



**International Journal of Biology, Pharmacy  
and Allied Sciences (IJBPAS)**

*'A Bridge Between Laboratory and Reader'*

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## DETERMINATION OF INSULIN AND HEMOGLOBIN LEVEL IN HEPATITIS C PATIENTS

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### ABSTRACT

The prevalence of Type 2 diabetes mellitus in chronic Hepatitis C Virus (HCV) patients ranges from 24-50% and this frequency is about 5 times greater than the rest of Hepatic cirrhosis. A link between the two disorders would not be surprising; as chronic HCV infection may cause cirrhosis, which through insulin resistance, predisposes patients to diabetes mellitus. Moreover, both disorders are common. The aim of the study was to detect a possible association between chronic hepatitis C virus (HCV) infection and diabetes mellitus (DM) among the HCV seropositive patients. For this purpose, HbA1C and serum insulin level were determined in fasting conditions. It is concluded that HCV induced insulin resistance is because of glucose imbalances that promote glucose intolerance and progresses towards Insulin Resistance, a step towards hepatocellular carcinoma rather it involves upregulation of the gluconeogenic and lipogenic genes.

**Keywords: Hepatitis, Insulin, Hemoglobin, Virus Infection and Normal Volunteer,  
Diabetes mellitus**

### INTRODUCTION

Chronic liver disease due to hepatitis B and C is more prevalent in Faisalabad, Pakistan [1]. Liver is essential for life, since it carries out a

multiplicity of metabolic activities necessary for homeostasis, alimentation and defense [2, 3]. The prevalence rate of chronic liver

diseases is 10% and genotype 3a in Pakistan [4, 5]. Hepatitis C virus infection is not restrained to the liver; it can stimulate disturbances in a lot of other systems and organs [6, 7]. Hepatitis C is not only as a viral disease, but also suggested it as a metabolic disease of liver i.e., insulin resistance [8] increased prevalence of glucose tolerance [9], diabetes mellitus [10], high incidence of steatosis [11] and changes in lipid metabolism [12-16]. An absolute deficiency of insulin causes a severe type of diabetes mellitus [17, 18]. Diabetes is a condition in which blood sugar levels are too high [19]. This can occur when the body does not produce enough insulin or when cells do not use insulin properly [20]. The condition in which body cells could not use insulin is known as insulin resistance. Insulin resistance may precede the development of type 2 diabetes or non insulin dependent diabetes mellitus [21]. Overtime high blood sugar levels can lead to many complications [22].

HCV may infect and damage the insulin producing beta cells of pancreas [23]. HCV is also known to be associated with autoimmune conditions [24], another possibility is that the immune system of people with HCV may attack and damage insulin producing cells. A second and possibly related metabolic effect of hepatitis C is its association with type 2

diabetes [25]. Chronic hepatitis C virus infection (HCV) and type 2 diabetes mellitus cause devastating long-term complications in a significant minority of affected patients [26]. The prevalence of Type 2 diabetes mellitus in chronic HCV patient ranges from 24-50% and this frequency is about 5 times greater than the rest of Hepatic cirrhosis [27]. A link between the two disorders would not be surprising; as chronic HCV infection may cause cirrhosis [28, 29], which through insulin resistance, predisposes patients to diabetes mellitus [30]. Moreover both disorders are common. Recent cross-sectional studies performed worldwide suggest that they are indeed closely link. So, the aim of the present study was to detect a possible association between chronic hepatitis C virus (HCV) infection and diabetes mellitus (DM) among the HCV seropositive patients.

## **MATERIALS AND METHODS**

### **Selection of Subjects**

A total of 30 subjects between the ages of 35-50 years who developed diabetes mellitus after diagnosis of hepatitis C were selected. The patients who were on treatment, their drug treatment were stopped two days prior to sampling. The patients did not have any other illness such as hypertension, tuberculosis or any malignancy. For control group 10 normal healthy subjects of same age group having

normal liver function test and negative for hepatitis C virus were included in this study. Before study, written consent was obtained from all participating individuals.

### Blood Sample

Fasting samples were selected. One ml of the sample in each case was processed for HbA<sub>1c</sub>. Four mL of blood took in centrifuge tube and allowed to clot for 20 min.

### Method for HbA<sub>1c</sub>

HbA<sub>1c</sub> was determined by a chromatographic spectrophotometric method [31, 32].

### Method for Insulin determination

Insulin level was determined by IEMA (immunoenzymetric assay) method [33].

### Statically Analysis

Data obtained was presented as mean  $\pm$  SD.

## RESULTS AND DISCUSSION

Blood samples from ten normal and 30 patients with chronic hepatitis C who develop diabetes mellitus were collected and analyzed for the determination of fasting insulin level and hemoglobin A<sub>1c</sub> (HbA<sub>1c</sub>). The individual values for both the parameters in case of control and chronic hepatitis individuals were measured.

