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EFFECT OF RECOVERY FOLLOW –UP IN DIABETES CENTER THROUGH MEASURE BLOOD GLUCOSE AND ACCUMULATION GLUCOSE AND LIPIDS IN INFECTED PATIENTS AND RELATION WITH STONE GALL BLADDER

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Abstract:
This research aims to relation between long period of infection and some drugs decrease lipids in serum blood induce to formation stone gallbladder Also studied effect of diabetes mellitus on Biochemical profile of : (the levels of blood glucose in , cholesterol, Tricholesterol ,High density lipoprotein – cholesterol(HDL-C) ,low density lipoprotein- cholesterol(LDL-C),glutamic pyruvate transaminase enzyme (GPT), glutamic oxaloacetate transaminase enzyme(GOT), Alkaline phosphates enzyme), total protein ,Albumin , Globulin and Glycosylate hemoglobin HbA1c in patients infected with diabetes type2 before and after treatment through three years follow –up there tests by recovery in (National diabetes center / Al- Mustansiriyah university/ Ministry of higher education) .Blood samples collected before and after three years follow –up period treatment and the above mention parameters were measured as scheduled. This study was contain on 100 Diabetes patients detected on the center (50males, 50females) and 50 healthy person (25 males ,25 females)from the same area with no history of diabetes mellitus as a control group . Blood samples divided into two tube (EDTA and plane tube). All examine Detected and measured in national diabetes center. The patients infected with diabetic treated by Dao nil and Metra famine and lipids drugs according doctor advice. High levels in lipids profile for three years caused to stone in gall bladder in female group more than male group due to relation between the infection with diabetes mellitus and length period infection. It is clear from above that the treatment of diabetes in lipids drugs which that given from the doctors in diabetes center caused decreasing in blood level profile and may be the patients had a few amount lipid in there foods. We found continuance high levels blood glucose and HbA1c in both infected group (male , female) after treatment this results lead high risk healthy trouble because the side effect of diabetes infection from one side and anther way may be the drugs to treated diabetes and this results showed in female group higher than male group.

Keywords: diabetes, blood glucose, glucose, lipids, stone gall bladder

Introduction:

High level of lipids consider diabetes mellitus type 1 and 2 as a complex situation of many symptoms and not just as arise in blood glucose is only a small part of the diabetic problem .Maintaining such as for example lows body weight , identifying and treating increase lipids levels in the blood ,controlling high blood pressure and avoidance of other risk factors like smoking sedentary life style ,is as important as treating increase blood sugar levels of diabetes mellitus . Diabetes causes many diabetics developing healthy problems like heart diseases, kidney, eyes or legs in spite of achieving normal blood glucose control with indigenous drugs over many years.

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Also must be determination concentration of lipids (cholesterol, triglyceride .high – density lipoprotein cholesterol, low- density lipoprotein cholesterol) that is very important to know healthy situation of patients (WHO, 1999; Americans Diabetes Association, 1995). Further ,diabetes symptoms within and individual vary greatly from time to time induce to the type of therapy treatment and other factors table(1)showed types of therapy for type 2 diabetes .(Testa and Meyer ,1996;Nogrady,1988).

Table (1) types of some drugs treated diabetes mellitus type 2

First group Sulphonyl urea	Second group Biguanides
1-Glibenclamide 2-Chloropropamide 3-Tolbutamide 4-Glipizide	1- Metformin 2- Phenformine
1-(work on increase β-cell release insulin) 2- good metabolism in muscle and lipids tissue, also decrease liver products glucose	1- Good metabolism of glucose in muscles 2- decrease level products of glucose in liver due to insulin action.
Examples : a- Tolbutamide $R_1 = CH_3$, Glibenclamide))ex : b- Chloropropamide $R_1 = Cl$ Glipizide))ex :	This is drugs latest usage because of high toxicity and effect on digestive system ,also causes high acidity of blood

Occasionally , one many even come across a diabetes mellitus with increase blood glucose to beginning with before and after taking insulin injections for some time be coming "normal " without the need to treatment insulin . This is popularly called a" honey moon phase " in a diabetic which may last for few weeks to few months .Some of the claims on cure in diabetes by indigenous drugs can be attributed to this phase . This leaded patients to never recovery to the doctors (al-ashbal ,2004).

A1c is a measure of the mean blood glucose level over the previous 2-3 months and particularly the previous 4 weeks .It is improve the essential base line measure of glycemic control in a diabetes mellitus and must be determent at least annually in all diabetics and more often (3 – monthly) when assessing the effect of changes in therapy or compliance Unlike fructose amine, heamoglobuline glycosylate A1c is unaffected by protein urea of obesity. It may be decrease however when there is shortened life of red blood cells survival as in hemolysis or bleeding (Ibrahim,et.al ,1987 ;al-ashbal ,2000)

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Serum glutamic – pyruvic transaminase or GPT (alt) is an enzyme found primarily in the liver but also to a lesser degree in, the heart and other tissues. It is useful in diagnosing liver function more than GOT (ast) levels. Decrease Gpt enzyme in combination with increased cholesterol levels is seen in cases of a congested liver. We also see increased levels in mononucleosis, alcoholism, liver damage, kidney infection, chemical pollutants or myocardial infection, and Diabetes (Abdel-Muneim and Al-Homrany (2002).figure (1,2,3)

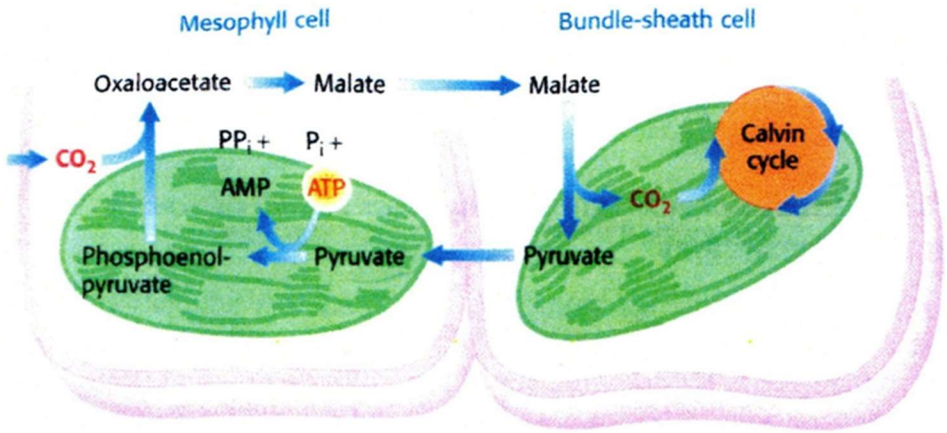

Figure (1) :Carbon way When oxygen disappear that's found concentration of fibers muscles to synthesis ATP (Berg *etal* .,2002)

