Retraction Notice

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X All authors
☐ Some of the authors:
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- ○ Journal owner (publisher)
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- ○ Lab error
- **X**○ Inconsistent data
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X were found to be overall invalid.

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* Also called duplicate or repetitive publication. Definition: "Publishing or attempting to publish substantially the same work more than once."

History
Expression of Concern:
X yes, date: 2021-3-23
☐ no

Correction:
☐ yes, date: yyyy-mm-dd
X no

Comment:

The article has been retracted due to the incomplete and inappropriate data published in it. Aim is to promote the circulation of scientific research by offering an ideal research publication platform with due consideration of internationally accepted standards on publication ethics. The Editorial Board would like to extend its sincere apologies for any inconvenience this retraction may have caused.

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Effect of Ascorbic Acid Supplementation on Liver Function Tests in Hepatitis C Patients

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Abstract

An isolated liver function test is of little role in selection of liver disease because many harmful liver diseases may be correlated with normal levels of LFT's. The outline of enzyme abnormalities in the perspective of patient's commonly observed symptoms and laboratory data might be helpful in directing the subsequent diagnosis of liver diseases. Liver Function Tests (LFTs) are most generally used screening blood tests for assessment of different liver diseases and these tests provide a lot of evidence for disease processes whether for the purpose of investigation of supposed liver disease or help in observing the progress of disease action or simply by blood investigation. The evaluation of different liver enzymes simply gives diagnostic information on basic level whether patient's principal disorder is actually hepatitis or cholestasis in source. However, it is necessary in various cases to evaluate LFTs with knowledge of liver functioning enzyme fractions. The objective of this study was to explore the effects of ascorbic acid supplementation on serum liver function tests in Hepatitis C patients. A total of 100 hepatitis C patients were selected randomly. 50 were given ascorbic acid supplementation for one month along with anti HCV treatment. The other 50 HCV patients took their normal anti HCV treatment without intake of ascorbic acid supplementation, and serum ascorbic acid level and liver function test parameters were observed before and after intake of ascorbic acid in both groups. The liver function parameters determined were aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), serum total bilirubin, direct bilirubin, indirect bilirubin and serum protein (total protein, albumin, globulin and A/G ratio). These parameters along with serum ascorbic acid were measured before and 30 days after vitamin C supplementation. Various abnormally elevated LFTs were also improved more rapidly when compared to other group which was not given ascorbic acid supplements for the period of one month. There was a significant change in levels of some liver function parameters before and after intake of ascorbic acid supplementation, and vari-

ous abnormally elevated LFTs were also improved when compared to other group which was not given ascorbic acid supplements for the period of one month. The effect of Vitamin C supplementation was more marked on serum aminotransferase levels. After one-month use of ascorbic acid, serum alanine aminotransferase ($p < 0.042$) and serum aspartate aminotransferase ($p < 0.000$) levels were significantly decreased in hepatitis C patient group. In HCV group with ascorbic acid supplementation, serum total bilirubin ($p < 0.046$) and serum direct bilirubin ($p < 0.048$) were found to be less than the pre values when compared to HCV group without ascorbic acid supplementation. It was also observed that some of protein values were suggestively improved after intake of ascorbic acid supplementation.

Keywords

Supplementation, Ascorbic Acid, Liver Function Tests, Alanine Aminotransferase, Aspartate Aminotransferase, Significant, Diagnoses, Alkaline Phosphatase

1. Introduction

1.1. Overview of Hepatitis

Hepatitis generally means inflammation of liver. Hepatitis is caused due to use of certain drugs, toxins, heavy use of alcohol, bacterial and viral infections. Hepatic diseases are a major fear for severe health related problems throughout the world. Viral hepatitis is the name of family which is caused by different viral infections. Viral Hepatitis is classified into different types such as Hepatitis A, Hepatitis B, Hepatitis C, etc. In various researches data predicted that East Asia is the most affected region of the world with hepatitis due to certain economic and social factors. Hepatitis C is one of the primary causes of illness and mortality in Pakistan and other developing countries of world. Among them Hepatitis B and Hepatitis C are blood borne. Most common causes to become infected with HCV virus are sharing of shaving blades, needles, syringes, or other surgical equipment to inject drugs in various health care settings or hospitals or baby born by an infected mother who has already infected with Hepatitis C [1].

1.2. Pathophysiology of Hepatitis C

Researchers collect data worldwide as Hepatitis C virus infects about 150 - 170 million people and among them chronic infection occurs in almost 40% - 80% of cases and then it often centrals to cirrhosis, chronic liver inflammation, liver necrosis or hepatocellular carcinoma. Existence cycle of HCV is not unstated properly due to lack of productive cell culture system. Some external factors increase risk of cirrhosis, such as chronic alcohol depletion and viral infections. Moreover participative role of HCV proteins is also not clearly understood in hepatic cell carcinogenesis. Further progress by the help of research work and experimental studies in understanding of HCV infection waits for the advent of new

technologies and health model system [2].

1.3. Physiology of Hepatitis C and Liver Functions

The physiology of the liver contains basic contents such as its metabolism, excretion, and body defense. In terms of cellular functioning, the liver is the elementary place of multiple biochemical responses which are very essential to the human organism including synthesis, degradation, transformation and biotransformation of certain substances or other biomolecules. The relationship between structure and functions of specific hepatic processes which control normal liver activities under normal conditions is essential for understanding of liver immune responses to observe clinical diseases distressing the liver normal physiology. The overview of hepatic physiology underline some of common facts of regular hepatic anatomy and functions of liver in relation to the physician challenging liver abnormalities and its diverse extents necessary for treating liver abnormalities for patient's benefit in future [3].

1.4. Significance of Liver Function Tests in Hepatitis

Many people with hepatitis C feel physically well and healthy and have no significant findings on routine physical examination that would predicts a health care provider to suspect and diagnose liver disease. Majority of people with hepatic disease that leads to cirrhosis have a normal physical examination and have a healthy appearance but the diagnosis, evaluation, findings, clinical laboratory reports and treatment of liver disease particularly in hepatitis C places a large necessity on laboratory tests results (especially liver function tests) to diagnose, predict and evaluate response to therapy.

The liver performs several functions and collectively it is called the body's manufacturing center and filtering plant. Different blood tests used to evaluate abnormal liver conditions can be divided into those which represent liver cell damage or cholestasis. In various cases, the damage to the hepatocytes or liver cell causes elevation in these enzymes as compared to their normal values and the degree of elevation is very important in diagnosis of liver damage in acute disease but is not much important in chronic diseased condition. The reasons of elevated levels of amino transferases are basically fatty liver, autoimmune hepatitis, medication induced hepatitis, viral hepatitis, liver necrosis and alcoholic liver disease so an abnormality or modification in these liver function tests does not mean that liver is not functioning properly [4].

