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RESEARCH

COMPARISON OF GLYCO PROTEINS LEVELS WITH SOME BIOCHEMICAL PARAMETERS IN IRAQI PATIENTS WITH CHRONIC LIVER DISEASES

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ABSTRACT

The aim of this study is to assess the comparison of serum protein bound hexose PBH , seromuciod proteins SP and protein bound fucose PBF with some biochemical parameters (age, hematological parameters , liver functions , lipid profile) in sera target population{61 (chronic hepatitis B & C)}and (30) healthy subjects. The results indicated that there were a significant increase in the levels of the serum PBH, SP , PBF , TSP , AST, ALT ,ALP and TSB in HBV and HCV patients ($p < 0.05$) in comparison with healthy subjects and a significant decrease in albumin and lipid profile levels . Finally, there were a positive correlation in serum PBH levels with ALT& negative correlation with SP, SP showed positive correlation with PBF and PBF showed positive correlation with ALP.

INTRODUCTION

Hepatitis means inflammation of the liver. There are many reasons for the liver to be inflamed by viral, toxic, metabolic, pharmacologic, or immune-mediated attack on the liver [1]. Viral hepatitis is a major glob health problem all over the world [2, 3]. The infection with chronic hepatitis B (HBV) and C (HCV) viruses, and alcoholic and non-alcoholic fatty liver disease are the major etiologies. Chronic hepatitis B and C are the leading causes of cirrhosis and of hepatocellular carcinoma (HCC) worldwide. Approximately 400 million people are chronically infected with HBV and 25%-40% of them die with cirrhosis and its end-stage complications [3]. The percent of Iraqi patients with chronic hepatitis B & C during 2008 to 2011 summarized in table (1) [4].

Glycoproteins (GPs) are proteins that contain oligosaccharide chains (glycans) covalently attached to polypeptide side chain; they play a key role in a number of biological processes involving cell-to-cell communication, cell proliferation, and recognition and cell death. There are many types of GPs according to the principle carbohydrates found in GPs [5]. This paper studied three kinds of GPs that are Protein Bound Hexose (PBH), Seromucoid Proteins (SP) and Protein Bound Fucose (PBF). Protein Bound Hexose are 6-carbon sugar molecules that play a key role in different biochemical pathways, including cellular energy release, signaling, carbohydrate synthesis, and the regulation of gene expression [6]. A marked increase in the level of serum PBH has been noted repeatedly inflammatory diseases, infection, malignancies and cancer, also PBH elevated in rheumatoid arthritis, leukemia and chronic infections [7, 8,9]. Seromucoid Proteins are the carbohydrate-protein conjugates in serum; these consist, predominantly, from carbohydrate rich glycoprotein fraction called the acute phase reactants, it is produced increased quantities in the liver parenchymal cells and is poured into the blood stream in infection, trauma and inflammatory [10]. Fucose may present in the human body in three forms: free fucose (FF), present in trace amount in serum, protein associated fucose called protein-bound fucose (PBF), and lipid associated fucose called lipid-bound fucose (LBF) [11]. Fucose naturally found in D, L forms only L-form is identified in human tissues and fluids, L-fucose (6-deoxy-L-galactose) [12], serum fucose content in the glycoprotein fraction was determined in various patients with malignant and benign diseases [13]. This study was aimed to evaluate the levels of serum PBH, SP , PBF and some biochemical parameters (prothrombin time PT , total protein TP, albumin , Alanine aminotransferase ALT, asparagine aminotransferase AST , total serum bilirubin TSB , alkaline phophatase ALP and lipid profile) in sera target population (chronic hepatitis B & C) and compared with healthy subjects. Finally, correlate GPs with these biochemical parameters in the patients groups.

