



مجلة التربوي

مجلة علمية محكمة تصدر عن كلية التربية جامعة المرقب

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Relationship between Amylase and Amylase Creatinine Clearance in Non-Insulin-Dependent Diabetics at the Diabetes and Endocrine Therapy Center in Alkoms, Libya

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ABSTRACT: In this study, 91 participants were randomly selected from the Center for Diabetes and Endocrinology Alkoms-Libya. Then, the participants were split into two groups: the 66 patients and the 25 participants in the control group. All the special measurements were taken for the patient and control groups, such as: fasting blood sugar, HbA1c, serum amylase, urine amylase, blood and urine creatinine, the amylase creatinine clearance rate was calculated by a certain equation. Safety evaluations included vital signs of laboratory parameters.

The mean and standard error for all cases in this investigation were as follows for the following measurements: fasting blood sugar, HbA1c, serum amylase, urine amylase, and amylase creatinine clearance as follows: 148.38 ± 8.43 mg/dl, $6.31 \pm 0.22\%$, 46.29 ± 4.94 U/l, 176.48 ± 17.95 U/l, $1.15 \pm 0.16\%$ respectively. When comparing the mean and standard error between patients and control for: fasting blood sugar, HbA1c, serum amylase, urine amylase, amylase creatinine clearance as follows: 86.08 ± 1.77 mg/dl, $4.61 \pm 0.06\%$, 37.48 ± 4.94 U/l, 143.16 ± 18.51 U/l, $1.37 \pm 0.19\%$ respectively, Patients were 171.98 ± 10.20 mg/dl, $6.95 \pm 0.26\%$, 49.62 ± 6.53 U/l, 189.11 ± 23.63 U/l, $1.07 \pm 0.21\%$ respectively, where the group of patients was higher than control except for amylase creatinine clearance was higher in control group. The comparisons in the different blood clinical parameters of the two groups, there were no significant relationships except for a relationship between the disease and serum amylase. The value of p-value = 0.05, which means that a relationship is at a significant level of 5%. There was also a relationship between fasting blood sugar and serum amylase, where p-value = 0.04.

According to the results of this study, low levels of amylase and low levels of amylase creatinine clearance occur in the absence of pancreatitis, high levels of amylase increase the likelihood of developing pancreatitis, and none of the participants had Insulin Dependent Diabetes Mellitus. There was an increase in serum and urine amylase levels in diabetics compared to control, after collecting the data and analyzing it. It is obvious that there is an increase in amylase level in serum, urine amylase, except for amylase level where it is decreased, which indicate that the high blood sugar is connected to the enzyme amylase.

Key words: Non-insulin dependent diabetes, Diabetes, Amylase creatinine, Pancreatitis, Mellitus, Serum amylase, Hormones, Blood sugar.

INTRODUCTION

A metabolic condition known as diabetes mellitus is characterized by hyperglycemia brought on by abnormalities in insulin secretion, insulin action, or both (Khatib, 2006). Fasting plasma glucose levels over 126 mg/dl (7.0 mmol/L) or 2-hour plasma



glucose levels over 200 mg/dl (11.1 mmol/L) are considered signs of diabetes mellitus (Sobel and Schneider, 2002). Diabetes chronic hyperglycemia is linked to significant long-term damage, dysfunction, and failure of many organs, especially the kidneys, eyes, nerves, heart, and blood vessels (Mann and Stewart, 2000). Type 2 diabetes mellitus is a heterogeneous disease that frequently results in weight issues, persists over nutrition, takes into account genetic susceptibility to cause impaired insulin signaling-insulin resistance, as well as a relative insulin deficiency of a non-autoimmune etiology, and develops. (Muoi and Newgard, 2008).

Insulin is the main hormone responsible for coordinating the absorption of glucose into cells from the bloodstream and also transforms glucose in the liver to glucagon and releases muscle insulin into blood cells in reaction to a high blood glucose level. The enzymes secreted through the pancreas, they excreted as ineffective and when you enter into the channel gastrointestinal turn become effective and helps in digestion of food. One of these enzymes amylase enzyme is a type of carbohydrate hydrolyzing enzyme. Amylase is secreted from acinar cells in the pancreas and enters the blood vessels large lymph thru the pancreatic duct when increasing hydrostatic pressure in it, which leads to higher speedy in amylase awareness in the blood (Smith *et al.*, 1997). Insulin is a tiny protein made up of two peptide chains termed A and B that are joined together by two disulfide links. The A chain has 21 amino acid residues while the B chain has 30 amino acid residues (Lullman *et al.*, 2000). Insulin is stored as an inactive proinsulin in the secretory vesicles. The cleavage of a linking peptide (C-peptide) to create two peptide chains connected by two disulfide bridges results in the conversion of proinsulin to insulin (Petersen, 2007).

Insulin attaches to the α -subunit of its receptor, which is located outside the cell membrane. This results in the α -subunit receptor's auto phosphorylation, which pushes it into the cell's cytoplasm and activates tyrosine kinase. The activation of the receptor tyrosine kinase triggers a series of cellular phosphorylation reactions that alter the activity of enzymes, including insulin receptor substrates, which mediate the effects of insulin. These outcomes including stimulation of fat synthesis and storage, activation of protein synthesis and storage, and increase of glucose absorption and storage, notably in muscle and liver cells (Gyton and Hall, 2006).

The results show that there was a significant decline in serum amylase and serum lipase in diabetic patients compared to controls who were age and sex matched, as well as a pancreatic exocrine destruction in type 2 Diabetes Mellitus (Vishwanath *et al.*, 2019). Although the majority of research on diabetes has been on dyslipidemia as a significant risk factor for cardiac, cerebral, and renal problems, the study amply demonstrates how both type 1 and type 2 diabetes affect pancreatic exocrine function. They propose that examination of serum pancreatic enzymes may provide additional useful information for determining the severity and progression of the illness as well as the response to therapy (Aughsteen *et al.*, 2005).

