Pro Index | Journal of Science in Medicine and Life

Volume: 2 Issue: 6 Year: 2024

http://journals.proindex.uz

Studying the Effect of Some Levels of Fats in Blood Serum in Patients with Type 2 Diabetes

Fatima Ahmed Chiad

Department of biology, College of Science, university of Albasrah

Marwan Hussein Kazem

Department of pathological analyzes, College of Science, University of Kufa

Ahlam Abdel Amir Radi

Department of Pathological Analysis, College of Applied Medical Sciences, University of Karbala

Imann Affat Press

Department of Biology, College of Science for Girls, University of Baghdad

Abstract: Diabetes is a dangerous illness that can lead to extremely dangerous side effects, particularly given its strong correlation with lipids and impact on atherosclerosis and heart disease. Type 2 diabetes and a few biochemical group factors for patients of all genders and ages were used to measure it. Patients with diabetes were taken from the general laboratory to be examined pathologically for the disease. Ten fit, non-diabetic individuals were chosen. Enzymatic colorimetric methods were utilized to assess Triglycerides, blood sugar, total cholesterol, and high-density lipoprotein (HDL) in both groups. Additionally, the cholesterol levels of each sample was determined for low-density lipoprotein (LDL). When compared to non-diabetic individuals, diabetics have higher levels of glucose, triglycerides, total blood cholesterol, and LDL cholesterol, but lower levels of HDL cholesterol.

Introduction

Diabetes mellitus isa class of metabolic disorders marked by increased blood sugar levels resulting from insufficiencies in the action or synthesis of insulin, or from both. Long-term damage, dysfunction, and organ failure are associated with diabetes's chronic hyperglycemia, namely to the kidneys, eyes, heart, nerves, and blood arteries. Diabetes has several pathogenic pathways in its etiology. Some of these abnormalities include autoimmune death of the pancreas cells and subsequent insulin insufficiency, which result in resistance to the effects of insulin. The main factor causing the abnormalities in the metabolism of proteins, lipids, and carbohydrates in diabetics is insulin's insufficient action on target tissues. Insufficient insulin action is brought on by insufficient insulin secretion and/or decreased tissue responses to insulin at one or more stages in the complex hormone action pathways.

Impaired insulin secretion and deficits in insulin action can coexist in the same patient, and it is often unclear which aberration, if any, is the primary cause of the hyperglycemia. Polyuria, polydipsia, weight loss, and even blurred eyesight are signs of severe hyperglycemia. Growth impairment and an elevated risk of some illnesses are additional symptoms of chronic hyperglycemia. Uncontrolled diabetes can cause non-kenotic hyperosmolar syndrome or hyperglycemia with ketoacidosis, two severe consequences that can be lethal [1].

Because fatty acids change insulin signaling, enzyme activity, and cell membrane function, dietary fat is particularly important for understanding glucose metabolism. as well as gene expression. [5]

Fat

In managing diabetes, carbohydrates, or "carbs," receive all the emphasis. But fat is also a crucial ingredient to take into account when planning a balanced diet. Eating the appropriate quantity and kind of fat has a crucial role in our bodies, despite the fact that this may seem counterintuitive. In addition to supporting cell proliferation and cushioning organs, fat also stores energy and insulates the body from the environment. Portion control is crucial when it comes to fat as fats have more calories per gram than other foods. Reducing your Eating the right fats also reduces the incidence of type 2 diabetes, cardiovascular disease, certain cancers, and other health problems. The four main types of fat are monounsaturated, polyunsaturated, trans, and saturated fats. The American Diabetes Association recommends eating a diet higher in polyunsaturated and monounsaturated fats than trans or saturated fats.

It's critical to comprehend what we mean when we discuss fat and cholesterol. There are two kinds of cholesterol: dietary cholesterol, which comes from our food, and blood cholesterol, which is present in our blood. The body uses blood cholesterol as a building block for many processes, including the synthesis of hormones, cell structures, vitamin D, and more. For these purposes, your body produces more cholesterol than is necessary, but it can also absorb trace quantities from the foods you eat. An excessive blood cholesterol level puts you at higher risk for heart disease. Nevertheless, dietary cholesterol has less of an effect on this level than previously thought, despite common perception. For the majority of people, blood cholesterol levels are elevated by saturated and trans fats, which increases the risk of heart disease. An excessive blood cholesterol level puts you at higher risk for heart disease. Nevertheless, dietary cholesterol has less of an effect on this level than previously thought, despite common perception. For the majority of people, blood cholesterol levels are elevated by saturated and trans fats, which increases the possibility of cardiovascular illness. Because foods that are often high in dietary cholesterol are also rich in saturated fat, focusing on reducing saturated fat is simple. Consult with your provider or a registered dietitian nutritionist (RD/RDN) to ascertain what will ensure that your goals are appropriate.of healthcare [6]