Table 1: percent of Iraqi patients with chronic hepatitis B&C during (2008, 2009, 2010, and 2011)

Years	HBV (donor) %	HCV (donor) %	HBV (danger) %	HCV (danger) %	HBV Total %	HCV Total %
2008	1.07	0.29	2.37	2.57	3.44	2.86
2009	0.53	0.16	1.62	1.36	2.15	1.52
2010	0.49	0.18	1.29	1.55	1.78	1.73
2011	0.47	0.14	1.19	0.80	1.66	0.94

MATERIALS AND METHODS

The study was carried out on 91 subjects, 31 of them with HBV, 30 with HCV, and 30 healthy volunteers as a control group (with no clinical or laboratory evidence of liver diseases). None of those 91 subjects had received any medications. The duration of the study was from September 2011 to March 2012. After ethical clearance the study was carried out in the Gastroenterology and Hepatology teaching hospital / Baghdad.

The process of collecting specimens by withdraw about 10 ml of venous blood using plastic disposable syringes.1.8 ml from whole blood add to 0.2 ml (200 µl) trisodium citrate in test tube to obtained plasma for PT test, the remaining Blood samples (8.2 ml) were left for 30 minutes at room temperature. After coagulation, the sera were separated by centrifugation at 704 xg for 10 min. Hemolysed samples were discarded and the sera were stored and frozen about -20C°until analysis.

All patients and healthy group were screened for HBsAg and Anti HCV-Ab using HBsAg ELISA Test Kit (Plasma Tec. Laboratory Products) &HCV ELISA Test Kit), respectively and the positive cases were confirmed by confirmatory tests. All cases were tested for Prothrombin time (PT) using NEOPLASTINE® CI PLUS kits, serum levels of bilirubin, Alanine aminotransferase(ALT), asparagine aminotransferase (AST), and total serum bilirubin (TSB) by RANDOX kit, alkaline phophatase (ALP) by bioMerieux® kit , total serum protein (TSP), serum albumin(ALB) by SPINREACT kit , total cholesterol , Triglyceride and HDL-C were measured enzymatically with commercial Linear Chemicals S.L. kits, VLDL was calculated using the Friedwald formula:(1/5(triglyceride), and LDL-C was calculated also by using the Friedwald formula:(total cholesterol)-(HDL-C)-1/5(triglycerides) [14]. All sera samples were tested for the presence of PBH and SP spectrophotometrically by the method of Weimer and Moshin [15]. While PBF determined according to Dische and Shettles method [16].

STATISTICAL ANALYSIS

For a statistical analysis of quantitative variables, the mean and standard deviation were calculated. One-sample t-tests were performed; comparisons were done with the independent-samples t- test and paired –samples t- test. All values are presented as mean ± SD. Statistical software was SPSS, version 11. It would be significant if p≤0.05.

RESULTS

The distribution of the studied groups according to age & sex are summarized in table (2).

Table (2): Distribution of the patients and control groups according to age & sex

Age	HBV		HCV		Control	
Groups (years)	male	Female	Male	female	male	Female
< 20	2	1	1	0	2	1
20 – 29	3	4	1	2	2	4
30 – 39	5	2	5	4	3	5
40 – 49	5	2	2	4	4	3
50 – 59	1	2	7	2	2	1
≥ 60	1	3	1	1	2	1
Sub Total	17	14	17	13	15	15
Net Total	31		30		30	
Total	91					

From a total of 91 subjects 49 (53.84%) were male and 42 (46.15%) were female. Hepatitis B and C was present in 61 (67.03%) cases. Out of these positive cases 31 (50.81%) were suffering from hepatitis B and 30 (49.18%) were suffering from hepatitis C, and in 30 (32.96%) cases were healthy (control). Among the 31 patients suffering from HBV, 17 (54.83%) were male and 14 (45.16%) were female. Out of 30 hepatitis C patients 17 (56.66%) were male and 13 (43.33%) were female patients. Clinical & Lab. data for the studied groups are given in table 3.

