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DIAGNOSTIC YIELD AND SAFETY OF PERCUTANEOUS LIVER BIOPSIES IN NORTH-WESTERN NIGERIA: CLINICAL OUTCOMES AND ONE HEALTH IMPLICATIONS

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Abstract

Accurate histological diagnosis of liver diseases supports the One Health framework by enabling identification of conditions influenced by infectious, environmental, and zoonotic exposures. Percutaneous liver biopsy (PLB) remains the gold standard for diagnosing and staging diverse liver diseases, particularly in regions where non-invasive diagnostic modalities are limited. Despite its widespread use, there is limited contemporary data on the diagnostic yield and safety of PLB in North-Western Nigeria. This study assessed the diagnostic performance and complication profile of PLB in a tertiary hospital over four years. A retrospective review was conducted on all adult patients who underwent PLB at Usmanu Danfodiyo University Teaching Hospital, Sokoto, from January 2021 to December 2024. Demographic, clinical, procedural, and histopathological data were extracted from medical and pathology records. Diagnostic yield was defined as the proportion of biopsies with a definitive histological diagnosis. Complications were categorized as minor or major. Data were analysed using SPSS version 25, with associations evaluated using chi-square tests. A total of 68 patients (mean age 35.1 ± 12.6 years; 55.9% male) underwent PLB. Chronic hepatitis was the most common indication (72.1%). Adequate tissue (≥1.5 cm) was obtained in all cases, yielding a diagnostic rate of 98.5%. Most biopsies (86.8%) were performed using the blind technique. Complications occurred in 86.8% of patients, all minor, predominantly post-procedural pain (94.9%); no major complications or mortality were recorded. Younger age was significantly associated with the occurrence of complications ($p = 0.025$). Percutaneous liver biopsy demonstrates excellent diagnostic yield and a favourable safety profile in this setting. It remains indispensable for liver disease evaluation in resource-limited environments.

Keywords: Percutaneous liver biopsy; Diagnostic yield; Complications.

INTRODUCTION

An essential organ, the liver plays a key role in several metabolic, synthetic, and detoxifying processes. As a result, a broad range of illnesses, such as autoimmune, metabolic, neoplastic, and viral diseases, can affect it, resulting in substantial morbidity and mortality on a global scale (Ginès et al., 2021). Despite significant advancements, non-invasive diagnostic techniques such as computed tomography (CT), fibroscan, and ultrasonography often fail to provide a conclusive histological diagnosis (Neuberger et al., 2020). Percutaneous liver biopsy (PLB) continues to prove its lasting value in this diagnostic void.

In hepatology, PLB remains a crucial diagnostic technique, especially in tertiary institutions where histological confirmation is often essential. The "gold standard" for diagnosing, staging, and treating a variety of liver diseases, such as inflammatory, metabolic, neoplastic, and cholestatic disorders, remains the liver biopsy, which is most frequently performed percutaneously and permits direct sampling of hepatic parenchyma (Chan & Navarro, 2023). Therefore, a crucial indicator of PLB's clinical usefulness is its diagnostic yield, which is the percentage of biopsies in which a conclusive histological diagnosis is obtained. A high diagnostic yield confirms the procedure's role in providing prognostic information and guiding therapeutic decisions, such as initiating immunosuppressive therapy for autoimmune hepatitis or antiviral treatment for chronic hepatitis B.

Despite its diagnostic supremacy, PLB is an invasive procedure and is not without risk. Its safety profile is a paramount concern for clinicians and patients alike. Even though they are rare, consequences can range from minor, self-limiting occurrences like temporary hypotension and localised pain at the biopsy site to more significant, major ones. The most feared significant complication is haemorrhage, which can present as subcapsular or intraperitoneal haemorrhage and can cause haemodynamic instability and, in rare cases, death (Thomaides-Brears et al., 2022). Biliary peritonitis, infection, and penetration of nearby organs (such as the colon or gallbladder) are further uncommon side effects. With a mortality rate of roughly 0.1%, the reported rates of serious complications vary worldwide but are typically described as being below 1% to 2% (Midia et al., 2019).

