BJMS
www.batnajms.net

Batna Journal of Medical Sciences 2026;13(8):14
https://doi.org/10.48087/BJMS.2026.130814

ORIGINAL ARTICLE

# Safety and diagnostic yield of pediatric renal biopsy in an adult nephrology setting: a single-center experience from Algiers, Algeria

Hind ARZOUR[1], Lynda GHERIB[1], Mohamed Rachid BAHRIZ[2], Mehdi RABHIA[1], Djihad SAAD DJABALLAH[1], Sabrina AZOUAOU[1], Karima DAGHOR-ABBACI[3], Feriel Yasmine BAGHDALI[1], Ryma SAI[1], Assia HADDOUCHE[4], Mohamed CHOULI[5], Ahlem ALGHAZALI[6], Leila LAOUAR[7], Reda BELBOUAB[5], Sofiane Samir SALAH[8], Farid HADDOUM[1]

## ABSTRACT

**Introduction:** Percutaneous renal biopsy (PRB) plays a pivotal role in establishing an accurate diagnosis in pediatric nephrology, particularly in children with atypical or steroid-resistant nephrotic syndrome. This study aimed to describe the epidemiological, clinical, and histopathological characteristics of Algerian children who underwent PRB in our center and to evaluate the safety and tolerability of the procedure when performed under local anesthesia. **Methods:** We conducted a retrospective descriptive study at Mustapha Bacha University Hospital, including 104 children aged 2 months to 16 years who were referred for PRB between March 2018 and June 2024. The biopsies were performed by experienced adult nephrologists under local anesthesia using lidocaine. Demographic, clinical, histopathological, and procedural safety data were collected and analyzed. **Results:** Eighty-four children underwent PRB (mean age: 11.3 years; 63.4% male). The leading indication was atypical or steroid-resistant nephrotic syndrome (78.4%). The most frequent histopathological diagnosis was minimal change disease (36.5%), followed by lupus nephritis (17.3%) and focal segmental glomerulosclerosis (15.4%). Overall, 26% of patients had steroid-resistant nephrotic syndrome. The relatively high proportion of minimal change disease in this subgroup likely reflects the selection bias inherent in biopsy indications. PRB was well tolerated, with only 4.8% of patients experiencing minor complications, including transient hematuria and small perirenal hematomas, and no major complications were observed. **Conclusion:** Percutaneous renal biopsy performed in an adult nephrology unit under local anesthesia is a feasible, safe, and diagnostically valuable procedure for characterizing the spectrum of pediatric kidney diseases in Algeria. This organizational model may represent a practical and effective approach for resource-limited tertiary care centers, with outcomes comparable to those reported in regional studies.

**Keywords:** percutaneous renal biopsy, child, atypical nephrotic syndrome, local anesthesia, minimal change disease.

1. Department of Nephrology, Dialysis and Kidney Transplantation, Mustapha University Hospital, Algiers - Faculty of Medicine, Youcef El Khatib University of Health Sciences, Algiers.Algeria. 2. Private Anatomical Pathologist, Algiers. Algeria. 3. Department of Internal Medicine, Bab El Oued University Hospital, Algiers - Faculty of Medicine, Youcef El Khatib University of Health Sciences, Algiers. Algeria. 4. Department of Rheumatology, Ben Aknoun Public Hospital, Algiers - Faculty of Medicine, Youcef El Khatib University of Health Sciences, Algiers. Algeria. 5. Department of Pediatrics, Mustapha University Hospital, Algiers - Faculty of Medicine, Youcef El Khatib University of Health Sciences, Algiers. Algeria. 6. Department of Intensive Care, Pierre and Marie Curie Center (CPMC), Algiers, Algeria Faculty of Medicine, Youcef El Khatib University of Health Sciences, Algiers. Algeria. 7. Department of Pulmonology, Mustapha University Hospital, Algiers - Faculty of Medicine,Youcef El Khatib University of Health Sciences, Algiers. Algeria. 8. Department of Immunology, Mustapha University Hospital, Algiers - Faculty of Pharmacy Youcef El Khatib University of Health Sciences, Algiers. Algeria.