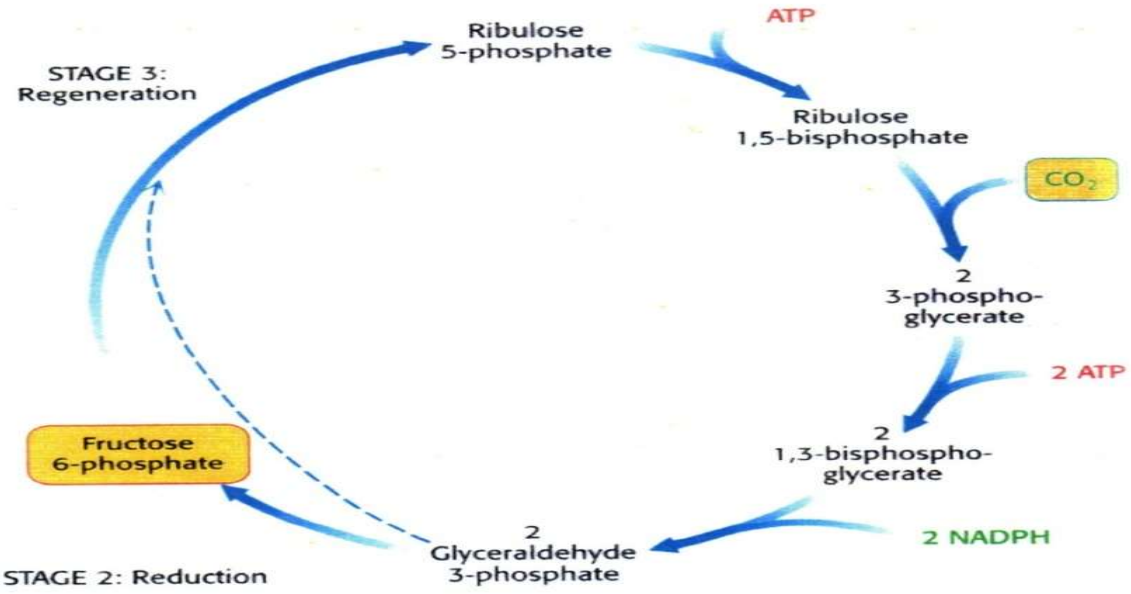

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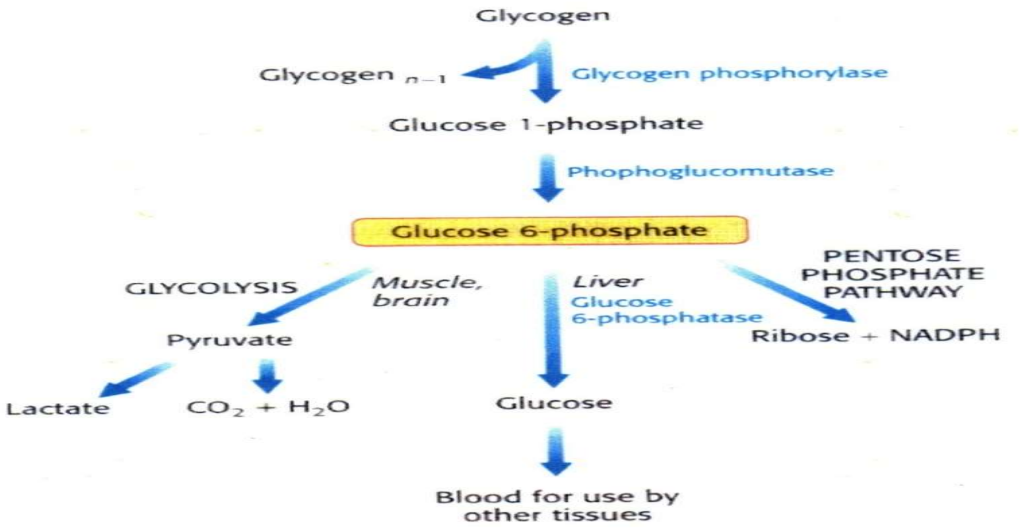
Figure (2) : Calvin cycle contents

Three stages: 1- carbon fixation by carboxylation process to Ribose to 1 ,5 , - bi phosphate 2- Reduce Carbone fixation to start synthesis glucose 6 carbon 3- re – creative ribose 1 ,5, phosphate structure (Berg *et al* .,2002)

Figure (3)



:Glycogen features :1- use in metabolic reaction aerobic and un aerobic such as in muscle 2- Divided to glucose such as in liver and release again to blood 3- Manufacture in pentose phosphate ways to created NADH or rib lose such as in different tissues(Berg *et al* .,2002) .

Liver synthesis of protein from amino acids which that explain in figure (4) (Berg *et al* .,2002) .

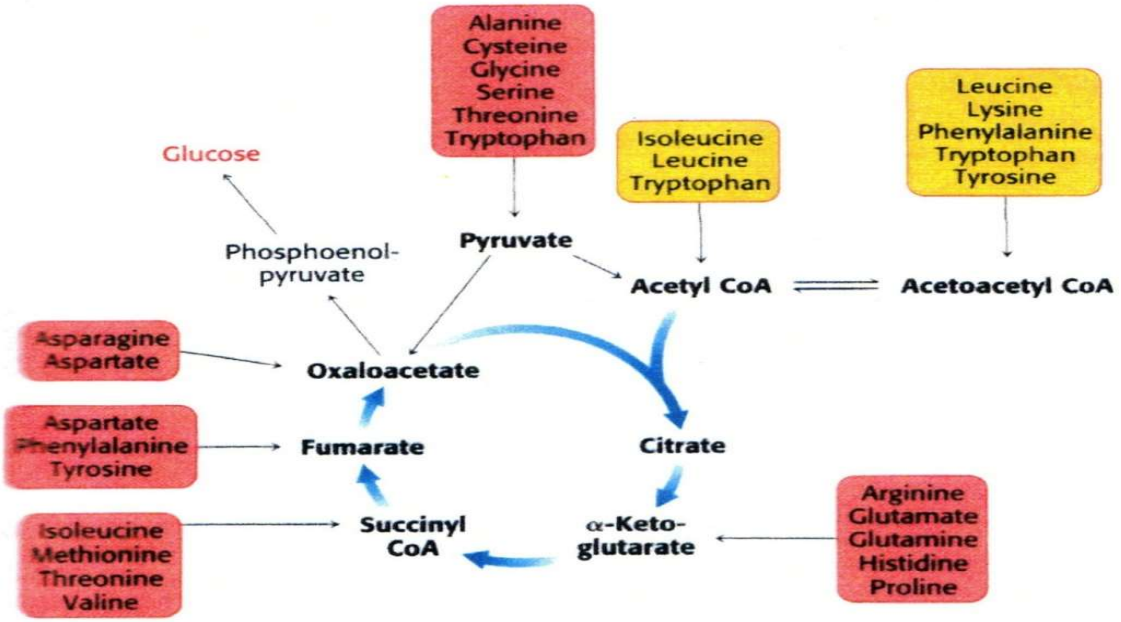


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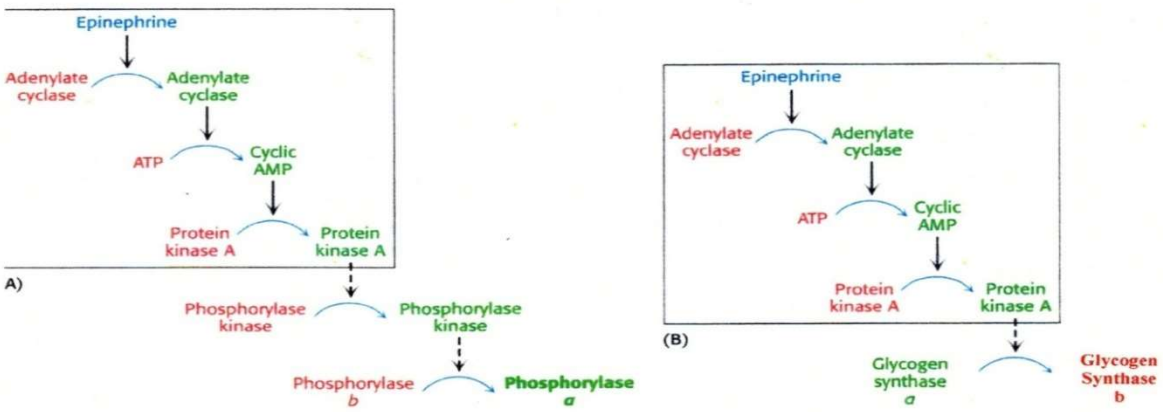
Figure (4): Carbon structure of amino acids usage in glucose synthesis from protein and amino acids to synthesis Ketogenic (Berg *et al* .,2002)

