International Journal of Contemporary Pediatrics
Saini S et al. Int J Contemp Pediatr. 2025 Jul;12(7):1131-1138
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: https://dx.doi.org/10.18203/2349-3291.ijcp20251865

Original Research Article

Hepatic masses in children: a 15-year experience at a single tertiary care center in India

Srishti Saini, Neelam Mohan*, Anushka Shankar, Sailen Kumar Bana

Department of Pediatric Gastroenterology, Hepatology, Liver Transplantation, Medanta-The Medicity, Gurugram, India

Received: 05 May 2025
Accepted: 05 June 2025

***Correspondence:**
Dr. Neelam Mohan,
E-mail: drneelam@yahoo.com

ABSTRACT

Background: Hepatic masses are rare and challenging to diagnose and manage in pediatric populations; therefore, data on clinical presentation, management strategies, and long-term outcomes are limited. Hence, the aim of the study was to review the incidence, clinical spectrum, management, and outcome of hepatic masses in pediatrics.
Methods: This retrospective, cross-sectional study reviewed the medical records of pediatric patients (age <18 years) presenting to a pediatric hepatologist and diagnosed with hepatic masses between 2010 and 2024 at a tertiary care center.
Results: Thirty-nine patients were identified with hepatic masses, 21 (53.8%) had benign tumors and 18 (46.2%) had malignant tumors. The median age of patients was 39 months (range: 2–208 months) at presentation, and 19 (48.7%) of them were females. The most common presentation is abdominal distension (n=14, 35.8%), while the less frequent presentations were abdominal pain (n=6, 15.38%), pallor (n=6, 15.38 %) and anorexia (n=4, 10.20%). Hepatic masses were an incidental finding in 5 patients (12.80%). Patients underwent different radiologic investigations including ultrasound imaging (n=15, 38.4%), computed tomography (CT; n=26, 66.6%), magnetic resonance imaging (MRI; n=8, 20.5%), and positron emission tomography (PET; n=11, 28.2%). Histopathology was done preoperatively in 9 (23.07%) patients and post operatively in 17 (43.5%) patients. Most patients underwent surgical resection (n=16, 41%), 5 (12.8%) patients received chemotherapy for malignant tumors, and 5 (12.8%) patients underwent liver transplantation. Surgical complications occurred in 2 (5.1%) patients but were successfully managed. One patient was lost to follow up and no mortality was reported in the remaining patients with long-term follow up.
Conclusion: The immediate and long-term clinical outcomes of surgical resection and liver transplantation, with or without chemotherapy, are good without considerable morbidity or mortality. This study contributes valuable real-world data to inform clinical practice and future research in this area.

Keywords: Hepatic masses, Histopathology, Chemotherapy, Liver transplantation

INTRODUCTION

Around 1–4% of tumors in pediatric patients comprise hepatic masses.[1] Due to the rare occurrence of hepatic masses in pediatric patients, they present diagnostic and treatment challenges.[2–4] The finding of incidental pediatric abdominal masses necessitates a rational radiologic approach along with comprehensive clinical evaluation for accurate diagnosis.[5] Based on the diagnosis, multidisciplinary as well as personalized treatment approaches-including liver transplantation-are essential for favorable outcomes.[2] Hepatic masses considerably vary in presentation, ranging from an incidental finding on routine imaging to a palpable abdominal mass accompanied by symptoms and signs such as anemia and jaundice.[3,6] Benign liver tumors comprise 30–40% of hepatic masses and include hepatic hemangioma (HH), mesenchymal hamartoma (MH), focal nodular hyperplasia (FNH), cystic liver lesions, liver adenoma, and inflammatory myofibroblastic

tumor.[1,6] Malignant liver tumors in children comprise two thirds of hepatic masses with hepatoblastoma being the most frequent, followed by hepatocellular carcinoma (HCC), fibrolamellar carcinoma, metastatic liver lesions, and cholangiocarcinoma.[2,7] Due to the diverse nature of these masses and their clinical presentations, hepatic masses should be managed by multidisciplinary teams including hepatologists, pathologists, surgeons, and oncologists.8

Real-world data on the clinical presentation, management strategies, and long-term outcomes of hepatic masses are limited. There are few Indian studies of single institutional experiences of pediatric patients with benign liver tumors, HH, FNH, hepatoblastoma, and MH.[9-17] To our knowledge, only one Indian study reports a single institutional experience on pediatric liver tumors, both benign and malignant.[18] Indian data on outcomes after liver resection and transplantation should be reported to highlight the improvement in surgical procedures in a developing country.

The aim of this study is to provide a comprehensive overview of hepatic masses in pediatric patients from our experience at a tertiary care center and contribute real-world data to the existing body of knowledge.