In fact mostly patients with elevated levels of amino transaminases, have normal liver function tests and have no alterations seen in them as compared to normal values.In most cases abnormality seen in chronic hepatitis C infection is often an elevated level of enzyme termed as alanine aminotransferase (ALT) but it was also observed in 60% of patients infected with hepatitis C have a normal transaminase level in them in any stage of hepatitis. The elevation in level of serum ALT does not associate with specified disease condition and it might be

normal in any stage of chronic hepatitis C. Innovative researches on hepatitis C indicates that an increase in ALP and total bilirubin as well as thrombocytopenia (low platelets) are also observed along with other abnormalities seen due to elevated levels of liver function enzymes and other parameters [5].

1.5. Effect of Ascorbic Acid (Vitamin C) on Human Health

Vitamin C has a vital role in metabolism of protein and correlated with collagen synthesis which is necessary element of connective tissues which plays an important role in wound healing. In addition to its metabolic functions it was suggested that vitamin C plays a major role in advancement of immune functions and improves the absorption of ferrous form of iron in RBC's.

Inadequate intake of vitamin C causes vitamin C deficiency disease known as scurvy(scorbutus), which is characterized by mouth and gum lesions, bleeding through lips, lethargy or lassitude, gums inflammation, severe connective tissue weakness, deferment in wound healing and capillary fragility [6].

2. Sample Groupings

Experimental Patients are divided into 2 groups;

1) Group A: 50 hepatitis C patients selected randomly who were not treated with ascorbic acid supplementation but they were receiving their anti HCV treatment. Their liver function test parameters such as serum alanine aminotransferase, serum aspartate aminotransferase, serum alkaline phosphatase, serum total bilirubin, direct bilirubin, indirect bilirubin, serum proteins (total, albumin, globulin, A/G ratio) and serum ascorbic acid was estimated by using appropriate method. Then these values were again estimated after one month and compare pre values with their post values.

2) Group B: 50 HCV positive patients were selected randomly for vitamin C supplementation and then their liver function test parameters such as serum alanine aminotransferase, serum aspartate aminotransferase, serum alkaline phosphatase, serum total bilirubin, direct bilirubin, indirect bilirubin, serum total protein, albumin, globulin, A/G and serum ascorbic acid were estimated by using appropriate methods before and one month after intake of vitamin C supplementation.

3. Research Methodology

To perform liver function tests, blood sample of normal individuals and HCV patients were taken randomly from local private sector hospitals who followed inclusion criteria. Patients were recruited, by convenience purposive sampling, to the study with polymerase chain reaction (PCR) confirm Hepatitis C finding. Inclusion criteria included male and female patients of age 25 to 65 years with detectable HCV RNA in serum by PCR, elevated ALT (>80 IU/L), and who were put on anti-viral treatment. Exclusion criteria included the patients with any history of Peg-interferon treatment, presence of any other form of liver disease (including viral hepatitis A and B), decompensated cirrhosis or concomitant

disease such as Diabetes and other hormonal diseases. It also included the use of hepato-tonic drugs, silymarin, garlic oil, usage within 2 weeks period, pregnancy or lactation and refusal to participate in the study. The recruited patients were divided in two groups and then evaluate liver function parameters such as serum alanine aminotransferase, serum aspartate aminotransferase, serum alkaline phosphatase, serum total bilirubin, direct bilirubin, indirect bilirubin, serum total protein, albumin, globulin and A/G ratio were evaluated by using appropriate methods as described below. Appropriate techniques of handling the samples, chemicals and laboratory instruments were used in whole research work.

4. Statistical Analysis

The results of this research study were expressed as mean ± S.D, standard error of the mean (SEM) and percentage where applicable statistical analysis was performed by using IBM SPSS software (statistical package of social sciences).The 'independent sample t test' was used for analysis of independent variables and 'paired t test' were used to compare means of two groups (normal individuals vs. HCV patients group).To prove study hypothesis Values $p < 0.01$ considered highly significant, $p < 0.05$ were considered significant and $p > 0.05$ were considered insignificant [7].

5. Results and Discussion

Data composed from different study groups such as normal individuals and hepatitis C patients (with and without intake of supplementation) were collected before intake of supplementation and observed parameters were again accessed after one month of supplementation intake to evaluate consequences of ascorbic acid supplementation on different LFT parameters. Data was collected after permission granted by local ethical committee of University of Sargodha because ascorbic acid is vitamin supplement and has not any serious side effect on health and do not interfere with hepatitis medication treatment. The concentrations of serum ALT, serum AST, serum ALP, serum bilirubin levels and serum proteins (total protein, albumin, globulin, A/G) were assessed and difference in LFT levels were evaluated before ascorbic acid supplementation intake and after supplementation intake (**Appendix 1** and **Appendix 2**).

5.1. Consequence of Ascorbic Acid Supplementation on LFT Parameters

Due to this fact that ascorbic acid reduces hepatocytes inflammation and increase antioxidant capacity, present study was based on evaluation of protective effects of ascorbic acid supplementation in hepatitis C patients. According to various clinical data it was observed that in normal individuals ascorbic acid supplementation produced certain healthy effects as well as use of these supplementation improve serum ascorbic acid level which was decreased markedly in some individuals due to lower consumption of vitamin C or deficiency of serum

ascorbic acid in them in normal daily routine. Moreover, different serum liver function parameters were also improved by use of ascorbic acid supplementation especially bilirubin and serum ALT level in HCV patients as shown in their clinical values compared to pretest values before intake of supplementation.

5.2. Effect of Ascorbic Acid Supplementation on Serum Alt

Mean ± SD of serum ALT calculated as (195 ± 65.715) before intake of supplementation and Mean ± SD of serum ALT (155 ± 40.854) after intake of supplementation and p value observed as 0.042 which indicate that p value is significant because $p < 0.05$. As it was shown that means of the two levels lies in appropriate range and from direction of t-value, we can determine that there was a significant improvement in ascorbic acid level following the intake of ascorbic acid supplementation.

It was observed that ALT level was much elevated in HCV patients 195 ± 65.715 before use of ascorbic acid supplementation due to certain reasons which cause liver toxicity and in association to hepatotoxicity liver enzymes become elevated than their normal levels. After use of ascorbic acid supplementation by hepatitis C patients, it was observed that ALT enzymatic level markedly decreased and shifted towards lower levels which indicate that ascorbic acid has a potential beneficial effect on elevated level of ALT in hepatitis C patients and improves abnormal transaminase levels in HCV patients as shown in Figure 1.

In another study ALT levels were observed in patients having hepatic complaints. 45 patients were observed for 6 months of supplementation therapy with antioxidant vitamin without any substantial side effects. Vitamins supplementation treatment resulted in a statistically significant progress in elevated aminotransferase level because $p = 0.002$. But there was no perfection in necrotic inflammatory activity or ALT activity in chronic cases with this combination therapy [8]. These observations support our results due to significant observed values.

