Evaluation of liver function show hypoproteinemia in untreated cancer patients: A cross-sectional study

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Abstract

Background: Liver function test (LFT) is a routine laboratory examination used in the diagnosis of many disorders, the liver participates in several essential functions in the human body, and liver dysfunction can lead to morbidity and mortality. Therefore, studying the levels of LFT in untreated cancer patients can identify how the liver perform when cancer begins, and which parameter of LFT is affected early.

Objective: This study aimed to evaluate levels of LFT including alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphatase (ALP), albumin, total bilirubin (T-bilirubin), direct bilirubin (D-bilirubin), and total protein (T-protein), in untreated cancer patients.

Design: Cross-sectional retrospective.

Settings: Taif city- king Faisal Hospital (KFH) and Taif university.

Patients and methods: Serum levels of ALT, AST, ALP, T protein, T bilirubin, D bilirubin, and albumin were evaluated. 256 Participants were included in this study and 30 were healthy participants. Cancer patients were as follows, gastrointestinal tract cancer patients were 59, breast cancer patients were 45, gynecological tumors were 50, head and neck cancer patients were 20, blood tumor patients were 28, and urogenital tract patients were 24. Statistical analysis applied were T-test, Chi-square, odds ratio, and relative risk.

Sample size: 256 participants were 30 healthy controls and 226 untreated cancer patients.

Results: Hypoproteinemia was highly detected as 44% of patients demonstrated hypoalbuminemia and 22.2% of patients have low levels in T protein. AST, ALT, and ALP showed significant increase in patients than healthy control.

Conclusion: Hypoproteinemia can be used as a prognostic marker of liver dysfunction in untreated cancer patients.

Keywords: Liver function test in untreated cancer patients

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Introduction

The liver is an organ that performs several functions in the human body, these are involved in the digestive system, conjugation, immune system as in reticuloendothelial functions, and blood purification. When abnormal conditions arise and lead to malfunction of liver, it can lead to several health conditions that can lead to illness and death. Several hepatic viruses are involved in damaging the liver and lead to cancer, a study has detected an association between hepatic viruses and human papilloma virus (HPV) infection that involved with several gynecological tumors and head and neck cancer and lack of awareness of HPV is common. Liver function tests (LFT) is an essential screening test requested by physicians, generally LFT includes alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphatase (ALP), albumin, total bilirubin (T-bilirubin), direct bilirubin (D-bilirubin), and total protein (T-protein), these are produced by liver and other organs. The levels of these enzymes and products are typically shift due to abnormal body conditions including cancer, infection, and autoimmune diseases. The results are helpful in diagnoses of these abnormalities, for example rise in AST and ALT is usually due to hepatocellular damage. ALP is raised due to several conditions including gall bladder and hepatocytes damage. Albumin is produced by the liver, when there is damage to the liver it will lead to reduce in albumin production and concentration, and this affect T protein concentration in the serum as it is composed of both albumin and globulins. Bilirubin helps to provide a perspective view about the liver uptake and excretion roles. This study aims to evaluate levels of LFT in untreated cancer patients before initiating cancer therapy.
Materials and Methods

Study design
This retrospective cross-sectional study was approved by the directorate of health affairs in Taif city for the period 2017 to May 2020, a consent form was provided prior using of data. The study aimed to obtain a total of 200 participants, still, this number was exceeded to reach 226 patients and 30 healthy participants to reach total of 256 participants, all these patients and healthy are free from viral hepatitis by analyzing hepatitis C virus (HCV), hepatitis A virus (HAV) total antibody, Hepatitis B core (HBc) total antibody, and HBc IgM. The kits are Bio-Rad Monolisa™ reference numbers are 72561, 72481, 72315, and 72382, respectively. Only untreated cancer patients were included in this study and patients who were previously diagnosed with cancer were excluded from this study as they have started their treatment which can affect LFT.

