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Determination of liver function test in DM patients

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BY

Zahraa neama kadhim

Nouralhoda Muhammad Khudhair

Tuqa jassim hameed

Supervisor

Dr. Nadia Hassan Kadhim

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[اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ (1) خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ (2) اقْرَأْ وَرَبُّكَ الْأَكْرَمُ (3) الَّذِي عَلَّمَ بِالْقَلَمِ (4) عَلَّمَ الْإِنْسَانَ مَا لَمْ يَعْلَمْ (5)]

صدق الله العظيم

سورة العلق الآية(1-5)

الأهداء

بسم الخالق

اهدي تعب عمري وسنيني

لمن تجعدت يديه ساعياً لرعايتي،

لمن شاب شعرها حرصاً عليّ،

للحظات الخوف التي صنعتني، للكسور التي حاولت تحطيم قدمي

مانعة أياي من اكمال الطريق،الطريق نحو القمة

لأيام البرد القارص وأصابعي المتجمدة وبالكاد استطيع الأمساك بقلمي،

....وأيام الحر والعرق المتصبب من جبيني

بهذه الكلمات توج النجاح وانتهت الرحلة وحصدت نتيجة الصمود

Abstract

Blood samples were collected from Marjan Hospital and Imam Sadiq Hospital, the main laboratory, Clinical Chemistry Division, and others from the consulting laboratory and the emergency laboratory for the period from 11/2/2023 until 30/3/2024. We conducted tests using an advanced device for chemical analysis. The tests included the following (fasting blood sugar test, blood test Urea, creatine test, in addition to liver function test)for research and investigation regarding our important topic for human life, which is Determination of liver function test in DM patients

Chapter one

Introduction

Diabetes mellitus (DM), commonly known as just diabetes, is a group of metabolic disorders characterized by a high blood sugar level over a prolonged period of time.

Classic signs and symptoms of DM include polydipsia (excessive thirst), polyuria (excessive urination), and polyphagia (excessive hunger). Individuals with type 1 DM may additionally present with unintentional weight loss.

If left untreated, diabetes can cause many health complications:

Acute complications can include diabetic ketoacidosis, hyperosmolar hyperglycemic state, or death.

Serious long-term complications include cardiovascular disease, stroke, chronic kidney disease, foot ulcers, damage to the nerves, damage to the eyes and cognitive impairment..[2][5]

Diabetes is due to either the pancreas not producing enough insulin, or the cells of the body not responding properly to the insulin produced [12].There are three main types of diabetes mellitus[2]

_Type 1 diabetes results from failure of the pancreas to produce enough insulin due to loss of beta cells.[12].This form was previously referred to as "insulin-dependent diabetes mellitus" (IDDM) or "juvenile diabetes".The loss of beta cells is caused by an autoimmune _mediated destruction. [2]

_Type 2 diabetes begins with insulin resistance, a condition in which cells fail to respond to insulin properly. As the disease progresses, a lack of insulin may also develop. This form was previously referred to as "non insulin-dependent diabetes mellitus" (NIDDM) or "adult-onset diabetes"[2].

_Gestational diabetes is the third main form, and occurs when pregnant women without a previous history of diabetes develop high blood sugar levels[2].

Type 1 diabetes must be managed with insulin injections.`

Prevention and treatment of type 2 diabetes involves maintaining a healthy diet [15], regular physical exercise, a normal body weight, and avoiding use of tobacco.[18].

Control of blood pressure and maintaining proper foot and eye care are important for people with the disease[10].

Insulin and some oral medications can cause low blood sugar.

Weight loss surgery in those with obesity is sometimes an effective measure in those with type 2 diabetes[19].

Gestational diabetes usually resolves after the birth of the baby.

Rates are similar in women and men. Trends suggest that rates will continue to rise[22] [23].

Diabetes at least doubles a person's risk of early death [23].

Effects of Diabetes on Liver Health

Diabetes can have significant consequences on the liver, both directly and indirectly. The liver plays a critical role in regulating blood sugar levels and metabolizing various nutrients. Here are some of the consequences of diabetes on liver health:

1_Non-Alcoholic Fatty Liver Disease (NAFLD)

NAFLD is a common liver condition that is closely associated with diabetes. It occurs when excess fat accumulates in the liver cells, leading to inflammation and potential liver damage. Insulin resistance, a hallmark of type 2 diabetes, can contribute to the development and progression of NAFLD[24]..