Fats monounsaturated Because of their protective properties for our hearts, monounsaturated fats are regarded as an vital element of a diet that is both balanced and healthful. It has been shown that these fats lower our LDL (low-density lipoprotein) cholesterol levels.a crucial indicator of heart health. While they are not always included on the Nutrition Facts label, foods that have a rich source of monounsaturated fats typically do.[6]

fats polyunsaturated Polyunsaturated fat is another essential fat that has to be a part of a healthy, balanced diet. Similar to monounsaturated fat, this fat lowers LDL cholesterol and the risk of heart disease and stroke.The polyunsaturated fatty acids omega-3 and omega-6 are two more types of fat that are linked to improved heart health. Because our bodies are unable to create them, these fatty acids are regarded as necessary and must be a component of a balanced diet.[6]

Trans fat Trans fats are created during the hydrogenation process, which turns liquid oil into a solid fat. Trans fat has the same potential to lower blood cholesterol levels as saturated fat. Because trans fat is more detrimental than saturated fat, you should limit your intake of it by avoiding foods that contain it if you wish to maintain a heart-healthy diet.

fat that is saturated This kind of fat can raise your risk of heart disease by raising your cholesterol. One fat that we should minimize in our diet is this one. Typically, tropical oils and animal products contain this fat in solid form at room temperature.

Diabetes mellitus type 2 (T2DM) is a developing global health concern that is closely linked to the obesity epidemic. People with type 2 diabetes (T2DM) have a considerable risk for both individual components of the insulin resistance (metabolic syndrome) and hyperglycemia macro and micro vascular consequences, such as cardiovascular comorbidities and retinopathy, nephropathy, and

neuropathy. The altered glucose homeostasis linked to type 2 diabetes is caused by a variety of pathophysiological problems, including poor diet, obesity, physical inactivity, and hereditary factors. Insulin resistance and decreased insulin production remain the two primary abnormalities associated with type 2 diabetes (T2DM); nevertheless, there are at least six other pathophysiological abnormalities that also contribute to the dysregulation of glucose metabolism To maintain normal glycaemic levels, a combination of various antidiuretic medicines will be needed due to the many pathogenetic abnormalities associated with type 2 diabetes. The therapy needs to enhance quality not only being secure and efficient, but also having life. While many novel medications are being investigated, the ones that increase insulin sensitivity, reverse or stop microvascular damage, and arrest the T2DM-associated increasing pancreatic κ-cell loss are the most important (7) damage.

High-fat diets' contribution to insulin resistance The The hypothesis that a high-fat diet is associated with reduced insulin activity is strongly backed by a sizable body of research data generated in laboratory animals. It appears from studies conducted on animals that saturated fats are especially bad. Professional associations such as the American Diabetes Association, the American Heart Association, and the U.S. Department of Agriculture have advised Americans to choose foods low in saturated fat and aim for a total fat intake of no more than 30% of calories. This recommendation is based on the information provided and the known risks associated with a high intake of saturated fat on the risk of cardiovascular disease.

Nonetheless, certain writers have questioned the validity of the data supporting these public health guidelines, contending that total fat as a percentage of total energy is insignificant in preventing type 2 diabetes. The latest study strengthens the long-standing advice to limit saturated and total fat. Even though the effect is eliminated when BMI is taken into account, dietary fat is still significant. It makes biological sense that a diet heavy in fat would encourage weight growth, which would then encourage insulin resistance. A sizable body is present. of proof in favor of this opinion. Furthermore, there is mounting proof that Obesity is one of the primary pathogenic factors in the onset of diabetes (1, 2). This suggests that any dietary element that promotes weight gain would most likely also promote the development of diabetes. Given the numerous roles that fat plays in fuel metabolism, energy and fat balance, cell membrane structure and function, and as a ligand for nuclear receptors that affect gene expression, it is quite possible that the type and quantity of dietary fat have an effect on insulin action, weight maintenance, and the prevention of diabetes.[7].

