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LIVER FUNCTION TESTS DERANGEMENT IN CRITICALLY ILL CHILDREN

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Abstract:

Aim and purpose: *To determine the frequency of liver dysfunction in critically ill patients admitted to the intensive care unit.*

Patients and Methods: *This is a prospective, descriptive observational study conducted in the intensive care unit of the Pediatric department of Ayub Teaching Hospital Abbottabad. The study included all patients aged 1 month to 12 years. Patients with pre-existing chronic liver disease were excluded from the study. The pre-designed proforma form was completed with parental consent. Proforma included an appropriate history, clinical signs, laboratory results, interventions (if required), and outcome. All patients were adequately treated and their liver function tests monitored. All data entered into SPSS-version 16 and the results were analyzed as a percentage.*

Results: *A total of 100 patients were enrolled in the study. Among them were 57% men and 43% women. Most of the patients, 75 (75%), were under 5 years of age and the mean age was 34.25 months. In 47% of patient's liver dysfunction was diagnosed, the most common causes of which were sepsis (46.8%), followed by tuberculosis (15%), intestinal fever (12.7%), central nervous system infections (6.38%), bronchopneumonia (10.6%), acute watery diarrhea (4.2%) and others (2.1%).*

Conclusion: *Of the critically ill patients, 47% had early liver dysfunction, and sepsis was the most common cause. As liver dysfunction has wide pathophysiological implications, it is considered a major risk factor in sick children in intensive care.*

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INTRODUCTION:

In the human body, the liver is the second largest organ and the largest gland (with an average weight of 1500 g)[1-2]. The liver is divided into 2 lobes by a wave ligament, the right lobe (larger) and the left lobe (smaller). Logically, the embryo grows as a diverticulum from the junction of the anterior and middle intestines to the abdominal mesogastrium. Various functions such as biochemical, synthetic and excretory functions are performed by the liver, and there is no single test available to detect all liver functions[3-4].

Liver function tests are divided into the following categories.

1. Serum bilirubin, urine bilirubin, urobilinogen etc. These tests are designed to test the liver's ability to transport organic anions and metabolize drugs.

2. Aminotransferases, alkaline phosphatase, glutamyl transpeptidase, leucine aminopeptidase etc. These tests show damage to hepatocytes.

Serum proteins, albumin, prealbumin, serum ceruloplasmin, fetal protein, prothrombin time etc. These tests are intended to test the biosynthetic capacity of the liver.

Abnormalities (liver function tests (LFT)) are commonly observed among critically ill patients in intensive care units[5]. The cause is almost always multifactorial, including intrahepatic sepsis cholestasis, hepatic congestion due to heart failure, and less commonly medications4. There are many causes of liver dysfunction, such as myocardial dysfunction, viral hepatitis, such as BC multi-organ dysfunction, metabolic disorders, and various therapeutic causes, such as blood transfusion, drug-induced nutrition, parenteral nutrition[6-7]. Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) are sensitive indicators of liver cell damage. In acute liver injury, albumin is not a useful indicator of liver dysfunction, but in chronic liver disease, its measurement is useful and is a component of staging systems. In both acute and chronic liver injury, prothrombin time (PT) is a useful indicator. that parenteral administration excludes cholestasis with malabsorption of vitamin K. Ration of vitamin K. Diagnosis of liver dysfunction is based on the following laboratory parameters such as elevated serum transaminases, alkaline phosphatase, lactate dehydrogenase, hyperbilirubinemia, low levels of albumin, and decreased levels of coagulation factors[8-9]. These parameters are used to detect damage to liver cells or bile ducts, although they are less sensitive and specific. The levels of transaminases (transaminases) and alkaline phosphatase differentiate liver damage and cholestasis. LFTs are not specific to liver diseases, with the exception of serum bile acids, and may be elevated in pathological processes outside the liver9. The specific pattern of LFT abnormalities and appropriate additional tests can narrow the differential diagnosis and provide a cost-effective approach.[10] With this in mind, we conducted a study to see impairment of liver function tests in sick patients.

PATIENTS AND METHODS:

This is a prospective, descriptive observational study conducted in the intensive care unit of the Pediatric department of Ayub Teaching Hospital Abbottabad. The study included all patients aged 1 month to 12 years. Patients with pre-existing chronic liver disease were excluded from the study. The pre-designed proforma form was completed with parental consent. Proforma contained a detailed history showing their demographics, complaints, clinical signs, laboratory results, length of stay, and results. Treatment included all patients and was followed up with respect to their LFT. All data entered into SPSS-version 16 and the results were analyzed as a percentage.

Operational definition

Hepatic impairment: Liver function tests were considered abnormal when ALT and prothrombin time were abnormal from their normal values.