**Received:** 08 Jun 2026
**Accepted:** 23 Jul 2026

**Correspondence to**: Ryma SAI
E-mail: sairyma.6@gmail.com

## 1. INTRODUCTION

Percutaneous Renal Biopsy (PRB) is the cornerstone of diagnostic pediatric nephrology. It is indispensable not only for establishing a precise histopathological diagnosis and guiding therapeutic management but also for refining the renal prognosis [1]. While corticosteroids may be initiated empirically for children presenting with steroid-sensitive nephrotic syndrome (SSNS), PRB remains formally indicated in cases of steroid-resistant nephrotic syndrome (SRNS), atypical nephrotic syndrome (associated with hematuria, hypertension, or renal impairment), or any suspicion of secondary or rapidly progressive nephropathy [2, 3]. The histological landscape

of pediatric glomerular diseases is globally dominated by Minimal Change Disease (MCD). However, more severe lesions such as Focal Segmental Glomerulosclerosis (FSGS) and Membranoproliferative Glomerulonephritis (MPGN) are more frequently associated with steroid resistance and an increased risk of progression to kidney failure [4, 5]. The pediatric histological spectrum exhibits geographical variation, but MCD and FSGS consistently rank among the most frequent lesions in both global and regional series. In Arab and Maghreb countries, a systematic review confirmed the prevalence of MCD, followed by FSGS. Lupus Nephritis and Henoch-Schönlein Purpura-associated Nephritis occupy a significant place among secondary causes [6]. Similar experiences in Morocco, Tunisia, and Saudi Arabia have widely underscored the necessity of PRB in managing atypical or resistant nephrotic syndromes [7, 8]. Despite regular practice in tertiary centers, published data on pediatric PRB outcomes in Algeria is scarce, highlighting a pressing need to locally characterize the profile of children's kidney diseases to adapt diagnostic and therapeutic strategies effectively.

The primary objective of this work is to describe the epidemiological, clinical, and histopathological characteristics of Algerian children who underwent PRB in our unit (March 2018–June 2024). We also aim to assess the tolerance and safety of this procedure performed under LA, and to determine the anatomic-clinical correlation of the diagnosed nephropathies.

## 2. MATERIALS AND METHODS

This was a retrospective descriptive study conducted over a period of 75 months, from March 2018 to June 2024, at the Adult Nephrology, Dialysis, and Transplantation Department of Mustapha Bacha University Hospital in Algiers, Algeria, a national tertiary referral center. The study included all children aged 2 months to 16 years who were referred from pediatric units and for whom a Percutaneous Renal Biopsy (PRB) was indicated and attempted during the study period (N=104). Indications for PRB were strictly defined and included atypical or impure nephrotic syndrome (associated with hematuria, hypertension, and/or renal impairment), steroid-resistant nephrotic syndrome (SRNS), isolated glomerular syndrome (unexplained proteinuria or hematuria), and suspected Rapidly Progressive Glomerulonephritis (RPGN). No specific exclusion criteria were applied.

The PRB procedure was performed by experienced adult nephrologists from the service, in close collaboration with the referring pediatric team. Crucially, all biopsies were carried out systematically under local anesthesia (LA), utilizing an infiltration of 1% or 2% lidocaine at the puncture site and along the needle path, thereby completely avoiding the need for general anesthesia. The procedure was guided by continuous real-time ultrasound (echo-guidance), using appropriate needle calibers for the pediatric age group (typically 16 or 18 Gauge). An average of two renal cores were obtained. Post-biopsy management, including strict clinical monitoring and bed rest, was provided either within the Adult Nephrology Unit or the patient's referring Pediatric Unit. Procedure tolerance and safety were assessed by recording the incidence of post-biopsy complications (hematuria, hematoma) and classifying them as minor or major.