The safety of the procedure is influenced by several factors, such as the operator's skill, the patient's coagulation status, the use of real-time ultrasound guidance, and the type of needle used (Geta, 2021).

Percutaneous liver biopsy has a wide range of changing clinical indications. Its primary role has historically been to diagnose and stage chronic viral hepatitis. However, metabolic dysfunction-associated steatotic liver disease (MASLD) and its more severe variant, metabolic dysfunction-associated steatohepatitis (MASH), have emerged as the main indications in many regions of the world due to the global rise in metabolic syndrome (Teng et al., 2022). The assessment of drug-induced liver injury, the diagnosis of autoimmune liver illnesses, the examination of unexplained hepatomegaly or abnormal liver enzymes, and the examination of suspected hepatic masses or infiltrative disorders are other common indications (Neuberger et al., 2020).

The spectrum of liver disease is thought to have distinct features in Nigeria, especially in the North-Western region. Viral hepatitis, especially Hepatitis B, which is hyperendemic in sub-Saharan Africa, is prevalent in this area (Schmit et al., 2021). In addition, toxic liver injuries from herbal remedies and environmental pollutants, as well as other infectious aetiologies like hepatic tuberculosis, are highly prevalent. Concern over the growing incidence of MASLD amid urbanisation is also emerging (Onyekwere et al., 2016). Consequently, due to differences in illness frequency, patient

demographics, resource availability, and technical knowledge, the pattern of indications, diagnostic yield, and consequences of PLB in this particular group may differ dramatically from those in Western or other African communities.
There is a significant lack of recent, thorough data from tertiary institutions in North-Western Nigeria, despite multiple studies worldwide confirming the safety and effectiveness of PLB (Geta, 2021). Local audit and research are essential, as they reflect the realities of the local practice environment, including available technology, the skill set of the operators, and the unique patient population. Understanding the local demographic profile of patients undergoing this procedure, the spectrum of indications, and, most importantly, the institution-specific diagnostic yield and complication rates, is crucial for quality assurance, optimal patient selection, and counselling (Charrier et al., 2025).
By doing this, the study adds to the growing body of research supporting the safe and efficient use of percutaneous liver biopsy in resource-limited settings. It may also highlight particular difficulties or improvements required in northwest Nigeria.
Accurate histological diagnosis of liver diseases supports the One Health framework by enabling identification of conditions influenced by infectious, environmental, and zoonotic exposures.
This study, therefore, aims to conduct a 4-year review of the Diagnostic Yield and Safety of Percutaneous Liver Biopsies in North-Western Nigeria: Clinical Outcomes and One Health Implications

METHODOLOGY

Study Design and Setting

This study is a retrospective, descriptive, design. It involved review of medical records of all patients who underwent PLB at the Gastroenterology/Hepatology unit of Usmanu Danfodiyo University Teaching Hospital (UDUTH) Sokoto, North-Western Nigeria. The review covered a four-year period, from January 2021, to December 2024.

Study Population and Sampling

The study population included all consecutive adult patients (aged 18 years and above) who underwent a PLB either blind or ultrasound guided during the study period. Exclusion criteria were: incomplete medical records where the biopsy report or key clinical data was missing, and biopsy procedures attempted that failed to yield a tissue sample.

Data Collection

Data were extracted from patient case files, procedure registers, and the histopathology department's records using a proforma. Data collected included age and gender as demographic data, clinical data; indication, histological outcome of the biopsied samples, diagnostic yield, and complications which are divided in to minor (pain and minor bleeding) and major (such as significant haemorrhage requiring blood transfusion or intervention, perforation of a viscus, or procedure-related mortality). Each patient had platelet count and Prothrombin Time/International Normalized Ratio (PT/INR) done before the procedure. For this study diagnostic yield was defined as; biopsied sample in which the pathologist's report provided a specific diagnosis, while an adequate sample was defined as biopsied sample that is 1.5cm in length either as single sample or as fragments.