5.3. Effect of Ascorbic Acid Supplementation on Serum AST

Mean ± S.D was 114.12 ± 31.18 before supplementation and then after one month of supplementation intake, the observed value of AST was maintained as

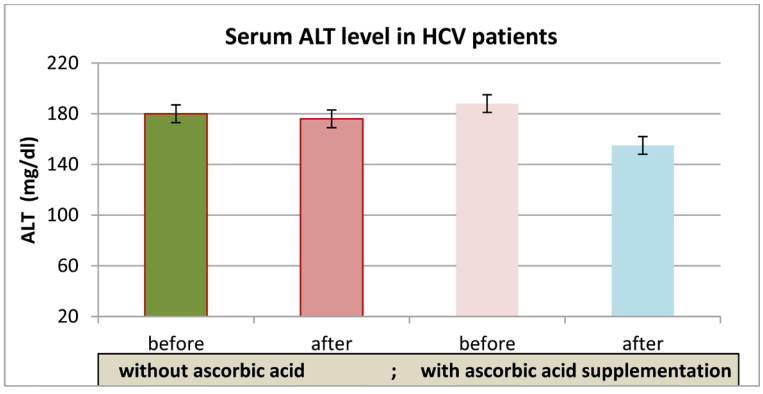

Figure 1. Effect of ascorbic acid supplementation on serum ALT.

102.15 ± 24.42 and p values were $p < 0.048$. 50 HCV patients take vitamin C supplementation for one month. Their Mean ± SD of serum AST calculated as (105 ± 43.217) before intake of supplementation and Mean ± SD of serum AST (85 ± 38.054) after intake as shown in Figure 2.

Studies recommend that anti-oxidative supplements may obstruct in advancement of HCV, to improve LFT levels and to reduce interferon antiviral therapy more effective. Some other studies also suggested that intake of antioxidants reduce LFT levels in HCV patients. In the existing research, vitamin C was linked with decline in serum liver enzymes levels of in patients who revealed increased levels before the supplementation involvement. Administration of vitamin C induced a significant reduction also in other liver enzymes such as serum AST, ALT, ALP ($p < 0.04$) levels along with reducing oxidative stress induced by hepatotoxicity and signifying that this antioxidant vitamin protect against liver damage and elevated LFT levels induced by hepatotoxicity [9].

5.4. Influence of Ascorbic Acid Supplementation on Serum ALP

Mean ± SD of serum ALP calculated before use of supplementation in HCV patients group without any intake of vitamin C supplementation was (212 ± 36.76) and after supplementation it was observed as (209 ± 32.408) and p values is (0.054).These results shown that only a little substantial change was observed on serum ALP level in these individuals without intake of ascorbic acid.

Serum ALP level of 50 HCV patients was observed before and after intake of vitamin C supplementation for one month. Their Mean ± SD of serum ALP calculated as (215 ± 35.213) before intake of supplementation and Mean ± SD of serum ALP enzyme was (185 ± 29.39) after intake of supplementation as shown in Figure 3 and p values observed as 0.051 which indicate that p values are non-significant for ALP because $p < 0.05$.

5.5. Effect of Ascorbic Acid Supplementation on Serum Bilirubin Levels

It was observed in present study that increased values of total bilirubin, direct

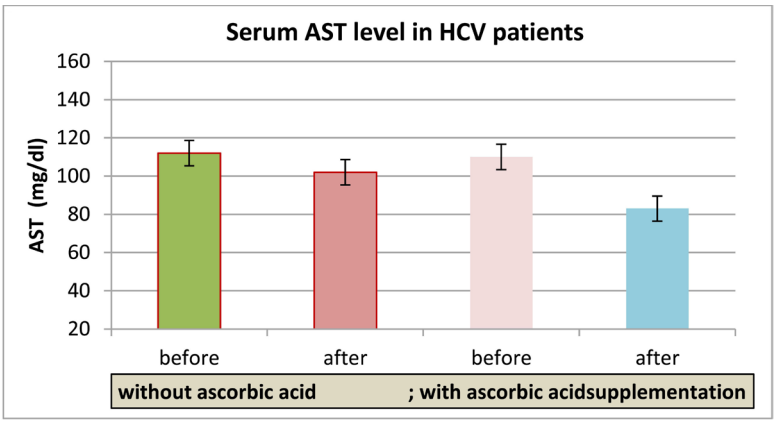

Figure 2. Effect of ascorbic acid supplementation on serum AST level.

bilirubin and indirect bilirubin can be transferred towards normal reference range after intake of vitamin C supplementation for prescribed time period and when comparison made between observed values of bilirubin before administration of vitamin C and after one month use of vitamin C it indicated slight difference between these two values. Because mean ± SD of total bilirubin was 2.409 ± 0.365 before supplementation and it became 2.207 ± 0.654 after one month of supplementation and $p < 0.046$. The consumption of vitamin C supplementation has a mild affective benefit on bilirubin level in HCV infected individuals because p values were not much clearly significant.

The results for Mean ± SD of serum total bilirubin calculated as (2.409 ± 0.365) before intake of supplementation and Mean ± SD of serum total bilirubin was (2.207 ± 0.654) after intake of supplementation and p values observed as 0.046 which indicate that p values are significant. Similarly, calculated values of Mean ± SD of serum direct bilirubin observed as (0.986 ± 0.356) before intake of supplementation and Mean ± SD of serum direct bilirubin was (0.812 ± 0.20) after intake of supplementation and p values observed as 0.048. Mean ± SD of serum indirect bilirubin observed as (1.423 ± 0.432) before intake of supplementation and Mean ± SD of serum indirect bilirubin was (1.395 ± 0.134) after intake of supplementation and p values observed as 0.053 and these observations are mentioned in Figure 4. These observations showed that there was no clearly significant change observed in serum direct bilirubin and indirect bilirubin.

5.6. Effect of Ascorbic Acid Supplementation on Serum Protein Levels

Serum total protein, albumin and globulin values were observed in 50 HCV patients before and after intake of vitamin C supplementation for one month. Mean ± SD of serum total protein shown in Figure 5, calculated as (6.561 ± 0.321) before intake of supplementation and Mean ± SD of serum ascorbic acid is (6.741 ± 0.426).