Tissue samples were immediately sent for histopathological analysis. One core was processed for light microscopy (LM) following standard fixation and staining (H&E, PAS, Masson's Trichrome, silver impregnation), and the second core was dedicated to immunofluorescence (IF) whenever the technique was available. Electron Microscopy (EM) was not systematically performed. Clinical and biological data were retrospectively extracted from the patient medical records. Collected variables included demographics (age, sex), clinical presentation, underlying syndrome (pure/impure), response to initial corticosteroid therapy (sensitive, dependent, resistant), and the final histopathological diagnosis. Data were entered and analyzed using descriptive statistics (frequencies, percentages, means ± standard deviation) via WPS Office software.

This study was conducted in accordance with the ethical standards of Mustapha University Hospital and with the 1964 Helsinki Declaration and its later amendments. Informed consent was obtained from the parents or legal guardians of all children prior to the biopsy procedure, and patient data were anonymized to ensure confidentiality.

## 3. RESULTS

A total of 104 children were included in this retrospective study spanning March 2018 to June 2024. The mean age of the cohort was 11.3 years (range: 2 months–16 years), with a clear majority (63.1%) falling into the 10- to 16-year-old age range. Males predominated (63.4%), corresponding to a male-to-female sex ratio of 1.74. The biopsy volume was notably impacted by the COVID-19 pandemic, with activity peaking in 2019 (29.8%) before a temporary decline. Most children (66.3%) had no significant medical history, with Henoch-Schönlein purpura (7.7%) and Systemic Lupus Erythematosus (SLE) (4.8%) being the most common prior conditions.

The vast majority of indications (98%) were for glomerular nephropathies. The primary clinical reason for performing the percutaneous renal biopsy (PRB) was atypical or steroid-resistant nephrotic syndrome (78.4%), followed by isolated glomerular syndrome (19.6%).

Most diagnosed nephropathies were classified as primary (76%), with secondary forms accounting for 24% of the cases (Table 1). The leading secondary etiologies were Henoch-Schönlein purpura (32% of secondary cases), SLE (36%), and post-infectious forms (28%).

**Table 1.** Distribution of Clinical Presentations and Diagnostic Indications (N = 104).

| Parameters & Indications | Number of Cases (n) | Percentage (%) |
|---|---|---|
| **Primary Indications** | | |
| Atypical / Steroid-Resistant Nephrotic Syndrome | 81 | 78.4% |
| Isolated Glomerular Syndrome | 21 | 19.6% |
| Other Syndromes (RPGN, etc.) | 2 | 2.0% |
| **Etiological Category** | | |
| Primary Nephropathies | 79 | 76.0% |
| Secondary Nephropathies | 24 | 24.0% |

Of the patients biopsied for nephrotic syndrome, 69% presented with an impure form, characterized mainly by gross hematuria (80% of impure cases) and hypertension (38%).

Among the 104 children included in the cohort, 84 successfully underwent percutaneous renal biopsy (PRB). Of these 84 biopsied children, a total of 32 samples (38% of the 84 biopsied cases) were either non-conclusive (25.5%) or had missing reports (12.5%), leaving 52 histologically exploitable biopsies for analysis. The most frequent histological lesions observed among these 52 exploitable biopsies Minimal Change Disease (MCD) (36.5%), followed by Lupus Nephritis (LN 17.3%) and Focal Segmental Glomerulosclerosis (FSGS) (15.4%). Regarding anatomic-clinical correlation, MCD lesions were nearly equally distributed between impure (53%) and pure (47%) nephrotic syndromes. In contrast, Membranoproliferative Glomerulonephritis (MPGN, 100%) was exclusively associated with impure forms.