The pancreas serves both as an organ of digestion and an organ of the endocrine system by secreting digestive enzymes and endocrine hormones. Early research has shown that people with type 1 diabetes, severe long-term type 2 diabetes, or chronic pancreatitis have lower serum amylase levels than healthy persons. According to their findings, metabolic syndrome and diabetes in asymptomatic persons were linked to low serum amylase levels. By reexamining earlier data from participants who had not had oral hypoglycemic medication or insulin treatment for their diabetes, they looked



into the underlying connection between serum amylase and cardiometabolic characteristics. It is likely because of decreased renal function that older patients had higher serum amylase levels than younger subjects. It seemed predicted that serum amylase would function in a manner comparable to other cardiometabolic protective factors (Nakajima *et al.*, 2011 and Zhuang *et al.*, 2016). The pancreas is made up of two main types of tissues: the islets of langerhans, which produce insulin and glucagon directly into the blood, and the digestive juice-secreting cells, which secrete digestive juices into the duodenum. Alpha, beta, and delta cells, which make up 1 to 2 million of the islets of langerhans, are three primary cell types that may be separated from one another by their morphology and staining properties. Approximately 60% of all cells are beta cells, which are mostly located in the center of the islet and release insulin. About 25% of the total cells are alpha cells, which release glucagon, and 10% are delta cells, which secrete somatostion, which has crucial activities that are unclear (Gyton and Hall, 2006; Walter and Emilel, 2005).

This study was conducted to investigate the effects of non-insulin dependent diabetes on pancreatic amylase. The primary goal is to show how diabetes affects the pancreatic enzyme amylase, which is not insulin dependent, and to contrast the outcomes between people with and without diabetes.

MATERIAL AND METHODS

Samples:

Blood collected divided to 2.5ml in EDTA containers for HbA1c and 2.5ml in plane containers for serum creatinine and serum amylase. The samples were collected under aseptic conditions. For serum creatinine, after clotting centrifuged for 3 min at 3000 RPM to obtain serum, and analyzed. Biosystems Model=BTS.350 Spain – Centrifuge - EDTA tube and Sterile plane tube - Disposable syringes - 70% alcohol – Tourniquets – Cotton - Micropipettes (automatic pipettes) - Graduated pipettes.

The collection of blood samples and urine of patients with diabetes type II.

Patients: 66 patients of type 2 Diabetes mellitus 35 females and 31 males ranged between ages (38-86) visiting Center for treatment diabetes and endocrine- alkomis during October 2017 to April 2018. Therapy for follow up check-ups will be included in this study. All participants will be given informed consent for the use of their medical data for research thesis. The medical history and the physical examination done for each patient. An inclusion criterion for them males and females with type 2 Diabetes mellitus in different ages without complications or any co-morbid conditions like hypertension, coronary artery disease, etc. 25 non-diabetic healthy 13 males and 12 healthy female's individuals who visited Center for medical check-ups considered as Control group. The fasting venous blood collected from all case to detect the fasting blood glucose, glycosylated hemoglobin (HbA1c), serum amylase and serum creatinine. On other hand, the urine sample also collected to detect the amylase and creatinine level in them.

The collected blood samples in non heparinized tubes. Centrifuge samples containing precipitate before performing the assay Biosystems bun analyzer set was used. Glucose kits (Biomaghreb- Tunisia). The collected blood from the saphenous vein by venipuncture the tube used. allows to clot, and separate the serum by centrifugation (2000 x g). A cuvette 2 ml was taken, 1000 µL from Glucose solution into cuvette was added, 10 µL from the standard solution, 10 µL each of samples were added, was mixed and incubated for 10 min at 37 °C mix stability 30 min, Cuvette



samples were absorbed by spectrophotometer 450nm. Blood collection tubes containing EDTA for HbA1c (lavender tube) were used then samples were put in Nyco card reader II. glycated hemoglobin (Roche diagnostic Gm bH). 5 µL whole blood to the test tube with R1/Reagent was added. Was mixed well. the tube was left for a minimum of 2 minutes. 25 µL of the mixture was applied to a TD/Test Device. the pipette approx was held for a minimum of 10 seconds. 25 µL R2/Washing Solution was applied to the TD/Test Device for minimum 10 seconds. The test results were read within 5 minutes using the NycoCard READER II. (IECR, 2009).

Amylase Enzyme:

It analyzes the enzyme amylase which hydrolyses starch into sugar maltose and glucose. The difference between the read control tube and detector tube in a specified period to give the speed of the enzyme. Samples will be estimated by fully automated biochemistry analyzer (Biosystems). Collected serum samples standardized by sampling tubes non heparinized. The urine samples were put in containers; but urine samples you need to mitigation to normal saline. Centrifuge samples containing precipitate before performing the assay. Amylase kits (analyticon, Centronic GmbH – Germany). 1000 µL from the R1/ Reagent was added, 200 µL from the R2/ Reagent, and 40 µL from serum sample and 20 µL from urine sample were added. The absorbance was mixed and read for 2 minutes, and then the process was repeated. The exact reading was 1, 2 and 3 minutes. The changes were determined in absorbance ($\delta A/\text{min}$). (Junge *et al.*, 1989).

Creatinine test:

$$\text{ACCR (\%)} = \frac{\text{Urine amylase (U/L)} \times \text{Serum creatinine (mg/L)}}{\text{Serum amylase (U/L)} \times \text{Urine creatinine (mg/L)}} \times 100$$

(ACCR): A= Amylase, C= Creatinine, C= Clearance, R= Rate. (Underwood, 1979).

Creatinine test: The collected blood samples in non heparinized tubes. Centrifuge samples containing precipitate before performing the assay Biosystems bun analyzer set was used. Creatinine kits (Biomaghreb- Tunisia). 500 µL from the R1/ Reagent was added, 500 µL from the R2/ Reagent. 100 µL from the standard solution, 100 µL from serum sample and urine sample were added after dilution 1:10. the mixture was mixed and read in less than 30 seconds (Henry, 1984).

Statistical Analysis:

The data were analyzed using Percentage and frequency, ANOVA, Chi square, Mean by SPSS Virsion:21 (SAS, 2006).

RESULTS

Among the 91 participants, there were 66 patients, 31males (M) and 35 females (F); similarly, of the 25 non-diabetic people (controls), there were 13 males and 12 females. Table 1 displays the characteristics of each participant group.

Table (1): Percentage and Number of male and female

Characteristics	Sex	Number	Percent
Control	Female	12	48
	Male	13	52
Patients	Female	35	53.03
	Male	31	46.96



Clinical characteristics for all cases:

The (mean and \pm SE) of age, weight, fasting blood sugar, HbA1c, serum amylase, urine amylase, amylase creatinine clearance levels are shown in Table (2).