METHODS

Study design

This study employed a retrospective, single-center cohort design. We did a review of the medical records of children diagnosed with hepatic masses between 2010 and 2024 at the Pediatric Hepatobiliary Department at Medanta, the Medicity, Gurgaon, India, a tertiary care center specializing in pediatric liver diseases.

The study was approved by the Institutional Review Board (IRB). Due to the retrospective nature of the study, informed consent was not required; however, patient confidentiality was maintained throughout the study.

Study population

The study population included all pediatric patients (age <18 years) diagnosed with a liver mass at the tertiary center. Assessment using radio imaging modalities along with histopathology of liver biopsies taken preoperatively confirmed the diagnosis.

Exclusion criterion includes liver space occupying lesions like liver abscess and hydatid cyst.

Data collection and management

Electronic medical records were meticulously reviewed to extract relevant clinical information for each patient. Database management and statistical calculations were done using Microsoft Excel (Microsoft 365).

RESULTS

Patient characteristics

A total of 39 pediatric patients were identified with a liver mass during the study period (2010–2024). The median age at presentation was 39 months (range: 2–208 months) and the proportion of females among the patients was 19 (48.7%) (Table 1). Benign tumors were identified in 21 patients (53.8%) and malignant ones in 18 patients (46.2%).

Figure 1 gives the frequency of the liver mass diagnoses in the study population. The most common presentations were abdominal distension (n=14, 35.8%) while the less frequent presentations were abdominal pain (n=6, 15.38 %), pallor (n=6, 15.38%) and anorexia (n=4, 10.20%) (Table 1). Anorexia and jaundice both were observed in two patients (5.12%) with Langerhans cell histiocytosis (LCH). In five patients (12.8%), hepatic masses were an incidental finding on imaging (Table 1).

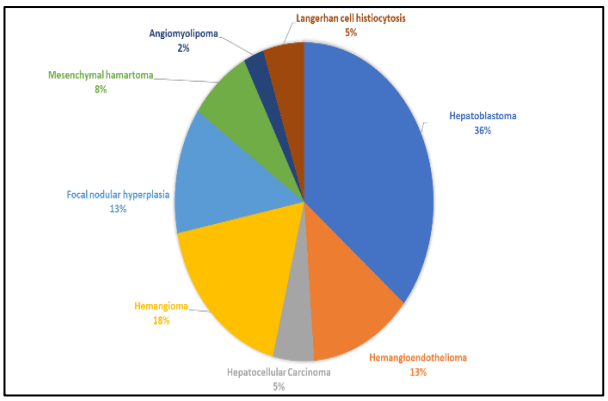

Figure 1: Distribution of hepatic masses in pediatric patients.

Diagnosis

Table 2 details the mode of diagnosis for the hepatic masses. Ultrasound sonography (USG) was the initial imaging modality employed in 15 (38.4%) patients because of the easy availability. Additional investigations included computed tomography (CT; n=26, 66.6%), magnetic resonance imaging (MRI; n=8, 20.5%) to know the nature and extent of the disease, and positron emission tomography (PET; n=11, 28.2 %) to rule out metastasis. Liver biopsy was performed in a subset of patients (n=9, 23%) to confirm the diagnosis, particularly for indeterminate lesions on imaging.

In 17 patients (43.5%), histopathology of resected specimen was followed after the surgery to confirm diagnosis. Alpha-fetoprotein (AFP) levels were tested for most of the patients (n=31, 79.4%), but were high in only 13 (33.3%) patients with malignant tumors. Total 6 (15.3%) patients had hypothyroidism: 3 patients with vascular hepatic tumor (1 with HH and 2 with

hemangioendothelioma), 1 patient with Beckwith-Wiedemann syndrome and HH, 1 patient with MH and 1 patient with LCH. The histopathology findings of hepatoblastoma tumors were available for 9 out of 14 patients; 5 patients had tumors of epithelial nature in which 3 patients had pure fetal subtype and 2 patients had macro trabecular subtype. Remaining 4 patients had tumors of mixed nature (both epithelial and mesenchymal). Immunohistochemistry of the tissues was done with various stains like glypican-3, beta-catenin, glutamine synthetase, Hep Par-1, glucose transporter 1 (GLUT-1) and various others as per requirement. The histopathology of FNH tissues was available for all 5 patients.

The imaging of all these 5 patients showed classic central stellate scar. The histopathology showed proliferation of bile ducts and glutamine synthetase, immunohistochemistry confirmed the diagnosis. Histopathology of MH tissues was done in 2 out of 3 patients. The tissues in both cases showed both epithelial and mesenchymal components and no immunohistochemistry staining was done for this sample. Only 2 out of 7 patients with HH underwent anatomical resection, but histopathology of only 1 patient showed infiltrating pattern of small capillaries and the sample was positive for GLUT-1 staining favoring the diagnosis of congenital HH.