Sample analysis
About 3 mL of venous blood were collected into plain tube, analyzed freshly and not stored through ROCHE COBAS® platform e501, KFH is adapting automated laboratory technologies. About 10 hours of fasting prior collecting of the blood from patients, samples were analyzed freshly and not stored. This study has collected the following information, sex, age of the patient, type of diagnosed cancer, and liver function test which include the following AST, ALT, ALP, T-bilirubin, D-Bilirubin, Albumin, and T-protein.

Statistical analysis
Microsoft excel for office was used for data analysis and most of statistical calculations. Pearson’s chi-square test was used to detect any significant frequency in a single category. Paired t-test was used to compare between mean levels of each parameter between the healthy and patients. For odds ratio (OR), relative risk (RR) and 95% confidence interval (95% CI) medical-website were used (www.medcalc.org), results when $P$ value < 0.05 were considered significant.

Results

Demographic analysis
Number of participants in this study was 256. Patients number was 226 participants and all of them are resident of Taif city. 30 healthy participants were included (Table:1).

Types of cancer
In table 2, the types of cancer involved in this study is illustrated. There were 45 female breast cancer patients, 50 Gynecological tumors patients, 20 head and neck cancer patients, 28 blood tumors, 24 urogenital tract patients, and 59 gastrointestinal tract patients. The total was 226 patients and 30 healthy participants were included to calculate means between patients and healthy participants, and analyses OR and RR.
Liver function test associated with age

The association between age and liver function test are illustrated in table 3. Age groups were divided into three types and the mean and the healthy were compared to the patients. ALP was significantly higher in ≤39-year-old blood and urogenital cancer patients than healthy controls (P value 0.002, 0.0491, respectively). D bilirubin was significantly higher in ≥65-year-old blood cancer patients (P value 0.0013). Moreover, T protein was significantly higher in ≥65-year-old blood cancer patients (P value 0.0457). Which was also significantly higher in breast cancer, gynecological cancer patients in 40 to 64-year-old patients (P value 0.0457, 0.0387, respectively). Moreover, ≤39-year-old urogenital cancer patients have more T protein than healthy controls (P value 0.034). Among head and neck cancer patients, ALT and ALP was higher in the ≤39-year-old patients than healthy controls (P value 0.0319, 0.0096, respectively).

Gastrointestinal tract cancer patients

Evaluation of LFT in gastrointestinal tract (GIT) cancer patients is illustrated in table 4. AST level was normal in most male and female patients, 8 patients have high levels (P value < 0.0001 and 0.0028). ALT levels were normal in most patients, 9 patients have high levels (P value 0.0003 and 0.0001). ALP levels were normal in most male and female patients, 7 patients have high levels (P value < 0.0001), and mean level was significantly higher in patients than healthy (P value 0.0017). T bilirubin levels were normal in most male and female patients, 6 patients have high levels (P value < 0.0001), and mean level was higher in patients than healthy (P value < 0.0001). D bilirubin levels were normal in most male and female patients, 24 patients have high levels, and only one male patient showed high level (P value 0.0075 and 0.0449), and mean level was significantly lower in patients than healthy (P value < 0.0001, OR 88.4 95% CI 5 to 1515, RR 36.7 95% CI 2.7 to 437). Albumin levels were normal in 32 patients, and low in 21 patients (P value 0.02971 and 0.0031), and mean level was significantly lower in patients than healthy (P value < 0.0001, OR 51 95% CI 3 to 883, RR 27.4 95% CI 2.7 to 434).

Blood tumor patients

Evaluation of LFT in blood tumor patients is illustrated in table 5. AST levels were normal in most male patients, 10 patients have high levels and mean level was significantly higher in patients than healthy (P value 0.0255, OR 34.6 95% CI 1.9 to 626.25, RR 22.45% CI 1.37 to 366). ALT levels were normal in female patients (P value 0.00018). ALP levels were normal in most male and female patients, 8 patients have high levels (P value 0.0242 and 0.0001), and mean level was significantly higher in patients than healthy (P value < 0.0001, OR 23.04 95% CI 1.26 to 420.4, RR 17 95% CI 1 to 281.9). T bilirubin levels were normal in most male and female patients, 2 patients have high levels (P value 0.0075 and 0.0001), and mean level was higher in patients than healthy (P value < 0.0001, OR 88.4 95% CI 5 to 1515, RR 36.7 95% CI 2.7 to 434).
Table 4: Evaluation of LFT in gastrointestinal tract cancer patients.