Mean ± SD of serum albumin shown in Figure 6 calculated as (3.510 ± 0.4633) before intake of supplementation and Mean ± SD of serum albumin is

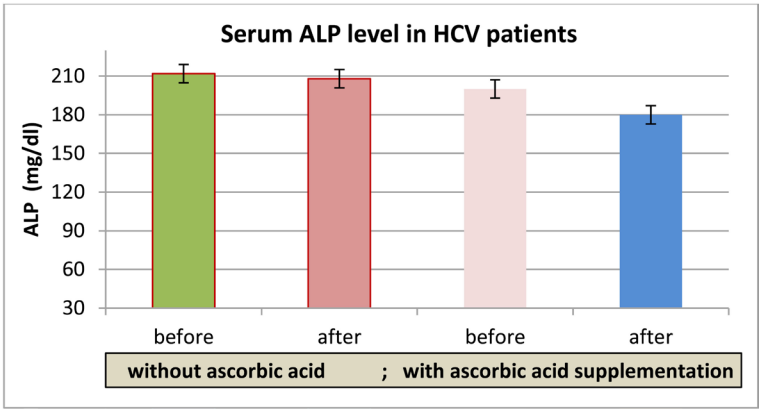

Figure 3. Effect of ascorbic acid on serum ALP level.

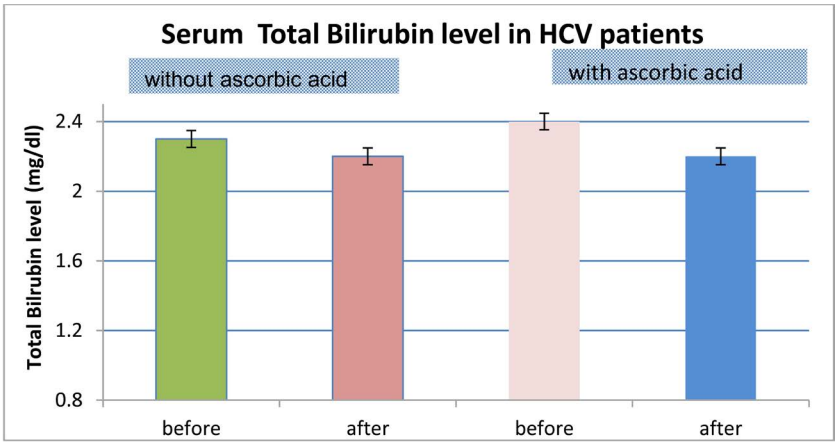

Figure 4. Effect of ascorbic acid on serum bilirubin.

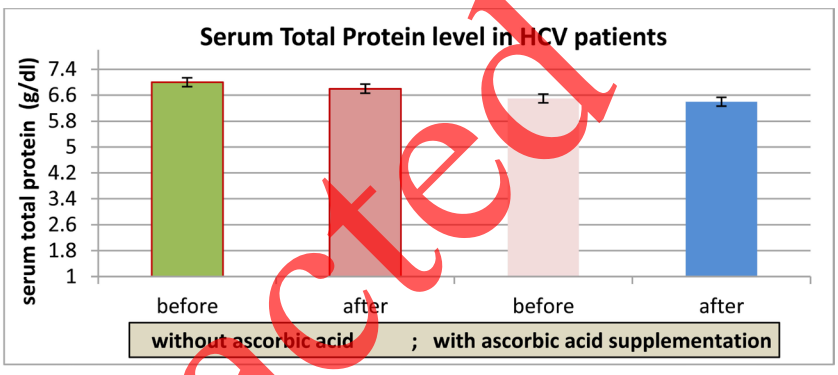

Figure 5. Effect of ascorbic acid on serum total protein.

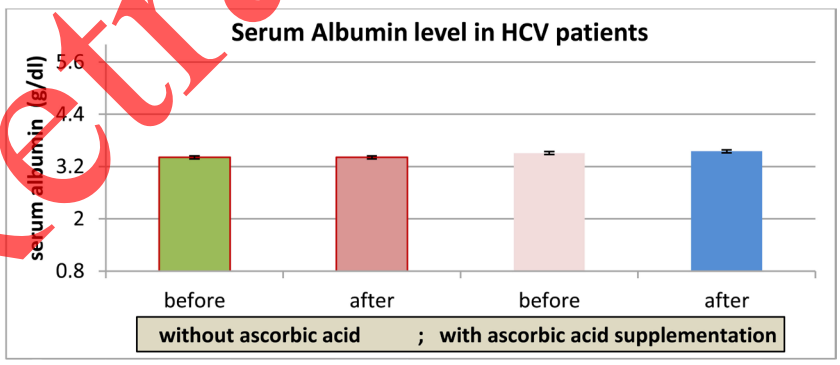

Figure 6. Effect of ascorbic acid on serum albumin level

(3.710 ± 0.4987) after intake of supplementation and p values observed as 0.053. Mean ± SD of serum total globulin is calculated as (2.951 ± 0.3853) before intake of supplementation and Mean ± SD of serum globulin after ascorbic acid supplementation was calculated as(2.752 ± 0.4987) and p values observed as 0.055 which indicate that p values are not significant for serum globulin because $p < 0.05$. Mean ± SD of A/G observed as (1.189 ± 0.275) before intake of supplementation and Mean ± SD of A/G after supplementation was (1.348 ± 0.364) and p values observed as 0.056 (shown in Figure 7) which indicate that p values are not significant and finally it was observed that t-test values for serum total

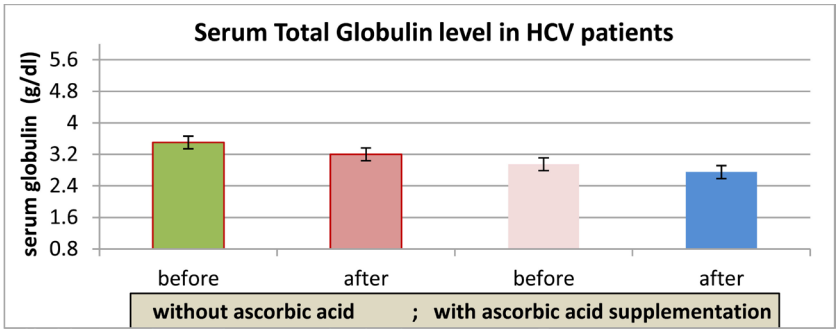

Figure 7. Effect of ascorbic acid on serum globulin level.

proteins proves to be insignificant and intake of vitamin C supplementation produce a slight improvement in levels of serum protein in HCV infected patients.

6. Discussion

Dietary vitamin C supplements markedly decline endogenous level of protein related oxidative damage related to liver. Assessments presented that administration of monosodium glutamate at various measure levels of 0.6 mg and then 6, 12, 30 and 60 mg/kg for 2 weeks increased serum ALT and AST [10].

Another study indicated that antioxidants levels of vitamins A, C and E were decreased ($P < 0.001$) paralleled to controls. The indicators of lipid peroxidation, antioxidant status, antioxidant activities and liver function were observed in blood and urine chronic hepatitis C patients. Oxidative stress shown in blood and urine due to antioxidant markers and it is a momentous feature of hepatitis C infection. Clear evidence of oxidative strain in non-cirrhotic patients was observed more. Therefore, it may be suggested that antioxidant remedy have a role in reducing disease advancement to hepatic and cirrhotic patients [11].

