INTRODUCTION

Acute liver failure (ALF) is a rare, life-threatening clinical condition that is characterized by severe and instant hepatocellular necrosis, jaundice, coagulopathy and encephalopathy. The aim of this study was to evaluate patients who underwent liver transplantation at Dokuz Eylül University of Medicine Faculty (DEUMF) due to ALF.

A meta-analysis consisting of 18 studies and 1105 patients indicated that the sensitivity, specificity and odds ratio of the King’s College criteria in ALF caused by nonparacetamol causes were 68 [95% confidence interval (CI) 59–77], 82% (95% CI 75–88) and 12.6 (95% CI 6.5–26.1), respectively. Today, 45% of adult ALF patients recover spontaneously, 25% undergo liver transplantation, and 30% of the adult patients pass before the liver transplantation due to absolute contraindications. In children with ALF, 56% recover spontaneously, 30% undergo liver transplantation, and 13% pass before the liver transplantation.

The aim of this study is to evaluate the patients who underwent liver transplantation at Dokuz Eylül University of Medicine Faculty (DEUMF) due to ALF.

MATERIALS AND METHODS

The patients who underwent liver transplantation at DEUMF due to ALF were evaluated retrospectively. Sex, age, preoperative biochemical test results, causes of ALF and the conditions of the donors (alive or cadaver) were
recorded. Data were examined using Microsoft Excel software.

RESULTS
Five of the cases (38.4%) who underwent liver transplantation at DEUMF due to ALF were male and eight (61.6%) were female. The mean age of the subjects was 29 (5–61) years. Three of the donors (23%) were cadaver and 10 of them (77%) were living. The mean values of the patients were as follows: Total Bilirubin: 31 mg/dl, AST: 766U/L, ALT: 787U/L, INR: 3.2, albumin: 3 gr/dl, MELD score: 31.5, encephalopathy stage: 2.5. When the etiology of ALF was examined, it was found that ALF was caused by drugs in six patients, caused by fireworks (due to the content of phosphorus) in two patients, caused by mushrooms in two patients, and caused by herbalin (herba centaurii) in one patient. One of the patients underwent liver transplantation due to autoimmune hepatitis and another for cryptogenic ALF (Tables 1 and 2). When we examine drug induced hepatotoxicity cases, Ornidazole and amoxicillin-clavulanate were found to be responsible for one patient. On the other hand, active substance could not be identified due to multiple drug use. Liver transplantation was successful in the treatment of all patients.

DISCUSSION
Acute liver failure is a rare, life-threatening clinical condition that is characterized by severe and instant hepatocellular necrosis, jaundice, coagulopathy and encephalopathy. Acute liver failure cases have no history of liver disease, and the symptoms of ALF appear within 26 weeks.1,2 Toxicity is the major cause of ALF in developed countries, while viral factors are the major cause in developing countries. Kayaalp et al analyzed 308 Turkish patients and found that the most common causes of ALF were hepatitis A in children (20.9%) and hepatitis B in adults (34.7%). Eighteen percent of ALS cases are due to cryptogenic causes, while 14% are due to metabolic causes. Wilson disease is the most common cause of metabolic diseases, while toxic liver failure is most often due to mushroom poisoning (13%). Poisoning from fireworks and phosphorus are regional factors, while anti-tuberculosis agents (3.2% of ALF causes) are the most common cause of drug-based ALF. Paracetamol is responsible for only 0.7% of ALF cases.6 In our current study, toxicity was the major cause of ALF in the patients who underwent liver transplantation (84%). None of the patients who underwent liver transplantation had ALF caused by viral factors. We believe that the results of this study do not reflect the patient profile of all of Turkey, but reflects only the profile of the patients who applied to our hospital.

Acute liver failure is related to high morbidity and mortality. Interactions between the patient, genetics,

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**Table 1: Characteristics of the cases**

| Cases (N) | Sex | Age (years) | Factor | Donor |
|-----------|-----|-------------|--------|-------|
| N1        | F   | 5           | Autoimmune | Alive |
| N2        | F   | 22          | Cryptogenic | Alive |
| N3        | F   | 47          | Toxic     | Cadaver |
| N4        | M   | 20          | Toxic     | Alive |
| N5        | M   | 28          | Toxic     | Alive |
| N6        | F   | 5           | Toxic     | Alive |
| N7        | F   | 8           | Toxic     | Alive |
| N8        | M   | 33          | Toxic     | Alive |
| N9        | M   | 43          | Toxic     | Alive |
| N10       | F   | 36          | Toxic     | Alive |
| N11       | F   | 61          | Toxic     | Cadaver |
| N12       | F   | 44          | Toxic     | Cadaver |
| N13       | M   | 28          | Toxic     | Alive |