Non-Alcoholic Steatohepatitis (NASH)

NASH is a more severe form of NAFLD characterized by liver inflammation and damage. It can lead to fibrosis (scarring) of the liver, cirrhosis, and, in some cases, liver failure. People with diabetes, particularly type 2 diabetes, are at an increased risk of developing NASH[25]..

2_Impaired Glucose Regulation

The liver plays a crucial role in regulating blood glucose levels. In individuals with diabetes, especially type 2 diabetes, the liver may produce excessive glucose, leading to elevated blood sugar levels. This can contribute to difficulties in glycemic control[26]..

Increased Risk of Hypoglycemia

In people with diabetes who are on certain medications like sulfonylureas, the liver's ability to regulate glucose production can be impaired[27].. **This**

can result in a higher risk of hypoglycemia (low blood sugar) if these medications are not properly adjusted

3_Impaired Lipid Metabolism

Diabetes can affect the way the liver processes lipids (fats), leading to elevated levels of triglycerides and non-high-density lipoprotein (non-HDL) cholesterol. This can contribute to an increased risk of cardiovascular disease[28]..

4_Risk of Cirrhosis and Liver Failure

Over time, uncontrolled diabetes, especially in combination with other risk factors like obesity and excessive alcohol consumption, can lead to cirrhosis (advanced scarring of the liver) and, in severe cases, liver failure[29]..

5_Risk of Hepatocellular Carcinoma

In individuals with advanced liver disease, such as cirrhosis due to NAFLD or NASH, there is an increased risk of developing hepatocellular carcinoma, which is a type of liver cancer[30]..

It's important for patients with diabetes to manage their insulin resistance and hyperglycemia effectively through lifestyle changes, medication management, and regular medical check-ups. Controlling blood sugar levels, maintaining a healthy weight, and addressing other risk factors like high blood pressure and high cholesterol can help reduce the risk of liver complications associated with diabetes. Consulting with a diabetes specialis is key for managing both diabetes and its potential liver consequences[31]..

-The effect of diabetes on liver enzymes

The liver has an essential part in the maintenance of glucose homeostasis [1]. A number of markers indicating liver injury, including γ-glutamyl-transferase (GGT), aspartate aminotransferase (AST), Alkaline phosphatase (ALP) and alanine aminotransferase (ALT) are measures for non-alcoholic fatty liver disease (NAFLD) which has been associated with insulin resistance [2] and the risk of diabetes [3].

Diabetes mellitus is one of the key public health problem as well as a leading factor of mortality and morbidity globally [4, 5]. As stated by International Diabetes Federation (IDF), approximately 1 out of 11 adult people in the world would be afflicted with diabetes mellitus [6]. Nearly 80% of diabetic subjects are residents of low and middle-income countries, and countries from South-East Asia especially are influenced by this disease [6]. Diabetes has been related to various liver illnesses such as NAFLD, hepatocellular carcinoma and cirrhosis [3, 7, 8].

These liver diseases are regarded as major contributors to death among diabetic patients [9]. An important marker of liver damage in NAFLD disease is altered liver enzyme levels [10] which are biological markers linking liver disease and diabetes [11]. Specific focus has been made on the contribution of liver enzymes to prediction of diabetes. In this respect, although many studies have shown a relation between diabetes and elevated liver enzymes, the results remain inconsistent [12]. Some studies showed significant relationship between high levels of AST, ALT, GGT and diabetes [13, 14]. In another study, a significant increase was observed for GGT, ALT and ALP levels but not AST [11]. Some studies showed that significant increases in ALT and AST are associated with diabetes [7, 15, 16]. On the other hand, in some studies, only an increase in GGT was associated with diabetes [17]. Considering the high prevalence of diabetes in Iran and its implications on cardiovascular diseases [18], it is of interest to determine the relationship between the levels of liver enzymes and diabetes. Our aim was to investigate the correlation of the level of liver enzymes with diabetes in the adult population of Rafsanjan. Moreover, we evaluated the association between liver enzyme levels within their normal ranges and the odds of diabetes.

Chapter two

Methods

The previously listed results were examined by a special device called Automated biochemistry analyzer respons®910.