Table (2): The (mean and \pm SE) of age, weight, fasting blood sugar, HbA1c, serum amylase, urine amylase, amylase creatinine clearance levels, N= 91

Characteristics	Age	Weight (kg)	Sugar (mg/dl)	HbA1C (%)	Serum Amylase (U/I)	Urine Amylase (U/I)	ACCR (%)	
Control	Minimum	37	50	67	4.1	10	33	0.25
	Maximum	56	83	105	5.1	85	405	3.7
	Mean	45.84	66.36	86.08	4.61	37.48	143.16	1.37
	Std. Error of Mean	1.04	1.91	1.77	0.06	4.94	18.51	0.19
	Std. Deviation	5.19	9.55	8.86	0.28	24.70	92.54	0.95
Patients	Minimum	38	57	45	4.3	5	22	0.03
	Maximum	86	124	396	12.8	272	868	9.87
	Mean	61.17	77.98	171.98	6.95	49.62	189.11	1.07
	Std. Error of Mean	1.42	1.49	10.20	0.26	6.53	23.63	0.21
	Std. Deviation	11.51	12.09	82.88	2.08	53.04	191.98	1.71
Total	Minimum	37	50	45	4.1	5	22	0.03
	Maximum	86	124	396	12.8	272	868	9.87
	Mean	56.96	74.79	148.38	6.31	46.29	176.48	1.15
	Std. Error of Mean	1.28	1.31	8.43	0.22	4.94	17.95	0.16
	Std. Deviation	12.26	12.53	80.43	2.06	47.16	171.25	1.54

The mean \pm SE levels of age, weight, fasting blood sugar, HbA1c, amylase levels in serum, urine, and creatinine clearance were 56.96 ± 1.28 , 74.79 ± 1.31 kg, 148.38 ± 8.43 mg/dl, $6.31 \pm 0.22\%$, 46.29 ± 4.94 U/l, 176.48 ± 17.95 U/l, $1.15 \pm 0.16\%$, respectively. The mean \pm SE levels in this experiment may differ from other studies.

Clinical characteristics for Type II diabetes mellitus for patients and control:

Table (3) and figures (2,3,4) compare various clinical parameters between patients and the control group.



Table (3): Comparison between the control and patients for clinical parameters

Characteristics		Age	Weight (kg)	Sugar (mg/dl)	HbA1C (%)	Serum Amylase (U/I)	Urine Amylase (U/I)	ACCR (%)
Control	Mean	45.84	66.36	86.08	4.61	37.48	143.16	1.37
	Std. Error of Mean	1.04	1.91	1.77	0.06	4.94	18.51	0.19
	Std. Deviation	5.19	9.55	8.86	0.28	24.70	92.54	0.95
Patients	Mean	61.17	77.98	171.98	6.95	49.62	189.11	1.07
	Std. Error of Mean	1.42	1.49	10.20	0.26	6.53	23.63	0.21
	Std. Deviation	11.51	12.09	82.88	2.08	53.04	191.98	1.71

(Means \pm SE)

The mean \pm SE levels in control for age, weight, fasting blood sugar, HbA1c, amylase levels in serum, urine, and creatinine clearance were 45.84 ± 1.04 , 66.36 ± 1.91 kg, 86.08 ± 1.77 mg/dl, $4.61 \pm 0.06\%$, 37.48 ± 4.94 U/l, 143.16 ± 18.51 U/l, $1.37 \pm 0.19\%$, respectively. The mean \pm SE levels in patients for age, weight, fasting blood sugar, HbA1c, serum amylase (S AM), urine amylase (U AM), and amylase creatinine clearance (ACCR) were 61.17 ± 1.42 , 77.98 ± 1.49 kg, 171.98 ± 10.20 mg/dl, $6.95 \pm 0.26\%$, 49.62 ± 6.53 U/l, 189.11 ± 23.63 U/l, $1.07 \pm 0.21\%$, respectively. The variables of blood for diabetes mellitus type 2 patients are higher than controls in all parameters.

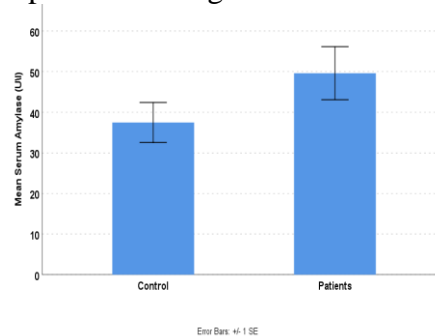


Fig (1): Serum Amylase (U/l) (Means \pm SE) in control and patients

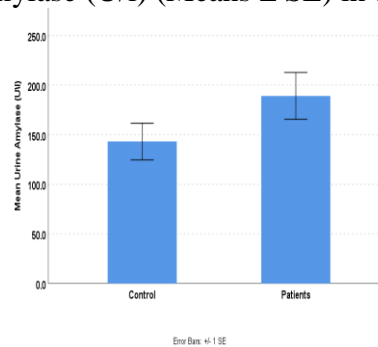


Fig (2): Urine Amylase (U/l) (Means \pm SE) in control and patients.

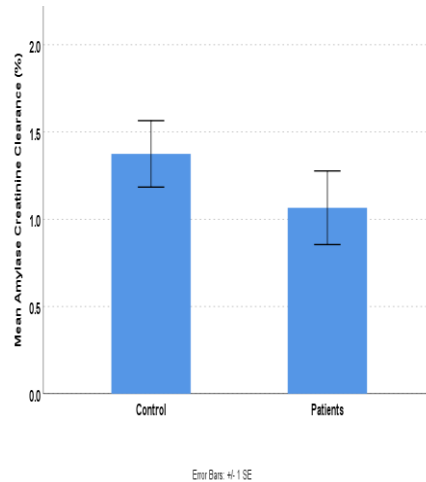


Fig (3): Amylase Creatinine Clearance (%) (Means \pm SE) in control and patients.

Clinical data and serum amylase relationships:

The association between serum amylase, age, and HbA1c was determined to be insignificant because the probabilistic values were greater than 0.05, are shown in tables (4,5) using a Chi square.