Data Analysis
The collected data were entered into IBM SPSS Statistics Version 25 (Armonk, NY: IBM Corp). Descriptive statistics were computed for all variables. Categorical variables such as gender, indications, histological outcome and types of complication were presented as frequencies and percentages. Continuous variables such as age, and INR values were presented as means ± standard deviations. The diagnostic yield was calculated as a percentage of diagnostic biopsies from the total number of adequate biopsies performed. A chi-square was used to determine associations between the categorical variables. A p-value <0.05 was considered statistically significant, and results were reported at a 95% confidence interval.

Ethical Consideration
Ethical approval for this study was obtained from the Health Research Ethics Committee of the institution (UDUTH/HREC/2025/1672/V1).

RESULTS

A total of 68 patients underwent percutaneous liver biopsy during the study period from January 2021 to December 2024. The highest number of procedures was recorded in 2021 (45.6%), while the fewest occurred in 2023 (13.2%). The patients' ages ranged from 20 to 69 years, with a mean ± SD of 35.10 ± 12.60 years. The majority (45.6%) were aged 20–29 years, and males constituted 55.9% of the cohort. The clinical indications for liver biopsy were chronic hepatitis (72.1%), liver mass (13.2%), metabolic dysfunction–associated steatotic liver disease (11.8%), while abnormal liver function tests accounted for 2.9%. Histologically, chronic hepatitis (72.1%) was the most frequent finding, followed by steatohepatitis (8.8%), while malignant liver mass, benign liver mass and steatosis each constitute 5.9%. The inconclusive results were recorded in 1.5% of patients. The above was shown in Table I.

Most biopsies (86.8%) were performed using the blind technique, while 13.2% were ultrasound-guided. Adequate tissue samples (≥1.5 cm) were obtained in all cases. A single needle pass was sufficient to obtained adequate samples in 85.3% of cases, with 60.3% yielding one core tissue piece and 30.9% yielding two pieces. Overall, diagnostic yield was excellent, with 98.5% of biopsies providing adequate diagnostic information as reflected in Table II.

Assessment of safety outcomes revealed that complications occurred in 86.8% of patients, all of which were minor. The commonest minor complication was post-procedural pain (94.9%), followed by bleeding and pain together (3.4%) while bleeding only was seen in (1.7%). No major complications or mortality were recorded. The majority (64.7%) of patients with pain required analgesics. All patients had a pre-procedure INR < 1.5 and platelet count ≥ 50,000/μL (Table III).

Statistical analysis showed no significant association between diagnostic yield and age, gender, or indication for biopsy ($p > 0.05$). However, a significant association was observed between complication rate and patient age ($p = 0.025$). No significant relationship was found between complications and gender, biopsy indication, or other procedural parameters ($p > 0.05$) as demonstrated in Table IV and V.

Table I: Socio-Demographic and Clinical Characteristics of the Patients

Variables	**Frequency (n=68)**	**Percentage (%)**
Year		
2021	31	45.6
2022	16	23.5
2023	9	13.2
2024	12	17.6
Age (years)		
20-29	31	45.6
30-39	21	30.9
40-49	6	8.8
50-59	2	2.9
≥60	8	11.8
Gender		
Male	38	55.9
Female	30	44.1
Indications of Liver Biopsy		
Chronic Hepatitis	49	72.1
Liver Mass	9	13.2
MASLD	8	11.8
Abnormal LFT	2	2.9
Histological Outcome of Liver Biopsy		
Chronic Hepatitis	49	72.1
Malignant Liver Mass	4	5.9
Steatohepatitis	6	8.8
Steatosis	4	5.9
Benign Liver Mass	4	5.9
Inconclusive	1	1.5
Mean age		
Mean ± SD	35.10±12.60years	