DESCRIPTION

respons®910 is a bench top analyzer with a throughput of 100 to 150 tests/hour. This analyzer is the ideal system for laboratories with a test volume up to 500 tests per shift.it is a compact and fully-automated bench top analyzer for maximum efficiency. During its development, special attention was paid to easy handling and optimized work flow thus leading to the ideal clinical chemistry system for many laboratories.

CHARACTERISTICS

Operation

automated

Configuration

compact

Sample type

serum, plasma, whole blood, urine

Other measured parameters

with immunoturbidimetric analysis

Options

with barcode reader, with STAT port, with crash sensor, with clot detection, with LIS connectivity

Throughput

100 p/h, 150 p/h

Sample volume

0.05 ml

(0.001691 US fl oz)

Reagent volume

Max.: 0.25 ml

(0.01 US fl oz)

Min.: 0.01 ml

(0 US fl oz)

Number of reagent positions

30 unit

Weight

60 kg
(132.3 lb)

Length

67 cm
(26.4 in)

Width

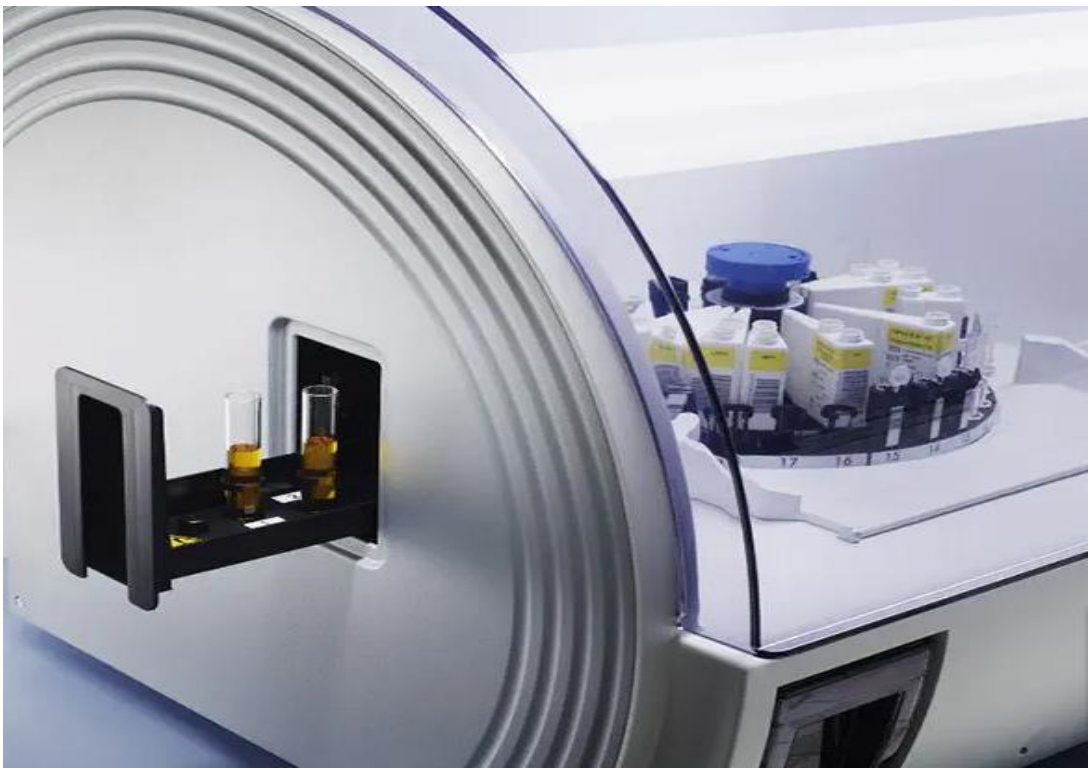
60 cm
(23.6 in)

Height

60 cm
(23.6 in)


respons 910


HBA1C
AMY
TRIG
CLM03
UREA
5
4
3
2
1
30
29
28



Kits for respons

- ALAT (GPT) FS (IFCC mod.)
- Albumin FS
- Albumin in Urine/CSF FS (Microalbumin)
- Alkaline phosphatase FS IFCC 37°C
- α-Amylase CC FS
- Antistreptolysin O FS
- Apolipoprotein A1 FS
- Apolipoprotein B FS
- ASAT (GOT) FS (IFCC mod.)