Table (3) :clinical and laboratory data of patients with HCB, HBV and control

	HCV patients	HBV patients	Control	P HCV	P HBV
No	30	31	30	--------	--------
Gender (M/F)	17/13	17/14	15/15	--------	--------
Age	42.53 ± 11.880	38.64 ± 14.947	37.53 ± 13.525	0.762	0.111
Prothrombin Time (Sec)	13.43 ± 0.747	13.27 ± 0.719	13.29 ± 0.329	0.913	0.390
Total serum protein (g/dl)	9.17 ± 1.624	9.29 ± 2.426	7.19 ± 0.662	0.000	0.000
Albumin (g/dl)	2.54 ± 0.170	2.63 ± 0.237	4.61 ± 0.578	0.000	0.000
AST (U/L)	9.63 ± 3.805	8.65 ± 4.423	5.69 ± 1.995	0.001	0.000
ALT (U/L)	16.54 ± 9.252	15.75 ± 9.306	6.92 ± 1.539	0.000	0.000
ALP (U/L)	90.59 ± 17.402	91.08 ± 17.133	50.83 ± 11.635	0.000	0.000
TSB (mg/dl)	1.01 ± 0.786	0.89 ± 0.838	0.42 ± 0.073	0.003	0.000
Total cholesterol (mg/dl)	93.52 ± 31.257	97.07 ± 26.358	166.66 ± 13.330	0.000	0.000
Triglyceride (mg/dl)	102.14 ± 63.585	103.45 ± 51.306	254.52 ± 26.493	0.000	0.000
HDL (mg/dl)	22.411 ± 8.507	22.57 ± 5.784	46.82 ± 11.623	0.000	0.000
VLDL (mg/dl)	20.40 ± 12.621	21.05 ± 10.593	50.904 ± 5.298	0.000	0.000
LDL (mg/dl)	50.74 ± 21.893	52.413 ± 22.282	68.77 ± 3.584	0.000	0.000
PBH (mg/dl)	156.11 ± 24.656	163.44 ± 25.791	97.50 ± 17.798	0.000	0.000
SP (mg/dl)	35.33 ± 7.621	36.12 ± 9.216	15.75 ± 5.987	0.000	0.000
PBF (mg/dl)	17.05 ± 3.278	16.42 ± 3.369	8.09 ± 1.042	0.000	0.000

Serum PBH levels were significantly higher in HBV (163.44 ± 25.791mg/ml) and HCV (156.11 ± 24.656mg/ml) (p <0.05) in comparison with control group (97.50 ± 17.798mg/mL) and there were a non significant increase in HBV patients compared to HCV (p >0.05) , serum SP levels were significantly higher in HBV (36.12 ± 9.216mg/ml) and HCV (35.33 ± 7.621mg/ml) (p < 0.05) in comparison with control group (15.75 ± 5.987mg/mL) and there were a non significant increase in HBV patients compared to HCV (p > 0.05) and serum PBF levels were significantly higher in HBV (16.42 ± 3.369mg/ml) and HCV (17.05 ± 3.278mg/ml) (p <0.05) in comparison with control group (8.09 ± 1.042mg/mL) and there were a non significant decrease in HBV patients compared to HCV (p >0.05).

Patients with HBV & HCV had also a significant higher total protein, AST, ALT, ALP, & TSB (p < 0.00) and significant lower ALB, Cholesterol, Triglyceride, HDL, VLDL & LDL compared to control as clear in table 3. The Spearman's Correlation Analysis between serum PBH, SP,

PBF and other biochemical parameters in HBV and HCV are shown in tables 4, 5 and 6.

Table 4: Spearman's Correlation Analysis between Serum PBH and patients with (HCV& HBV) and Biochemical Variables of the Study Subjects.

