

# Prevalence and Characteristics of Pediatric Abdominal Mass in Radiology Department Prof. Ngoerah General Hospital Bali, From January 2018 to December 2020

Ni Nyoman Margiani<sup>1\*</sup>**ABSTRACT**

**Introduction:** Abdominal mass is one of the common pediatric tumors that can manifest as abdominal pain or a distended abdomen, and it requires immediate management. Some of them can often be incidentally discovered by parents, during routine pediatric examination in an outpatient clinic, or detected on imaging multimodalities. This study is aimed to evaluate the prevalence of pediatric abdominal mass and to demonstrate tumor characteristics by radiology imaging findings in Prof. I G. N. G. Ngoerah Hospital Denpasar.

**Methods:** We conducted a descriptive, cross-sectional study of patients with abdominal masses discovered by Abdominal CT scan in the Radiology Department of Prof. I G. N. G. Ngoerah Hospital from January 2018 to December 2020. Medical record review and data analysis were done retrospectively.

**Results:** We identified 143 pediatric patients diagnosed with abdominal masses discovered by a CT scan in the Radiology Department of Prof. I G. N. G. Ngoerah Hospital from January 2018 to December 2020. Female patients were found more than male patients (77 vs. 66 patients). Out of all patients, the majority of age were 1 to 9 years old (65 patients, 45%), while the second were 10 to 18 years old (52 patients, 35%), and the rest were one month – 11 months (17 patients, 12%) and <1 month (5 patients, 4%) respectively. The average age was 7.44 years old.

**Conclusion:** The abdominal imaging and histopathological findings help evaluate abdominal mass in children. An accurate diagnosis is essential for proper management.

**Keywords:** Abdominal tumor, Abdominal CT scan, children.

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**INTRODUCTION**

Abdominal mass in children is one of the most common malignancies, which requires rapid diagnosis for further evaluation and appropriate management.<sup>1,2</sup> The annual incidence of malignant masses in pediatrics is about 1-2 per 10,000 children under 15 years of age, in which Neuroblastoma and Wilms' tumor are the most commonly found within them.<sup>3</sup> In Indonesia, approximately 11,000 cases of pediatric cancer are diagnosed every year, with Wilms' tumor being the third most common pediatric malignancy after Leukemia and Lymphoma.<sup>4</sup> In Denpasar, Bali, according to the study conducted in Prof. I G. N. G. Ngoerah Hospital from 2008 to 2017, 22 cases of neuroblastoma

were found during this period which they accounted for 5.4% out of all pediatric cancer cases in this hospital.<sup>5</sup>

Abdominal masses can often be incidentally discovered by parents while bathing the child, during routine pediatric examination in the outpatient clinic, or detected on imaging multimodalities. The causes are extensive, ranging from benign to neoplastic, often originating from various organs within the abdominal cavity. At presentation, children may be asymptomatic or have various complaints, such as fever, hematuria, abdominal distension, and abdominal pain. When an abdominal mass is discovered, imaging is required to narrow the differential diagnosis. Ultrasound may be preferred for the initial examination, and then

a computed tomography (CT) scan or magnetic resonance imaging (MRI) may be necessary to evaluate organ involvement and staging.<sup>6</sup>

This study aimed to evaluate the prevalence of pediatric abdominal mass evaluated by CT scan of Prof. I G. N. G. Ngoerah Hospital Denpasar. With the knowledge of multiple etiologies found in abdominal masses in pediatrics, precise diagnosis and appropriate treatment are expected to improve their life expectancy.

**METHODS****Study Design and Sampling**

We conducted a descriptive, cross-sectional study of all pediatric patients (0-18 years old) with abdominal masses

discovered by Abdominal CT scan in the Radiology Department of Prof. I G. N. G. Ngoerah Hospital, Denpasar, Bali, from January 2018 to December 2020. Medical record review and data analysis were done retrospectively. Each patient's medical record number, age, and gender were recorded.

### Data Collection

All patients underwent Abdominal CT scans. Each patient's CT Scan results were then classified according to tumor characteristics; solid, cystic, mixed, and other findings.