Pathophysiology and Risk Factors Type 2 diabetes is a result of a complicated interaction between genetic, metabolic, and environmental factors (T2DM). The main modifiable risk factors for type 2 diabetes are obesity, low physical activity, and an unhealthy diet. Although there is a strong genetic basis to an individual's predisposition to type 2 diabetes due to non-modifiable risk factors like ethnicity and family history/genetic predisposition, epidemiological studies have shown that many cases of T2DM can be prevented. What is the main cause of type 2 diabetes? Being overweight, obese, and not getting enough exercise Excess abdominal fat is linked to heart disease, blood vessel disease, insulin resistance, and type 2 diabetes.

Materials and methods:

The samples were obtained from the central laboratory, where some of the research's tests were carried out. A few samples from various regions have been recorded. The items that were utilized are: Diabetes, triglycerides, cholesterol, HDL, and LDL in cats. Spectrophotometers are one of the instruments utilized. 2. A centrifuge 3. A specimen of the patient's serum, or blood. 4. Gel-filled test tubes 5. The incubator.

Calculating fasting blood glucose (FBG): Serum FBG was assessed through the use of chemical colorimetric test (glucose oxidase technique) Triglyceride (TG) estimation: The enzymatic colorimetric assay (glycerol oxidase phosphate technique) is used to assess serum triglycerides. Calculating total cholesterol levels: The Cholesterol Oxidase Method is an enzymatic colorimetric assay used to detect serum total cholesterol. Calculating HDL cholesterol: Cholesterol Direct, an enzymatic colorimetric direct test, is used to quantify serum HDL-Cholesterol. All samples were analyzed using the same colorimetric equipment (spectrophotometers) and chemical reagent kit

(HDL-Cholesterol Kit 100ml). In an enzymatic reaction, cholesterol oxidase breaks down the cholesterol from low density lipoprotein (LDL), very density lipoprotein (VLDL), and chylomicron. This is the basis for the test's principle. Next, using the coupled process that is explained below, the HDL cholesterol is quantified spectrophotometrically. The typical HDL cholesterol level is more than 50 mg/dl. [8]