Hepatic fat accumulation is well recognized complication of diabetes mellitus reported frequency of 40-70 %. Unfortunately and associated obesity is a frequently occurring confounding variable. Type 1 diabetes is not associated with fat accumulation if glycaemia level is well controlled, but type 2 diabetes may have a 70% correlation regardless of blood glucose control (Norum and Christain,1983). Fat is store in the form of triglyceride and may be a manifestation of increased fat transport to liver, enhanced hepatic fat synthesis, and decreased oxidation or removal of fat from the liver. The statuses may be micro vesicular infection or macro vesicular diseases and may lead to fibrosis and cirrhosis .The degree of glycemic control does not correlate with the presence or absence of fat (Pusztai ,et.al ,1998). Figure (5)



Figure(5): Explain regular catabolism and anabolism of glycogen by hormone epinephrine cAMP: a :catabolism b: anabolism (Berg *et al* .,2002)

There is reported increased incidence of cholelithiasis in diabetes mellitus, but obesity and hyper lipidemia may again be confounding variables. Several articles have reported a two- three fold high degree incidence of gallstones in diabetic patients, where as other have failed to demonstrate significant association. Gallbladder emptying abnormalities found in diabetic patients may predispose patients cholelithiasis , whereas others have failed to demonstrate significant association(Cooper ,et.al,1991 ; Ransohoff et.al ,1987).Secretion of Lactogenic bile by the liver in patients with type 2 diabetes propably predisposes them to forming gall stone (Thalerand Schaffiner ,1986 ; Ruiztmlina et .al, 1997) . Treatment Therapy by the Biguanides metformin (Glucophage) did not undergo hepatic metabolism and like Chloropropamide. .
(Diabetes) is execrated unchanged in the urine (Testa and mayer,1996). Fourthly therapy for fat like (Genfibrozil) may be cause gallstone (Davidson ,1992 ; Nogrady ,1988)

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Material and Methods

This study researched in National diabetic center / Mustansiriyah University /ministry of higher education of Iraq .length of this study for two period, first in 24-02-2009
To 15-03 – 2009 and the second period 24-9-2011 to 24- 10-2011.concedre on files for pie tents in the national diabetes center .Diabetes diagnosed in the diabetes center after that recovery of the doctors in the diabetes center. Data collected included different analysis examine such as (blood glucose ,cholesterol ,triglyceride ,HDL-C, LDL-C ,HbA1c ,hormones ,liver enzymes ,ultrasound ,optical examine , and determination type of drugs which need each case and dose of drugs .

Collection of blood and tests of parameters

This study was contain on 100 diabetes patients detected on the diabetic center(50males , 50females) and 50 healthy person (25 males ,25 females)from the same area with no history of diabetes mellitus as a control group . Blood samples takes in fasting patients divided into two tube (EDTA and plane tube).All patients under recovery the doctors every three months All analysis examine in the laboratory of diabetes center .
The parameters include:

1- Determination of blood glucose level.

Serum blood glucose was estimated by an enzymatic analysis method by (Barham and Tinder (1972)) , using Guess kit reagents and products (Italy). The principle of method was described in bulletin paper with kit.

2- Determination of serum cholesterol level.

Serum cholesterol level was estimated by an enzymatic analysis method by (Young ,D.S.*etal*.,1975) , using Guess kit reagents and products (Italy). The principle of method was described by bulletin paper with kit. .

3- Determination of serum triglyceride level

Serum triglyceride level was estimated by an enzymatic analysis method by(Young ,D.S.*etal*.,1975) , using Guess kit reagents and products (Italy). The principle of method was described by bulletin paper with kit.

4- Determination of serum HDL-C (High Density lipoprotein – cholesterol).

Serum HDL-C level was estimated by an enzymatic analysis method by (Demacherp,N.M.1980) , using Guess kit reagents and products (Italy). The principle of method was described by bulletin paper with kit.

5- Determination of serum LDL-C (Low Density lipoprotein – cholesterol).

Serum LDL-C level was estimated by(Demacherp,N.M.1980) used mathematics value
LDL-C = chol. – (HDL-C + Triglyceride)/5

6- Determination of serum liver enzyme (GOT,GPT) .

Serum (GOT,GPT) . Level was estimated by color method by (Ritman-Frankel, 1957)evaluated by enzymatic method using Guess kit reagents and products (Italy). The principle of method was described by bulletin paper with kit.

7- Serum, Alk phosphatase (Alk) follow kinetic method by Young,D.N.*eta.,*(1975). using Guess kit reagents and products (Italy).

8- Measurement of glycosylated hemoglobin's (HbA1c).
Determination of (HbA1c) in the haemolysate was carried out calorimetrically using system Bio RAD , hemolysis reagent Bio- RAD ,the results analysis automatic in the monger of system and printing with printer correlated with monitor .
9- Diagnostics of gallbladder stone.
Stones diagnostic by wave of Ultrasound examine in the National diabetes center.

Statistical analysis:
All the medical data results were analyzed statistically using (Statistical Package of Social Science) SPSSII – t – test for paired data Of different level of significance. All the results were expressed as mean ± S.E.M. (ANOVA) One way analysis of Variances
(Depending on statistical books)
Results and discussion:
The results in tables (1and2)refer to male infected group before treatment showed high level in parameters :blood glucose (192.16 ± 42.95 mg/dl),HbA1c(9.34 ± 2.34 %) , chol.(222.00 ± 20.46 mg/dl) ,tri chol. (209.84 ± 58.83 mg/dl) , LDL-c (145.80 ± 36.40 mg/dl) and low level in HDL-C (40.22 ± 8.06 mg/dl), comparing with male control group (non – infected with diabetes was :(99.68 ± 11.02mg/dl , 4.40 ± 1.44 % ,181.60 ± 6.82 mg/dl , 101.60± 10.79 mg/dl , 101.16 ± 12.70mg/dl 50.72 ± 3.50 mg/dl respectively)the data obtained shows significant changes $p<0.01$,$p<0.05$ between infected male group and control groups . Also the results in female infected group remarkable increased before treatment in levels parameters of above : :blood glucose (209.46 ± 64.15 mg/dl),HbA1c(9.60 ± 2.15) , chol.(203.16 ± 24.05 mg/dl) ,tri chol. (207.50 ± 39.04 mg/dl , LDL-c (, 145.80 ± 31.40 mg/dl) ,and low level in HDL-C (42.52 ± 8.65 mg/dl) comparing with female control group(non – infected with diabetes :blood glucose (84.68 ± 6.84 mg/dl),HbA1c(4.24 1.28 %) , chol.(167.00 ± 6.36 mg/dl) ,tri chol. (93.84 ± 9.50 mg/dl) , LDL-c (90.50 ± 12.70 mg/dl) HDL-C (53.16 ± 4.13 mg/dl) . The data obtained shows significant changes $p<0.01$,$p<0.05$ between infected female group and control groups . The changes in above parameters levels after treatment show in tables (3and 4) in both infected groups (male and female) showed different from male to female in different parameters .The results of blood glucose and HbA1c in male infected group was (171.00± 43.53 mg/dl ,8.88 ± 0.94%)the ratio decrease % , % and in female infected group (188.32± 44.73 mg/dl , 9.68 %) the ratio decrease % , % ,cholesterol level in male infected group (173.26 ± 25.05 mg/dl) the ratio decrease % , % in female infected group (201.48 ± 35.75 mg/dl) the ratio decrease % , %,Tricholesterol level in male infected group (148.48 ± 21 .07 mg/dl) the ratio decrease % , % in female infected group (141.18± 20.92 mg/dl) the ratio decrease % , % ,HDL-C level in male infected group (45.18 ± 4.53)the ratio increase % in female infected group (43.68 ± 6.57 mg/dl) the ratio increase %,LDL-C level in male infected group (100.66± 13.61mg/dl) the ratio decrease % in female infected group (116.32 ± 20.03 mg/dl) the ratio decrease %, comparing with male control group (99.68± 11.03 mg/dl ,4.80 ± 0.77% , 181.60 ± 6.74 mg/dl , 102.20 ± 10.77 mg/dl , 50.52 ± 4.02 mg/dl , 95.72 ± 10.59 mg/dl ,