The pathological reports were reviewed in 84 patients to determine a histopathological diagnosis concerning the Abdominal CT Scan findings.

### Data Analysis

Descriptive statistics, including patient age, gender, tumor characteristics based on radiological findings, and histopathological diagnosis, were presented as frequencies and percentages of categorical variables.

## RESULTS

We identified 143 pediatric patients diagnosed with abdominal masses discovered by CT scan in the Radiology Department of Prof. I G. N. G. Ngoerah Hospital, Denpasar, Bali, from January 2018 to December 2020.

### Characteristics of Research Subjects

Female patients were found more than male patients (77 vs. 66 patients). Out of all patients, the majority of age were 1 to 9 years old (65 patients, 45%), while the second were 10 to 18 years old (52 patients, 35%), and the rest were one month – 11 months (17 patients, 12%) and <1 month (5 patients, 4%) respectively. The average age was 7.44 years old. The complete results are shown in Table 1.

### Abdominal CT Findings

Each patient underwent Abdominal CT scans and was classified according to findings of tumor characteristics. We divided the findings into three categories: solid, cystic, or mixed. Solid tumors accounted for 62% of all tumors, with cystic and mixed-type tumors being the

**Table 1. Patient Demographic Characteristics.**

Parameter	Total (n=143)		
	n	Percentage	
Gender	Male	66	46
	Female	77	54
Age	<1 month	5	4
	One month – 11 months	17	12
	One year – 9 years	69	48
	Ten years – 18 years	52	36

**Table 2. Tumor characteristics according to CT findings.**

Tumor Characteristics	n	Percentage
Cystic	33	23
Solid	88	62
Mixed	22	15

second and the third, respectively (23% and 15%). Out of every CT scan finding, lymphadenopathy accounted for 19 of them (13%), Wilms' Tumor was 10%, and teratoma was tied with lymphoma with 8%. Other findings were Carooly disease, Lymphadenitis, Choledochal cyst, follicular cyst, mesenteric mass, nephroblastoma, pyelonephritis, lymphoproliferative lesion, rhabdomyosarcoma, functional cyst, phaeochromocytoma, mesenteric cyst, yolk sac tumor, neuroblastoma, islet cell hyperplasia, renal cyst, ovarian cyst, ovarian carcinoma, Ewing sarcoma, urinoma, hydatid cyst, embryonal tumor, fibrosarcoma, hepatoblastoma, GIST, omental cyst, angiomyolipomatosis, pancreatic endocrine tumor, umbilical hernia, pseudocyst, hepatocellular carcinoma, abdominal TB, liposarcoma, cystic nephroma, and Mullerian duct anomaly. Unfortunately, 19 of the CT findings were non-specific (11%). The results are shown in Tables 2 and 3.

### Histopathological Findings

Tissue analyses were done in 84 out of 143 patients. Out of every tumor assessed, teratoma was the most commonly found (10 patients), and lymphoma was the second (9 patients). Yolk sac tumor was found in 8 patients, and nephroblastoma was found in 6 patients. Other findings were Wilms' tumor, Chronic inflammation, mucinous cyst adenoma, choledochal cyst, follicular cyst, multicystic renal dysplasia, chronic pyelonephritis, lymphoproliferative lesion, rhabdomyosarcoma, chronic appendicitis,

phaeochromocytoma, mesenteric cyst, fibrolipoma, neuroblastoma, islet cell hyperplasia, chronic cholecystitis, gliomatosis peritonei, ovarian carcinoma, Ewingsarcoma, pancreatic neuroendocrine tumor, haemangiolympangioma, embryonal carcinoma, fibrosarcoma, hepatoblastoma, colonic duplication, and the rest were non-specific. The results are shown in Table 4.