Parameters	HCV patients N=(30)	P-value	HBV patients N=(31)	P-value
Age Years	0.102	0.591	-0.213	0.251
Prothrombin Time (Sec)	0.306	0.100	-0.075	0.688
Total serum protein (g/dl)	0.071	0.710	-0.076	0.685
Albumin (g/dl)	-0.117	0.536	-0.059	0.754
AST (U/L)	0.153	0.421	-0.173	0.352
ALT (U/L)	0.511**	0.004	0.053	0.779
ALP (U/L)	0.028	0.885	0.014	0.938
TSB (mg/dl)	-0.029	0.879	-0.045	0.811
Total cholesterol (mg/dl)	-0.167	0.377	0.159	0.394
Triglyceride (mg/dl)	-0.138	0.466	0.037	0.842
HDL (mg/dl)	-0.148	0.436	-0.082	0.661
VLDL (mg/dl)	-0.138	0.466	0.072	0.699
LDL (mg/dl)	-0.093	0.625	0.232	0.209
SP (mg/dl)	-.470**	0.009	0.159	0.393
PBF (mg/dl)	-0.189	0.318	0.086	0.646

**. Correlation is significant at the 0.05 level (2-tailed).*
***. Correlation is significant at the 0.01 level (2-tailed).*

Table 5: Spearman's Correlation Analysis between Serum SP and patients with (HCV& HBV) and Biochemical Variables of the Study Subjects

Parameters	**HCV patients N=(30)**	**P-value**	**HBV patients N=(31)**	**P-value**
Age Years	0.008	0.965	-0.037	0.843
Prothrombin Time (Sec)	0.041	0.831	-0.321	0.078
Total serum protein (g/dl)	0.034	0.859	-0.167	0.368
Albumin (g/dl)	0.247	0.187	-0.050	0.790
AST (U/L)	-0.265	0.157	0.190	0.306
ALT (U/L)	-0.319	0.086	-0.053	0.776
ALP (U/L)	0.213	0.258	0.082	0.662
TSB (mg/dl)	-0.063	0.739	0.329	0.070
Total cholesterol (mg/dl)	0.136	0.474	-0.169	0.362
Triglyceride (mg/dl)	0.029	0.879	-0.293	0.110
HDL (mg/dl)	0.278	0.137	0.230	0.214
VLDL (mg/dl)	0.037	0.844	-0.262	0.154
LDL (mg/dl)	0.059	0.757	-0.105	0.575
PBH (mg/dl)	-0.470**	0.009	0.159	0.393
PBF (mg/dl)	0.364*	0.048	0.046	0.807

**. Correlation is significant at the 0.05 level (2-tailed).*
***. Correlation is significant at the 0.01 level (2-tailed).*

Table 6: Spearman's Correlation Analysis between Serum PBF and patients with (HCV& HBV) and Biochemical Variables of the Study Subjects

Parameters	**HCV patients** N=(30)	**P-value**	**HBV patients** N=(31)	**P-value**
Age Years	-0.046	0.810	0.070	0.708
Prothrombin Time (Sec)	0.051	0.790	-0.061	0.745
Total serum protein (g/dl)	0.041	0.831	0.026	0.888
Albumin (g/dl)	0.005	0.979	0.105	0.575
AST (U/L)	0.060	0.754	0.053	0.777
ALT (U/L)	-0.197	0.297	-0.059	0.753
ALP (U/L)	0.415*	0.023	-0.308	0.092
TSB (mg/dl)	0.329	0.076	-0.097	0.604
Total cholesterol (mg/dl)	0.089	0.641	-0.062	0.739
Triglyceride (mg/dl)	0.024	0.900	-0.070	0.710
HDL (mg/dl)	0.161	0.395	-0.009	0.963
VLDL (mg/dl)	0.026	0.892	-0.126	0.498
LDL (mg/dl)	0.045	0.814	-0.003	0.987
PBH (mg/dl)	-0.189	0.318	0.086	0.646
SP (mg/dl)	0.364*	0.048	0.046	0.807

**. Correlation is significant at the 0.05 level (2-tailed).*
***. Correlation is significant at the 0.01 level (2-tailed).*

Serum PBH levels showed positive correlation with ALT (r=0.511, p = 0.004) & negative correlation with SP(r=-0.0470, p = 0.009), also SP showed positive correlation with PBF(r=0.364, p = 0.048), PBF showed positive correlation with ALP(r=0.415, p=0.023) in HCV patients.