respectively) and female control group (84.68± 6.84 , 4.32 ± 0.88% , 167.00± 6.48mg/dl , 95.44± 10.40 mg/dl , 51.36± 4.58mg/dl , 93.72± 12.20 mg/dl respectively) % . Also founded significant difference in $p<0.01$,$p<0.05$ between infected male group and control groups and infected female group and control group. Also we found formation stone in gallbladder appear after three years treatment in some patients reached in female group(20) and in male group (10) this due to high level of cholesterol and the wemen infected have higher ability to formation stone gallbladder than men infected . Serum cholesterol ,triglyceride ,ldl-c levels increase in diabetes mellitus ,and such increase represent the risk factor for coronary heart disease (Peter,et.al.,2005 ; C0nway ,et.al.,2004). Decreasing of serum fat concentration through dietary or drugs therapy like to be associated with lowering of the risk of heart disease (Ganong ,1997).The abnormal increase concentration of serum lipids in diabetes patients is due , mainly , to the increase in the mobilization of free fatty acids from the peripheral lipids stores ,since insulin inhibits the hormone – sensitive lipase . On the other hand, glucagon, catecolaminase, and other hormones enhance lipolysis. The marked hyperglycemia that characterizes the diabetic state may, therefore, be regarded as consequence of the uninhibited effect of lipolysis hormones on the fat stores (Goodman and Gilman ,1985) . Cholesterol synthesis is also increase in ldl-c , and if insulin deficiency is very sever , chylomicrons may accumulate in the blood (Zilva and pannall ,1985). The results of this studied to ability of lipid drugs like Genfibrozil and Dao nil and Metra famine for diabetes treatment lead to no hypoliposis eficiency in infected groups latter findings shows that continuous administration of the drugs prevent of the level of serum lipids secondary to diabetes mellitus state . the hypoliposis effect of lipid drug can be explained as a direct result for the reduction in the blood glucose concentration (Zilva and pannall ,1985) .The data obtained from this study demonstrate that the drug Genfibrozil and Dao nil and Metra famine aldose – dependent reduction in the glycaemia level cause significant changes and produce evaluable decrease in the blood glucose level in both males and females groups (Zilva and Pannall ,1985).

Hemoglobin A1c, a glycosylated fraction of Hb A, was available to increase in patients with diabetes mellitus , and the amount of this fraction is directly proportional to fasting blood glucose ((Howerd et.al.,2004 ; Faruk and Jinan ,2016). The published reports also revealed that the level of Hb A1c correlate best with the degree diabetic control obtained several months earlier. This would be expected because of the 120 days life span of the red blood cells and because the glycosylation reaction is irreversible. There seems to be little doubt that levels of glycosylated determent of overall diabetic control. It is valuable in assessing control, both in diabetic population and in individual patients (American diabetes Association,1995 ; Al- Yassin and Ibrahim ,1981). The result of total serum protein,Albumine and globulin shown in table(5)after treatment recorded decreasing in male infected group (6.64 ± 1.41 gm/dl , 4.10± 0.82 gm/dl , 2.64± 0.66 gm/dl respectively) % comparing with male control group (7.92 ± 2.28gm/dl , 4.44± 1.34 gm/dl , 3.04± 0.89gm/dl respectively) % .Also showed little decreasing in female infected group in total protein,Albumine and globulin levels (6.48± 1.41 gm/dl , 3.94 ± 0.84 gm/dl , 2.76± 0.63 gm/dl respectively) % comparing with female control group (

7.52± 2.05 gm/dl ,4.44 ± 1.16 gm/dl ,2.92 ± 0.89 respectively) % the data founded no significant changes between groups . This results refers to liver function in good situation because protein synthesis (albumin, globulin, fibrinogen) in liver. (Murry etal.(2000) .

The reading of liver s enzymes (GPT ,GOT ,ALK) after treatment as shown in table(5) in male infected group was (18.60± 3.68 gm/dl , 25.96 ± 5.21 I.U/L , 9.04± 2.23 I.U/L respectively) % comparing with male control (17.88± 5.12 I.U/L l ± 24.28 ± 7.32 I.U/L , 7.04± 2.05 I.U/L, respectively) % . Also showed high levels in liver' s enzymes (GPT ,GOT ,ALK) in female infected group (20.06 ± 5.43 I.U/L , 24.44 ± 5.17I.U/L , 9.40± 2.43 I.U/L respectively) % comparing with female control group (18.24± 5.40 I.U/l , 24.52 ± 7.32I.U/, 6.56± 2.05 I.U/L respectively) % Garber and Karlsson 2001). the data founded significant difference between infected groups and control groups . Significantly increased levels of ALT(SGPT) often suggest the existence of other medical problems such as viral hepatitis , Diabetes mellitus ,congestive heart failure , liver damage ,bile duct problems ,infectious mononucleosis , or myopathy ,so ALT is commonly used as a way of screening for liver disease . Increase of ALT enzyme may be also enhanced by dietary choline deficiency . However, elevated levels of ALT enzyme do not automatically mean that healthy problems exist. Fluctuation of ALT levels is normal over the course of the day , and they can also increase in response to strenuous physical exercise (Paul and Giboney ,2005).When elevated ALT levels enzyme are found in the blood , the possible underlying causes can be further narrowed down by measuring other enzymes . For example, elevated ALT levels due to hepatocyte damage can be distinguished from bile duct problems by measuring alkaline phosphatase. Also ,myopathy –related elevated in ALT must be suspected when the aspartate transaminase GOT (AST) is greater than ALT ; the possibility of muscle disease creating kinase .Many drugs elevated GPT levels, including Zileuton , Omega -3-acid ethyl Easters (Lovaza),(Ghouri,et.al.,2010).Anti –inflammatory drugs, antibiotics, cholesterol medications, some antipsychotics such as risperidone, and anticonvulsants ..Paracetamol may also elevated Alt levels (Watkins, et.al.(2006)).There is an objective test to prove or to disprove claims any substance with blood glucose lowering effect. In person with fasting and early morning blood glucose exceeding 250 mg/dl ,anon- toxic dose of attest substance be able to bring down the blood glucose level at least 30% percent at the end to lower blood glucose only when the morning blood glucose in person is less than 250 mg/dl ,and so they may be some use in mild diabetics along with dietary and activity management .Diabetes manifests in different person in many different ways , and depending in the body ,medical treatment greatly varies . for example a diabetic ,either in young age , during pregnancy ,if suffering from tuberculosis or afoot ulcer or ,with recent heart attack or paralysis ,should be given insulin injection only ,and no other antidiuretic drugs of any systems of medicine ,not even oral drugs usually prescribed by allopathic .One should also consider diabetes as a complex situation of many symptoms and not just as arise in blood glucose alone Unfortunately all diabetics are made to put a lot of emphasis on reducing blood glucose level by whatever means they are familiar with ,either by diet or ayurvedic drugs . In conclusion , our study has document several lipid abnormalities in type II DM patients