RESULTS:

A total of 100 patients were enrolled. Among them were 57% men and 43% women. In terms of age, 75 (75.0%) of the children were under 5 years of age, 18 (18.0%) were between 5 and 10 years of age, and 8 (8.0%) were over 10 years of age. The mean age was 34.25 months (Table 1).

TABLE 1: **Age Distribution**

Age	Frequency	Percentage
< 1year	43	43.0
1-5 year	32	32.0
5-10 year	18	18.0
>10 year	7	7.0
Total	**100**	**100.0**

Liver dysfunction was found in 47% of patients, the most common causes of which were sepsis (46.8%), followed by tuberculosis (15.0%), intestinal fever (12.7%), central nervous system infections (6.38%), bronchopneumonia (10.6%), acute watery diarrhea (4.2%) and others (2.1%), (Table 2)

TABLE 2: Frequency of deranged LFT's in sick children

Diagnosis	LFT's		Total (%)
	Normal (%)	Deranged (%)	
Sepsis	11(20.7)	22 (46.8)	33 (100.0)
Tuberculosis	6 (12.7)	8 (15.0)	14 (100.0)
Enteric Fever	1 (2.0)	6 (12.7)	7 (100.0)
CNS infections	13 (24.5)	3 (6.38)	16 (100.0)
Bronchopneumonia	16 (32.0)	5 (10.6)	21 (100.0)
AWD	4 (7.5)	2 (4.2)	6 (100.0)
Others	2 (3.7)	1 (2.1)	3 (100.0)
Total	**53 (53.0)**	**47 (47.0)**	**100 (100.0)**

The mean values of the liver function tests are given in table 3. Patient results, 89% were discharged, 2% were LAMA (left against medical advice) and 9% were expired. Of the patients who died, most of them had sepsis (55.5%) and hepatic impairment.

TABLE 3: Mean values of liver function tests

	Serum Albumin	PT	ALT	Serum bilirubin
Mean	3.6390	22.94	107.3	1.04
Std. Deviation	0.51540	15.755	146.4	0.659
Minimum	2.50	12	12.00	0.40
Maximum	4.50	66	910.00	3.50

DISCUSSION:

Liver dysfunction plays a significant role in the morbidity and mortality of patients in the intensive care unit (ICU). Metabolic, hemodynamic and inflammatory factors contribute to liver damage. Hepatic ischemia and hepatotoxic effects of inflammatory mediators are factors causing liver damage. In our study, liver functions were impaired in 47% of cases. While a study by Kramer et al. Revealed that early liver dysfunction is present in 11% of critically ill patients[10]. Another study by Brienza et al. Found liver dysfunction in 31% of critically ill patients. Severe sepsis, septic shock and multiple organ failure are among the most common causes of morbidity and mortality in intensive care units. In the present study, among patients with hepatic impairment, the majority of children (46.8%) had sepsis, followed by tuberculosis (17%), intestinal fever (12.7%), central nervous system infections (6.8%) and others (16.9%). Whereas in another study sepsis, severe shock, and major surgery were the main etiological causes of liver dysfunction[11]. Liver ischemia and reperfusion injury occurred in sepsis. In acute liver failure and sepsis, splanchnic blood flow and oxygen consumption increased. So, in sepsis, in patients with hyperdynamic circulation, hepatic splanchnic flow increases[12]. As oxygenation of splanchnic tissue may be compromised in septic shock due to a significant increase in metabolic demand, reflected in increased tissue oxygen consumption and impaired oxygen extraction. Thus, endotoxin-induced hypoxia in the liver depends on the balance of two different pathological problems: defective oxygen supply and oxygen consumption. Thus, hepatic microcirculation increases initially and then decreases, and as sepsis is induced, liver function gradually deteriorates[13]. As in patients with sepsis, liver dysfunction is strongly associated with mortality, so careful evaluation of liver function tests is important. Hyperbilirubinemia and hepatic dysfunction may develop in critically ill patients as a consequence of drug toxicity, parenteral nutrition, steatosis, ischemic cholangiopathy, or secondary sclerosing cholangitis. In our study, 17% of TB cases who were treated with anti-tuberculosis had an altered liver function test. Liver enzymes can be increased by various medications, such as anti-tuberculosis drugs, anti-epileptic drugs, non-steroidal anti-inflammatory drugs, and antibiotics[14]. The study showed that liver dysfunction is not a late organ dysfunction but can occur early in the course of severe disease. Such early liver dysfunction is supported by physiological pathology data: tubular bile secretion decreases within minutes of termination of experimental toxemia, and impaired bile secretion can be considered a major component of early liver

dysfunction in sepsis and systemic inflammatory response syndrome[15].

CONCLUSION:

Of the critically ill patients, 47% had early liver dysfunction, with sepsis being the most common cause. As liver dysfunction has wide physiological implications, it is considered a major risk factor in sick children in the intensive care unit.

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