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Principles and Regulation

A brief about the Journal

It is an evaluated-based, quarterly journal issued **Africa University for human and Applied Sciences** – Libya - in Arabic and English. It is interested in publishing research papers and scientific studies, as well as, presenting books and periodicals summaries, Doctorate or Master Theses, conferences and workshops reporters inside and outside Libya.

Journal Objectives

Activating and enriching scientific research in all scientific fields related to the University majors Paying attention to the comprehensive development issues in the light of the local, regional and international changes offering a chance for researchers to publish their studies and to convey their ideas in order to expand the circle of knowledge among researchers, decision makers and practitioners inside and outside Libya creating a scientific dialogue among researchers and those who are interested in updated issues in all scientific fields related to the University majors

Publishing principles, regulations and criteria

Studies and research papers presented to publication in the journal should accordance with the following principles and regulations:

1. **Research and studies:**

These should be :

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- ✓ written in a correct methodology and
- ✓ written in a clear and correct language; they should be coherent and cohesive

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- Drury, Colin (2000), Management and Cost Accounting, 5th edition, (London: Thomson Learning).
- Kaplan, Robert (2000), Balance without profit, Financial Management, (January), 23-26

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For citing material from the Web, two additional pieces of information are usually needed:

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- ✓ Researchers should write their names, degrees, occupations, place of work in the first page of their research. It is also important to mention the correspondent address, fax and phone number, and e- mail.
- ✓ Research papers and studies should be written in Arabic and English provided that a summary in Arabic, of not more than 150 words, is enclosed.
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- ✓ Research papers and studies should be printed in Microsoft Word on one side paper of (A4) single-spaced. A (CD) of the work and a Curriculum Vita (CV) of the researcher should be enclosed.
- ✓ Works presented in Arabic should be in **(Simplified Arabic)**.Works presented in English should be in **(Times New Roman)**.
- ✓ Font size should be as follows:
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    - Size 16 for the subtitles
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    - Size 12 for the abstract in *italic*
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- ✓ Margins should be as follows:
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The research papers and the studies presented to the journal are subject to the evaluation by specialized professors assigned confidentially by the editorial committee. The journal has the right to ask the researcher to make the necessary corrections required by the evaluators. The journal has the right to make minor correction, when necessary, without an advanced permission from the researcher. The

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Content Issue No. 4

The Effect of Hemoglobin A1c on the levels of urea and Creatinine among Diabetic Patients, in Marzouk Region – Southern Libya

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Abstract

This study was conducted on 150 (74 males, 76 females) patients with diabetes attending Marzouk General Hospital and clinic with ages that ranges between 14-90 years. Blood samples along with some pertinent patients' data were collected and recorded in a questionnaire. The cumulative sugar, urea and creatinine were measured. The results of this study showed that the mean values of urea and creatinine in patients with normal levels of urea and creatinine were 31.8 ± 8.6, 0.8 ± 0. 2 mg/dl respectively, While subjects with high levels of urea or creatinine were 64.8 ± 13.1, 1.6 ± 0.4 mg/dl respectively, and patients with high level of both urea and creatinine were 80.5 ± 38.5, 1.97 ± 0.7 mg/dl respectively. The mean values of urea, creatinine and glycosylated haemoglobin for diabetic patients with normal levels of urea and creatinine were 29.88 ± 6.44, 0.7 ± 0.2 mg/dl, 7.2 ± 1.6% respectively. While the mean values of urea, creatinine and glycosylated haemoglobin in patients with diabetes with high levels of urea and creatinine were 52 ± 5.1, 1.6 ± 0.6 mg/dl, 8.7 ± 2.8 % respectively. Comparing the statistical results of this study, the T-test shows that there are significant differences between the mean values of urea and creatinine and glycosylated haemoglobin with the value of $P < 0.05$. Furthermore it is found that most patients with uncontrolled levels of glucose in the blood with appropriate dose of treatment for a prolonged period, leads to reduced ability of the kidneys for blood filtration and progresses to kidney failure over the years.