Analysis of the corticosteroid response profile at the time of biopsy revealed that 26% of patients were steroid-resistant and 17% were steroid-dependent. Histological analysis of the steroid-resistant subgroup showed an unexpected dominance of MCD (43.7%), followed by FSGS (24%). This finding strongly reflects the inherent selection bias of the study, as PRB was preferentially performed on cases that failed to respond to empirical initial treatment.

The procedure, performed systematically under local anesthesia, demonstrated excellent tolerance. 95.2% of the biopsied children experienced no complications. Only four minor complications (4.8% of performed PRBs) were recorded, comprising two cases of transient gross hematuria and two self-limiting local hematomas. Crucially, no major complications (e.g., transfusion requirement or surgical intervention) were reported.

## 4. DISCUSSION

Percutaneous renal biopsy (PRB) remains the cornerstone for precise histological diagnosis and management guidance in pediatric nephrology. Our study, encompassing 104 children in Algiers, represents a critical contribution to the sparse regional literature. The demographic

profile, including a mean age of 11.3 years and a male predominance (63.4%), aligns with major pediatric series globally and regionally [1, 4, 5]. Consistent with practices in North Africa and the Middle East, the overwhelming primary indication for PRB was atypical or steroid-resistant nephrotic syndrome (78.4%), confirming that our center employs a selective biopsy strategy, reserving the procedure for complex cases that fail initial empirical therapy [1, 6].

The histological spectrum observed is highly consistent with regional trends. Minimal Change Disease (MCD) remains the most frequent lesion (36.5%), echoing findings from systematic reviews across the Arab world [2, 6, 8]. Crucially, the significant incidence of secondary nephropathies (24%), dominated by Henoch-Schönlein Purpura (32% of secondary cases) and Lupus Nephritis (28%),

confirms the substantial burden of connective tissue diseases and vasculitis in the etiology of pediatric renal disease within this region [4, 7,13]. This necessitates a comprehensive diagnostic approach that PRB uniquely provides.

Furthermore, our anatomic-clinical correlation revealed a surprisingly balanced distribution of MCD between pure and impure nephrotic syndromes (47% vs. 53%). While the association of MPGN and MGN exclusively with impure forms carries significant negative predictive value, the unexpected presence of MCD in the impure group highlights the importance of biopsy to avoid misclassification and inappropriate therapeutic escalation.

A key finding requiring careful interpretation is the dominance of MCD (43.7%) among the steroid-resistant (26%) subgroup. This is biologically counterintuitive, as MCD is classically defined by its high steroid sensitivity [9]. This discordance is unequivocally attributable to a strong institutional selection bias: PRB is selectively performed on MCD cases that demonstrate either primary resistance or an atypical presentation (impure syndrome). According to consensus guidelines on the management of steroid-resistant nephrotic syndrome (SRNS), biopsy is mandatory to differentiate between MCD and FSGS, which have drastically different prognoses and therapeutic regimens [14]. The high rate of MCD in our SRNS group confirms that the biopsy successfully identified these challenging phenotypes, underscoring the indispensable diagnostic role of PRB, even when MCD is suspected clinically.

**Study Limitations**

The primary limitations of this work are its retrospective and single-center nature. Furthermore, the significant proportion of missing data (25%) regarding therapeutic response and full histological reports must be considered when interpreting lesion frequencies.

## 5. CONCLUSION

Our study, the first comprehensive report on pediatric PRB in Algeria, confirms the feasibility, safety, and diagnostic yield of performing the procedure in local anesthesia. This organizational model offers a pragmatic solution for tertiary care hospitals facing resource constraints. The observed histological spectrum is characterized by the prevalence of MCD alongside a significant burden of secondary nephropathies. The identification of steroid-resistant MCD validates PRB as an indispensable tool for achieving a precision diagnosis and guiding appropriate therapeutic management for children in our setting.