DISCUSSION

Viral HBV and HCV infections are the greatest infectious disease problems among the world's , about 350 million people have chronic hepatitis B virus (HBV) infection, and about 125 million have been infected with hepatitis C virus (HCV) , therefore these diseases are important candidates for public health measures aimed at prevention , early diagnosis and treatment [17] , also Individuals with chronic hepatitis especially through HBV and HCV, are at highest risk to progress to cirrhosis hepatocellular carcinoma (HCC) [18,19].

In the present study patients with chronic liver diseases (HBV & HCV) were compared with healthy subjects in term of age , hematological parameters , liver functions , lipid profile, PBH, SP, PBH .Interestingly , HBV & HCV patients were commonly found in ages ranged between 20-49 years , the median of patients age was 4 years older than that of the healthy subjects , these findings are related to the author observed that infection with HCV were most prevalent among people age between 30 to 49 years[20] . The results show that the gender in HBV patients were about (54.8% male & 45.2% female) and in HCV patients were about (56.6% male & 43.3% female) , Tungtrongchitr et al[21], in their study on Thailand patients with HBV , HCV & non – alcoholic steatosis hepatitis found that most subjects were males since liver disease is more common among men . To our knowledge, this is the first study that shows the concentration of some glycoproteins types in sera of patients with HBV&HCV patients.

Moschides E et al [22] , who pointed out the presence of a decrease in Seromucoid protein in liver disease which is in disagreement with the results of this study. Vijayalakshmi S et al [23], studied serum glycoproteins in platelets of liver cirrhotic bleeders and found significantly decrease in it, while Frances E et al[24] and other studies dealt with level of glycoproteins but in breast cancer and malignancies and they found elevation in serum glycoproteins levels. The interpretation of the results in this study may be, because Hepatitis C is caused by an enveloped virus whose entry is mediated by two glycoproteins, namely, E1 and E2, which have been shown to assemble as a non covalent heterodimer, The envelope proteins of a virus play a pivotal role in its lifecycle, They participate in the assembly of the infectious particle and also play a crucial role in virus entry by binding to a receptor present on the host cell and inducing fusion between the viral envelope and a membrane of the host cell. The glycoproteins retained within the cell were not rapidly degraded, appearing as aggregates, enriched

So this may be reason to increase glycoprotein [25]. Also may be the damaging of hepatocyte after infection with viral hepatitis led to infiltration the glycoproteins that

soluble in cell to the circulation and that may be lead to increase levels of glycoproteins in serum.

The behavior of PBH, SP and PBF concentrations in the course of liver disease due to HBV & HCV infection is still under investigation, in this study serum PBH, SP and PBF levels were significantly high in both patients groups as compared to healthy subjects. The ALT and AST are also important biological markers that are widely used for liver diseases. All types of hepatitis and cirrhosis have been reported to cause liver damage that can lead to elevations in the serum ALT and AST activities [26]. This study revealed that their were a significant increase in ALT, AST and ALP activities in patients with HBV & HCV, damaged liver cells may be the result of increase these enzymes activities[27].

Elevation of serum bilirubin reflects the degree of liver damage [28], in other meaning which is reflected as deficiencies in bilirubin metabolism [29]. From table (3), total serum bilirubin were significant increase ($p < 0.05$) in HBV& HCV patients compared to control group and this agreed with the results obtained by LI X.M. et al[30] and Hano A et al[31].

Also the results in this study shown that there were a non significant difference in the level of PT and this results agreement with the results obtained by Mustafa G et al [32]. The prothrombin test is not a sensitive index of chronic liver disease because, even in severe cirrhosis, PT can be normal or only slightly prolonged [33].