Total 13   61% F  39% M  Average age 29.2  11 Toxic  23% Cadaver  23%  Autimmune  1 Cryptogenic  77% Alive

F: Female; M: Male

**Table 2: Laboratory test results of cases**

| Case | AST (u/l) | ALT (u/l) | T. Bil (mg/dl) | Cr. (mg/dl) | Na (meq/l) | Alb (g/dl) | INR | MELD | Encephalopathy grade | Assit |
|------|-----------|-----------|----------------|-------------|------------|------------|-----|------|---------------------|-------|
| N1   | 57        | 73        | 17.29          | 0.52        | 143        | 5.3        | 2.933 | 29   | 4                   | None  |
| N2   | 622       | 756       | 20.56          | 0.5         | 139        | 2.3        | 3.406 | 32   | 4                   | Low   |
| N3   | 1507      | 1668      | 45             | 0.2         | 139        | 3.4        | 4.42  | 37   | 4                   | Low   |
| N4   | 625       | 504       | 48             | 1           | 137        | 2.8        | 2.933 | 33   | 1                   | Low   |
| N5   | 1723      | 1967      | 42             | 0.6         | 138        | 2.7        | 6.05  | 41   | 3                   | None  |
| N6   | 2210      | 1188      | 26.5           | 0.2         | 142        | 3.4        | 2.3   | 28   | 3                   | Low   |
| N7   | 1747      | 1150      | 3.2            | 1           | 132        | 1.8        | 2.3   | 20   | 3                   | None  |
| N8   | 126       | 197       | 43.92          | 0.56        | 137        | 3          | 2.55  | 31   | 1                   | Low   |
| N9   | 87        | 1540      | 19.92          | 0.81        | 144        | 3.2        | 3.18  | 31   | 3                   | Low   |
| N10  | 622       | 659       | 26.06          | 0.33        | 140        | 2.7        | 2.84  | 30   | 1                   | None  |
| N11  | 120       | 70        | 39.01          | 0.63        | 137        | 2.8        | 5     | 38   | 2                   | None  |
| N12  | 205       | 134       | 46.7           | 0.2         | 133        | 2.9        | 2.18  | 30   | 1                   | Low   |
| N13  | 313       | 331       | 33.8           | 0.39        | 149        | 3.1        | 2.5   | 30   | 3                   | None  |

Total 13  766.4  787.4  31.6  0.5  139.2  3.0  3.2  31.5  2.5

F: Female; M: Male; T. bil: Total bilirubin; Cr: Creatine; Alb: Albumine; MELD: Model for end-stage liver disease
the cause of the hepatic injury play a role in the prognosis of ALF. Today, 45% of adult patients recover spontaneously, 25% undergo liver transplantation, and 30% are lost before the liver transplantation due to absolute contraindications. On the other hand, 56% of children with ALF recover spontaneously, 30% undergo liver transplantation, and 13% are lost before the liver transplantation. In our hospital, 13 cases of acute liver failure were treated via liver transplantation (three from cadaver, 10 from living donor). Liver transplantation is a very successful method for the treatment of ALF.

Results of this study indicate that toxicity is the major cause of ALF in patients who underwent liver transplantation at DEUMF. However, this result is not in accordance with the general situation in Turkey. Our current results only reflect the characteristics of our region. However, liver transplantation was successful in all patients, and there were no complications during or after the surgery. As previous studies have shown, liver transplantation is a very safe and effective method for the treatment of ALF.

REFERENCES

1. Larson AM. Diagnosis and management of acute liver failure. Curr Opin Gastroenterol 2010;26(3):214-221.
2. Bernal W, Auzinger G, Dhawan A, Wendon J. Acute liver failure. Lancet 2010;376(9736):190-201.
3. Strnad P, Zhou Q, Hanada S, Lazzeroni LC, Zhong BH, So P, Davern TJ, Lee WM. Acute Liver Failure Study Group, Omary MB. Keratin variants predispose to acute liver failure and adverse outcome: race and ethnic associations. Gastroenterol 2010;139(3):828-835.
4. Mc Phail MJ, Wendon JA, Bernal W. Meta-analysis of performance of King's College Hospital Criteria in prediction of outcome in nonparacetamol-induced acute liver failure. J Hepatol 2010;53(3):492-499.
5. Lee WM, Squires RH Jr, Nyberg SL, Doo E, Hoofnagle JH. Acute liver failure: summary of a workshop. Hepatol 2008; 47(4):1401-1415.
6. Kayaalp C, Ersan V, Yilmaz S. Acute liver failure in Turkey: a systematic review. Turk J Gastroenterol 2014; 25(1):35-40.