LFT: Liver function test, MASLD: Metabolic Dysfunction Associated Steatotic Liver Disease, SD: Standard Deviation

Table II: Diagnostic Yield of Percutaneous Liver Biopsy Among the Patients

Variables	**Frequency (n=68)**	**Percentage (%)**
Type of PLB		

Blind	59	86.8
Ultrasound guided	9	13.2
Adequate Sample(≥1.5cm)	68	100
Number of Passes per Procedure		
One	58	85.3
Two	10	14.7
Number of Core Tissues Pieces Obtained		
One	41	60.3
Two	21	30.9
Three	6	8.8
Diagnostic Yield		
Adequate Diagnostic Yield	67	98.5
In adequate Diagnostic Yield	1	1.5

PLB=Percutaneous Liver Biopsy

Table III: Safety Profile of Percutaneous Liver Biopsy Among the Patients

Variables	Frequency (n=68)	Percentage (%)
Complication		
Yes	59	86.8
No	9	13.2
Type of Complication		
Minor	59	100
Major	NIL	NIL
Type of Minor Complication		
Pain	56	94.9
Bleeding	1	1.7
Pain and Bleeding	2	3.4
Patients Requiring Analgesic Yes	44	64.7

No	24	35.3
INR Pre-Procedure		
<1.5	68	100
≥1.5	NIL	NIL
Platelet Count Pre-Procedure		
>100,000	59	86.8
50,000-100,000	9	13.2

INR=International Normalize Ratio

Table IV: Relationship of Diagnostic Yield with Clinical and Biopsy Related Parameters

Variables	**Adequate Diagnostic Yield (n=67) n (%)**	**Inadequate Diagnostic Yield(n=1) n (%)**	**p-value χ^2 test**
Age			
20-29	31(46.3)	0(0)	p=0.235
30-39	21(31.3)	0(0)	x^2= 7.043
40-49	6(9.0)	0(0)	
50-59	2(3.0)	0(0)	
≥60	7(10.4)	1(100)	
Gender			
Male	37(55.2)	1(100)	p=1.00
Female	30(44.8)	0(0)	x^2=0.801
Indication for PLB			
Chronic Hepatitis	49(73.1)	0(0)	p=0.279
Liver Mass	8(11.9)	1(100)	x^2=0.801
MASLD	8(11.9)	0(0)	
Abnormal LFT	2(3.0)	0(0)	
Type of PLB			
Blind	59(88.1)	0(0)	p=0.132

Ultrasound guided	8(11.9)	1(100)	x^2= 6.653

PLB=Percutaneous Liver Biopsy, LFT=Liver Function Test, MASLD=Metabolic Dysfunction Associated Steatotic Liver Disease

Table V: Relationship of PLB Complication with Clinical and Biopsy Related Parameters

Variables	**Complication Present (n=59) n (%)**	**Complication Absent Yield(n=9) n (%)**	**p-value χ^2 test**
Age			
20-29	27(45.8)	4(44.4)	p=0.025*
30-39	21(35.6)	0(0)	x^2= 9.724
40-49	4(6.8)	2(22.2)	
50-59	2(3.4)	0(0)	
≥60	5(8.5)	3(33.3)	
Gender			
Male	30(50.8)	8(88.9)	p=0.067
Female	29(49.2)	1(11.1)	x^2=4.584
Indication for PLB			
Chronic Hepatitis	43(72.9)	6(66.7)	p=0.792
Liver Mass	7(11.9)	2(22.2)	x^2=1.346
MASLD	7(11.9)	1(11.1)	
Abnormal LFT	2(3.4)	0(0)	
Type of PLB			
Blind	52(88.1)	7(77.8)	p=0.340
Ultrasound guided	7(11.9)	2(22.2)	x^2= 0.730
Number of Passes			
One	52(88.1)	6(66.7)	p=0.120
Two	7(11.1)	3(33.3)	x^2= 2.869
Platelet Count			
>100	50(84.7)	9(100)	p=0.346
50-100	9(15.3)	0(0)	x^2= 1.582