Comorbidities were observed in 7 patients (17.9 %) like dilated cardiomyopathy was seen in 1 patient with HCC whereas congenital hypothyroidism was seen in 1 patient with MH, 2 patients with hemangioendothelioma,1 patient with multiple infantile HH, 1 patient with LCH, and 1 patient with hepatoblastoma. Twenty patients underwent 2D echocardiography to look for high output cardiac failure in vascular hepatic tumors, like HH and hemangioendothelioma, as a part of cardiac clearance before resection surgery or liver transplant. One patient with LCH had dilated left auricle and left ventricle, and 1 patient with angiomyolipoma had two small echogenic masses: one each at the right side of septum and the left ventricle apical area of septum.

Treatment and monitoring

Table 3 gives the treatment approach to hepatic masses. Surgical resection with or without lobectomy was done for the majority of patients (n=16, 41.02%). Four patients with HH and 3 patients with hemangioendothelioma were treated with propranolol (1–2 mg/kg/day) and the regression in tumor size was followed up by abdominal USG. Two cases of HH underwent resection, while 1 patient with giant hemangioblastoma underwent living donor liver transplant (LDLT). All 5 patients with FNH and 3 patients with MH underwent successful resection surgery. All patients with hepatoblastoma were managed according to SIOPEL protocol. Five patients received chemotherapy. Two patients with hepatoblastoma with PRETEXT III disease underwent orthotopic liver transplant (OLT), 6 had complete excision of the involved lobe/s, 2 received 2 sessions of chemotherapy before excision but then did not pursue the treatment. Six patients with hepatoblastoma abandoned chemotherapy and surgical resection soon after diagnosis.

Liver transplantation was performed in 5 patients (15%), 1 patient with benign tumor giant hemangioblastoma, 2 with hepatoblastoma, 1 with LCH, and 1 with HCC secondary to tyrosinemia type 1 and in all cases, it was a left lobe LDLT and immunosuppression was achieved with tacrolimus, prednisolone, and mycophenolate mofetil. The patient with angiomyolipoma who showed kidney involvement underwent partial nephrectomy, and no intervention was advised for liver. Nine (23.07%) patients did not pursue the treatment at the center. The remaining patients with benign and malignant masses underwent regular follow-up to monitor for recurrence or complications.

Outcome

Table 4 gives the outcomes of patients who pursued treatment at the center. One patient with hepatoblastoma presented with a large mass in the lung lobes with contiguous extension into multiple other structures after resection. This patient refused chemotherapy and underwent right lobe hepatectomy only. This new mass in the lung could be a residual or recurrent mass; however, this patient was lost to follow-up later. One patient with hemangioblastoma who underwent a left hepatectomy with caudate lobe resection had an intrahepatic inferior vena cava replacement.

Re-exploration was required in 1 patient with LCH due to post-transplant hepatic artery thrombosis for which portal vein arterialization was done. Surgery for re-exploration of the abdomen and closure of bile duct leak at liver transection surface was required in a patient with HCC after the liver transplantation. All complications were successfully managed with good outcomes. There were no deaths in perioperative period, no due to sepsis or cardiotoxicity. One patient with a high-risk hepatoblastoma had a post-transplant complication of acute cellular rejection, which was managed with tacrolimus, prednisolone, and mycophenolate mofetil.

Most of the HH hemangiomas and hemangioendotheliomas showed gradual decrease in the size of tumor after conservative management. Two patients with hemangioma were unresponsive to conservative treatment and underwent surgical resection. Two patients had giant hemangioendothelioma and were advised liver transplantation; one patient underwent LDLT, while the other did not pursue treatment. The patient with HCC who underwent liver transplant did well for 2 years but later succumbed to hepatitis C infection which lead to rapid deterioration of the grafted liver. There was no mortality observed in this study in the follow-up period.

Table 1: Patient demographics and characteristics.

Category	Value
Gender, N (%)	
Female	19 (48.7)
Age in months, median (range)	39 (2–208)
Presenting features, N (%)	
Abdominal distension	14 (35.8)
Palpable abdominal mass	8 (20.5)
Abdominal pain	6 (15.3)
Anorexia	4 (10.2)
Jaundice	2 (5.1)
Pallor	6 (15.3)
Laboratory findings, N (%)	
Altered liver function tests	18 (46.1)
High AFP levels	13 (33.3)
Hypothyroidism	6 (15.3)
Histology findings, N (%)	
Pre-surgery diagnostic liver biopsy	9 (23)
Post-surgery resected specimen	17 (43.5)
Incidental finding on imaging, N (%)	5 (12.8)

AFP, alpha-fetoprotein.