***Keywords**: Diabetic Complications, Glycosylated Haemoglobin, Kidney failure.*

Introduction

Diabetes is one of the most common diseases in the world and that has significant impact on the normal functioning of the organs of the body, such as the heart and retina, nerves and blood vessels. The World Health Organization in 2006 stated that the prevalence of diabetes around the world had reached 250 million people and is increasing rapidly and by the 2030s, it is likely that this figure will double. Each year, 3.2 million people die as a result of complications from diabetes. In the Middle East and North Africa Region, diabetes affects about 24.5 million people of the population, the highest prevalence rate in the world. And is expected that this figure will double by 2025 (Bos and Agyemang 2013; WHO, 2014). Diabetes is a chronic disease and the risk factors includes the following but not limited to; genes, lifestyle, or dietary factors. The most serious problem, however, is in the numerous types of complications arising from the disease, which affect most number of organs in the body (Suleiman, 2007; Burtis et al., 2008). In Libya, the World Health Organization estimated that there is about 88,000 thousand patients with diabetes, and an estimated rate of affected adults is about 23.7%. This number is expected to reach 245 thousand in 2030 (WHO, 2014).

Diabetic Nephropathy

Complications of the disease usually affect the kidneys, blindness, nerve atrophy and heart disease. With high sugar levels in the blood for over a long period of time, the workload of haemodialysisby the kidneys increases and causes an imbalance in the quality and function as a filter for waste and other impurities and as a result, it gradually accumulates in the blood and at times evident of a leakage of protein in the urine. Over time, the kidneys lose its ability to function normally in filtering blood and may develop into complete renal

failure (Callaghan and Brenner, 2000). The diagnosis of diabetes nephropathy depends on the kidney function tests, which includes the measurement of urea concentration and serum creatinine. A measure of urea concentration is less useful than creatinine for the measurement of glomerulus function, as the urea level in the serum is influenced by food intake, increased levels is also likely in cases of bleeding in the gastrointestinal tract, protein breakdown or reabsorption of urea by the renal tubules in the case of low urine output (Gaw et al., 1999). Creatinine is produced from creatine, as the muscles of the body contain about 98% creatinine, which is excreted from the muscles, enters the bloodstream and then filtered by the kidneys. Therefore, in cases of kidney failure, the level of serum creatinine increases significantly. (Wagle et al., 2010).

Glycated haemoglobin (HbA1c)

Glycated haemoglobin is a protein (globulin) linked with iron in the group (Haem), and protein (haemoglobin) and is related to the glucose sugar to what is known as haemoglobin diabetes, haemoglobin A1C, HbA1c or sugar cumulative. There are several types of haemoglobin, namely:

Types of haemoglobin	Haemoglobin in human blood%	Components
1. Haemoglobin (HbA) A	96%	2 series of alpha and beta.
2. Haemoglobin (HbA2) A2	2%	2 series of alpha and 2delta
3 Haemoglobin (HbF) F	2%	2 series of alpha and gamma

Haemoglobin A has several other sub-types which are (Hba1a, HbA1b, HbA1c)(Kilpatrick, 2010). The A1c is of great significance in this study because it is characterized by being linked with glucose, where a small percentage of 5-10 % of haemoglobin and blood glucose, is called the associated segment (glycosylated haemoglobin). Thus, the glucose correlation depends on the level of haemoglobin in the blood, and a substantial proportion of HbA1c is high in diabetic patients who have chronic high blood glucose concentration (Chandalia and Krishnaswamy, 2002; Coban et al., 2004). The level of glycosylated haemoglobin is directly proportional to glucose concentration because red blood cells have a permeability of free glucose. The length of exposure to glucose and its exposure to mature blood cells results to high glucose concentration for several hours. The longer HbA1c remains throughout the period of red cell life, these increases the time of red blood cells to be subjected to this high concentration of glucose (Mckenzie et al., 1996). The average life span of haemoglobin inside red blood cells is 2-3 months (Krishnmaurti, 2001). Objective of study to examine the effect of high levels glycosylated haemoglobin depend on the levels of urea and creatinine as indicators of renal function.