The liver is the central organ for cholesterol, phospholipid, and triglyceride and lipoprotein metabolism. The functional impairment of liver would result in the reduced capacity to synthesize many important biomolecules, including lipids [34] . Hepatitis C virus infection is reported to be associated with hypocholesterolaemia [35]. In this study, lipid profile levels are found to be decreased in sera of patients with HBV and HCV compared to healthy subjects. Finally, there were a positive correlation in serum PBH levels with ALT& negative correlation with SP, also SP showed positive correlation with PBF , PBF showed positive correlation with ALP, also there were no correlation between PBH , SP and PBF with lipid profile , AST , bilirubin that used in this study , this might be argues against the potential role played by GPs in pathogenesis of human chronic liver disease or may be from the small number of subjects in this study so further studies on larger sample size are being planned to confirm these observations.

REFERENCE

1. Ansreolo.T.E, Binjamin.I.J, Griggs.R.C, Wing.E.J: Andreoli and carpinter's Cecil essentials of medicine .8th edition.2010 Elsevier Inc. All rights reserved: P: 466.
2. Mudawi M.H.: Epidemiology of viral hepatitis in Sudan. Clinical and Experimental Gastroenterology 2008; 1, 9–13.
3. Sorrell MF, Belongia EA, Costa J, Gareen IF, Grem JL, Inadomi JM, Kern ER, McHugh JA, Petersen GM, Rein MF, Strader DB, Trotter HT. National Institutes of Health Consensus Development Conference Statement: management of hepatitis B. Ann Intern Med 2009; 150: 104-110.
4. Center Of The Disease Control (CDC/ministry of health / Baghdad – Iraq); 2011.
5. Alam A., Singha L.I. and Singh V. Simple, Extremely Fast, and High-Yielding Oxidation of Thiols to Disulfides Mol. Cell. Biochem 2005; 271: 177.
6. Solomon E, Berg L and Martin D.W. Biology. 8th ed.Brooks Cole, Belmont CA 2007.
7. Stary von Z., Akkurt S. and Bodur H., Untersuchungen uber den Polysaccharidegehalt von Blutserum und Pleuraexsudaten bei der Lungentuberkulose. Med. Monatschr 1954; 11:722.
8. Stary von Z., Kaleoglu O. and Bursa F. Uber die Hyperpolysaccharidaemie und ihre Klinischen Formen. Istanbul Contributions to Clinical Science 1951; 1:158.
9. Shetlar M. R., Kelly K. H., Foster J. V. Shetlar, C. L. and Everett M. R. Serum polysaccharide levels in pregnancy, parturition and post-partum state. Am. J. Obst. & Gynec 1950; 59:1140.
10. Varma R., Michos G.A. And Varma RS. The Protein-Bound Carbohydrates of Seromucoid from normal Human Serum. J.Clin. Chem. Biochem 1983; 21:273-277.
11. Flowers H.M. Chemistry and biochemistry of D-and L-fucose. Advances in carbohydrate Chemistry and Biochemistry 1986; 39: 280-337.
12. Moloney D.J. and Haltiwanger R.S. The O-linked fucose glycosylation pathway: identification and characterization of a uridine diphosphoglucose: fucose-beta1, 3-glucosyltransferase activity from Chinese hamster ovary cells. Glycobiology 1999; 9: 679–687.
13. Marshal M.M, Geirges R.J, Clark B.F, Whitby L.G. and Duncan L.J.P, Metabolism 1970; 19: 114-119.
14. Dubey S, Kabra M, Bajpai A, Pandey RM, Hasan M, Gautam RK et al. Serum leptin levels in Obese Indian children relation to clinical and biochemical parameters. Indian Pediatr 2007; 44: 257-262.
15. Weimer H.E., Moshin JR. J: Am. Rev.Tuber pulm disease.1952; 68: 594.
16. Dische and Shetlles. J.Biol.Chec.1948; 175: 595-603.
17. Russmann S et al. Prevalence and associated factors of viral 1. Hepatitis and transferrin elevations in 5036 patients admitted to the emergency room of a Swiss university hospital: cross-sectional study. BMC Gastroenterology, 2007, 7:5.
18. Di Bisceglie AM (2004). Issues in screening and surveillance for hepatocellular carcinoma. Gastroenterology, 127(5 Suppl 1): S104-7.
19. Deuffic-Burban S, Poynard T, Sulkowski MS, Wong JB. Estimating the future health burden of chronic hepatitis C and human immunodeficiency virus infections in the United States. J Viral Hepat 2007; 14:107–115.
20. Koulentaki M, Ergazaki M, Moschandrea J, Spanoudakis S, Tzagarakis N, Drandakis PE, et al. Prevalence of hepatitis B and C markers in highrisk hospitalised patients in Crete: a five-year observational study. BMC Public Health 2001; 1: 17-24. Epub 2001 Dec 21.
21. Tungtrongechitr R , Treeprasertsuk S , Nyein Ei N , Thepouyporn A ,Phonrat B & Huntrup A . Serum Leptin Concentrations in Chronic Hepatitis .J Med. Assoc. Thia. 2006; 89(4): 490-99.
22. Moschides E, Stefanini M, Magalini S.I. and Kistner S.A. Cintent and composition of mucoprotein fraction of human serum (Seromucoid) in disease with special reference to Hematologic disorders, J Clin Invest 1958;37(1): 127-37.