Table 2. Diagnosis of hepatic masses.

Hepatic masses	Total	USG	CT	MRI	PET/CT	Pre-surgery liver biopsy	Post-surgery histopathology	High AFP levels	Hypothyroidism
HH	7	4	4	1	0	0	1	0	1
Hemangioendothelioma	5	2	3	0	1	0	0	0	2
FNH	5	2	4	2	0	0	4	0	0
MH	3	1	2	0	1	1	3	0	1
Angiomyolipoma	1	1	1	0	0	1	0	0	0
Hepatoblastoma	14	2	8	3	8	5	7	12	1
LCH	2	2	2	1	0	2	1	0	1
HCC	2	1	2	1	1	0	1	1	0
Total, N (%)	39 (100)	15 (38.4)	26 (66.6)	8 (20.5)	11 (28.2)	9 (23.07)	17 (43.5)	13 (33.3)	6 (15.3)

AFP, alpha-fetoprotein; CT, computed tomography; FNH, focal nodular hyperplasia; HCC, hepatocellular carcinoma; HH, hepatic hemangioma; LCH, Langerhans cell histiocytosis; MH, mesenchymal hamartoma; MRI, magnetic resonance imaging; PET, positron emission tomography; USG, ultrasound sonography.

Table 3: Treatment of hepatic masses.

Hepatic masses	Total	Propranolol	Chemotherapy	Resection	Transplantation	Did not pursue treatment
HH	7	4	0	2	0	1
Hemangioendothelioma	5[a]	3	0	0	1	1
FNH	5	0	0	5	0	0
MH	3	0	0	3	0	0
Angiomyolipoma	1[b]	0	0	0	0	0
Hepatoblastoma	14	0	5[c]	6	2	6
LCH	2	0	2[d]	0	1	0
HCC	2	0	0	0	1	1
Total, N (%)	39 (100)	7 (18)	7(18)	16 (41)	5 (12.8)	9 (23)

FNH, focal nodular hyperplasia; HCC, hepatocellular carcinoma; HH, hepatic hemangioma; LCH, Langerhans cell histiocytosis; MH, mesenchymal hamartomaaTwo patients had giant hepatic hemangioendothelioma and were advised liver transplant surgery. bPartial nephrectomy was performed and no intervention was advised for liver. cOne patient did not pursue treatment after 2 cycles of chemotherapy. dOne patient underwent chemotherapy alone, while other underwent chemotherapy and liver transplant.

Table 4. Outcomes of patients with hepatic masses who pursued treatment.

Hepatic masses	Total	Surgical complications	Survived	Loss to follow-up
HH	6	0	6	0
Hemangioendothelioma	4	0	4	0
FNH	5	0	5	0
MH	3	0	3	0
Hepatoblastoma	8	1	8	1
LCH	2	1	2	0
HCC	1	0	1	0
Total, N (%)	29 (74.3)	2 (5.1)	29 (74.3)	1 (2.5)

FNH, focal nodular hyperplasia; HCC, hepatocellular carcinoma; HH, hepatic hemangioma; LCH, Langerhans cell histiocytosis; MH, mesenchymal hamartoma.

DISCUSSION

This study reporting a 15-year experience of liver tumors at a tertiary care center provides valuable insights into the presentation, diagnosis, management, and outcomes of pediatric hepatic masses. It contributes to the existing knowledge based on this relatively understudied population. In this study, nearly half of the pediatric liver tumors were malignant. The observed distribution of benign (53.8%) and malignant (46.2%) hepatic masses in our study aligns with previously reported data.[19] Hepatoblastoma (35.8%) was the most common malignant tumor with an equal distribution of epithelial and mixed type in histology.

Only one-fourth of hepatoblastoma presented in infancy (<1 year-old), while the rest presented in children older than 1 year. HCC (5.1%) and LCH (5.1%) were the other malignant tumors. The most commonly observed benign liver mass is HH followed by hemangioendothelioma and FNH, and this is mirrored in our study.[20,21] HH (18%) was the most common benign hepatic tumor in our study followed by hemangioendothelioma (12.8%), FNH (12.8%) and MH (7.7%). Nearly half of the patients with HH and hepatoblastoma were infants (<1 year-old).