| Characteristics | Patients | Healthy | Odds Ratio | Relative Risk | P value |
|-----------------|----------|---------|------------|--------------|---------|
|                 | mean ±SD | Frequency | P value | mean ±SD | OR 95% CI | P value | RR 95% CI | P value |
| AST Male        | 2.28±16.3 | 4 | 28 | - | <0.0001 | 24.5±13.7 | 0.135 | 8.7 | 0.143 | 7.75 | 0.45 (0.15 to 31) | 0.1561 |
| Female          | 24.8±30.9 | 4 | 24 | - | <0.0002 | 17.5±5.37 | 0.002 | 31.2 | 0.135 | 11.85 | 0.45 (0.15 to 31) | 0.1561 |
| ALT Male        | 16.7±16   | 4 | 27 | - | <0.0001 | 16.9±12.5 | 0.4573 | 11.5 | 0.097 | 9.8 | 0.6 (0.6 to 163) | 0.1112 |
| Female          | 17.4±24   | 5 | 23 | - | <0.0001 | 13.75±5.8 | 0.0001 | 17.6 | 0.143 | 7.75 | 0.45 (0.15 to 31) | 0.1561 |
| ALP Male        | 71.75±48.5 | 5 | 26 | 0 | <0.0001 | 88.88±25.2 | 0.0017 | 8.7 | 0.143 | 7.75 | 0.45 (0.15 to 31) | 0.1561 |
| Female          | 106±144.4 | 2 | 26 | 0 | <0.0001 | 88.5±27.09 | 0.0001 | 7.4 | 0.1774 | 6.7 | 0.45 (0.1 to 115) | 0.1893 |
| T Bilirubin Male| 0.67±0.9 | 4 | 27 | - | <0.0001 | 0.65±0.38 | <0.0001 | 4.05±90.2 | 0.0001 | 7.13±1.13 | 0.1774 | 6.7 | 0.45 (0.1 to 115) | 0.1893 |
| Female          | 0.75±1.75 | 2 | 26 | - | <0.0001 | 0.40±90.2 | <0.0001 | 7.13±1.13 | 0.0001 | 7.13±1.13 | 0.1774 | 6.7 | 0.45 (0.1 to 115) | 0.1893 |
| Albamin Male    | 3.26±1.9 | 1 | 11 | 19 | <0.0003 | 3.49±0.66 | <0.0001 | 88.4 | 0.002 | 36.7 | 2.4 (2.4 to 57) | 0.0105 |
| Female          | 2.95±1.18 | 0 | 13 | 15 | 0.0459 | 3.3±0.63 | <0.0001 | 88.4 | 0.002 | 36.7 | 2.4 (2.4 to 57) | 0.0105 |
| T protein Male  | 7.1±1.15 | 4 | 16 | 11 | <0.0001 | 7.13±1.13 | <0.0001 | 7.13±1.13 | 0.0005 | 7.13±1.13 | 0.1774 | 6.7 | 0.45 (0.1 to 115) | 0.1893 |
| Female          | 6.8±1.3 | 1 | 16 | 10 | <0.0001 | 6.9±0.37 | <0.0001 | 7.13±1.13 | 0.0005 | 7.13±1.13 | 0.1774 | 6.7 | 0.45 (0.1 to 115) | 0.1893 |

healthy (P value < 0.0001, OR 11.2 95% CI 0.57 to 218.34, RR 5.35 95% CI 0.26 to 106.7). D bilirubin levels were normal in most male and female patients, 2 patients have high levels (P value 0.0075 and 0.0001), and mean level was significantly lower in patients than healthy (P value < 0.0001). Albumin levels were normal in most male and female patient (P value < 0.0001), 6 female patients have shown low levels but results were insignificant, furthermore, mean level was significantly lower in patients than healthy (P value < 0.0001, OR 61 95% CI 3.4 to 1095, RR 31 95% CI 1.9 to 496). T protein levels were normal in 22 patients, high in 2 male patients, and low in 4 patients (P value 0.0102 and 0.0001), and mean level was significantly higher in patients than healthy (P value < 0.0001, OR 17.6 95% CI 0.94 to 329).