- Bicarbonate FS
- Bilirubin Auto Direct FS
- Bilirubin Auto Total FS

- Calcium P FS
- Chimneys
- Chloride 21 FS
- Cholesterol FS
- Cholinesterase FS
- CK-MB FS
- CK-NAC FS
- Cleaner A
- Cleaner B
- Cleaner respons®920/940/Cleaner A/Cleaner B
- Complement C3c FS
- Complement C4 FS
- Creatinine FS
- Creatinine PAP FS
- CRP FS
- CRP U-hs
- Cystatin C FS

- D-Dimer FS

- Ethanol FS

- Ferritin SR

- Gamma-GT FS (Szasz mod./IFCC stand.)
- Glucose GOD FS
- Glucose Hexokinase FS

- oneHbA1c FS
- HbA1c net FS
- HDL-c direct FS
- HDL-C Immuno FS
- ß-Hydroxybutyrate 21 FS

- Immunoglobulin A FS
- Immunoglobulin E FS
- Immunoglobulin G FS
- Immunoglobulin M FS
- Iron FS Ferene
- ISE Urine diluent

- Lactate FS
- LDH 21 FS (IFCC mod.)
- LDL-c direct FS
- LDL-C Select FS
- Lipase DC FS
- Lp(a) 21 FS
- Lp-PLA_2 FS

- Magnesium XL FS
- Myoglobin FS

- NEFA FS

- Pancreatic amylase CC FS
- Phosphate FS
- Phospholipids FS
- Potassium FS
- Prealbumin FS
- Procalcitonin FS

- Rheumatoid factor FS

- Rheumatoid factor FS

- Sodium FS

- Total bile acids 21 FS (serum)
- Total bile acids 21 FS (stool)
- Total protein FS
- Total Protein UC FS
- Transferrin FS
- Triglycerides FS

- UIBC FS
- Urea FS
- Uric acid FS TOOS

Chapter three

Result and discussion

The correlation coefficient is measured on a scale that varies from + 1 through 0 to – 1. Complete correlation between two variables is expressed by either.

	Mean	SD	CORRELATION CREATININE & UREA	CORRELATION GOT& GPT	CORRE GOT UREA	CORRE GPT,CREA	CORRE GPT,UREATININ	CORRE GOT,REATININ
CREATININ mmol/liter	99.7	32.9	0.139	0.14	0.O52	O.OOO12	0.08	0.0005
UREAmmol/ liter	4.96	2.9						
GOT IU/L	26.9	14.5						
GPT IU/L	27.9	19.3						

There is adirect relationship between the studied variable coefficients the excretion of waste products and toxins such as urea, creatinine and uric acid, regulation of extracellular fluid volume, serum osmolality and electrolyte concentrations

Serum creatinine is also utilized in GFR estimating equations such as the Modified Diet in Renal Disease (MDRD) and the CKD-EPI (Chronic Kidney Disease Epidemiology Collaboration) equation. These eGFR equations are superior to serum creatinine alone since they include race, age, and gender variables. GFR is classified into the following stages based on kidney disease.

Urea or BUN is a nitrogen-containing compound formed in the liver as the end product of protein metabolism and the urea cycle. About 85% of urea is

eliminated via kidneys; the rest is excreted via the gastrointestinal (GI) tract. Serum urea levels increase in conditions where renal clearance decreases (in acute and chronic renal failure/impairment). Urea may also increase in other conditions not related to renal diseases such as upper GI bleeding, dehydration, catabolic states, and high protein diets. Urea may be decreased in starvation, low-protein diet, and severe liver disease. Serum creatinine is a more accurate assessment of renal function than urea; however, urea is increased earlier in renal disease.

Alanine transaminase test

Alanine transaminase (ALT), one of the most important liver function tests, is an enzyme that contributes to the breakdown of proteins, and its elevation indicates liver damage.

Aspartate aminotransferase test

Aspartate transaminase (AST) is one of the main enzymes in the liver, and a high AST indicates liver damage or disease.

Alkaline phosphatase test

Alkaline Phosphatase (ALP) test is an enzyme found in the liver, bile ducts, and bones, and high levels indicate liver damage or liver disease, bile duct obstruction, or bone disease.

Albumin test

Albumin is the main protein made by the liver, and it performs many important functions in the body, such as nourishing tissues, transporting hormones and vitamins in the body, and preventing fluid leakage from blood vessels. A liver function test measures the quality of making this protein, and low levels indicate that the liver is not working properly. good.

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