The most common presenting features in our study-abdominal distention and palpable abdominal mass-are observed in pediatric patients with hepatic masses.[22] Though rare, some hepatic masses are incidental findings.[4] In our study 5 patients (12.8 %) presented with incidental findings, highlighting the importance of maintaining a high index of suspicion for hepatic masses during routine imaging in children, especially when the presentation includes abdominal distention and palpable abdominal mass along with cutaneous hemangiomas.[23] The evaluation of hepatic tumors is largely driven by the age of presentation, presence of any medical comorbidities, and initial testing with AFP and imaging. Hepatoblastoma, HH and MH are the hepatic tumors more commonly seen in infants and toddlers, while HCC and FNH are more commonly seen in school aged children and adolescents. Once detected, abdominal masses can be characterized based on radiologic findings.[22,24] In our study, ultrasound served as the initial imaging modality in all cases. It provided information regarding size, echogenicity, focality and demarcation. Based on the primary results, MRI and CT scans provided further characterization of the masses, such as degree of demarcation and extent of involvement into vessels or other organs. PET scans were used in only 11 patients to rule out metastasis. Histology may be further required to guide the management approach.[24] In our study, histology was done on liver biopsy tissues from 9 patients (23 %) and all post-surgery tissues (n=17, 43.5 %).

Of the 7 patients diagnosed with infantile HH, 4 patients presented with palpable abdominal mass and pallor, and 3 were incidental findings. The diagnosis was made on a combination of clinical findings and imaging. Abdominal ultrasound showed a hypoechoic mass with vascular channels. While 4 patients were treated with propranolol, 2 underwent resection, and 1 patient did not pursue treatment. All patients had positive outcomes. Propranolol is a non-selective beta-blocker shown to be effective and safe in treating infantile HH and infantile hemangioendotheliomas.[25–27] We gave propranolol in a dose of 1-2 mg/kg/day to 4 patients with HH and 3 patients with hemangioendothelioma with positive outcomes, and none of them had any adverse events. The median duration of treatment with propranolol that leads to a decrease in size of a hemangioma is 6.4 months.

Propranolol induces vasoconstriction and downregulates growth factors such as vascular endothelial growth factor and upregulates of cellular apoptosis. Of the 5 patients with hemangioendotheliomas, 2 had a giant hemangioendothelioma and were counselled for liver transplantation because resection was not a viable option. However, one patient did not pursue the treatment and other one underwent liver transplant.

One patient underwent liver resection surgery but later was lost to follow up. A rare complication of HH is hypothyroidism secondary to a high level of triiodothyronine deiodinase activity within the hemangioma or hemangioendothelioma.[28,29] Large HHs can also be associated with high output heart failure as a result of arteriovenous shunting within the hemangioma.[30] In our study, 1 patient with HH and 2

with hemangioendothelioma had hypothyroidism. FNH accounts for 2–7% of pediatric hepatic tumors.[31] In our study, FNH constituted 12.8% of all hepatic masses. While a previous study concludes MRI as the most sensitive imaging modality for the diagnosis of FNH, our study confirmed diagnosis using abdominal USG and CT scans.[32] CT scans showed the characteristic features of FNH in all the patients with FNH. This refers to a homogeneous lesion, isodense to slightly hypodense to surrounding tissue with a hypoattenuating central stellate scar, becoming hyperintense during the arterial phase followed by isointense during the venous or delayed phase on CT.

This confirmed the diagnosis with no dilemma. Atypical radiographic findings may warrant a pre-excision lesion biopsy. No treatment is required in asymptomatic patients; however, patients in our study presented with either palpable abdominal mass, abdominal pain and abdominal distention and therefore all underwent successful resection surgery. There was no need of pre–excision biopsy in our patients. One patient required infrahepatic inferior vena cava replacement during surgery.

MH of infancy is a rare, benign tumor and differentiating it from malignant tumors—particularly hepatoblastoma—is a challenge.[6,16] An Indian study reporting long-term follow up data of 9 pediatric patients with MH outlines the importance of radiology and histopathology in diagnosis and shows positive outcomes after hepatic lobectomy, wedge resection, and enucleation.[17] In our study, 3 patients were diagnosed with MH using USG and CT as the imaging modalities and were successfully treated with lobectomy. One of the patients was diagnosed with a ruptured MH and had successful surgical resection.

Since the last two decades, liver resections have been safely performed in India.[33] The latest and largest Indian study on liver resections presents promising outcomes in patients with mostly malignant liver tumors and emphasizes on a dedicated multidisciplinary treatment approach and standardization of liver resections.[34] In our study, 16 pediatric patients underwent liver resections with or without lobectomy. All patients were successfully managed without morbidity or mortality.