### Hemoglobin A<sub>1c</sub>

The average levels of hemoglobin A<sub>1c</sub> were found to be 5.07+ 0.81, and 8.05 + 0.73% in case of healthy and chronic hepatitis C

patients, respectively. **Table 1** show that the levels of hemoglobin A<sub>1c</sub> in patients having chronic hepatitis C were significantly higher than normal individuals. The levels of HbA<sub>1c</sub> in patients having chronic hepatitis were higher than the normal range (4.2 – 6.2%) and these finding were statistically different (**Table 2**) These findings were supported by Fraser *et al.*, [34]; Devika Sennik [35]. This high level of HbA<sub>1c</sub> shows the association of hyperglycemia and diabetes mellitus with chronic hepatitis C infection because the HCV infections are strongly associated with diabetes. In addition, a high prevalence of both diabetes and impaired fasting glucose has been reported in HCV infected patients in comparison with other chronic liver diseases. Although the specific mechanisms involved in the pathogenesis of diabetes associated with HCV remain to be elucidated, it seems that insulin resistance plays an essential role. High levels of proinflammatory cytokines have been found in HCV-infected patients and, thereby, they could be involved in the pathogenesis of insulin resistance associated with HCV. On the other hand, cell dysfunction might also be related to glucose abnormalities in HCV chronic hepatitis [36, 37].

Fasting Blood Insulin Level: The average levels of fasting blood insulin were found to

be  $15.9 \pm 2.0656$  and  $22.43 \pm 6.986$  for healthy and chronic hepatitis C patients, respectively (**Table 1**). The results showed that chronic hepatitis C had significant effect on insulin of the patients. The levels of fasting serum insulin were higher in studied subjects as compare to control. These finding were statistically different in both groups (**Table 2**). The presence of Insulin Resistance in chronic HCV infection has been reported previously. Authors also indicated that chronic HCV infection was associated with a higher insulin resistance and lower adiponectin level [38]. Our findings were in accordance with previous reports [39, 40], who found the increased level of insulin in hepatitis c patients. The result show that the secretion of insulin from beta cells of the pancreas is decreased by toxin produced by hepatitis C virus. The probable cause of glucose intolerance in these patients may be the resistance of receptors to insulin [41].

Glucose regulatory hormone (hyperglycemic hormone) rather than insulin may be the cause of glucose intolerance and insulin resistance in these patients [42]. The level of these hormones may be measured to ensure the reason. Insulin resistance plays a crucial role in fibrosis progression, and has been demonstrated to have a negative impact on treatment responses to antiviral therapy in patients with chronic hepatitis C [43]. Chronic infection with the HCV is a major cause of progressive liver damage, whose long-term sequels include cirrhosis and primary hepatocellular carcinoma. However, the rate of histological and clinical progression of chronic hepatitis C is variable, depending on the presence of several cofactors. These include age at infection, gender, prolonged alcohol abuse and co-infections with the hepatitis B virus or the immunodeficiency virus [44].

**Table 1: Level of HbA1C and Insulin Hepatitis C Patients and Normal Volunteers**

S. No.	Hepatitis C patients			Normal volunteers		
	Age / Sex	HbA1v %	Insulin	Age / Sex	HbA1c %	Insulin
	year/	%	mIU/ml	Year/	%	mIU/ml
1	41 / f	7.60%	13	30/m	5%	15.5
2	48 / f	8.30%	25	38/f	5.40%	16
3	50/f	6.80%	20	32/m	4%	14
4	50/m	9.30%	17	33/m	5.70%	13
5	50/m	8.40%	19	32/m	6%	18
6	40/m	8.00%	23	37/f	4.55%	14
7	49/f	7.90%	26	30/m	5%	15.5
8	51/m	7.20%	14	35/m	4%	17
9	47/m	7.50%	29	37/m	6.40%	20
10	41/f	8.30%	36	29/f	4.70%	16
11	50/f	8.00%	13	Mean	5%	15.9
12	32/f	9.10%	38	SD	0.008	2.07
13	50/f	7.60%	20			
14	37/f	7.30%	24			
15	48/f	8.70%	15			
16	42/m	8.10%	27			
17	40/f	7.50%	12			
18	50/f	7.90%	23			
19	35/f	8.20%	27			
20	40/f	8.70%	19			
21	35/m	7.60%	20			
22	45/m	9.80%	17			
23	42/f	6.90%	25			
24	43/m	7.50%	21			
25	40/f	7.80%	32			
26	46/m	8.30%	36			
27	39/f	9.10%	16			
28	48/f	9.00%	27			
29	47/m	7.80%	21			
30	46/f	7.20%	18			
Mean		8.05%	22.43			
SD		0.007	6.98			

Table 2: Statistical Analysis of HbA1c and Insulin in Normal and Hepatitis Patients

	HbA <sub>1c</sub>	Insulin
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$X_1-X_2$	5.07-8.05	15.9-22.43
Variance	0.56	38.25
SD	0.21	2.23
T-value	-14.48	-2.89
P-value	<0.005	<0.05

## CONCLUSION

From results, it is concluded that that increased IR, regardless of the presence of diabetes, is significantly associated with chronic HCV infection, a step towards hepatocellular carcinoma rather it involves upregulation of the gluconeogenic and lipogenic genes. These proteins help virus to replicate and damage host machinery. The study found that predictors of insulin resistance were viral load. This suggests the possibility that the virus alters either fat supply or alters the cell signalling proteins released from subcutaneous fat, either of which could generate insulin resistance.

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