Table (4): Relationship between age and serum amylase

Item			Serum Amylase U/l			Total	Test	P-value
			Less than 28y	28 to 100	More than 100			
Control	HbA1c %	Less than 4.5	Count	3	4	7	0.103	0.999
		HbA1c %	42.90%	57.10%	100.00%			
	4.5 to 6.3	Count	9	9	18			
		HbA1c %	50.00%	50.00%	100.00%			
	Total	Count	12	13	25			
		HbA1c %	48.00%	52.00%	100.00%			
Patients	HbA1c %	Less than 4.5	Count	0	1	1	4.109	0.312
		HbA1c %	0.00%	100.00%	0.00%	100.00%		
	4.5 to 6.3	Count	11	15	3	29		
		HbA1c %	37.90%	51.70%	10.30%	100.00%		
	More than 6.3	Count	21	12	3	36		
		HbA1c %	58.30%	33.30%	8.30%	100.00%		
	Total	Count	32	28	6	66		
		HbA1c %	48.50%	42.40%	9.10%	100.00%		



The level of p-value = 0.9 is greater than 0.05, there is no relationship between age and serum amylase, Chi- Square=0.8 for control, Chi- Square=1.5 for Patients.

Table (5): Relationship between HbA1c and serum amylase

Item				Serum Amylase U/l			Total	Test	P-value
				Less than 28y	28 to 100	More than 100			
Control	F_age	Less than 40y	Count	2	1		3	0.476	0.593
		% F_age	66.70%	33.30%		100.00%			
	40 to 60 y	Count	10	12		22			
		% F_age	45.50%	54.50%		100.00%			
	Total	Count	Count	12	13	25			
		% F_age	48.00%	52.00%		100.00%			
Patients	F_age	Less than 40	Count	0	1	0	1	1.572	0.909
		% F_age	0.00%	100.00%	0.00%	100.00%			
	40 to 60 y	Count	16	15	3	34			
		% F_age	47.10%	44.10%	8.80%	100.00%			
	More than 60y	Count	16	12	3	31			
		% F_age	51.60%	38.70%	9.70%	100.00%			
	Total	Count	32	28	6	66			
		% F_age	48.50%	42.40%	9.10%	100.00%			

The level of p = 0.9 for control is greater than 0.05, p= 0.3 for patients there is no

relationship between HbA1c and serum amylase, Chi- Square=0.14 for control, Chi-Square=4.1 for Patients.



Relationship between Urine Amylase and clinical data:

The relationship between urine amylase, age, HbA1c, sex was assessed as not significant because the probabilistic values were greater than 5%, are shown in Tables (6,7,8) using a Chi square.

Table (6): Relationship between age and urine amylase

Item				Urine Amylase			Total	Test	P-value
				Less than 28	28 to 100	More than 100			
Control	F_age	Less than 40y	Count	2	1		3	0.476	0.593
			% F_age	66.70%	33.30%		100.00%		
		40 to 60y	Count	10	12		22		
			% F_age	45.50%	54.50%		100.00%		
	Total		Count	12	13		25		
			% F_age	48.00%	52.00%		100.00%		
Patients	F_age	Less than 40	Count	0	1	0	1	1.572	0.909
			% F_age	0.00%	100.00%	0.00%	100.00%		
		40 to 60 y	Count	16	15	3	34		
			% F_age	47.10%	44.10%	8.80%	100.00%		
		More than 60 y	Count	16	12	3	31		
			% F_age	51.60%	38.70%	9.70%	100.00%		
	Total		Count	32	28	6	66		
			% F_age	48.50%	42.40%	9.10%	100.00%		

The level of p-value = 0.5 is greater than 0.05, there is no relationship between age and urine amylase, Chi square= 1.0.

Table (7): Relationship between HbA1c and urine amylase

Item				Urine Amylase		Total	Test	P-value
				Less than 450	More than 450			
Control	HbA1c %	Less than 4.5	Count	7		7	0.16	0.999
			% HbA1c	100.00%		100.00%		
		4.5 to 6.3	Count	18		18		
			% HbA1c	100.00%		100.00%		
	Total		Count	25		25		
			% HbA1c	100.00%		100.00%		
Patients	HbA1c %	Less than	Count	1	0	1		
			%	100.00%	0.00%	100.00%		



	4.5 to 6.3	HbA1c			
		Count	25	4	29
	More than 6.3	% HbA1c	86.20%	13.80%	100.00%
		Count	31	5	36
	Total	% HbA1c	86.10%	13.90%	100.00%
		Count	57	9	66
		% HbA1c	86.40%	13.60%	100.00%

The level of $p = 0.9$ is greater than 0.05 , there is no relationship between HbA1c and urine amylase, Chi square= 0.16 .

Table (8): Relationship between sex and urine amylase

Item			Urine Amylase		Total	Test	P-value
			Less than 450	More than 450			
Control	Sex	Female	Count	12	12	0.308	0.724
			% Sex	100.00 %	100.00 %		
	Male	Count	13	13			
		% Sex	100.00 %	100.00 %			
	Total	Count	25	25			
		% Sex	100.00 %	100.00 %			
Patients	Sex	Female	Count	31	35	0.308	0.724
			% Sex	88.60%	11.40%		
	Male	Count	26	31			
		% Sx	83.90%	16.10%	100.00 %		
	Total	Count	57	66			
		% Sex	86.40%	13.60%	100.00 %		

The level of $p = 0.72$ is greater than 0.05 , there is no relationship between sex and urine amylase, Chi square= 0.3 .

Relationship between Amylase Creatinine Clearance and clinical data:

The relationship between amylase creatinine clearance, fasting blood sugar, HbA1c, age was assessed as not significant because the probabilistic values were greater than 5%, are shown in Tables (9,10,11) using a Chi square.



Table (9): Relationship between fasting blood sugar and amylase creatinine clearance

Item				ACCR		Total	Test	P-value
				Less than 5	More than 5			
Control	Sugar mg/dl	Less than 120	Count	14		14	1.617	0.655
			% Sugar mg/dl	100%		100%		
	Total	Count	14		14			
		% Sugar mg/dl	100%		100%			
Patients	Sugar mg/dl	Less than 120	Count	20	0	20	1.617	0.655
			% Sugar mg/dl	100%	0.00%	100%		
		120 to 140	Count	9	0	9		
			% Sugar mg/dl	100%	0.00%	100%		
		More than 140	Count	35	2	37		
			% Sugar mg/dl	94.60%	5.40%	100%		
	Total	Count	64	2	66			
		% Sugar mg/dl	97.00%	3.00%	100%			

The level of p-value = 0.65 is greater than 0.05, there is no relationship between fasting blood sugar and amylase creatinine clearance, Chi square= 1.6.