Breast cancer patients

Evaluation of LFT in cancer patients is illustrated in table 6. AST levels were normal in most patients, 10 patients showed high levels (P value < 0.0001), and mean level was significantly higher in patients than healthy (P value 0.0013, OR 18.04 95% CI 1.0148 to 320). ALP levels were normal in most patients, 4 showed high level, and one showed low level (P value < 0.0001), and mean level was significantly lower in patients than healthy (P value < 0.0001). T bilirubin levels were normal in most patients (P value < 0.0001), and mean level was significantly lower in patients than healthy (P value < 0.0001). D bilirubin levels were normal in most patients, only one patient showed high level (P value < 0.0001), and mean level was significantly lower in patients than healthy (P value < 0.0001). Albumin levels were normal in most patients, 11 patients showed low level and one showed high level (P value < 0.0001), mean level was significantly higher in patients than healthy (P value < 0.0001).
Liver functions in Cancer Patients

Gynecological tumors

Evaluation of LFT in gynecological tumors patients is illustrated in table 7. AST levels were normal in most patients, only 3 patients have high levels (P value < 0.0001), and mean level was significantly higher in patients than healthy (P value < 0.0001). ALT levels were normal in most patients, 9 patients showed high levels (P value < 0.0001), and mean level was significantly higher in patients than healthy (P value < 0.0001). ALP levels were normal in most patients, 3 showed high levels, and one showed low levels (P value < 0.0001), and mean level was significantly higher in patients than healthy (P value < 0.0001). T bilirubin levels were normal in most patients, only one patient showed high level (P value < 0.0001), and mean level was higher in patients than healthy (P value < 0.0001). D bilirubin levels were normal in most patients, only two patients showed high level (P value < 0.0001), and mean level was significantly higher in patients than healthy (P value < 0.0001). Albumin levels were normal in most patients, 18 patients showed low level and one showed high level (P value < 0.0001), mean level was significantly higher in patients than healthy (P value 0.0014, OR 103.8 95% CI 5.9 to 1800, RR 28.9 95% CI 1.8 to 460.9). T protein levels were normal in 38 patients, high in 2 patients, and low in 9 patients (P value < 0.0001), and mean level was significantly higher in patients than healthy (P value < 0.0001, OR 18.2 95% CI 1.03 to 321.7, RR 14.2 95% CI 0.87 to 233.5).

Head and neck cancer patients

Evaluation of LFT in blood tumor patients is illustrated in table 8. AST levels were normal in most male and female patients, one male patient have high levels (P value 0.01963 and 0.009), and mean level was significantly higher in patients than healthy (P value 0.0022). ALT levels were normal in most female and male patients (P value 0.0021 and 0.0348). ALP level was normal in most patients, one patient has high level (P value 0.0001, OR 20.3 95% CI 15.5 to 253, RR 15.5 95% CI 0.94 to 253).

| Characteristics | Patients | Healthy | Odds Ratio | Relative Risk |
|-----------------|----------|---------|------------|---------------|
| AST             | 19.9±7.5 | 4 41    | 6.61       | 6.26          |
| ALT             | 18±11.5  | 10 35   | 18.04      | 14.15         |
| ALP             | 66.9±27.9| 4 40    | 8.28       | 7.4           |
| T Bilirubin     | 0.55±0.6 | 1 44    | 2.05       | 2.0           |
| D Bilirubin     | 0.17±0.21| 1 44    | 2.05       | 2.0           |
| Albumin         | 3.4±1.2  | 1 33    | 53.4       | 28.9          |
| T Protein       | 7.4±0.95 | 4 34    | 6.9±0.37   | 15.5          |