PLB=Percutaneous Liver Biopsy, LFT=Liver Function Test, MASLD=Metabolic Dysfunction Associated Steatotic Liver Disease

DISCUSSION

This four-year retrospective research analyses the practice and outcomes of PLB in a tertiary institution in North-Western Nigeria. The study, comprising 68 procedures, provides significant insights into the demographic characteristics, clinical indications, diagnostic efficacy, and, importantly, the safety profile of this invasive diagnostic procedure in a resource-constrained environment.

The demographic profile of our study sample is characterized by a mean age of 35.1 ± 12.6 years, with the majority aged 20–29 years, and 55.9% were male. These findings suggest that PLB in our context is conducted with a younger cohort than in many Western studies, where the mean age frequently exceeds 50 years. The findings are similar to patterns reported in earlier research on liver diseases conducted in Nigeria and sub-Saharan Africa (Oje et al., 2024). A study conducted in Lagos, South-West Nigeria, found a mean age in the fourth decade for patients having liver biopsy, indicating a younger demographic and the early onset of liver diseases, notably viral hepatitis, in the region (Oje et al., 2024).

The significant prevalence of chronic hepatitis (72.1%) as the primary reason for PLB is a notable observation. It corresponds with the established hyperendemicity of Hepatitis B virus (HBV) in Nigeria, where national prevalence rates are estimated to range from 5.4% to 13% (Olakunde et al., 2025). This discovery highlights the ongoing and significant impact of viral hepatitis as a primary contributor to chronic liver disease in North-Western Nigeria, establishing PLB as a crucial instrument for grading and staging the disease to inform the commencement of antiviral therapy.

The comparatively lower percentages of indications MASLD (11.8%) and liver masses (13.2%) are also informative. Although MASLD is emerging as a global pandemic and a primary indication for biopsy in Western countries (Amini-Salehi et al., 2024), its reduced incidence in our study may be attributed to several factors: the predominant prevalence of viral hepatitis, potential underdiagnosis in primary care, and a possibly distinct, albeit increasing, true prevalence in our population. The discovery of hepatic masses underscores the significance of PLB in the diagnostic evaluation of space-occupying liver lesions, an essential role in areas with elevated rates of hepatocellular carcinoma, which frequently complicate chronic HBV infection.

The remarkable diagnostic yield of 98.5% seen in this study substantiates the designation of PLB as the gold standard for histopathological diagnosis of liver disorders. This figure is comparable to, and even exceeds, the yields documented in several worldwide investigations, which generally range from 93% to 96% (Neuberger et al., 2020). A Nigerian study comparing blind and ultrasound-guided PLB found a 100% yield with ultrasound guidance and 93.5% with the blind approach ($p = 0.008$) (Aliyu S & AB, 2020). The elevated yield in our group likely indicates effective procedural planning, an adequate sample size (≥1.5 cm in total), and possibly a selection bias towards patients suitable for biopsy.

The elevated adequacy rate questions the essential role of routine ultrasonography guidance, a standard recommendation in most international guidelines (Neuberger et al., 2020). Although ultrasound guidance is indisputably more successful for targeting localized lesions and in patients with complex anatomical considerations, our results

indicate that in environments characterized by a high prevalence of diffuse liver disease (such as chronic hepatitis) and skilled practitioners, the blind technique can be remarkably efficient, this our findings is a crucial discovery for resource-constrained environments where ultrasound devices or qualified sonographers may not be accessible for every procedure. Furthermore, the safety profile is satisfactory even with a blind approach; however, ultrasound guidance could further diminish even mild pain or bleeding (Midia et al., 2019).