## DISCUSSION

As one of the most commonly found tumors within the pediatric population, malignant abdominal mass accounts for 16% of all pediatric cancers.<sup>1</sup> Imaging plays a vital role in assessing the likely origin of the mass, its relationship with surrounding structures, including vessels, and the presence of local lymph nodes.<sup>7</sup> Even though ultrasonography is the initial imaging of choice, CT may obtain an entire anatomic section of tissue, which aids in determining the precise extent of the disease. It is not operator dependent and permits accurate measurement of tissue attenuation coefficient. Enhancement with contrast medium may also help in determining pathological abnormalities.<sup>8</sup>

In our study, the majority of the age population was 1 to 9 years old (65 patients, 45%). This result is consistent with another study by Doumbia et al., in which abdominal masses were most commonly found within the 1 to 5 years old age group for about 55% of their population.<sup>1</sup> In contrast to most studies, our study found

**Table 3. CT Diagnostic Findings.**

Radiological result	n
Caroli disease	1
Teratoma	11
Wilms Tumor	14
Lymphadenitis	1
Lymphoma	11
Choledochal cyst	5
Follicular cyst	1
Mesenteric mass	1
Nephroblastoma	2
Pyelonephritis	1
Lymphoproliferative lesion	1
Rhabdomyosarcoma	2
Functional cyst	4
Phaeochromocytoma	1
Mesenteric cyst	2
Yolk Sac tumor	6
Lymphadenopathy	19
Neuroblastoma	9
Islet cell hyperplasia	1
Renal cyst	2
Ovarian cyst	2
Ovarian carcinoma	2
Ewing sarcoma	4
Urinoma	1
Hydatid cyst	1
Embryonal tumor	1
Fibrosarcoma	1
Non-specific	16
Hepatoblastoma	4
GIST	2
Omental cyst	2
Angiomyolipomatosis	1
Pancreatic neuroendocrine tumor	1
Umbilical hernia	1
Pseudocyst	2
Hepatocellular carcinoma	1
Mesothelioma	1
Abdominal TB	1
Liposarcoma	1
Squamous cell carcinoma	1
Cystic nephroma	1
Mullerian duct anomaly	1

that the female population was more than the male (77 vs. 66 patients).<sup>1,9</sup>

Solid tumors were found in 62% of the patients, while cystic and mixed accounted for 23% and 15%, respectively. This was similar to the study by Doumbia et al., in which solid tumors were found in

94% of their population, and as was stated by Ferrero et al., intraabdominal cystic masses were reasonably uncommon.<sup>1,10</sup>

Lymphadenopathy was the most commonly found in CT in our study. This might be due to its multifactorial causes, such as malignancy, infection,

autoimmune disorders, medications, and iatrogenic causes. In malignancy, generalized lymphadenopathy in children might be due to leukemias, lymphomas, and advanced metastatic carcinomas.<sup>11</sup>

Histopathological results showed that teratoma was the most common finding in 10 total patients. Being one of the most frequent ovarian masses in children, they also are the most common benign tumors of the ovary. Radiologically, most pelvic abnormalities, including teratomas, could be diagnosed by ultrasound and CT scan, respectively, for about 77% and 87%. This might be challenging, mainly if torsion or hemorrhagic complications occur, creating a radiological dilemma.<sup>12</sup>

The limitation of this study was that not all patients underwent tissue analysis. Further research is needed for more in-depth analysis.

## CONCLUSION

The clinical approach to abdominal masses in pediatrics can be challenging so correct assessment with the imaging modality of choice, such as a CT scan, may aid in precise and accurate diagnosis for further management.

## ACKNOWLEDGEMENT

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## ETHICS APPROVAL

This research was approved by the Research Ethics Committee of Faculty of Medicine, Udayana University/Prof. I.G.N.G Ngoerah with the Letter of exemption ref:No.0178//FK UNUD/IV/2018) and was certified ethically eligible.

## FUNDING

This study was self-funded.

## AUTHOR CONTRIBUTION

All authors have contributed to this research process, including conception and design, analysis and interpretation

of the data, drafting of the article, critical revision of the article for important intellectual content, final approval of the article, collection and assembly of data.

