of 85% aligns closely with findings from Piprikar et al., who reported an 86% concordance between ultrasonography and dermoscopy in pediatric vascular anomalies.[5] This reinforces the reliability of USG as a first line tool, especially when combined with other modalities for deeper characterization. Similarly, melanoma in our cohort showed the highest concordance (90%), consistent with reports that advanced imaging techniques such as VECTRA and AI analysis can facilitate conservative management and reduce unnecessary excisions in pediatric melanoma cases.[6] Discordance was observed in 20% of cases, particularly in deep fungal infections (30%) and chronic eczema (25%). This reflects the diagnostic overlap of these conditions with bacterial or inflammatory dermatoses, a challenge also noted in international studies where radiologic misinterpretation of nonspecific soft tissue changes led to misclassification of cellulitis and related conditions.[7] Our findings emphasize the corrective role of imaging in such scenarios, preventing inappropriate antibiotic use or surgical intervention. The therapeutic impact of imaging was evident across all cases. Imaging guided biopsy site selection (20%), optimized surgical excision planning (25%), and prompted systemic therapy initiation (15%). Importantly, imaging supported conservative management in 30% of patients, thereby avoiding unnecessary surgery. This outcome parallels evidence from reflectance confocal microscopy studies, which highlight the value of non-invasive imaging in reducing reliance on biopsies and enabling longitudinal monitoring in pediatric dermatology.[8] Furthermore, advanced care referral in 10% of cases underscores imaging's role in identifying systemic or severe disease requiring specialized intervention.

By comparing our findings with similar studies, it is clear that imaging modalities significantly enhance diagnostic accuracy in pediatric dermatology. The high concordance rates, particularly for vascular malformations and melanoma, validate imaging as a confirmatory tool. Discordant cases highlight the importance of radiological correction in complex dermatoses. Most importantly, the productive outcomesranging from biopsy guidance to avoidance of unnecessary surgerydemonstrate that imaging is not merely diagnostic but decisively therapeutic in its influence.

CONCLUSION

Imaging modalities such as ultrasonography, MRI, and CT significantly enhance diagnostic accuracy in pediatric dermatology. In this study, overall clinico radiological concordance was 80%, with imaging correcting misdiagnoses in 20% of cases. Beyond diagnosis, imaging directly influenced therapeutic decisions, guiding biopsy, surgical planning, systemic therapy, conservative management, and advanced care referral. These findings establish imaging not only as a diagnostic adjunct but also as a decisive tool that improves patient outcomes and reduces unnecessary interventions.

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