Hepatoblastoma was the most commonly observed malignant hepatic mass in our study; this incidence is observed in previous studies too.[19,35] Most of our patients with Hepatoblastoma presented with palpable abdominal mass, abdominal distention, pain in right hypochondrium and increased liver enzymes. Immediate radiologic investigations were offered to all patients, USG whole abdomen followed by CT abdomen and chest. After confirming the diagnosis, PET CT was done. Simultaneously, AFP level was also recorded before the initiation of treatment. Children's Oncology Group (COG) and international childhood liver tumor strategy group (SIOPEL) protocols were followed for risk stratification and management of patients with hepatoblastoma. One patient with hepatoblastoma at PRETEXT 3 stage underwent 8 sessions of chemotherapy, with repeat PET CT showing a hepatic mass involving two adjacent central sectors with encasement of all three hepatic veins; the patient eventually underwent a liver transplant. 2 patients with hepatoblastoma at PRETEXT 2 stage (standard risk) underwent resection followed by chemotherapy. 2 patients with hepatoblastoma at PRETEXT 1 stage (low risk) underwent resection alone. Finally, 1 patient with a ruptured hepatoblastoma staged PRETEXT 3 (high risk) received neoadjuvant chemotherapy followed by LDLT (due to unresectable tumor after chemotherapy) and adjuvant chemotherapy.

In Indian pediatric patients with malignant hepatoblastoma, the median event-free survival ranges from 33–100% and treatment failure is due to treatment-related mortality (0–50%) or progression of disease (0–30%).35 In our study, there was no treatment-related morbidity or mortality. However, of the 14 patients diagnosed with hepatoblastoma in our study, 6 patients did not pursue the treatment, and 1 was lost to follow up after resection. We cannot comment on the outcomes of these 7 patients. Of all the patients treated in our center, 6 underwent resection, 5 received chemotherapy, and 2 underwent liver transplantation.

HCC is largely a chemo-resistant tumor, therefore either surgical resection or transplant should be considered. The PRETEXT system is used to stage HCC surgically, while other factors like lymphovascular invasion, extrahepatic disease and metastatic disease also determine the prognosis. In our study, one patient who was a diagnosed case of Tyrosinemia type 1 was diagnosed with HCC on a regular follow up and underwent LT. Excluding HH and hemangioendothelioma, surgical resection or liver transplantation, with or without chemotherapy, were the main stay of treatment for hepatic masses. Liver transplantation was done for 12.8% of tumors where surgical resection was not an option. Chemotherapy was offered as per the SIOPEL protocol.[36]

Liver transplantation is indicated for malignant tumors like hepatoblastoma and HCC.[37] In our study, 5 patients underwent LDLT, 1 patient with benign giant hepatic hemangioendothelioma, 2 with hepatoblastoma, and 1 each with HCC (secondary to Tyrosinemia type 1) and LCH. One patient with hepatoblastoma who underwent resection was advised chemotherapy but did not undergo chemotherapy sessions and presented 2 years later with a large mass in the right lung lobe. This may be a residual or recurrent mass. Perhaps, chemotherapy in this case could have prevented this event. Notably, the liver was disease-free after 2 years of follow up. Treatment abandonment is a major hurdle in improving outcome of pediatric liver tumors. However, reasonably good outcomes can be achieved if patient comply with therapy.

A study by Rao et al has demonstrated the feasibility of liver transplantation in pediatric patients in India.[38] Availability of liver transplantation in India as a therapeutic modality for high-risk malignant liver tumors can improve outcomes in pediatric patients.[35] Our study shows the successful management of even high-risk tumors without treatment-related mortality.

AFP monitoring is vital in management of hepatic tumors. Increased AFP levels are mainly seen in hepatoblastoma followed by HCC, but high levels are also reported in some benign tumors such as HH and MH. AFP levels have both diagnostic value as well as value in monitoring treatment response in pediatric patients with malignant hepatic tumors.[39] AFP levels help with risk stratification for children with hepatoblastoma. A decrease in AFP levels after treatment is associated with successful resection and a good prognosis. In our study, 1 patient with hepatoblastoma who underwent surgical resection did not show the expected decline in AFP levels. The cancer later relapsed in and metastasized to the lungs and bones; the patient was lost to follow up.

Five patients with hemangioma, 3 patients with hemangioendothelioma, and 1 patient with angiomyolipoma underwent observation only. No complications were reported on long-term follow up. This highlights the importance of a tailored management approach based on the specific diagnosis. The absence of mortality in this study upon long-term follow-up is encouraging. The results of this study may not be generalizable to pediatric patients treated at other general hospital settings.

Limitations of the study include the retrospective nature of the review as well as the relatively small sample size. The strength of this study is that covers data of both benign and malignant masses. It presents the incidence of the different types of hepatic masses and their management in a tertiary center. Future studies with larger, multicenter cohorts are required to generalize the findings and understand the landscape of pediatric hepatic masses in India. Additionally, long-term follow-up data are needed to assess the impact of treatment on patient survival and quality of life.