Table (10): Relationship between HbA1c and amylase creatinine clearance

Item				ACCR		Total	Test	P-value
				Less than 5	More than 5			
Control	HbA1c %	Less than 4.5	Count	7		7	0.056	0.999
			% HbA1c	100.00%		100.00%		
		4.5 to 6.3	Count	18		18		
			% HbA1c	100.00%		100.00%		
	Total	Count	25		25			
% HbA1c		100.00%		100.00%				
Patients	HbA1c %	Less than 4.5	Count	1	0	1	0.056	0.999
			% HbA1c	100.00%	0.00%	100.00%		
		4.5 to 6.3	Count	28	1	29		
			% HbA1c	96.60%	3.40%	100.00%		
		More than 6.3	Count	35	1	36		
			% HbA1c	97.20%	2.80%	100.00%		
	Total	Count	64	2	66			
		% HbA1c	97.00%	3.00%	100.00%			

The level of p-value = 0.9 is greater than 0.05, there is no relationship between HbA1c and amylase creatinine clearance, Chi square= 0.11.



Table (11): Relationship between age and amylase creatinine clearance

Item			ACCR		Total	Test	P-value	
			Less than 5	More than 5				
Control	F_age	Less than 40 y	Count	3		3	0.036	0.999
		% F_age	100.00%		100.00%			
	40 to 60 y	Count	22		22			
		% F_age	100.00%		100.00%			
	Total		Count	25		25		
			% F_age	100.00%		100.00%		
Patients	F_age	Less than 40 y	Count	1	0	1	0.036	0.999
			% F_age	100.00%	0.00%	100.00%		
	40 to 60 y	Count	33	1	34			
		% F_age	97.10%	2.90%	100.00%			
	More than 60 y	Count	30	1	31			
		% F_age	96.80%	3.20%	100.00%			
	Total		Count	64	2	66		
			% F_age	97.00%	3.00%	100.00%		

The level of p-value = 0.9 is greater than 0.05, there is no relationship between age and amylase creatinine clearance, Chi square= 0.03

Relationship between Serum, Urine Amylase and Amylase Creatinine Clearance and clinical data by Analysis of variance:

There is a relationship between disease and serum amylase, there was also a relationship between fasting blood sugar and serum amylase, because the p-values were less than 5%, are shown in Tables (12,13,14).

Table (12): Analysis of variance between serum amylase and both disease (Diabetes Mellitus II) and fasting blood sugar

Tests of Between-Subjects Effects					
Dependent Variable: Serum Amylase					
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Disease	8050.718	1	8050.718	3.750	.056
N_sugur	8559.847	1	8559.847	3.987	.049
Error	188923.924	88	2146.863		
Total	395112.000	91			
Corrected Total	200156.571	90			

From the variance analysis table, there is a relationship between disease (Diabetes Mellitus II) and serum amylase, where p-value = 0.05, which means that the relationship is at a significant level of 5%, There was also a relationship between fasting blood sugar and serum amylase, where p-value = 0.04.

Table (13): Analysis of variance between urine amylase and fasting blood sugar



Tests of Between-Subjects Effects					
Dependent Variable: Urine Amylase					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
N_sugur	44800.550	1	44800.550	1.542	.218
Error	2556349.067	88	29049.421		
Total	5473752.000	91			
Corrected Total	2639426.725	90			

From the analysis table, there is no a relationship between fasting blood sugar and amylase of urine. The level of p-value = 0.2 are greater than 5%.

Table (14): Analysis of variance between amylase creatinine clearance and weight

Tests of Between-Subjects Effects					
Dependent Variable: Amylase Creatinine Clearance					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Weight	6.301	1	6.301	2.685	.105
Error	206.542	88	2.347		
Total	335.040	91			
Corrected Total	214.577	90			

From the variance analysis table, there is no a relationship between weight and amylase creatinine clearance, where p-value = 0.1 was greater than 0.05. Diabetes mellitus is prevalent globally as well as in the Libya.

DISCUSSION

There is a dearth of published information in our country's research on human diabetes. According to projections, there will be 366 million persons with diabetes worldwide by 2030, up from 171 million in 2000. (Wild *et al.*, 2004).

The sample size was 91 out of them 66 were Diabetic and 25 were Non- Diabetic individuals (control). The participants were diabetic patients who had been referred to the Diabetes and endocrine Center, Alkoms- Libya. The mean ages of the patients (those with type 2 diabetes) and controls were 45.84 1.04 and 61.17 1.42 years, respectively. According to Rodger (1991) and Umpierrez *et al.* (2006), type 2 diabetes mellitus often appears after the age of 40. It has been discovered that having diabetes runs in the family. This result is consistent with other research that found a family history of diabetes to be a risk factor (Annis *et al.*, 2005; Harrison *et al.*, 2003; Pijl *et al.*, 2009 and Yassin *et al.*, 2011). According to the study's data, patients had higher average fasting blood sugar, HbA1c, serum amylase, and urine amylase levels than controls. The findings of certain researchers, like Aughsteen *et al.* (2005) and Nakajima *et al.* (2011) and Vishwanath *et al.* (2019).

Elevated amylase leads to pancreatitis and this causes the enzyme to leak from the pancreatic canal to the blood instead of the duodenum (Smith *et al.*, 1997). The increase urine amylase is due to the increased filtration of amylase from the kidney as it is characterized by small particles and therefore easily filtered (Abou- Seif and Youssef, 2004) In the absence of pancreatitis, the pancreatic enzyme demonstrates a decrease in the level of amylase and an increase in the level of trypsinogen. (Balk *et*



al., 1975). whereas the clearance of amylase from the body was lower in patients than in controls, Murray et al. (1974) also found a similar result, which they attributed to the glomerulus's poor ability to filter amylase. It was thought that rare diseases would lead to low serum amylase (Seno *et al.*, 1995; Nakajima, 2016).

These results increased of serum amylase was 49.62 U/l compared with the control group 37.48U/l. Amylase levels in urine from diabetes patients were significantly higher than those from the control group, coming in at 189.11 U/l versus 143.16 U/l, according to the urine study. The study also showed significant decrease in the occurrence of the amylase creatinine clearance rate to 1.07% compared with the control group 1.37% these values were lower than serum amylase 262 U/l Compared with the control group 140 U/l the urine study has shown a significant rise in the value of the enzyme amylase in urine in patients with diabetes 541U/l compared with the control group 313U/l, the study also showed significant increase in the occurrence of the amylase creatinine clearance rate to 7.8% compared with the control group 3.19% reported by Bakaa, (2008).