7. Comparison between Different LFT Parameters

Serum ascorbic acid supplementation was given in Hepatitis C patients for one month and selected parameters were observed in both groups classified as hepatitis C patients with supplementation and without supplementation. Sampling techniques, dose of supplementation, duration of supplementation, sample size, the observed parameters, observations before supplementation and after supplementation remained same throughout the study. The results of observed parameters showed that ascorbic acid supplementation improve serum ascorbic acid level in group named as hepatitis C patients treated by vitamin C supplements but significantly serum ascorbic acid level was predominantly increased in normal individuals as compared to HCV affected patients after intake of vitamin C but on the other hand vitamin C supplementation markedly improved some specific parameters of liver function tests especially it decrease ALT and serum direct bilirubin level in HCV effected patients as compared to HCV patients without intake of vitamin C supplementation. A very comparable change ($p <$

0.0527) was observed in serum ascorbic acid level in HCV patients without intake of vitamin C supplementation and ($p < 0.038$) in hepatitis C patients after a suggestive intake of ascorbic acid supplementation. These results indicate that vitamin C might be helpful to decrease the oxidative strain linked with abnormal liver functions and also help to recover the antioxidant defense system. There is therefore a strong outcome of this study was to accomplish that antioxidants are useful beneficial agents for hepatitis C to normalize elevated liver function tests. Moreover significant difference was observed between levels of serum ALT, AST, serum bilirubin in hepatitis C patients by intake of vitamin C which indicate that use of vitamin C supplementation is effective for HCV patients to improve their LFT values and help to minimize elevation in certain LFT parameters which otherwise proven to be fatal if abnormally raised for long duration.

In the present study, the use of ascorbic acid supplementation has a beneficial effect on serum ascorbic acid level in HCV patients because ascorbic acid level improved in 2nd group in which HCV patients were treated by ascorbic acid supplementation. Studies reported that the patients of HCV with elevated levels of LFT values, when take vitamin C, have a substantial decrease in serum aminotransferase levels, in addition to reducing oxidative stress induced by hepatotoxicity. Thus it was shown in present study that intake of vitamin C might defend against liver damage due to its antioxidant status because antioxidant property of vitamin C also prevent cirrhosis induced by HCV and also be helpful to normalize the elevated LFT parameters and related liver enzymes.

Vitamin C regulated intensities of hepatic function parameters along with blood hydro-peroxide value in hepatic cells. It was helpful to conserve cell integrity and potentiates actions of alanine aminotransferase. In that study, treatment with vitamin C (1000 g/day) helps to normalize the above-mentioned parameters or shifted these parameters from abnormal elevated levels towards the normal reference range [12].

Antioxidants are basic and most commonly used supplements by healthy individuals as well as patients with hepatitis viral infection. The use of ascorbic acid supplements causes beneficial effects on biochemical parameters because oxidative stress causing damage to host inflammatory processes and stimulation in different diseases especially by viral proteins. Successfully increasing antioxidants level in body, it is able to decrease the possible risk of hepatocellular toxicity and so decrease liver injury and other inflammatory responses. Presence of oxidative stress in hepatitis is well recognized because of fact that various oxidized protein cause damage to hepatic cells causing necrosis and inflammation. Different biochemical studies on vitamins had shown that ascorbic acid (vitamin C) is effective antioxidant which can produce its effect by searching free reactive oxygen species (ROS). Another study has equally shown protection from hepatic oxidative damage due to anti-oxidant effect of ascorbic acid and other vitamins. [13].

The results of previous studies related to effect of vitamin C against liver in-

jury. Although this study was done on male rats but results were encouraging and characterized with increased activities of serum enzymatic levels of AST and ALP. Abnormal hepatic functions and liver injuries also decreased the concentrations of various other parameters such as serum protein, albumin and globulin. The result of that study shown, that treatment of individuals having liver injury due to oxidative damage when treated with vitamins C resulted in significant reduction in levels of serum ALT, AST and ALP as well as serum vitamin C level. It was helpful in substantial increase in serum total protein levels. Vitamin C also have an effect on reduction of liver cell necrosis and the safe administration of vitamin C make it capable to normalize histological damage associated.In addition to this, vitamin C is known to show activity by blocking the antioxidant chain that averts cell membrane damage averts by ROS in hepatic cells. It was signifying that, the flavanone containing antioxidant vitamin might protect against liver damage produced due to various pathological conditions. Such types of results were observed after supplementation with other antioxidant nutrients alone or combined with vitamin A and E as detected in subjects submitted to cadmium induced hepatotoxicity [14].

The present study indicates that use of vitamin C by HCV patients helps to decrease the elevated abnormal level of different enzymes, which considered to be abnormally raised in hepatitis C participants. A significant difference ($p < 0.042$) was observed in serum ALT values observed in patients of HCV after intake of vitamin supplementation. The significant p values showed that, elevated serum ALT levels can be decreased after regular intake of vitamin C that may be due to its effective role in body chemistry. Similarly significant difference ($p < 0.048$) observed in serum direct bilirubin level after intake of vitamin C which indicate that LFT values can be changed in HCV patients after supplementation with vitamin C.

In another similar study again on rats, vitamin C was described to minimize the liver damage caused by various chemical mediators. In a study it was observed that it helped to normalize the abnormal levels of ALT, AST and ALP. Ascorbic acid was capable to conserved cellular integrity and restrained activity of alanine aminotransferase and aspartate aminotransferase. Such observation was reported in Wister rats for estimation of hepatic functions and enzymes related to significant liver activities. SGOT (AST), SGPT (ALT), alkaline phosphatase and gamma-GT also significantly improved. Studies results also shown that pretreatment with ascorbic acid 200 mg/kg efficiently regulated liver related parameters and help to minimize elevated liver enzymes values [15].

In another study it was to investigate the effect of different doses of vitamin C on the biochemical parameters of normal and streptozotocin (STZ)-induced hepatic subjects. Liver and kidney enzymes were elevated after the onset of diseases. Moderate doses of vitamin C significantly ($P < 0.0008$) reduced plasma gamma-glutamyl level. The plasma level of electrolytes, such as calcium and sodium, also changed significantly ($P < 0.00001$) after oral administration of vita-

min C. Antioxidants, such as vitamin C, may ameliorate the biochemical parameters of diseased patients [16].