CONCLUSION

Early identification and comprehensive management of pediatric hepatic masses are important for good clinical outcomes. Surgical resection remains the mainstay of treatment for benign masses, and good outcomes are achievable with liver transplantation and chemotherapy for malignant masses. In this study, nearly half of the pediatric liver tumors are found to be malignant. Hepatoblastoma (77.8%) was the commonest malignant tumor with an equal distribution of epithelial and mixed type in histology and none with mesenchymal nature. HCC (11%) and LCH (11%) were the other malignant tumors. Only 36% of hepatoblastoma presented in infancy, while the rest presented in younger children. Hemangioma was the most common (33%) benign hepatic tumor in our study followed by Hemangioendothelioma (24%), FNH (24%) and mesenchymal tumor of infancy (14%). In infancy 50% of patients had hemangioma and rest were hepatoblastoma.

Surgical resection was the main stay of treatment in 41% patients. Liver transplantation was done in 13% of tumors where surgical resection was not an option. Chemotherapy was offered as per SIOPEL-3 protocol. Advancement in histopathology and radiology helps to better delineate the liver tumors. Refined surgical staging, resection and liver transplantation has significantly improved the survival in these patients. Real-world data may guide clinical practice and future research efforts in India.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Franchi-Abella S, Branchereau S. Benign hepatocellular tumors in children: focal nodular hyperplasia and hepatocellular adenoma. Int J Hepatol. 2013;2:1-11.
2. Kelgeri C, Renz D, McGuirk S, Schmid I, Sharif K, Baumann U. Liver tumours in children: the hepatologist's view. J Pediatr Gastroenterol Nutr. 2021;72(4):487-93.
3. Lucas B, Ravishankar S, Pateva I. Pediatric primary hepatic tumors: diagnostic considerations. Diagnostics (Basel). 2021;11(2):333.
4. Cekuolis A, Schreiber-Dietrich D, Augustinienė R, et al. Incidental findings in pediatric patients: how to manage liver incidentaloma in pediatric patients. Cancers (Basel). 2023;15(8):2360.
5. Karmazyn B, Rao GS, Johnstone LS. Diagnosis and follow-up of incidental liver lesions in children. J Pediatr Gastroenterol Nutr. 2022;74(3):320-7.
6. Fuchs J, Warmann SW, Urla C, Schäfer JF, Schmidt A. Management of benign liver tumors. Semin Pediatr Surg. 2020;29(4):150941.
7. Meyers R, Hiyama E, Czauderna P, Tiao GM. Liver tumors in pediatric patients. Surg Oncol Clin N Am. 2021;30(2):253-74.
8. Venkatesh SK, Chandan V, Roberts LR. Liver masses: a clinical, radiologic, and pathologic perspective. Clin Gastroenterol Hepatol. 2014;12(9):1414-29.
9. Qureshi SS, Bhagat M, Kembhavi S. Benign liver tumors in children: outcomes after resection. Pediatr Surg Int. 2015;31(12):1145-9.
10. Gontumukkala C, Teja R. Benign liver tumors in children-single centre experience. Int Surg J. 2017;5(1):143.