and has pointed to the significance of diabetic control in control of lipid abnormalities in the diabetic patients .These may involve dietary intervention ,increase in physical exercise ,control of blood pressure , avoidance of smoking ,and control of overweight and obesity .Also results to no change of patients situation refer to become better than before treatment especially in women group wherever blood concentration still high more than men group then the doctor advice to take insulin injection rather than oral drugs because afraid from diabetic effects also some oral drugs gave toxicity if it use for long period especially it could not try or give a good result when it has taken . We strongly recommend " lipid and diabetes awareness programs " for the Iraqi population in general and diabetic patients ,as well as high –risk groups ,in particular , in an attempt to improve the overall health status of the Iraqi population , and to encourage the growth of a healthier future generation of young Iraqis. ..

Table (1)Blood glucose level in serum blood in experimental groups (mg/dl)and glycosylated Heamoglobulin HbA1c(%) in pateints befor recovery in diabeteic center

Type of analysis groups	HbA1c %	Blood glucose mg/dl
Male control negative	4.40 ▲ ± 1.44	99.68 ▲ ± 11.02
Male infected diabetes 2	9.34 ± 2.34	192.16 ● ± 42.95
Female control negative	4.24 ■ ± 1.28	84.68 ■ ± 6.84
Female infected diabetes 2	9.60 ± 2.15	209.46 ± 64.15

Significant difference between male control group and male and female infected group $p< 0.01$, $p<0.05$ ▲

Significant difference between female control group and male and female infected group $p< 0.01$, $p<0.05$ ■

Significant difference between male and female infected group $p< 0.01$, $p<0.05$ ●

Table (2) levels of serum lipids profile (cholesterol, triglyceride, HDL-C, LDL-C) before recovery in diabetes center

Type of analysis Groups	LDL-C mgl/dl	HDL-Cmg/dl	Tricholesterol mg/dl	Cholesterol mg/dl
Male control negative	101.16 ▲ ± 12.70	50.72 ▲ ± 3.50	101.60 ▲ ± 10.79	181.60 ▲ ± 6.82
Male infected diabetes 2	145.80 ± 36.40	40.22 ± 8.06	209.84 ± 58.83	222.00 ± 20.46
Female control negative	90.50 ■ ± 12.70	53.16 ■ ± 4.13	93.84 ■ ± 9.50	167.00 ■ ± 6.30
Female infected diabetes 2	145.80 ± 31.40	42.52 ± 8.65	207.50 ± 39.04	203.16 ± 24.05

Significant difference between male control group and male and female infected group $p< 0.01$, $p<0.05$ ▲

Significant difference between female control group and male and female infected group $p< 0.01$, $p<0.05$ ■

Significant difference between male and female infected group $p< 0.01$, $p<0.05$ ●

Table (3) Blood glucose levels in serum blood in experimental groups (mg/dl)and glycosylated Heamoglobuline HbA1c(%) in patients after recovery in diabetic center

Type of analysis Groups	HbA1c %	Blood glucose mg/dl
Male control negative	4.80 ▲ ± 0.77	99.68 ▲ ± 11.03
Male infected diabetes 2	8.88 ± 0.94	171.00 ● ± 43.53
Female control negative	4.32 ■ ± 0.88	84.68 ■ ± 6.84
Female infected diabetes 2	9.68 ± 1.40	188.32 ± 44.73

Significant difference between male control group and male and female infected group p< 0.01, p<0.05 ▲
Significant difference between female control group and male and female infected group p< 0.01, p<0.05 ■
Significant difference between male and female infected group p< 0.01, p<0.05 ●

Table (4) levels of serum lipids profile (cholesterol, triglyceride, HDL-C, LDL-C) in patients groups after recovery in diabetic Center

Type of analysis Groups	LDL-C mgl/dl	HDL-C mg/dl	Tricholesterol mg/dl	cholesterol mg/dl
Male control negative	95.72 ▲ ± 10.59	50.52 ▲ ± 4.02	142.20 ▲ ± 10.77	181.60 ▲ ± 6.74
Male infected diabetes 2	1oo.66 ± 13.61	45.18 ± 4.53	148.48 ± 21.07	173.26 ± 25.05
Female control negative	93.72 ■ ± 12.20	51.36■ ± 4.58	95.44■ ± 10.40	167.00 ■ ± 6.48
Female infected diabetes 2	116.32 ± 20.03	43.68 ± 6.57	141.18 ± 20.92	201.48 35.76

Significant difference between male control group and male and female infected group p< 0.01, p<0.05 ▲
Significant difference between female control group and male and female infected group p< 0.01, p<0.05 ■
Significant difference between male and female infected group p< 0.01, p<0.05 ●

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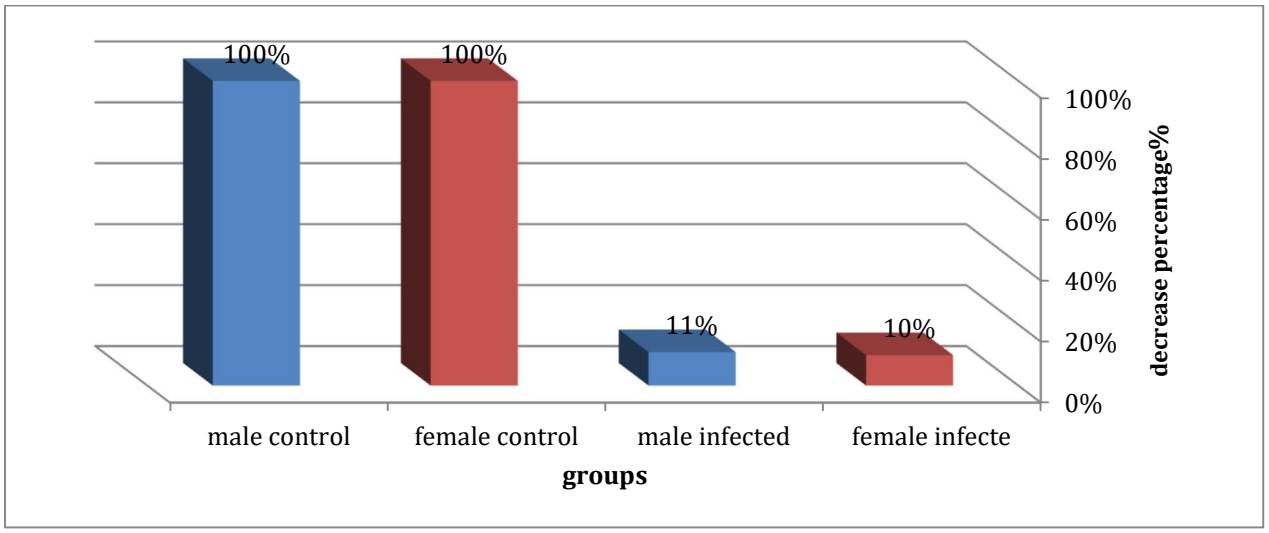

Figure (6) decrease percentage ratio of glucose levels in male and female control groups and male and female control groups after 3 years treatment