8. Conclusion

Various etiologic factors in Hepatitis may lead to oxidative stress and thereby inflammation of liver. Abnormal hepatic functions and liver injuries also decreased the concentrations of various other parameters such as serum protein, albumin and globulin. The result of this study shown, that treatment of individuals having liver injury due to oxidative damage when treated with vitamins C resulted in significant reduction in levels of serum ALT, AST and ALP as well as serum vitamin C level. It was helpful in substantial increase in serum total protein levels. Vitamin C also have an effect on reduction of liver cell necrosis and the safe administration of vitamin C make it capable to normalize histological damage associated. In addition to this, vitamin C is known to show activity by blocking the antioxidant chain that averts cell membrane damage ayerts by ROS in hepatic cells. Hence, it may be proposed that decreased blood ascorbic acid level may leads to signs or severity of magnitude of pathologic event. A powerful defense system may be compromised in ascorbic acid deficiency and possibly considered to be improved after this vitamin intake. It is proposed that the consumption of vitamin C may lessen the oxidative pressure associated with abnormal liver functions, and its addition in diet may be beneficial to restore the antioxidant defense system. There ascorbic acid may be a useful adjuvant therapeutic agent in hepatitis C along with anti-viral treatment to normalize abnormal elevated liver function tests and to cure the disease.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Appendix 1. Demographic Data of Individuals of Serum Ascorbic Acid and LFTS in HCV Patients with no Ascorbic Acid Supplementation

SR.NO	Pt.NAME	Pt.AGE	A.A1	A.A2	ALT1	ALT2	AST1	AST2	ALP1	ALP2	TB1	TB2	DB1	DB2	IB1	IB2	T.P1	T.P2	ALB1	ALB2	GB1	GB2
1	tanveer	47	0.5	0.5	176	104	65	31	134	154	1.3	1.2	1.1	0.7	0.2	0.5	6.1	5.3	3.6	3.2	2.7	2.6
2	shahida	44	0.4	0.4	187	105	43	123	165	184	1.4	1.3	0.9	1	0.5	0.3	5.3	6.4	3.7	3.6	2.7	2.7
3	hassan ali	41	0.4	0.6	199	154	61	143	201	198	1.5	0.9	1.1	0.9	0.4	0	7.4	5.3	3.6	3.7	1.9	1.9
4	rashida	47	0.7	1	234	124	45	106	154	143	1.2	1.1	1	1.1	0.2	0	7.7	5	3.2	3.6	3.2	3.2
5	sundas	54	0.7	1.1	265	143	45	76	144	175	0.9	1	0.9	1	0.1	0	6.1	5.3	3.6	3.2	3.3	3.3
6	jahan khan	46	1	1.1	276	145	32	145	176	234	1.4	1.5	0.8	1	0.6	0.5	5.1	5.3	4	3.7	1.3	1.3
7	M.shahbaz	41	0.7	0.6	287	78	156	156	187	265	0.8	0.7	1	1	0.2	0.2	7.4	6.4	4	3.6	2.4	2.4
8	shafiq	41	0.6	1.2	276	113	176	172	154	165	0.8	0.8	1	0.9	0.2	0.1	7.7	6.9	3.2	3.2	3.7	3.7
9	samina ali	32	0.7	0.5	234	183	72	87	187	107	0.9	1	1	1.4	-0.1	0.4	6.1	6.1	3.6	3.7	2.7	2.7
10	G.abbas	31	0.9	0.9	211	76	52	87	234	197	1.4	1.5	1.3	1	-0.1	0.5	5.3	5.3	3.7	3.6	1.6	1.6
11	shahnwaz	43	0.9	0.8	143	183	87	121	232	134	1.6	1.6	1	1	0.6	0.6	6.4	6.4	3.6	3.6	2.7	2.7
12	shrraz ali	42	0.9	0.8	156	121	87	145	124	265	1	0.9	0.9	0.8	0.1	0.1	6.9	6.9	3.2	3.4	3.7	3.7
13	saira noor	47	1	0.3	176	124	121	176	154	165	1.1	1	0.8	0.8	0.1	0.3	6.1	5.3	3.6	3.2	3.3	3.3
14	taliayan	34	1.1	0.6	166	123	145	176	184	107	0.8	0.7	0.8	1	0.1	0.1	5.3	6.4	3.7	3.6	2.4	2.4
15	afsa khan	31	1.1	0.7	143	165	176	132	198	197	0.8	0.8	1	0.6	0	0	6.4	6.9	3.6	3.7	1.9	1.9
16	bakhat bhari	27	0.6	0.7	123	107	176	154	143	134	0.9	1	0.7	0.6	0.2	0.4	6.9	6.1	3.2	3.6	3.2	3.2
17	irfan mumtaz	45	1.2	0.6	76	197	132	143	175	154	1	1	0.8	0.7	0	0	6.1	5.3	3.2	3.2	3.7	3.7
18	rehana	31	0.5	0.7	66	134	112	104	234	184	0.7	0.9	0.8	0.7	0.2	0.2	5.3	6.4	3.6	3.6	1.9	1.9
19	kausar	30	0.7	1.2	45	213	76	132	265	198	1	0.9	1	1	0.2	0.1	6	6.3	3.7	3.2	2.4	2.4
20	faisal	47	0.8	0.5	32	254	104	121	165	143	1	1	0.8	0.7	0.2	0.2	7.4	5.3	3.6	3.6	1.9	1.9
21	aqeel sajid	44	0.8	0.6	156	154	45	132	107	175	0.9	0.8	1	1	0.1	0.1	7.7	5	3.2	3.7	3.2	3.2
22	riasat ali	41	0.3	0.6	176	143	32	143	197	234	1.2	1	0.8	0.8	0.4	0.3	6.1	5.3	3.2	3.6	3.7	3.7
23	hajra	47	0.6	0.6	187	173	156	122	134	265	1	1	0.8	1	0.2	0.3	5.3	6.4	3.7	3.6	3.2	3.2
24	farhana	54	0.7	0.7	154	143	176	103	121	165	1.3	0.9	1	1	0.3	0.2	6.4	6.9	3.6	3.2	1.3	1.3
25	nasreen	46	0.7	0.4	187	165	56	55	145	107	1.4	1.2	0.6	0.8	0.4	0	6.9	6.1	3.2	3.2	2.2	2.2
26	asmat nwaz	41	0.6	0.7	234	154	123	34	176	197	1	1	0.9	0.9	0	0	6.1	5.3	3.4	3.6	2.7	2.7
27	nighat	41	0.7	0.6	232	173	143	65	176	134	0.8	1	0.9	0.8	0.2	0.1	5.3	6.4	4	3.7	1.3	1.3
28	amna	32	0.9	0.6	124	143	103	31	132	134	1	1.1	0.7	0.7	0.1	0.1	7.4	5.3	4	3.6	2.4	2.4
29	allah rakha	30	0.4	0.5	154	175	165	123	211	165	1	1	0.8	0.8	0	0	7.7	5	3.2	3.2	3.7	3.7
30	rehmat	47	0.4	0.6	154	234	134	76	213	201	1.3	1	0.8	1	0.3	0.3	6.1	5.3	3.6	3.7	2.7	2.7
31	sardar bibi	44	0.9	0.6	184	265	165	66	104	103	1.4	1.3	1	1	0.4	0.4	5.3	6.4	3.7	3.6	1.6	2.8
32	jaweria	41	0.9	0.6	198	165	76	45	105	165	0.9	0.8	1	1	0.1	0.2	6.4	6.9	3.6	3.6	2.8	2.7