23. Vijayalakshmi S, Geetha A. and Jeyachristy S.A. A biochemical study on the level of lipids and glycoproteins in the serum and platelets of liver cirrhotic bleeders. Acta Biochimica Polonica 2006; 53: 213-220.
24. Francis E, Murray S, James M and Ernest F. Camcer, Dec 1971; 28: 1575-1579.
25. Brazzoli M., Helenius A., Foung S. K., Houghton M., Abrignani S. and Merola M. Folding and dimerization of hepatitis C virus E1 and E2 glycoproteins in stably transfected CHO cells. Virology 2005; 332: 438–453.
26. Cohen JA, Kaplan MM (1979) The SGOT/AGPT ratio — an indicator of alcoholic liver disease. Dig Dis Sci 24: 835–838.
27. Chopra S, Griffin PH. Laboratory tests and diagnostic procedures in evaluation of liver disease. Am j Med. 1985; 79:221-230.
28. College N.R, Walker B.R. and Ralston S.H. Davidson's principles & practice of medicine. 21st ed., 2010; pp: 922-954, 924-926, 947,925.
29. Guyton, A.C. and Hall, J. E. Text book of medical physiology. 12th ed., W.B. Saunders Company 2011; p: 822.841, 887,888.
30. Li X.M., Ma L., Yang Y., Shi Z. and Zhou S. Analyses of prognostic indices of chronic liver failure caused by hepatitis virus. World J Gastroenterol 2005; 11(18): 2841-2843.
31. Hano A.E., Deghady A., Shaaban S. and Rahman M. Serum Visfatin in patients with chronic hepatitis C. Journal of American Science 2011; 7(2): 94-101.
32. Mustafa G, Sakslli H., Yakar T., Sezgin N. and Gulsen M.Evaluation of Serum Lipid Profile in Turkish Patients with Chronic Hepatitis C. Eur J Gen Med 2011; 8(1):7-12.
33. Schiff E.R., Sorrell M.F., Maddrcy and Willis C. Schiffs Diseases of the Liver. 10th ed. 2007; 2: pp.752.-820.
34. Ahaneku JE, Taylor GO, Olubuyide IO, Agbedana EO (1992) abnormal lipid and lipoprotein patterns in liver cirrhosis with and without hepatocellular carcinoma. J Pak Med Assoc 42: 260–263.
35. . Polgreen PM, Fultz SL, Justice AC, Wagner JH, Diekema DJ, Rabeneck L, Weissman S, Stapleton JT (2004) Association of hypocholesterolaemia with hepatitis C virus infection in HIV-infected people. HIV Med 5: 144–150.