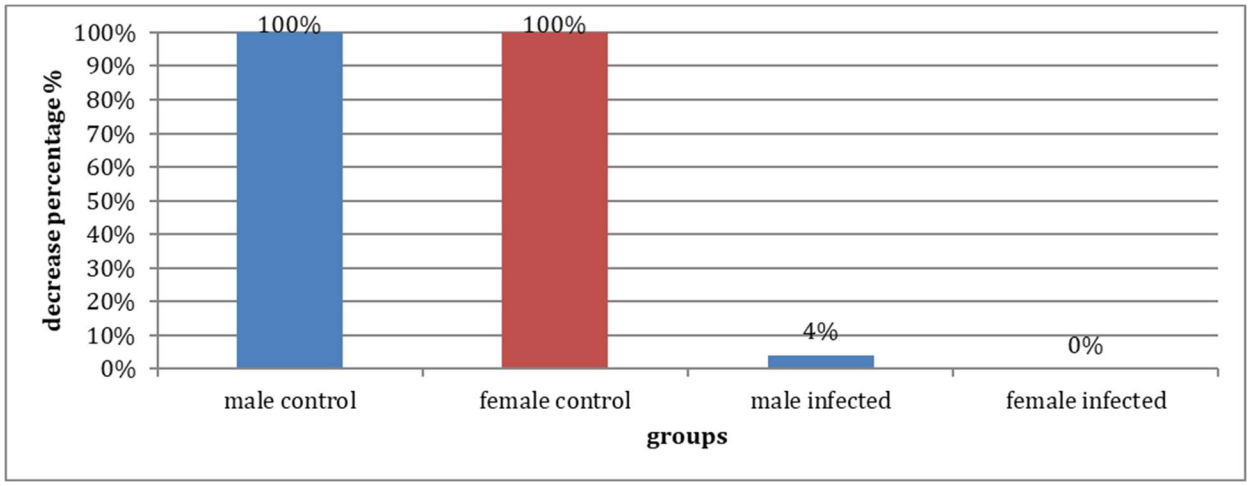

Figure (7)decrease percentage ratio of HbA1Clevele in male and female control groups and male and female control groups after 3 years treatment

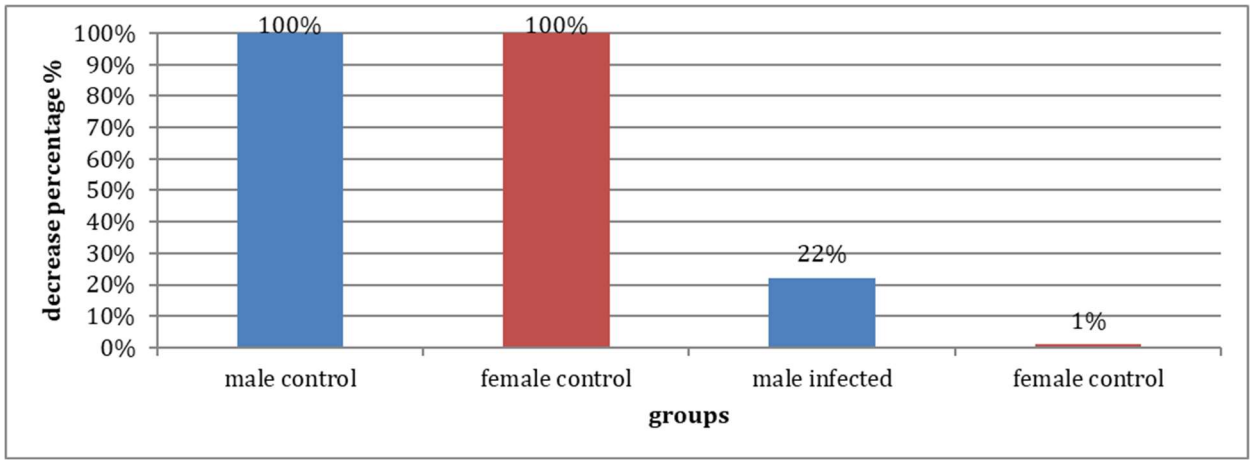

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Figure (8) decrease percentage ratio of cholesterol levels in male and female control groups and male and female control groups after 3 years treatment

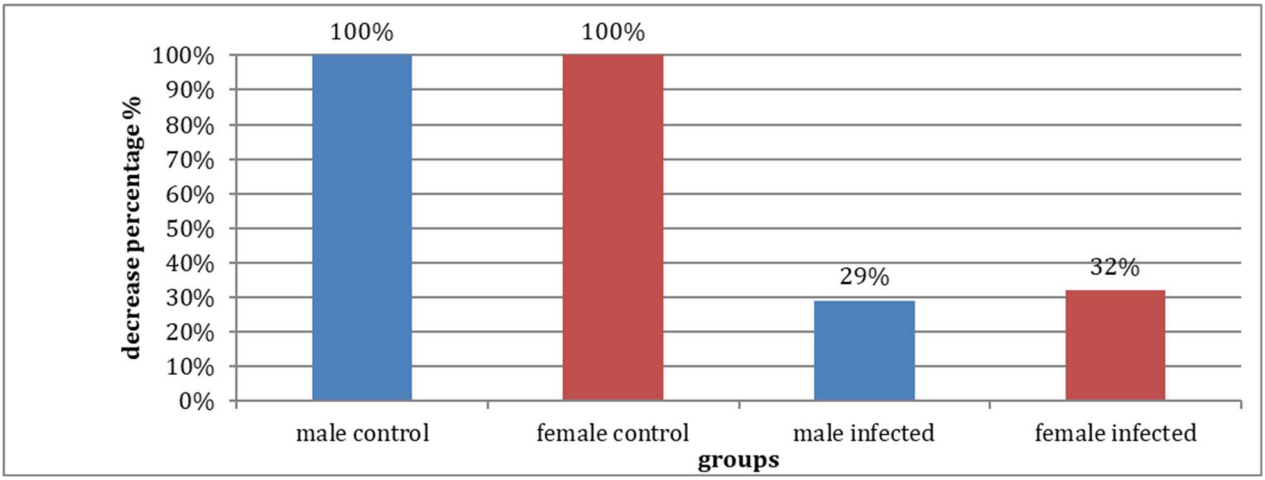

Figure (9) decrease percentage ratio of triglyceride levels in male and female control groups and male and female control groups after 3 years treatment

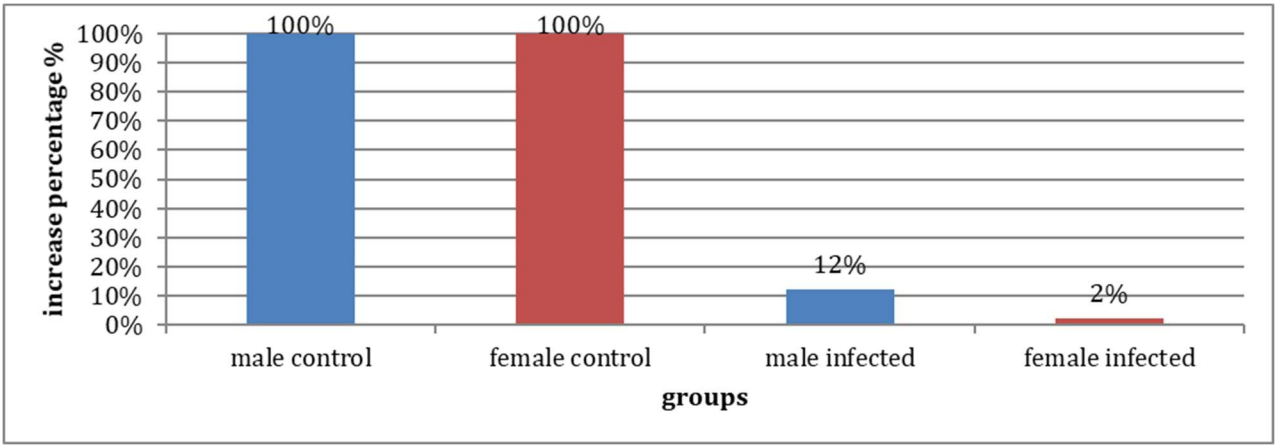

Figure (10) increase percentage ratio of HDL-C levels in male and female control groups and male and female control groups after 3 years treatment