11. Ray G, Das K, Sarkar A, Bose D, Halder P. Propranolol monotherapy in multifocal/diffuse infantile hepatic hemangiomas in Indian children: a case series. J Clin Exp Hepatol. 2023;13(4):707-12
12. Islam N, Halder A, Ghosh R, Banerjee S, Mishra P, Chatterjee U. Focal nodular hyperplasia of the liver in children: a report of 2 cases. Indian J Pathol Microbiol. 2019;62(2):261.
13. Shukla PJ, Barreto SG, Qureshi SS. Hepatoblastoma: a single institutional experience of 18 cases. Pediatr Surg Int. 2008;24(7):799-802
14. Singh T, Satheesh C, Appaji L. Hepatoblastoma: experience from a single center. Indian J Cancer. 2010;47(3):314.
15. Shanmugam N, Scott JX, Kumar V. Multidisciplinary management of hepatoblastoma in children: experience from a developing country. Pediatr Blood Cancer. 2017;64(3):26249
16. Dhali A, Mandal TS, Das S. Clinical profile of hepatoblastoma: experience from a tertiary care centre in a resource-limited setting. Cureus. 2022;14(7):26494.
17. Pandey A, Gangopadhyay A, Sharma S. Long-term follow-up of mesenchymal hamartoma of liver – single center study. Saudi J Gastroenterol. 2011;17(1):20
18. Muthuvel E. A clinicopathological study of paediatric liver tumours in a tertiary care hospital. J Clin Diagn Res. 2017;11(4):14-6.
19. Ayllo M, Tamire A, Legas M, Arega G. Patterns and clinico-radiological characteristics of primary liver masses in children treated at a tertiary referral hospital, in Ethiopia. Pediatr Health Med Ther. 2023;14:455-64.
20. Bajenaru N, Balaban V, Săvulescu F, Campeanu I, Patrascu T. Hepatic hemangioma–review. J Med Life. 2015;8(2):4-11.
21. Kochin IN, Miloh TA, Arnon R, Iyer KR, Suchy FJ, Kerkar N. Benign liver masses and lesions in children: 53 cases over 12 years. ISR Med Assoc J. 2011;13(9):542-7.
22. Mittal S, Singh S, Batra R. Imaging appearances of pediatric hepatic masses−a review. MAMC J Med Sci. 2020;6(3):176.
23. Al Tasseh F, El-Khansa M, Abd O, Abdel Khalek A, El-Rifai N. Diffuse hepatic hemangioma with single cutaneous hemangioma: an alerting occurrence. Clin Case Rep. 2017;5(6):887-90.
24. Thyagarajan MS, Sharif K. Space occupying lesions in the liver. Indian J Pediatr. 2016;83(11):1291-302.
25. Shayan YR, Prendiville JS, Goldman RD. Use of propranolol in treating hemangiomas. Can Fam Physician. 2011;57(3):302-3.
26. Tian R, Liang Y, Wang J. Propranolol for infantile hepatic hemangioendothelioma: clinical evaluation of drug efficacy and safety using a single-center patient cohort. Ann Hepatol. 2020;19(5):530-4.
27. Léauté-Labrèze C, De La Roque ED, Hubiche T, Boralevi F, Thambo JB, Taïeb A. Propranolol for severe hemangiomas of infancy. N Engl J Med. 2008;358(24):2649-51.
28. Siano MA, Ametrano O, Barbato F. Consumptive hypothyroidism due to hepatic hemangiomas: a case series and review of the literature. JPGN Rep. 2022;3(4):270.
29. Çetinkaya S, Kendirci HNP, Ağladıoğlu SY. Hypothyroidism due to hepatic hemangioendothelioma: a case report. J Clin Res Pediatr Endocrinol. 2010;2(3):126-30.
30. Zhang X, Ren W, Song G, Xiao Y, Sun F, Wang N. Infantile hepatic hemangiomas associated with high-output cardiac failure and pulmonary hypertension. BMC Cardiovasc Disord. 2019;19(1):216.
31. Chiorean L. Benign liver tumors in pediatric patients–review with emphasis on imaging features. World J Gastroenterol. 2015;21(28):8541-53.
32. Valentino PL, Ling SC. The role of diagnostic imaging and liver biopsy in the diagnosis of focal nodular hyperplasia in children. Liver Int. 2014;34(2):227-34.
33. Marwah S, Mustafizur Rahman Khan M, Chaudhary A, et al. Two hundred and forty-one consecutive liver resections: an experience from India. HPB (Oxford). 2007;9(1):29-36.
34. Patkar S, Parray A, Kanetkar A, Shetty N, Kulkarni S, Goel M. Towards standardization of liver resections in India: five hundred consecutive oncological liver resections – trends, techniques and outcomes. J Gastrointest Cancer. 2021;52(2):651-8.
35. Arora RS. Outcomes of hepatoblastoma in the Indian context. Indian Pediatr. 2012;49(4):307-9.
36. Zsíros J, Maibach R, Shafford E. Successful treatment of childhood high-risk hepatoblastoma with dose-intensive multiagent chemotherapy and surgery: final results of the SIOPEL-3 hours study. J Clin Oncol. 2010;28(15):2584-90.
37. Grimaldi C, Goyet J, Bici K, Cianci MC, Callea F, Morabito A. The role of liver transplantation in the care of primary hepatic vascular tumours in children. Front Oncol. 2022;12:1026232.
38. Rao S, D'Cruz AL, Aggarwal R. Pediatric liver transplantation: a report from a pediatric surgical unit. J Indian Assoc Pediatr Surg. 2011;16(1):2-5.
39. Głowska-Ciemny J, Szymanski M, Kuszerska A, Rzepka R, Von Kaisenberg CS, Kocyłowski R. Role of alpha-fetoprotein (AFP) in diagnosing childhood cancers and genetic-related chronic diseases. Cancers (Basel). 2023;15(17):4302.

Cite this article as: Saini S, Mohan N, Shankar A, Bana SK. Hepatic masses in children: a 15-year experience at a single tertiary care center in India. Int J Contemp Pediatr 2025;12:1131-8.