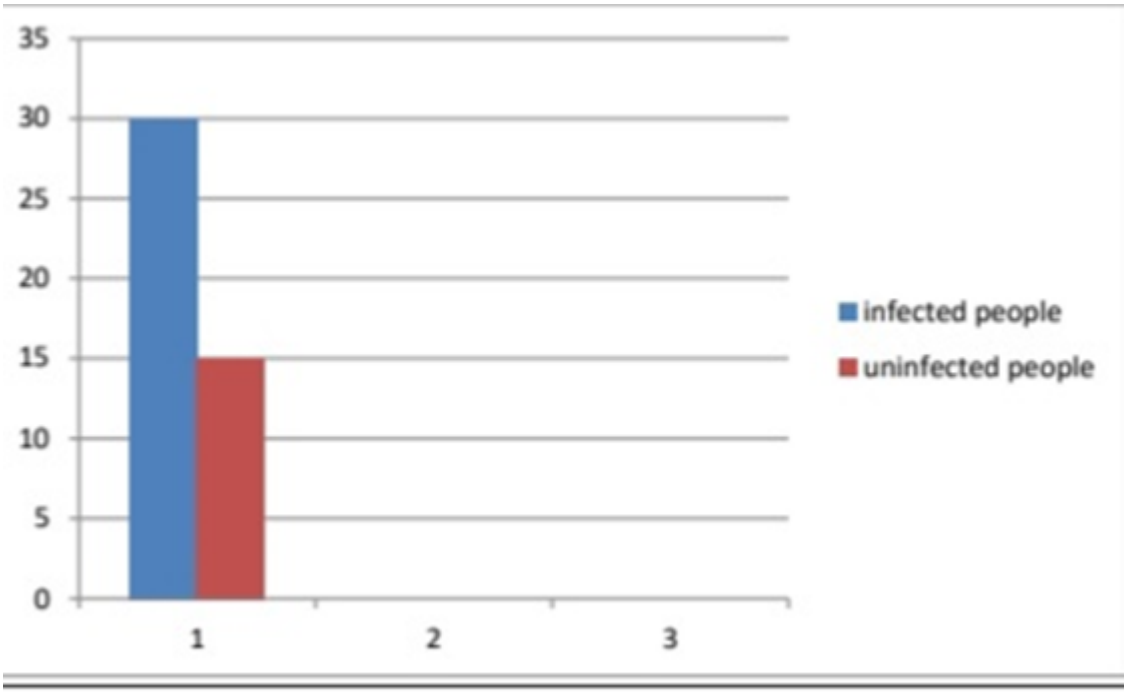
Sample results

Para.	Healthy Control		D.M		T-TESE
	Mea.	St.	Mea.	St.	
BMI	22.90	2.443	25.344	4.321	0.000
Age	50	5.215	60.15	11.98	0.000

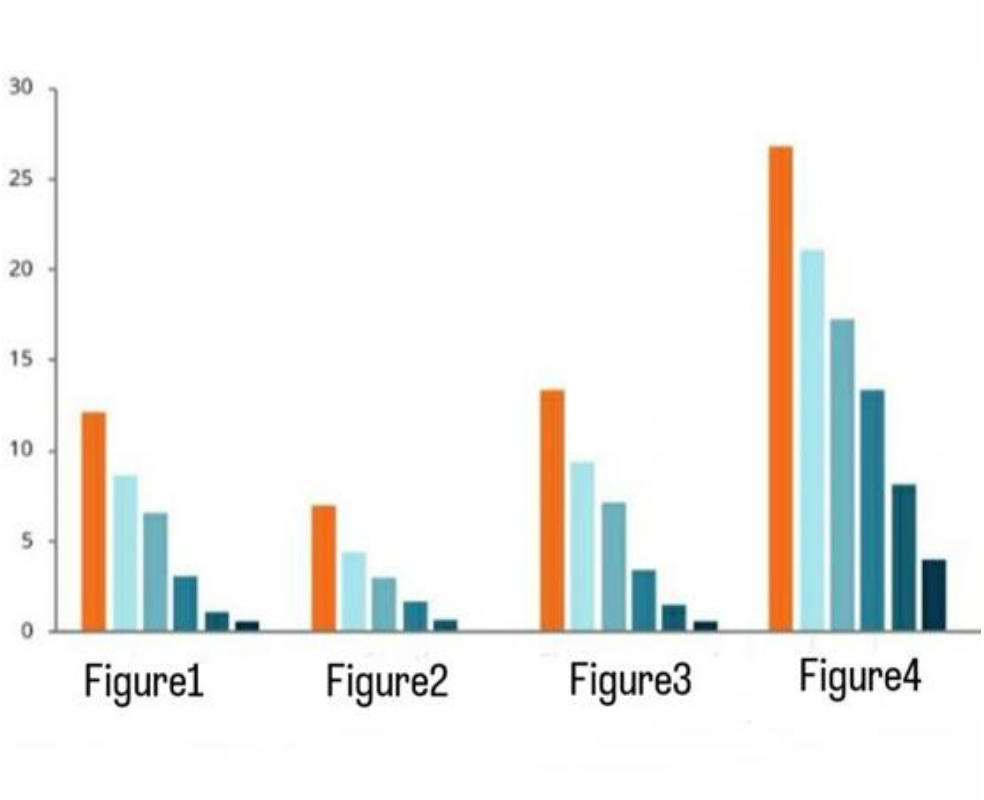
Table 1 shows the age (years) and BMI of the healthy and diabetic populations.

Para.	Healthy Con.		D.M		T-TESE
	Mea.	St.	Mea.	St.	
D.M.	80.5	6.432	140.21	50.51	0.000
CHOL.	154.32	22.83	182.35	56.46	0.002
T.G.	109.71	35.81	190.11	80.31	0.000
HDL	55.56	5.921	45.46	77.430	0.000
LDL	130.51	29.54	199.33	5.55	0.000

Table 2: Type II Diabetic Patients' Lipid Profile (TC, TG, LDL, and HDL) and Normal Subjects' Glucose Level



the quantity of samples, both from men and women, that were both infected and uninfected.