The amylase creatinine clearance in patients in this study was $1.07 \pm 0.21\%$ and control was $1.37 \pm 0.19\%$ this result was lower than the value 9.8 ± 3.5 (Warshaw and Fuller, 1975; Tanvi *et al*, 2017). The specificity of serum amylase to identify pancreatic disorders is too low (Vissers et al., 1999 and Harper et al., 2011). Potential hyperamylasemia markers include urine amylase. Urine amylase and ACCR were the variables from urine samples that were examined (Gambill and Mason, 1963).

Amylase levels in the blood are correlated with illness occurrence. Additionally, a correlation between fasting blood sugar and serum amylase was found, and Nakajima et al. (2011) findings are supported by the fact that people with normal or mildly impaired glucose metabolism (HbA1c up to 6.0%) may have more complex HbA1c levels.

This the point has not been discussed as far as we know before, the relationship between fasting blood sugar; Because the higher the fasting blood sugar but other things there is no relationship, while amylase was positively with diabetes and negatively with creatinine clearance rate. The serum amylase level increased, while urine amylase showed a decrease in creatinine clearance. The normal range for Amylase creatinine clearance ranging from 1-5 % but it is influenced by the quality of the method used to measure the effectiveness of amylase. There cases increase to more than 5%, such as burns, diabetic Ketoacidosis, acute renal failure or severe renal insufficiency and pancreatic cancer. however, this ratio remains strong evidence of damage to the pancreas. as for if the ratio is less than 1% This indicates Macro amylasemia where amylase cannot run through the kidney because of their large size, where up molecular weight of more than 200,000 Daltons. The increase in size is done through amylase link pancreatic or salivary protein so it remains in the blood not to run during kidney (Seno *et al.*, 1995).



Low serum amylase levels are linked to Type 2 diabetes, indicating a potential exocrine-endocrine connection in this condition. Its function as a useful marker in numerous other clinical pancreatic disorders needs to be clarified, nevertheless (Vantghem *et al.*, 1999).

The decrease in serum amylase levels in type 2 diabetes mellitus was observed to produce similar outcomes (Vishwanath *et al.* 2019).

The excretion of amylase in the urine is a very sensitive marker for acute pancreatitis. When the serum concentration was abnormal, the urinary excretion remained abnormal always, and the excretion remained abnormal for a considerable amount of time even after the serum concentration had returned to normal. In order to diagnose fading pancreatitis and to provide convalescent care for acute pancreatitis, the urine amylase excretion is a valuable monitor. Urinary levels may be more sensitive than serum levels because pancreatitis causes an increase in the removal of pancreatic enzymes from the circulation through the urine. It is advised to measure the amount of amylase in the urine for these reasons. After serum levels have returned to normal, urine amylase levels typically stay high for a few days. Amylase in the urine was discovered to significantly correlate (Clavien *et al.*, 1989).

CONCLUSION

From these results we concluded, that low levels of amylase and low levels of amylase creatinine clearance occur in the absence of pancreatitis, greater levels of amylase are associated with a higher chance of developing pancreatitis, and none of these conditions cause insulin-dependent diabetes mellitus. Blood and urine samples were tested for amylase and creatinine. Diabetes was positively associated with amylase, while creatinine clearance rate was adversely associated with amylase, and there was an increase in serum and urine amylase levels in diabetics compared to controls. The results show that the amylase enzyme plays a role in the elevated fasting blood sugar. Amylase levels in the serum and urine have increased, but urine amylase creatinine clearance has reduced.

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الفهرس

الصفحة	اسم الباحث	عنوان البحث	رت
1-10	Manal Mohammed bilkour	An optimal fuzzy zero point method for solving fuzzy transportation problem	1
11-24	Mohamed Bashir M. Ismail	Assessing the Adaptability of Students and Teachers in the Faculty of Arts at Alasmarya Islamic University to the Sudden Transition to Online Teaching and Learning Processes during the COVID- 19 Pandemic	2
25-34	Dawi Muftah Ageel	Environmental study for Cyanobacteria Blooms using Envisat data at the western coastal of Libya	3
35-53	Nuria Mohamed Hider	Possible solutions to ensure data protection in cloud computing to avoid security problems	4
54-60	Gharsa Ali Elmarash Najla Mokhtar	A printed book or an e-book? Student Preferences & Reasons	5
61-75	هدية سليمان هويدي نادية عطية القدار دعاء عبد الباسط باكير	التشهير الإلكتروني عبر مواقع التواصل الاجتماعي من وجهة نظر طلبة كلية طب الأسنان بمدينة زليتن	6
76-89	Hamza A. Juma Saif Allah M. Abgenah Mustafa Almahdi Algaet Munayr Mohammed Amir	Designing an Autonomous Embedded System for Temperature Monitoring and Warning in Medical Warehouses	7
90-101	Salem Msaoud Adrugi Tareg Abdusalam Elawaj Milad Mohamed Alhwat	The effect of using electronic mind maps in learning visual programming through e-learning platforms An experimental study of computer departments students at Elmergib University	8
102-110	Suad Mohamed Ramadan Zainab Ahmed Dali Ahlam Mohammad Aljarray Zenoba Saleh Shubar	Performance analysis of different anode materials of double chamber Microbial Fuel Cell technology using different types of wastewater	9
111-116	Faiza Farag Aljaray Saad Belaid Ghidhan	Evaluation of Hardness for Electroless Ni-P Coatings	10
117-128	Saleh Meftah Albouri Hadya S Hawedi Mansur Ali Jaba	Using Smartphone in Education: How Smartphone has impacted in Education, A Review Paper	11
129-139	Ibrahim O, Sabri	The Concept of Illegal Immigration and Its Causes in North Africa Region	12
140-151	A.S. Deeb I.A.S. Gjam	Solution of a problem of linear plane elasticity in region between a circular boundary with slot by boundary integrals	13