**Table 4. Histopathological result.**

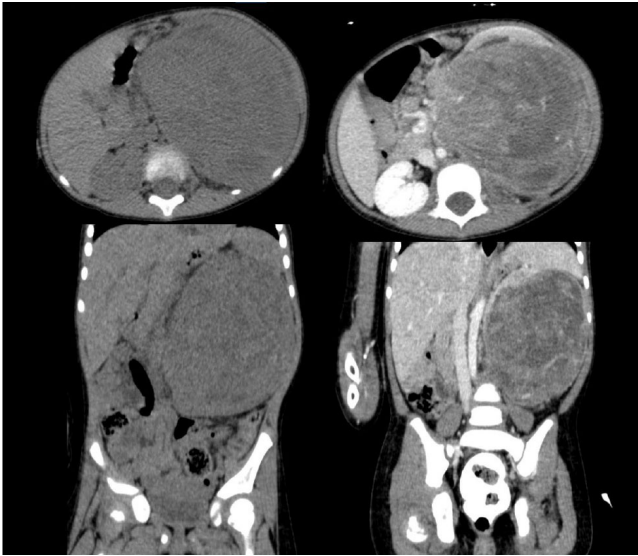
Histopathological Result	n
Carooly Disease	1
Teratoma	10
Wilm's Tumor	4
Chronic Inflammation	4
Lymphoma	9
Mucinous Cyst Adenoma	2
Choledochal Cyst	2
Follicular Cyst	2
Multicystic Renal Dysplasia	1
Nephroblastoma	6
Chronic Pyelonephritis	2
Lymphoproliferative Lesion	1
Rhabdomyosarcoma	2
Chronic Appendicitis	1
Phaeochromocytoma	1
Mesenteric Cyst	2
Yolk Sac Tumor	8
Fibrolipoma	1
Neuroblastoma	4
Islet Cell Hyperplasia	2
Chronic Cholecystitis	1
Gliomatosis Peritonei	1
Ovarian Carcinoma	2
Ewing Sarcoma	2
Pancreatic Neuroendocrine Tumor	1
Haemangiolympangioma	1
Embryonal Carcinoma	1
Fibrosarcoma	1
Hepatoblastoma	1
Colonic Duplication	1
Non Specific	7

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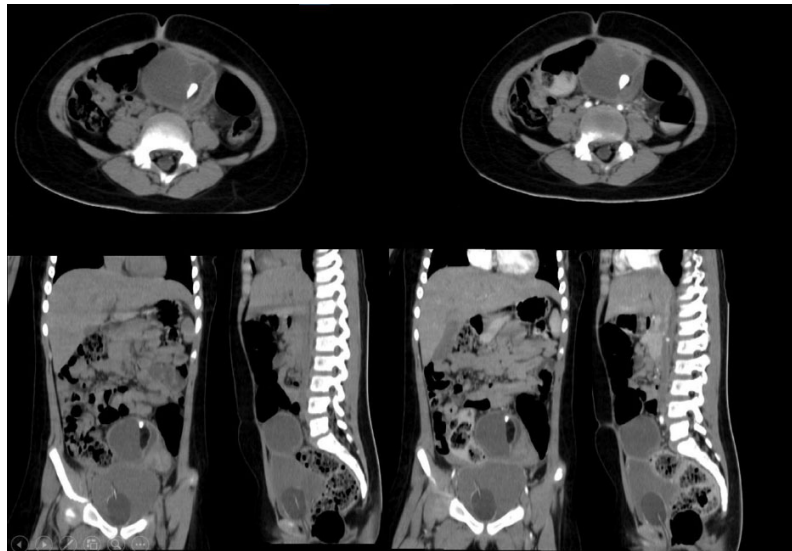
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**Figure 1.** Solid mass situated in the posterior aspect of the left kidney with Claw sign (+), likely Wilms tumor.



**Figure 2.** Septated cystic lesion extending from abdominal to pelvic cavity (possibly from retroperitoneal origin) shifting surrounding organs laterally and posteriorly, likely 1. Severe left hydronephrosis and hydroureter, 2. Cystic abdominal lesion (omental cyst, intestinal duplication cyst).



**Figure 3.** Cystic lesion with solid component situated in the lower aspect of the abdominal cavity, stuck to bladder roof and sigmoid colon, likely teratoma.