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33	azmat ali	47	1	0.7	143	107	87	32	154	134	0.8	0.7	0.7	0.6	0.1	0.1	6.9	6.1	3.2	3.4	3.7	2.7
34	M.tabassum	54	1.3	0.4	175	197	132	156	124	165	0.8	0.8	0.8	0.8	0	0	6.1	5.3	3.7	3.5	2.8	1.8
35	liaqat	46	1.6	0.7	234	134	121	165	103	143	0.9	1	0.8	0.8	0.1	0.1	6.9	6.9	3.2	3.6	3.7	3.7
36	kaiynat	41	1.1	0.6	265	154	132	76	165	176	1.1	1	0.8	1	0.2	0.2	5.3	6.1	3.6	3.2	1.7	1.7
37	nwazish awan	41	0.6	0.6	165	187	143	87	134	103	0.8	0.8	1	0.7	0	0	5	5.3	3.7	3.6	2.4	2.4
38	sajid meer	32	0.7	0.8	107	234	122	132	165	165	1	0.8	0.7	0.7	0.2	0.3	5.6	6.4	3.6	3.7	2	2
39	quratulain	31	0.4	1.2	197	232	103	121	201	134	1.2	1	1	1	0.2	0.3	5.1	6.9	3.2	3.6	1.9	1.9
40	safdar mubben	43	0.8	1.1	134	124	55	132	103	165	1.2	1.1	0.8	0.8	0.1	0.3	5.3	6.4	3.7	3.6	3.2	3.2
41	dilawar ali	42	0.6	1	213	154	145	65	165	201	0.9	1	0.8	0.7	0.2	0.3	6.4	6.9	3.6	3.2	1.3	1.3
42	sajjad	47	0.7	1	254	154	78	31	134	103	1.1	1	0.8	0.8	0.1	0.3	6.9	6.1	3.2	3.2	2.2	2.2
43	fwad bhati	34	0.7	0.6	154	184	113	123	165	165	0.7	0.9	0.8	0.7	0.2	0.2	5.3	6.4	3.6	3.6	1.9	1.9
44	arfat aziz	31	0.6	0.9	143	165	183	76	143	134	1	0.9	1	1	0.2	0.1	6	6.3	3.7	3.2	2.4	2.4
45	umar ahmed	27	0.5	0.8	173	107	76	66	176	165	1	1	0.8	0.7	0.2	0.2	7.4	5.3	3.6	3.6	3.1	1.9
46	slamat malik	45	0.6	0.7	143	197	183	45	103	134	0.9	0.8	1	1	0.1	0.1	7.7	5	3.2	3.7	3.2	1.3
47	ali	31	0.6	0.7	165	134	121	125	134	165	1.2	1	0.8	0.8	0.4	0.3	6.1	5.3	3.2	3.6	1.8	1.7
48	farkhanda	30	0.6	0.7	154	213	124	112	165	201	1	1	0.8	1	0.2	0.3	5.3	6.4	3.7	3.6	1.6	2.8
49	saima jallel	47	0.7	0.6	173	166	123	104	201	218	1.3	0.9	1	1	0.3	0.2	6.4	6.9	3.6	3.2	1.3	3.7
50	iqbal	44	0.4	0.5	187	180	161	165	166	176	1.5	1.5	1	0.9	0.6	0.6	5.6	5.1	3.2	2.5	2	3

^(A.A = ascorbic acid, ALT1, ALT2 = serum alanine enzyme before and after, ALP1, ALP2 = ALP enzyme before and after, TB = total bilirubin, DB = direct bilirubin, IB = indirect bilirubin, TP = total protein, Alb = albumin, Glb = globulin,).

Appendix 2. Demographic Data of Individuals of Serum Ascorbic Acid and LFTS in HCV Patients with Ascorbic Acid Supplementation

SR.NO	Pt.NAME	Pt.AGE	A.A1	A.A2	ALT1	ALT2	AST1	AST2	ALP1	ALP2	TB1	TB2	DB1	DB2	IB1	IB2	T.P1	T.P2	ALB1	ALB2	GB1	GB2
1	abdul khan	42	0.7	0.9	187	106	132	123	154	104	0.8	0.8	0.8	1	0	1.2	7.4	5.3	3.2	3.6	3.7	2.7
2	abdul majid	47	0.6	0.8	234	187	121	112	184	143	1	0.8	1	1	0.2	0.2	7.7	5	3.6	3.2	1.7	1.7
3	G.mustafa	34	0.7	1.2	232	210	132	125	198	121	1.5	1	1.5	1.5	0	0.5	6.1	5.3	3.7	3.6	2.4	2.4
4	shahida	31	0.9	1.1	124	121	65	89	143	131	1.6	1.5	1.6	1	0	0.5	5.3	6.4	3.6	3.7	2	2
5	ibrar hassan	27	0.4	1	154	143	66	28	175	119	1.7	1	1.7	1.1	0	0.1	6.4	6.9	3.2	3.6	1.9	1.9
6	samina bibi	45	0.4	1	165	153	123	91	234	145	1	1	1	0.9	0	0.1	6.9	6.1	3.2	3.2	3.7	2.9
7	rashida	31	0.9	0.6	184	175	76	39	265	176	1.3	1.2	1.1	0.7	0.2	0.5	6.1	5.3	3.6	3.2	2.7	2.6
8	abdul aleem	30	0.9	0.9	165	111	66	57	165	176	1.4	1.3	0.9	1	0.5	0.3	5.3	6.4	3.7	3.6	2.7	2.7
9	abid hussain	47	1	0.8	107	100	45	42	107	132	1.5	0.9	1.1	0.9	0.4	0	7.4	5.3	3.6	3.7	1.9	1.9
10	sajid ali	44	0.5	0.7	197	190	125	111	197	154	1.2	1.1	1	1.1	0.2	0	7.7	5	3.2	3.6	3.2	3.2
11	ulfat	41	1	1.3	134	76	52	51	134	143	0.9	1	0.9	1	0.1	0	6.1	5.3	3.6	3.2	3.3	3.3
12	farhat abbas	47	1.1	1.2	121	89	87	81	168	104	1.4	1.5	0.8	1	0.6	0.5	5.1	5.3	4	3.7	1.3	1.3