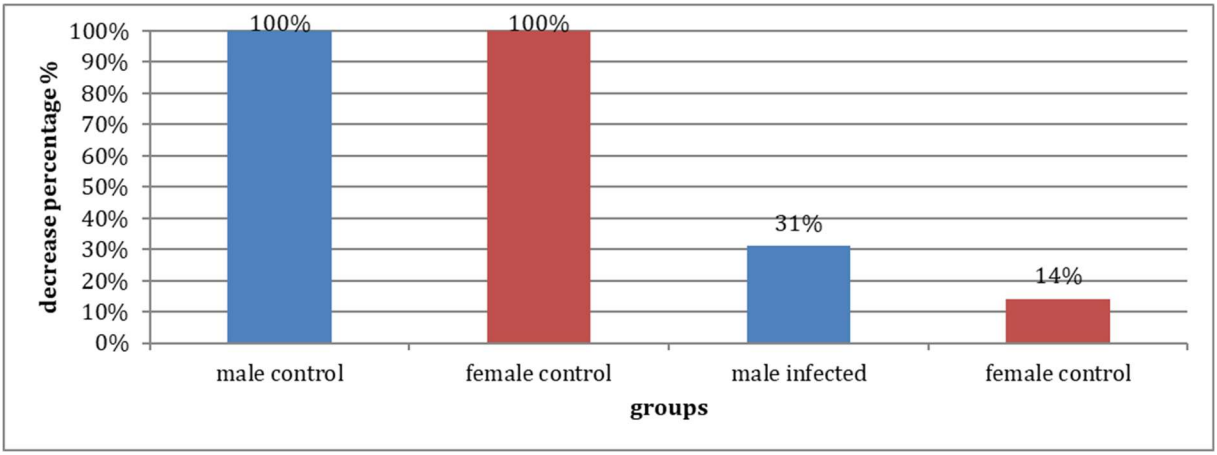

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Figure (11) decrease percentage ratio of LDL-C levels in male and female control groups and male and female control groups after 3 years treatment

Table (5) liver enzymes levels in serum blood and total serum protein ,albumin, globulin Of experimental groups after recovery in diabetic center

Type of analysis Groups	globulin	albumin	total protein	ALK IU/l	GOT IU/l	GPT IU/l
Male control negative	3.04 ▲ ± 0.89	4.44▲ ± 1.34	7.92▲ ± 2.28	7.04▲ ± 2.05	24.28▲ ± 7.32	17.88▲ ± 5.12
Male infected diabetes 2	2.64 ± 0.66	4.10 ± 0.82	6.64 ± 1.41	9.04 ± 2.23	25.96 ± 5.21	18.60 ● ± 3.68
Female control negative	2.92 ■ ± 0.89	4.44■ ± 1.16	7.52■ ± 2.05	6.56■ ± 2.05	24.52■ ± 7.32	18.24■ ± 5.40
Female infected diabetes 2	2.76 ± 0.63	3.94 ± 0.82	6.48 ± 1.41	9.40 ± 2.43	24.44 ± 5.17	20.06 ± 5.43

Significant difference between male control group and male and female infected group $p< 0.01$, $p<0.05$ ▲

Significant difference between female control group and male and female infected group $p< 0.01$, $p<0.05$ ■

Significant difference between male and female infected group $p< 0.01$, $p<0.05$ ●

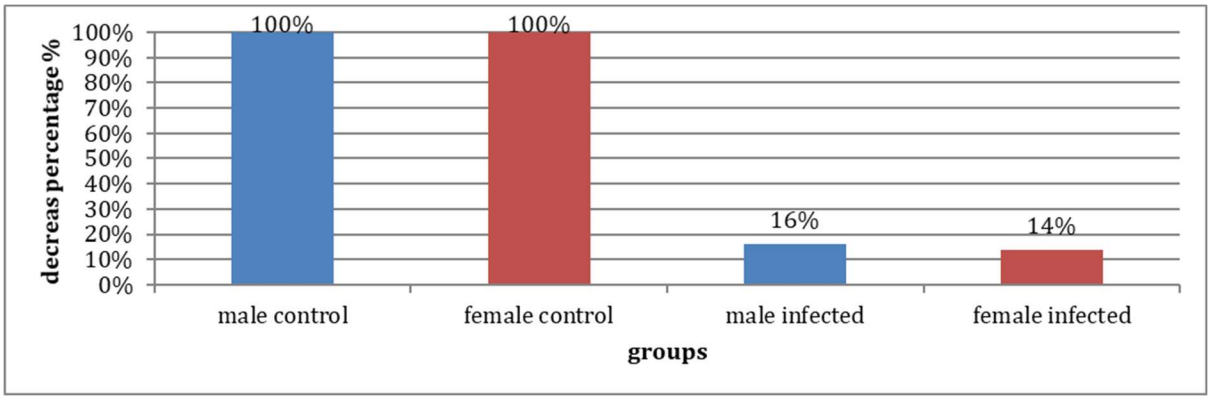

Figure (12) decrease percentage ratio of total serum protein levels in male and female control groups and male and female control groups after 3 years treatment

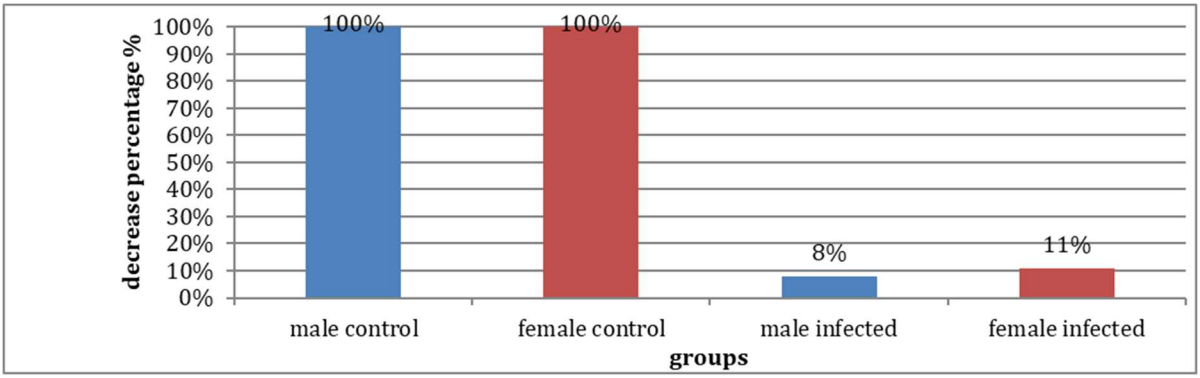

Figure (13) decrease percentage ratio of serum albumin level in male and female control groups and male and female control groups after 3 years treatment