- Infected people have higher average MDs than uninfected people, as seen in Figure 1. Significant differences were found at the significance level (p=0.000).
- The average CHOL of infected people is higher than that of uninfected people, as seen in Figure (2). Significant differences were found at the significance level (p=0.002).
- The average of TG-infected people is higher than that of uninfected people, as seen in Figure 3. Significant differences at the significance level of p=0.000 are present.
- Infected and uninfected HDL are displayed in Figure (4). Significant differences were found at the significance level (p=0.000).

Discussion: The blood glucose levels of participants with diabetes and those without diabetes varied in this study (1). A noteworthy distinction was noted (p=0.000). Patients with diabetes who had high blood glucose levels because they are resistant to insulin showed similar outcomes. The diabetic group also had increased fasting blood glucose levels (2), which suggests that their diabetes is not well controlled. In actuality, hyperglycemia and changes in the biochemistry of glucose are the hallmarks of diabetes mellitus. [13] The findings of this investigation revealed significantly higher total cholesterol levels (p=0.002) in diabetic patients vs to people without the disease (2). This increase may have been brought on by a rise in LDL plasma concentration, which may have resulted from a reduction in LDL clearance from the bloodstream. According to the study, people with diabetes have considerably higher levels of LDL (p=0.000) and more LDL receptors (6), which raises the LDL-cholesterol value in diabetes mellitus. notably high amounts of plasma triglycerides (p=0.000) in diabetic patients (4) may be caused by excess VLDL production, which in turn lowers high density lipoprotein HDL-cholesterol through an cholesterol ester transfer protein, which facilitates the exchange process (CETP).

This leads to improper glucose use, resulting in hyperglycemia and fat from adipose tissue being mobilized[14]. Hyperglycemia occurs when tissue in diabetes does not use blood glucose. Adipose tissue mobilizes its fatty acids for energy purposes, and any surplus is stored in the liver where it is transformed into triglycerides. Significantly lower HDL levels (p=0.000) in patients with diabetes than in participants without diabetes (5) elevated levels of the liver's cholesterol ester transfer protein and triglyceride lipase

triglyceride enrichment are responsible for the lower HDL cholesterol levels. Even though the liver produces HDL particles, HDL is largely composed of leftover particles from the metabolism of lipoproteins high in TG. Diabetes usually impairs this metabolism, which lowers the amount of HDL-C that the liver synthesises. In return for TG, an enzyme called cholesterol ester transport protein (CETP) moves cholesterol ester from HDL particles to VLDL particles. This transport protein not only reduces blood HDL-C levels but also promotes the production of tiny, dense LDL particles and lipid levels that are impacted by glucose levels. This is due to the lipids' metabolism and carbohydrates is linked; any disturbance in one of these processes results in a disturbance in the metabolism of fats, which raises triglyceride and HDL cholesterol concentrations. amounts causes insulin resistance. Mention that type II diabetes mellitus typically develops more gradually and affects those over 40. Our findings have indicated a degree of agreement with. In comparison to younger people, older people had greater levels of triglycerides, LDL, and cholesterol; however, The two groups' lipid profiles do not differ statistically significantly ($p>0.05$) [15].

Despite the fact that ladies with diabetes have a greater BMI than males, both sexes with diabetes were overweight. From a statistical perspective, there is no discernible variation ($p>0.05$) in their GL, TC, TG, LDL-C, and HDL-C levels. It may be linked to varying levels of insulin resistance in the sexes or to a direct impact of hormonal state on one or more lipoprotein metabolism-related enzymes. Age, the length of diabetes, HBALC, and medication compliance are some of the variables that may have an impact on lipid profile. The lipid profile seems to be influenced by dietary components. It also depends on a person's surroundings, occupation, degree of education, physical activity, obesity, hypertension, smoking, usage of contraceptives, and some genetic predisposing factors in the population [16]. Increased cell fat levels inhibit the effects of insulin, leading to insulin resistance and the eventual onset of type II diabetes. The increased incidence of obesity has been mostly linked to dietary practices, such as consuming a lot of sweet, fatty, and date-based meals and being inactive. A major long-term effect of diabetes in individuals is atherosclerotic vascular disease humans, is acceleratedly developing in people with diabetes mellitus due to higher plasma cholesterol levels, as numerous studies have shown. The results of our investigation indicated that although there was a statistically non-significant link between HDL and a P-value less than 0.05, there was a substantial ($p>0.05$) correlation between levels of low-density lipoprotein, triglycerides, cholesterol, and cardiovascular problems. These findings were consistent with. High triglyceride levels (hypertriglyceridemia) are a hallmark of hypercholesterolemia in diabetic individuals, elevating the low levels of HDL and tiny LDL particle concentrations [9].