152-173	Musbah Ramadan Elkut	Transforming TESOL Pedagogy: Navigation Emerging Technology and Innovative Process	14
174-192	سالم علي سالم شخطور	آراء أبي محمد القيسي في خزانة الأدب "دراسة وتحليل"	15
193-217	نورية صالح إفريج	اعتراضات النحاة على حجية الشواهد في مسألة إعادة حرف الجر مع حتى العاطفة	16
218-238	نجاه صالح اليسير	الازدواجية اللغوية وأثرها في تعليم اللغة العربية الصفوف الأولى من المرحلة الابتدائية (أنموذجاً)	17
239-256	محمود محمد رحومة الهوش	الرضا الوظيفي وأثره على الاداء المهني لدى معلمي ومعلمات التربية البدنية ببلدية العجيلات	18
257-272	إبراهيم رمضان هدية	السرد الروائي عند إبراهيم الكوني في رواية الدنيا أيام ثلاثة	19
273-279	ابراهيم علي احمدودة ابراهيم علي ارحومة	التحليل الاستراتيجي لشركة الخطوط الجوية الليبية دراسة تطبيقية على الشركة باستخدام النماذج	20
280-294	Ismail F. Shushan Emad Eldin A. Dagdag Salah Eldin M. Elgarmadi	Petrography of Abushyba Formation columnar-jointed sandstones (Triassic-Jurassic) from Jabal Nafusa- Gharian, NW-Libya	21
295-307	Samera Albghil	Multimodal discourse analysis of variations in Islamic dress code in Bo-Kaap, Cape Town	22
308-317	عبداللطيف بشير المكي الديب رجب فرج سالم اقنيير	(استخدام نظم المعلومات الجغرافية والاستشعار عن بعد في تقدير النمو العمراني وأثره على البيئة المحلية بمنطقة سوق الخميس - الخمس / ليبيا)	23
318-331	حنان عبد السلام سليم عائشة حسن حويل	تطوير الخدمات العقارية باستخدام تقنية المعلومات (تطبيق أندرويد للخدمات العقارية أنموذجاً)	24
332-338	Mahmoud Mohamed Howas	Hepatoprotective Potential of Propolis on Carbontetrachloride-Induced Hepatic Damages in Rats	25
339-352	نورية محمد النائب الشريف	البناء العشوائي في مدينة الخمس (مفهومه - أسبابه - تأثيره على المخطط)	26
353-371	إسماعيل حامد الشعاب معمر فرج الطاهر سالم العامري	اختلاف القراء السبعة في البناء للفاعل وغير الفاعل وأثره في توجيه المعنى "نماذج مختارة"	27
372-376	عبد السلام صالح أبوسديل عطية رمضان الكيلاني	دراسة على مدى انتشار Gnathia sp. في بعض الأسماك البحرية المصطادة من شواطئ الخمس- ليبيا	28
377-392	الصغير محمد المجري	(بيان فعل الخير إذا دخل مكة من حج عن الغير) للملا علي القاري المتوفي سنة 1014هـ دراسة وتحقيق	29
393-421	نجيب منصور ساسي	فضل المواهب في شرح عيون المذاهب لعبد الرؤوف الأنطاكي (1009هـ) (الاستنجا ونواقض الوضوء من كتاب الطهارة) دراسة وتحقيقا	30
422-439	حنان ميلاد عطية	برنامج ارشادي معرفي سلوكي في خفض مستوى الوحدة النفسية لأبناء النازحين الليبيين	31
440-457	Hanan A. Algrbaa,	Speaker recognition from speech using Gaussian mixture model (GMM) and (MFCC)	32
458-467	هشام علي مرعي	علاقة المنطق بالعلوم الشرعية عند الغزالي	33



468-476	خالد الهادي الفيتوري زينب أحمد زوليه	الحلول العددية للمعادلات التفاضلية الملزمة باستخدام ب-سبلين التكعيبية	34
478-500	خميس ميلاد الدزيري	تأثير نظم معلومات التسويقية على توزيع السلعة " دراسة تطبيقية على إدارة مصنع إسمنت المرقب "	35
501-517	منصور عمر سالم فرعون	إدارة الوقت في الإدارة المدرسية في ضوء مهامهم الإدارية	36
518-533	فائزة محمد الكوت	أراء العلامة الدماميني النحوية في باب الظروف في كتاب خزانة الأدب ولب لباب لسان العرب	37
534-547	محمد محمد مولود الأنصاري حمزة مسعود محمد مكاري	"فوائد الفرائد في الاستعارة " عبد الجواد بن إبراهيم بن شعيب الأنصاري (1073هـ)	38
548-559	عبدالرحمن بشير الصابري إبراهيم عبد الرحمن الصغير أبوبكر أحمد الصغير	حروف الجر بين التناوب والتضمن دراسة تطبيقية على آيات من القرآن الكريم "دراسة وصفية تحليلية"	39
560-565	Ayda Saad Elagili Abdualah Ibrahim Sultan	An Application of "Kushare Transform" to Partial Differential Equations	40
566-598	أمل إجمد إقميع فاطمة محمد ابوراس	الأداء الوظيفي للمعلم وأثره على العملية التربوية دراسة سوسولوجية على عينة من معلمين ومعلمات مرحلة التعليم الأساسي	41
599-623	خيري عبدالسلام كليب عبدالسلام بشير اشتوي طارق أبوفارس العجيلي محمد عبدالسلام الأسطي فتحية خليل طحيشات	مدى التزام المصارف التجارية بتطبيق مبادئ إدارة الجودة الشاملة (دراسة ميدانية على مصرف الجمهورية فرع المرقب)	42
624-633	Abdulrhman Iqneebir Khaled Muftah Elsherif	Determination of Some Physical and Chemical Parameters of Groundwater in Ashafyeen-Masallata Area	43
634-650	أحمد على معتوق الزائدي	أحكام الأهلية وعوارضها عند الإنسان	44
651-671	عمر مصطفى النعاس السيد مصطفى السنباطي	الثقة بالنفس وعلاقته بالتوجه نحو الحياة لدى طالبات كلية الآداب	45
672-700	فاطمة جمعة الناكوع	معايير جودة آليات التدريب الميداني	46
701-718	إيمان عمر بن سعد بثينة علي أبو حليقة عمر محمد بشينه وليد حسين الفقيه	أثر المخاطر المالية في الأداء المالي للمصارف التجارية الليبية للفترة من (2011-2017)	47
719-730	هدي الهادي عويطي	دور مداخل ادارة المعرفة في تحسين ادارة الموارد البشرية في المؤسسات الحديثة	48
731-739	Khaled Abdusalam B. A Eman Mohammed Alshadhli Tasnim Adel Betro Amera Lutfi Kara Mawada Almashloukh	Antimicrobial Activities of Methanol Extract of Peganum harmala Leaves and Seeds against Urinary Tract Infection Bacteria	49
740-750	فتحية زايد شنيبه نجاة بشير الصابري	الصور البيانية في سورة الواقعة	50