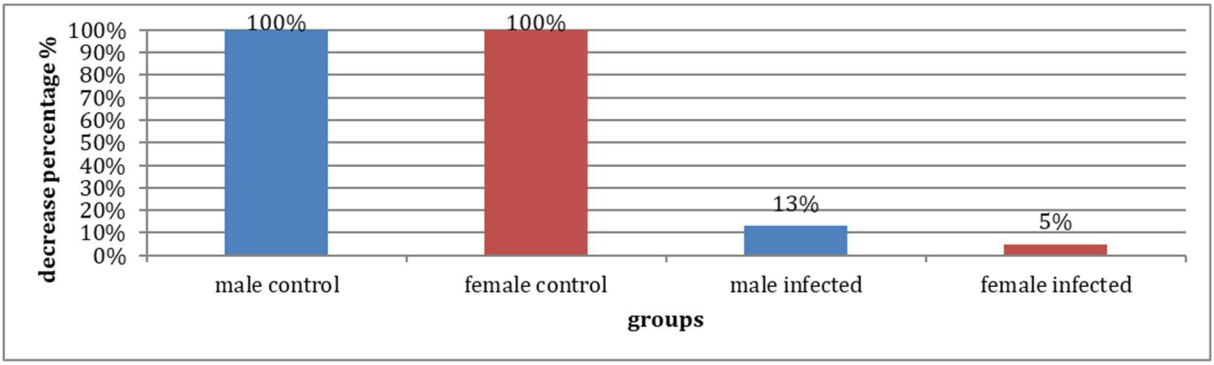

Figure (14) decrease percentage ratio of globulin level in male and female control groups and male and female control groups after 3 years treatment

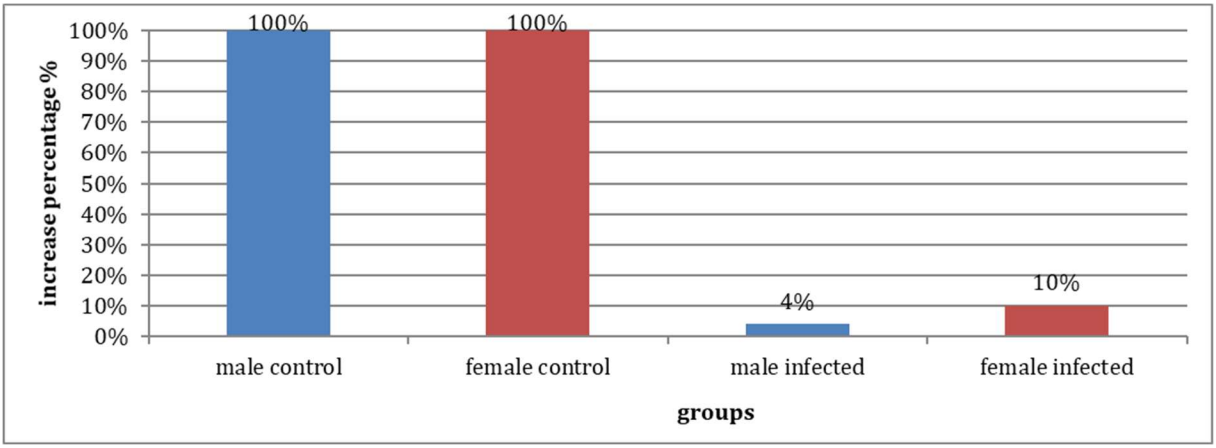

Figure (15) increase percentage ratio of liver enzyme GPT level in male and female control groups and male and female control groups after 3 years treatment

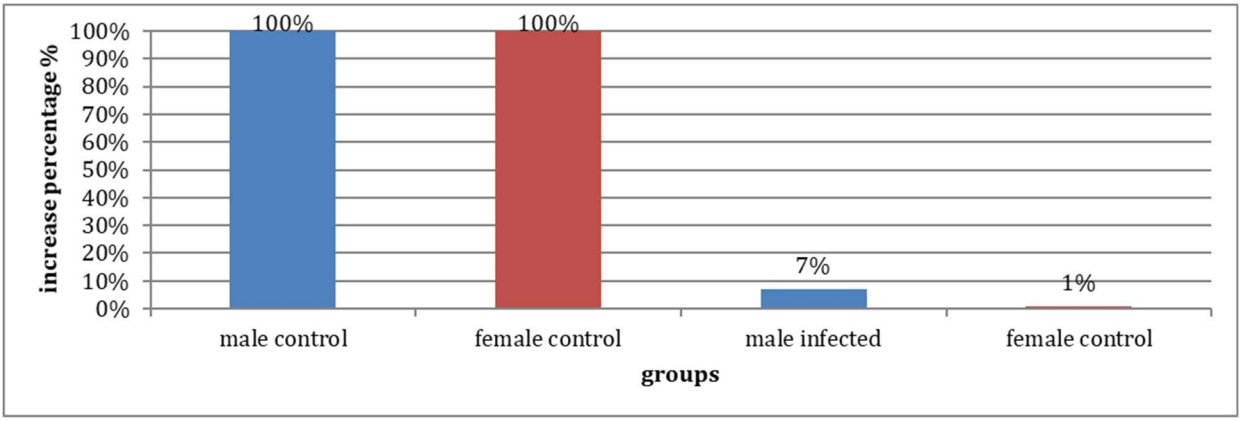

Figure (16) increase percentage ratio of liver enzyme GPT in male and female control groups and male and female control groups after 3 years treatment

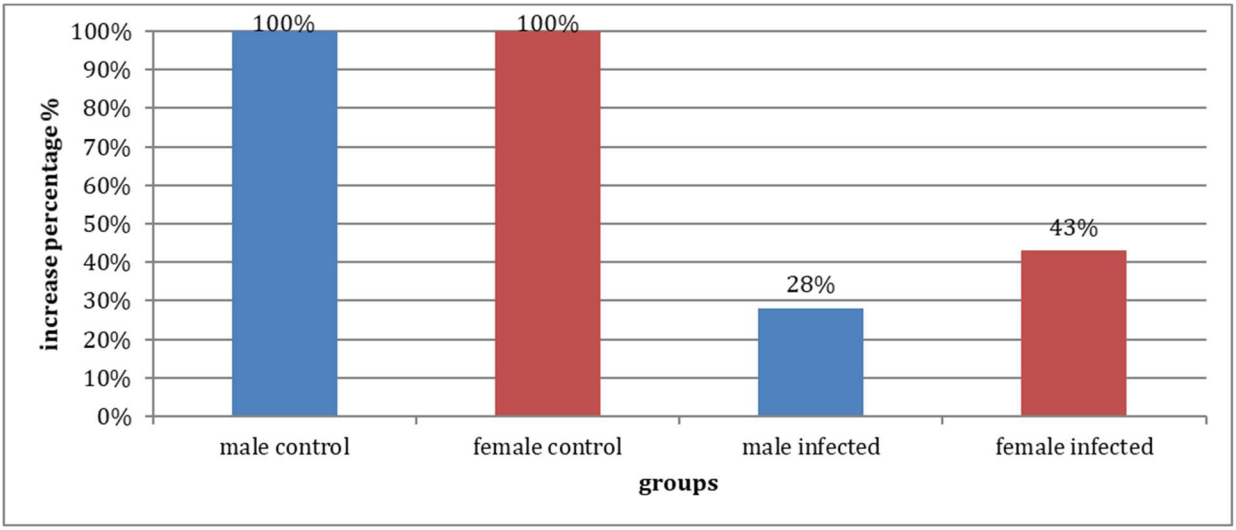

Figure (17) increase percentage ratio of liver enzyme ALK phosphatase in male and female control groups and male and female control groups after 3 years treatment

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