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13	afshan	54	0.6	0.9	88	88	87	83	153	132	0.8	0.7	1	1	0.2	0.2	7.4	6.4	4	3.6	2.4	2.4
14	shokat ali	46	0.7	1	94	91	121	104	198	121	0.8	0.8	1	0.9	0.2	0.1	7.7	6.9	3.2	3.2	3.7	3.7
15	tanver	41	0.4	0.6	38	39	145	143	143	132	0.9	1	1	1.4	−0.1	0.4	6.1	6.1	3.6	3.7	2.7	2.7
16	shabaz	41	0.8	0.9	54	57	176	121	175	131	1.4	1.5	1.3	1	−0.1	0.5	5.3	5.3	3.7	3.6	1.6	1.6
17	noreen	32	0.6	0.8	187	176	176	131	234	119	1.6	1.6	1	1	0.6	0.6	6.4	6.4	3.6	3.6	2.7	2.7
18	shahina	31	0.7	1.4	234	215	132	119	265	145	1	0.9	0.9	0.8	0.1	0.1	6.9	6.9	3.2	3.4	3.7	3.7
19	ahmad sheer	43	0.7	1	232	231	112	123	165	176	1.5	1	1	1.5	0.5	0.5	6.1	5.3	3.7	3.5	2.1	2.1
20	luqman	42	0.6	1	124	120	76	62	107	176	1.6	1.3	1.2	1	0.4	0.3	5.3	5	3.2	3.6	2.1	2.1
21	madiha	47	0.6	0.9	154	143	104	125	197	132	1.7	1.4	1.2	1.2	0.5	0.2	6.4	6.1	3.6	3.2	3.2	3.2
22	kiran farooq	34	0.8	1.4	154	142	45	89	134	154	1	1	1	1.1	0	0.1	6.9	5.3	3.7	3.6	3.2	3.2
23	arsalan gul	31	0.4	1	184	165	32	42	154	143	1.4	1.3	0.6	0.6	0.2	0.3	5.3	6.4	3.6	3.7	1.7	1.7
24	sobia fraz	27	0.7	0.8	165	129	156	91	184	104	0.9	1	0.8	0.8	0.1	0.1	6.9	6.9	3.2	3.6	3.7	3.7
25	M.nauman	45	0.6	1.2	107	107	176	39	198	132	1.1	1	0.8	1	0.2	0.2	5.3	6.1	3.6	3.2	1.7	1.7
26	faiqa	31	0.7	1.1	197	182	89	57	143	121	0.8	0.8	1	0.7	0	0	5	5.3	3.7	3.6	2.4	2.4
27	qandeel	30	0.9	1	134	105	88	81	175	132	1	0.8	0.7	0.7	0.2	0.3	5.6	6.4	3.6	3.7	2	2
28	faiza	47	0.4	1	107	103	91	81	234	165	1.2	1	1	1	0.2	0.3	5.1	6.9	3.2	3.6	1.9	1.9
29	M.shafeeq	44	0.4	0.6	197	148	39	42	265	107	1.2	1.1	0.8	0.8	0.1	0.3	5.3	6.4	3.7	3.6	3.2	3.2
30	shabana	41	0.9	0.9	134	98	57	41	165	197	0.9	1	0.8	0.7	0.2	0.3	6.4	6.9	3.6	3.2	1.3	1.3
31	fahad	47	0.9	0.8	213	223	176	143	107	134	1.1	1	0.8	0.8	0.1	0.3	6.9	6.1	3.2	3.2	2.2	2.2
32	hajra bibi	54	1	1.3	163	160	63	61	197	154	0.8	0.7	0.8	1	0.1	0.1	6.1	5.3	3.4	3.6	2.7	2.7
33	hamza munneb	46	1.3	1.4	154	148	59	54	134	184	0.8	0.8	1	0.6	0	0	5.3	6.4	4	3.7	1.3	1.3
34	shaista	41	1	0.7	143	116	54	51	146	176	0.9	1	0.7	0.6	0.2	0.4	7.4	5.3	4	3.6	2.4	2.4
35	arshad	41	0.5	0.6	173	165	64	62	134	176	1	1	0.8	0.7	0	0	7.7	5	3.2	3.2	3.7	3.7
36	abdul rehman	32	0.6	0.5	57	50	134	132	123	132	0.7	0.9	0.8	0.7	0.2	0.2	6.1	5.3	3.6	3.7	2.7	2.7
37	tahira	31	0.7	1.1	76	67	121	103	190	154	1.4	1.3	0.9	0.6	0.5	0.1	5.3	6.4	3.7	3.6	1.6	2.8
38	khursheed	43	0.4	1	65	61	88	83	125	143	1.5	0.9	1.1	0.9	0.4	0.6	6.4	6.9	3.6	3.6	2.8	2.7
39	zaigam	47	0.8	1	98	92	94	84	89	104	1.2	1.1	1	1.1	0.2	0.1	6.9	6.1	3.2	3.4	3.7	2.7
40	gohar	44	0.6	0.6	121	120	38	38	185	132	0.9	1	0.9	1	0.1	0.1	6.1	5.3	3.7	3.5	2.8	1.8
41	ali arsalan	41	0.7	0.9	82	75	54	54	176	121	1.4	1.5	0.8	1.5	0.6	0.6	7.4	6.4	3.7	3.6	3.7	2.8
42	munaza	47	0.7	0.8	107	102	42	42	198	132	0.8	0.7	1	0.7	0.2	0.2	7.7	6.9	3.6	3.2	4.1	3.7
43	rehmat ali	54	0.6	0.9	197	138	47	41	211	175	0.8	0.8	1	0.8	0.2	0	6.1	6.1	3.2	3.2	2.2	1.2
44	hamza munneb	46	0.6	0.7	134	97	62	53	198	234	0.9	1	1	1	−0.1	−0.1	5.3	5.3	3.4	3.6	1.9	2.7
45	sobia fraz	41	0.7	0.7	213	187	39	37	143	265	1.4	1.5	1.3	1.5	−0.1	−0.1	6.4	6.4	4	3.7	2.4	2.7
46	kiran sheikh	41	1	1.4	254	231	134	124	175	165	1.6	1.6	1	1.6	0.6	0	6.9	6.9	4	3.6	2.9	3.3
47	usman	32	1.2	1.4	154	156	121	84	234	107	0.7	0.7	1	0.7	0.3	0	6.1	5.3	3.2	3.2	2.9	2.1
48	qurban	31	0.7	1	143	129	88	93	265	197	0.9	0.9	1	0.6	0.1	0.3	5.3	5	3.6	3.7	1.7	2.7
49	fabia slamat	43	0.8	0.9	173	139	94	84	165	134	1	0.8	1.4	0.9	0.4	0.1	6.4	6.1	3.7	3.6	2.7	2.5
50	M.farhan	27	0.7	0.9	61	54	38	31	107	141	1.4	1.1	1	1.1	0.4	0	6.9	5.3	3.6	3.6	2.7	1.7

^(A.A = ascorbic acid, ALT1, ALT2 = serum alanine enzyme before and after, ALP1, ALP2 = ALP enzyme before and after, TB = total bilirubin, DB = direct bilirubin, IB = indirect bilirubin, TP = total protein, Alb = albumin, Glb = globulin).