Conclusion:

According to our research, there is a statistically non-significant association between HDL and cardiovascular problems, although there is a substantial correlation between blood levels of low-density lipoprotein, triglycerides, and lipid cholesterol. The results of the study show that low-density lipoprotein (LDL), triglycerides, and cholesterol are all higher in those with diabetes. in their serum, while non-diabetic participants had lower levels of HDL cholesterol. Patients with diabetes versus those without diabetes. Diabetes medicines, insulin, or both are commonly used in conjunction with lifestyle modifications and blood sugar control in order to manage and avoid type 2 diabetes.

References:

1. Mellitus, Diabetes. "Diagnosis and classification of diabetes mellitus." Diabetes care 28.537 (2005): S5-S10.
2. Mellitus, D. (2005). Diagnosis and classification of diabetes mellitus. Diabetes care, 28(S37), S5-S10.
3. MELLITUS, Diabetes. Diagnosis and classification of diabetes mellitus. Diabetes care, 2005, 28.S37: S5-S10.

4. DeFronzo, Ralph A., et al. "Type 2 diabetes mellitus." Nature reviews Disease primers 1.1 (2015): 1-22.
5. DeFronzo, R. A., Ferrannini, E., Groop, L., Henry, R. R., Herman, W. H., Holst, J. J., ... & Weiss, R. (2015). Type 2 diabetes mellitus. Nature reviews Disease primers, 1(1), 1-22.
6. DEFRONZO, Ralph A., et al. Type 2 diabetes mellitus. Nature reviews Disease primers, 2015, 1.1: 1-22.
7. MARSHALL, Julie A.; BESSESEN, Daniel H. Dietary fat and the development of type 2 diabetes. Diabetes care, 2002, 25.3: 620-622.
8. Marshall, Julie A., and Daniel H. Bessesen. "Dietary fat and the development of type 2 diabetes." Diabetes care 25.3 (2002): 620-622.
9. Marshall, J. A., & Bessesen, D. H. (2002). Dietary fat and the development of type 2 diabetes. Diabetes care, 25(3), 620-622.
10. Loscalzo, Joseph. Harrison's cardiovascular medicine 2/E. McGraw-Hill Education, 2013.
11. Loscalzo, J. (2013). Harrison's cardiovascular medicine 2/E. McGraw-Hill Education.
12. LOSCALZO, Joseph. Harrison's cardiovascular medicine 2/E. McGraw-Hill Education, 2013.
13. Risérus, U., Willett, W. C., & Hu, F. B. (2009). Dietary fats and prevention of type 2 diabetes. Progress in lipid research, 48(1), 44-51.
14. Risérus, Ulf, Walter C. Willett, and Frank B. Hu. "Dietary fats and prevention of type 2 diabetes." Progress in lipid research 48.1 (2009): 44-51.
15. RISERUS, Ulf; WILLETT, Walter C.; HU, Frank B. Dietary fats and prevention of type 2 diabetes. Progress in lipid research, 2009, 48.1: 44-51.
16. Hu F.B., Manson J.E., Stampfer M.J., Colditz G., Liu S., Solomon C.G., Willett W.C. Diet, lifestyle, and the risk of type 2 diabetes mellitus in women. N. Engl. J. Med. 2001;345:790–797. doi: 10.1056/NEJMoa010492. [PubMed] [CrossRef] [Google Scholar]
17. Hu F.B., Manson J.E., Stampfer M.J., Colditz G., Liu S., Solomon C.G., Willett W.C. Diet, lifestyle, and the risk of type 2 diabetes mellitus in women. N. Engl. J. Med. 2001;345:790–797. doi: 10.1056/NEJMoa010492. [PubMed] [CrossRef] [Google Scholar
18. Ganong WF Review of Medical Physiology 21ed Endocrine Function of pancreas & Regulation of Carbohydrate Metabolism. 2003, 324-33
19. Bays H. Atherogenic dyslipidemia in type2 diabetes and metabolic syndrome: current and future treatment options. Br J Diabetes Vase Dis. 2003, 3(5): 356-360