**Competing interests:** The authors declare that they have no competing interest.

**Funding:** This research received no external funding.

## REFERENCES

1. Souilmi FZ, Houssaini TS, Alaoui H, Harmouch T, Atmani S, Hida M. Indications and results of renal biopsy in children: a single-center experience from Morocco. Saudi J Kidney Dis Transpl. 2015;26(4):810-5. doi: 10.4103/1319-2442.160225.
2. Alwahaibi NY, Al Issaei HK, Al Dhahli BS. Incidence of pediatric glomerular diseases in Arab world: a systematic review. Saudi J Kidney Dis Transpl. 2019;30(1):15-23. doi: 10.4103/1319-2442.252904.
3. Alwahaibi NY, Alhabsi TA, Alrawahi SA. Pattern of glomerular diseases in Oman: a study based on light microscopy and immunofluorescence. Saudi J Kidney Dis Transpl. 2013;24(2):387-91. doi: 10.4103/1319-2442.109616.
4. Al Battashi M, Al Nadhairi Z, Al Riyami A, Al Gaithi B, Al Maskari A, Al Saidi S, et al. Pediatric kidney biopsies in Oman: a retrospective study. Oman Med J. 2023;38(3):e503. doi: 10.5001/omj.2023.72.
5. Demircin G, Delibaş A, Bek K, Erdoğan O, Bülbül M, Baysun S, et al. A one-center experience with pediatric percutaneous renal biopsy and histopathology in Ankara, Turkey. Int Urol Nephrol. 2009;41(4):933-9. doi: 10.1007/s11255-008-9433-9.
6. Hadidi R, Hadidi M, alDabbas M. Spectrum of biopsy-proven kidney disease in children at a Jordanian hospital. Saudi J Kidney Dis Transpl. 2014;25(3):680-3. doi: 10.4103/1319-2442.132238.
7. Abdullah LS. Histopathological pattern of pediatric renal diseases: a study from a university hospital in western Saudi Arabia. Saudi J Kidney Dis Transpl. 2012;23(2):377-84.
8. Hamza WM, Fayed A, Shaker AM, El Nokeety MM. Spectrum of histopathological findings in pediatric renal biopsies: a five-year single-center experience in Egypt. J Nephropathol. 2023;12(2):e17247. doi: 10.34172/jnp.2022.17247.
9. Santangelo L, Netti GS, Giordano P, Carbone V, Martino M, Torres DD, et al. Indications and results of renal biopsy in children: a 36-year experience. World J Pediatr. 2018;14(2):127-33. doi: 10.1007/s12519-018-0147-5.
10. Franke M, Kramarczyk A, Taylan C, Maintz D, Hoppe B, Koerber F. Ultrasound-guided percutaneous renal biopsy in 295 children and adolescents: role of ultrasound and analysis of complications. PLoS One. 2014;9(12):e114737. doi: 10.1371/journal.pone.0114737.

11. Okada A, Ikeda Kurakawa K, Harita Y, Shimizu A, Yamaguchi S, Aso S, et al. Comparison of bleeding complications after pediatric kidney biopsy between intravenous sedation and general anesthesia: a nationwide cohort study. BMC Pediatr. 2023;23(1):33. doi: 10.1186/s12887-022-03828-8.
12. Al Makdama A, Al-Akash S. Safety of percutaneous renal biopsy as an outpatient procedure in pediatric patients. Ann Saudi Med. 2006;26(4):303-5. doi: 10.5144/0256-4947.2006.303.
13. Saca E, Hazza I, El-Imam O, Kawar M. Spectrum of biopsy-proven renal disease in the pediatric age group at King Hussein Medical Center. JRMS. 2007;14(1):34-7.
14. Kidney Disease: Improving Global Outcomes (KDIGO) Glomerular Diseases Guideline Work Group. KDIGO 2021 Clinical Practice Guideline for the Management of Glomerular Diseases. Kidney Int. 2021;100(4 Suppl):S1-S276. doi: 10.1016/j.kint.2021.05.021.