| Characteristics | Patients | Healthy | Odds Ratio | Relative Risk |
|-----------------|----------|---------|------------|---------------|
| AST             | 18.9±11.4| 3 46    | 4.5        | 4.3           |
| ALT             | 16.73±11.6| 9 40   | 14.3       | 11.8          |
| ALP             | 90.6±71.05| 3 45    | 6.03       | 5.6           |
| T Bilirubin     | 0.61±1.5 | 1 48    | 1.89       | 1.86          |
| D Bilirubin     | 0.3±0.7  | 2 47    | 3.2        | 3.1           |
| Albumin         | 3.4±1.09 | 0 31    | 103.8      | 39.06         |
| T Protein       | 7.1±1.16 | 2 38    | 18.2       | 14.2          |

Table 6 Evaluation of LFT in breast cancer patients.

| Characteristics | Patients | Healthy | Odds Ratio | Relative Risk |
|-----------------|----------|---------|------------|---------------|
| AST             | 19.9±7.5 | 4 41    | 6.61       | 6.26          |
| ALT             | 18±11.5  | 10 35   | 18.04      | 14.15         |
| ALP             | 66.9±27.9| 4 40    | 8.28       | 7.4           |
| T Bilirubin     | 0.55±0.6 | 1 44    | 2.05       | 2.0           |
| D Bilirubin     | 0.17±0.21| 1 44    | 2.05       | 2.0           |
| Albumin         | 3.4±1.2  | 1 33    | 53.4       | 28.9          |
| T Protein       | 7.4±0.95 | 4 34    | 6.9±0.37   | 15.5          |
value 0.0017 and < 0.0001), and mean level was significantly lower in patients than healthy (P value < 0.0001). T bilirubin levels were normal in most male and female patients, two patients have high levels (P value 0.0196 and 0.0066), and mean level was lower in patients than healthy (P value < 0.0001, OR 8.24 95% CI 0.4 to 181, RR 7.4 95% CI 0.37 to 146). D bilirubin levels were normal in most male and female patients, one male patient has high level (P value 0.0196 and 0.0009), and mean level was lower in patients than healthy (P value < 0.0001, OR 31.5 95% CI 1.7 to 580). Albumin levels were normal in 16 patients, low in 3 patients (P value < 0.0001), and mean level was significantly lower in patients than healthy (P value < 0.0001). Albumin levels were normal in most male and female patients, 4 patients have high levels (P value 0.0111 and 0.00002), and mean level was significantly lower in patients than healthy (P value 0.0005 and 0.0209). D bilirubin levels were normal in most male and female patients, 2 female patients have high levels (P value 0.0005 and 0.0209). D bilirubin levels were normal in most male and female patients, 2 female patients have high levels (P value 0.0005 and 0.0209). Albumin levels were low in most male and female patients, 6 patients have shown normal levels (P value 0.0183 and 0.0009), mean level was significantly lower in patients than healthy (P value < 0.0001, OR 174 95% CI 9.2 to 3265, RR 46 95% CI 2.9 to 724). T protein levels were normal in 15 patients, high in 2 male patients, and low in 3 patients (P value 0.0017), and mean level was significantly higher in patients than healthy (P value < 0.0001, OR 27 95% CI 1.4 to 520).

### Table 8 Evaluation of LFT in head and neck cancer patients.

| Characteristics | Patients | Healthy | Odds Ratio | Relative Risk |
|-----------------|----------|---------|------------|---------------|
|                 | mean ±SD | mean ±SD | OR 95% CI  | P value       |
|                 |          |          |            | RR 95% CI     | P value       |
| AST             | Male     | 20.7±6.4 | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
|                 | Female   | 21.8±6.8 | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
| ALP             | Male     | 88.5±7.6 | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
|                 | Female   | 72±26    | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
| Bilirubin       | Male     | 0.6±0.3  | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
|                 | Female   | 0.4±0.3  | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
| Albumin         | Male     | 3.8±0.7  | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
|                 | Female   | 3.65±0.8 | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
| T Protein       | Male     | 7.6±0.7  | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
|                 | Female   | 7.1±1.3  | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |

### Table 9 Evaluation of LFT in Urogenital tract cancer patients.

| Characteristics | Patients | Healthy | Odds Ratio | Relative Risk |
|-----------------|----------|---------|------------|---------------|
|                 | mean ±SD | mean ±SD | OR 95% CI  | P value       |
|                 |          |          |            | RR 95% CI     | P value       |
| AST             | Male     | 27.3±1.5 | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
|                 | Female   | 31.5±3.1 | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
| ALP             | Male     | 17.1±13.4| 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
|                 | Female   | 94±107   | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
| Bilirubin       | Male     | 0.5±0.1  | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
|                 | Female   | 1.67±3.6 | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
| Albumin         | Male     | 3.8±0.23 | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
|                 | Female   | 3.6±0.9  | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
| T Protein       | Male     | 7±1.6    | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |
|                 | Female   | 7±1.3    | 1.09±0.10 | <0.0001       | 2.7±1.8      | 0.0086       |

### Urogenital tract

Evaluation of LFT in urogenital tract cancer patients is illustrated in table 9. AST levels were normal in most male and female patients, 4 patients have high levels (P value 0.0209). ALP levels were normal in most male and female patients, four patients have high levels (P value 0.0111 and 0.00002), and mean level was significantly lower in patients than healthy (P value 0.0005 and 0.0209). D bilirubin levels were normal in most male and female patients, 2 female patients have high levels (P value 0.0005 and 0.0209). D bilirubin levels were normal in most male and female patients, 2 female patients have high levels (P value 0.0005 and 0.0209). Albumin levels were normal in most male and female patients, 6 patients have shown normal levels (P value 0.0183 and 0.0009), mean level was significantly lower in patients than healthy (P value < 0.0001, OR 174 95% CI 9.2 to 3265, RR 46 95% CI 2.9 to 724). T protein levels were normal in 16 patients, low 2 female patients (P value 0.0009), and mean level was significantly higher in patients than healthy (P value < 0.0001, OR 31.4 95% CI 1.7 to 347, RR 21 95% CI 1.3 to 520).
Liver functions in Cancer Patients


diagnosis. Moreover, it is used for screening to evaluate several disorders, this test helps in diseases of the urogenital tract, GIT, and head and neck, and is arranged as follows, gynecological cancer, breast cancer, transaminase in malignant breast cancer patients than healthy in all groups except urogenital group. This is due to growth in the activity of the liver leading to impact on its functions, this followed by abnormality of LFT

Table 10 Evaluation of the ratio of D/T bilirubin.

|                     | D Bilirubin | T Bilirubin | D/T ratio |
|---------------------|-------------|-------------|-----------|
| Healthy             | 0.19±0.12   | 0.53±0.3    | 0.358491  |
| Gastrointestinal tract | 0.31±0.7   | 0.71±1.3    | 0.43662   |
| Blood tumor         | 0.17±0.11   | 0.54±0.34   | 0.314815  |
| Breast cancer       | 0.17±0.21   | 0.55±0.6    | 0.309891  |
| Gynecological tumors | 0.3±0.7     | 0.61±1.5    | 0.496093  |
| Head and neck       | 0.17±0.1    | 0.5±0.28    | 0.34      |
| Urogenital tract    | 0.5±0.85    | 1.09±1.8    | 0.458716  |

Analysis of D/T -Bilirubin ratio

The analysis of D bilirubin / T bilirubin ratio is displayed in table 10. Calculating the ratio can identify if patients have developed conjugated hyperbilirubinemia if D/T ratio exceeds 70% or 0.7[14,10]. The highest ratio is followed as follows, gynecological cancer, breast cancer, urogenital tract cancer, GIT, and head and neck, and blood tumor.