Our observation of complications in 86.8% of patients (all mild) exceeds that reported in other PLB studies (Thomaides-Brears et al., 2022). A comprehensive review and meta-analysis encompassing 64,356 percutaneous liver biopsies identified significant complications in 2.44% (95% CI 0.85-6.75), minor complications in 9.53% (95% CI 3.68-22.5), and technical failure in 0.91% (Charrier et al., 2025). Additional sources indicate that slight pain occurs in up to 25% or more of cases, while severe bleeding is reported in less than 2% (Bath & Wu, 2018). Our significantly elevated minor complication incidence may indicate discrepancies in classification: we categorized all instances of pain, both with and without analgesic intervention, as well as bleeding episodes, as "complications," whereas most studies consider only more severe occurrences. Our results indicate that a significant majority (94.9%) of complications were attributed to pain, whereas only 1.7% involved bleeding and 3.4% were characterized by a combination of pain and bleeding. No significant haemorrhage, pneumothorax, or mortality occurred, aligning with the global literature indicating that PLB is safe when appropriately selected (Al Bulushi et al., 2023). An Ethiopian study showed a higher-than-average pain rate, implying that patient expectations, cultural interpretations of pain, and documentation procedures in our regional context may differ from those in Western populations (Geta, 2021). The lack of serious consequences, including substantial haemorrhage necessitating transfusion, organ perforation, or mortality, represents the most critical safety finding in the study. A paper from Ibadan, Nigeria, reported a diagnostic yield of 92% with no death in blind PLB (Otegbayo et al., 2002). They further noted that in the study, PLB is both viable and secure. The pre-procedure assessment of INR (<1.5) and platelet count (≥50,000/μL) likely mitigated the occurrence of significant problems. The absence of major complications and mortality corresponds with the acceptable thresholds of <0.5% for serious events and <0.1% for mortality (Neuberger et al., 2020).

Younger age was strongly correlated with an increased complication rate ($p = 0.025$) in our analysis. The literature indicates that younger age, reduced body mass, increased number of passes, and diminished platelet count may increase the risk of bleeding or hospitalization following biopsy (Tian et al., 2020).

Our findings indicate that younger patients may exhibit greater susceptibility to even moderate pain, and this may indicate physiological factors (e.g., heightened anxiety in younger patients, diminished pain threshold) or could be attributed to more intrusive procedures in younger patients; however, our data did not reveal a correlation with the number of passes. The absence of correlation between diagnostic yield and demographic or clinical characteristics underscores the procedure's consistent dependability across diverse patient populations.

Limitation

The retrospective aspect presents the possibility of absent or inconsistently documented data. The limited sample size of 68 across 4 years constrains the generalizability of the findings and the statistical analysis, especially given the infrequency of significant complications.

Conclusions and Recommendations

Our data indicate that percutaneous liver biopsy is a safe and highly effective diagnostic method, achieving nearly universal diagnostic yield in suitable patients. Considering the resource limitations and elevated prevalence of chronic hepatitis in Nigeria, the ongoing utilization of PLB is warranted. Nonetheless, initiatives to mitigate even minor difficulties, such as the regular administration of analgesics, patient counselling, and ultrasound guidance, may enhance the patient experience. The notable correlation between younger age and minor complications indicates the necessity for specialized support for younger patients, including anxiety control and pain alleviation.

From a One Health perspective, the high diagnostic yield and favorable safety profile of percutaneous liver biopsy underscore its importance in strengthening integrated health systems in resource-limited settings. Accurate histopathological diagnosis of liver diseases supports early detection and management of conditions influenced by infectious agents, environmental exposures, and lifestyle factors, thereby contributing to improved population health outcomes. Sustaining safe and effective diagnostic practices such as percutaneous liver biopsy enhances health system resilience and aligns with One Health goals of promoting interconnected human health, environmental safety, and sustainable healthcare delivery.

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