751-757	Afifa Milad Omeman	Phytochemical, Heavy Metals and Antimicrobial Study of the Leaves of Amaranthus viridis	51
758-765	أسماء جمعة القلعي	قواعد المنهج عند ديكرت	52
766-777	فرج مجد صالح الدريع	النفط والاقتصاد الليبي 1963م - 1969م	53
778-789	عمر عبدالسلام الصغير رضا القدافي الأسمر	تقويم دية القتل الخطأ بغير الأصل	54
790-804	أبو عجيبة رمضان عويلي أحمد عبد الجليل إبراهيم	مناقشة المسألة الأربعين من كتاب المسائل المشككة للفارسي	55
805-823	فتحية أبو عجيبة جبران صالحة عمر الخرارزة	في منطقة سوق الخميس التلوث البيئي الناتج عن محطات الوقود (بحث مقدم للحصول على ترقية عضو هيئة تدريس)	56
824-856	هنية عبدالسلام البالوص	بعض المشكلات الضغط النفسي وعلاقتها بالصحة النفسية	57
857-871	احمد علي عزيز علي مفتاح بن عروس	تطبيقات البرمجة الخطية ونماذج صفوف الانتظار في مراقبة وتحسين الأداء دراسة إحصائية تطبيقية على القطاع الصحي بمدينة الخمس	58
872-879	Mona A. Sauf Fathi Shakurfow Sana Ali Soof Abdel-kareem El-Basheer	Isolation of Staphylococcus Aureus From Different Clinical Samples And Detects on Its Antibiotic Resistance	59
880-885	Wafa Mohamed Alabeid Omar Alamari Alshbaili	Combined Method of Wavelet Regression with Local Linear Quantile Regression in enhancing the performance of stock ending-prices in Financial Time Series	60
886-901	خالد مجد بالنور خالد أحمد قناو	حجم الدولة الليبية وأثره عليها طبيعياً وبشرياً	61
902-918	Amna Ali Almashrgy Hawa Faraj Al-Burrki Khadija Ali AlHebshi	EFL Instructors' and Students' Attitudes towards Using PowerPoint Presentation in EFL Classrooms	62
919-934	سالمة عبد العالی السيليني	اضطرابات الشخصية الحدية وعلاقتها بالجمود المعرفي	63
935-952	Samah Taleb	Common English Pronunciation Difficulties Encountered by Third Year Students at the Faculty of Education- English Department- Elmergib University	64
953-958	Hassan M. Krma	A Study on Bacterial Contamination of Libyan Currency in Al-Khoms, Libya	65
959-964	Jamal Hassn Frjani	A New Application of Kushare Transform for Solving Systems of Volterra Integral Equations and Systems of Volterra Integro-differential Equations	66
965-978	Ismail Elforjani Shushan Saddik Bashir Kamyra Hitham A. Minas	Study of chemical and biological weathering effects on building stones of the Ancient City of Sabratha, NW-Libya	67
979-991	مجد عبد السلام دخيل	الآثار الاجتماعية والثقافية المصاحبة للتغير الاجتماعي في المجتمعات النامية	68



992-998	Ismael Abd-Elaziz Fatma Kahel	Molecularly imprinted polymer (poly-pyrrole) modified glassy carbon electrode on based electrochemical sensor for the Sensitive Detection of Pharmaceutical Drug Naproxen	69
999-1008	خالد رمضان الجربوع علي إبراهيم بن محسن صلاح الدين أبوغالية	علي الجمل وقصيدته (اليوم الأربعاء في رثاء النورس الكبير)	70
1009-1014	نادية مجد الدالي ايمان احمد اخميرة	Comparing Review between Wireless Communication Technologies	71
1015-1024	Khairi Alarbi Zaglom Foad Ashur Elbakay	The importance of Using Classroom Language in Teaching English language as a Foreign Language	72
1025-1042	حمزة بن ربيع لقرون	الأدلة المختلف فيها التي نُسب الاختصاص بها إلى مذهب مُعَيَّن (دراسة تحليلية مقارنة)	73
1043-1052	أسماء السنوسي لحيو	معدل انتشار بعض الأوليات المعوية الطفيلية في مدينة الخمس، ليبيا	74
1053-1067	برنية صالح إجمد صالح	استعمالات (ما) النافية في سورة البقرة	75
1068-1085	اسماعيل عبدالكريم اعطية	عوامل نجاح وفشل نظام المعلومات دراسة تطبيقية على شركة الأشغال العامة بني وليد	76
1086-1098	نجوى الغويلي	"الرعاية الاجتماعية والدعم الاجتماعي والتربية الإيجابية للطفل"	77
1099-1105	Seham Ibrahim abosoria Fatheia Masood Alsharif Abdussalam Ali Mousa Hamzah Ali Zagloulm	The Error Correction in second language writing	78
1106-1128	ميسون خيري عقيلة	أساليب المعاملة الوالدية وعلاقتها بالتحصيل الدراسي لدى عينة من طلبة كليات جامعة المرقب بمدينة (الخميس)	79
1129-1135	Majdi Ibrahim Alashhb Mohammed Alsunousi Salem Mustafa Aldeep	Quality of E-Learning Learning Based on Student Perception Al Asmarya University	80
1136-1150	Ekram Gebiril Khalil	The Importance of Corrective Feedback in leaning a Foreign Language	81
1151-1164	سكينة الهادي الحوات فوزي مجد الحوات سليمة رمضان الكوت	شكل العلاقات الاجتماعية في ظل انتشار الأوبئة والأمراض السارية (جائحة كوفيد 19 نموذجاً)	82
1165-1175	Salma Mohammad Abad	A comparative study of the effects of Rhazya stricta plant residue on Raphanus sativus plant at the age of 15 and 30 days	83
1176-1191	محمد عمر محمد الفقيه الشريف	توظيف الاعتزال عند الزمخشري وانتصاره له من خلال تفسيره	84
1192-1210	عبدالله احمد الفراني علاء الدين مجد خليل المخ	مشكلات تطبيق التربية العملية من وجهة نظر الطلاب بكلية التربية بالجامعة الاسمية بدولة ليبيا	85
1211-1222	M. J. Saad N. Kumaresan Kuru Ratnavelu	Integral Averaging Techniques for Oscillation Nonlinear Differential Equations of Third Order	86



مجلة التربوي
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معامل التأثير العربي 1.63
العدد 23

1223-1239	Nadia Ali Alshukri Ali Moftah Abuhagr	Relationship between Amylase and Amylase Creatinine Clearance in Non-Insulin-Dependent Diabetics at the Diabetes and Endocrine Therapy Center in Alkoms, Libya	87
1240	الفهرس		