Discussion

LFT is a routine test usually requested by clinicians to predict several disorders, this test helps in diseases diagnosis. Moreover, it is used for screening to evaluate patient’s progression, medications side effect, and several other purposes Hepatotoxicity leads to damage of the liver leading to impact on its functions, this followed by abnormality of LFT[12, 13]. In this study 256 participants were included, 30 of the participants were healthy. About 70% of the study population were female, and majority were 40 – 64 years old. In this study LFT has included AST, ALT, ALP, D bilirubin, T bilirubin, T protein, and albumin, and the study group was untreated cancer patients in Taif city. The percentage of patients with normal AST level was 86.7%, and 13.3% with high level. For ALT, about 79.6% showed normal level while 20.4% showed high level. Elevation of AST and ALT are evidence of liver dysfunction, damage and necrosis of tissues, a study has reported that ALT was in normal level in breast carcinoma patients before starting the chemotherapy course until the fifth day after starting the treatment then boosted[21]. Mean levels of AST and ALT were higher in patients more than healthy in all groups except urogenital group. This is due to growth in the activity of transaminase in malignant breast cancer patients than benign and healthy[14,16]. High levels of AST and ALT were reported in a study with similar types of participants, and these abnormal levels were associated with patients death in about six weeks, however, this study investigated advanced cancer patients[17]. The studies that focused on LFT at untreated cancer patients are few and have not focused on all types like this study. Most of the patients showed normal level of ALP 86.7%, high level was in 12.3%, and less than 1% showed low level, comparing age groups identified that ≤39-year-old blood and urogenital cancer patients have higher levels than patients. ALP was detected in breast cancer patients and advancement in ALP is suggestive of breast cancer metastases, other studies have reported ALP was normal[14, 18-20]. T bilirubin was normal in 93% of the patients, and high in 7% only. D bilirubin was normal in 94.25% of patients, and high in 5.75% of the patients, and higher in ≥65-year-old blood cancer patients. Only small percentage of this study group have high levels of bilirubin, also, only head and neck cancer patients have lower levels than healthy participants. These findings are reasonable as bilirubin was reported to increase due to chemotherapy[21, 22]. And those patients have not started their treatments, no type of cancer has reached D/T bilirubin ratio equal to 0.7. In other hand, albumin was normal in 55%, hypoalbuminemia in 44%, and hyperalbuminemia in 1%. Albumin is synthesized by the liver and is a good indicator of liver productivity, inflammation, and malnutrition. A study reported hypoalbuminemia in advance cancer patients, also, it was reported hypoalbuminemia can increase mortality rate in cancer patients[8, 17, 23-27]. Malnutrition can affect the liver function and it is associated with inflammation which can impair LFT levels[21]. T protein was normal in 70% of cases, low in 22.2%, and high in 7.8% of cases, and in age groups those more than 40 have high levels in breast cancer, gynecological cancer patient, and less than 39 urogenital cancer patients. T protein of the serum is composed of albumin and globulins; therefore, hypoalbuminemia can have a major effect on T protein and this study has detected low levels of T protein in 22.2% of the patients. To summarize these findings, the parameters of LFT significantly affected were albumin, T protein, ALT, AST, ALP, T bilirubin, and D bilirubin, respectively.

Limitations of the study are as follows, height and weight of patients were not measured which can assist in analyzing LFT compared to BMI in this study. Proteins produced by the liver and involved in hemostasis were not analyzed which can help to compare them with albumin levels and assess liver productivity, this also help to study prothrombin time in these patients. LFT levels of patients after initiating their treatment is initiated in different hospital which can help in comparing the levels.

Conclusion

The current work evaluated levels of LFT in untreated cancer patients before they initiate any type of treatment. This can provide a point of view about LFT levels in those patients. Albumin and T protein were highly affected and significant part of the study group demonstrated hypoproteinemia. Which can be used as a prognostic marker of poor prognosis and dysfunction of the liver.
ALT, AST, and ALP were also significantly increased than healthy participants which can also show abnormality in liver activity.

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