Materials and Methods:

Employed in this study is a selection of 150 diabetic patients who have attended Marzouk General Hospital, with age ranges from 14-90 years old, composed of 76 females and 74 males. We collected 2 ml. of blood samples to measure the cumulative sugar in the EDTA containers, and 3 ml of blood samples in the tube without anticoagulant for serum used to estimate urea and creatinine. Data collected were recorded in the questionnaire. Centrifuge speeds of 3000 rpm for 5 minutes were used to separate the serum from the blood cells. Glycosylated haemoglobin (HbA_{1C}) percentage was determined according to a boronate affinity chromatography method

using NYCO Card reader II; Creatinine and urea in the serum were measured by commercial kits, using Spectrophotometer (6300).

The normal ranges: Urea (10-50 mg / dL); Creatinine (male: 0.7-1.2 mg / dl); (female: 0.5-0.9 mg/ dL). HbA_{1C} (diabetic patients: 5-7%); (normal individuals: up to 6.4%).

Results and discussion

A total number of 150 patients with diabetes (Males (74) 49% and Females (76) 51%), age range (14-90 years) old, the samples were classified depend on Period of illness (years) into five groups as shown in Table (1).

Table (1): the distribution of the diabetic patients according to the duration of the disease.

Period of illness (years)	Number	Percentage%
Less than 5	61	40.6%
From 6-10	55	36.6%
From 11-15	19	12.6%
From 16-20	9	6%
Over 20	6	4%

The results of this study showed that (101) 67% of urea and creatinine results from samples were normal, while (49) 33% of urea and creatinine were found in abnormal levels as shown in Table (2).

Table (2): the number and percentages of diabetic patients with normal or abnormal levels of urea and creatinine.

Samples	Number	Percentage
Normal Level	101	67%
Abnormal Level	49	33%
Total	150	100%

Furthermore, the study showed that the mean value of urea and creatinine in subjects with normal levels of urea and creatinine concentration was 31.8 ± 8.6, 0.8 ± 0. 2 mg/dl respectively, the high level concentration of urea or creatinine was 64.8 ± 13.1, 1.6 ± 0.4mg/dl respectively. Moreover, a high mean value concentration for both urea and creatinine was expected at 80.5 ± 38.5, 1.97 ± 0.7 mg/dl respectively, as shown in Table (3).

Table (3): the mean values (± SD) of urea and creatinine levels for all samples

Tests	Normal		One abnormal		Both abnormal	
	No..	Mean ± SD	No..	Mean ± SD	No..	Mean ± SD
Urea (mg/dl)	101	31.8 ± 8.6	15	64.8 ± 13.1	11	80.5 ± 38.5
Creatinine (mg/dl)	101	0.8 ± 0.2	23	1.6 ± 0.4	11	1.9 ± 0.7

A total of 48 (32%) samples were evaluated for glycosylated haemoglobin levels. A number of 21 samples (44%) were found to be within normal levels which can be an indicative of a normal functioning kidney (Callaghan and Brenner, 2000) and a higher number of 27 samples (56%) with abnormal levels of HbA1c as shown in Table (4).

Table (4): the number and percentage of patients with normal / or abnormal glycated haemoglobin level.

Tests	**Normal**		**Abnormal**	
HbA1c %	Number	%	Number	%
	21	44	27	56

The mean values of urea, creatinine and glycosylated haemoglobin in patients with diabetes with normal levels of concentration of urea and creatinine were, 29.88 ± 6.44, 0.7 ± 0.2 mg/dl, 7.2 ± 1.6% respectively, While the mean values of urea, creatinine and glycosylated haemoglobin in patients with high levels of urea and creatinine were 52 ± 5.1, 1.6 ± 0.6 mg/dl, 8.7 ± 2.8 % respectively. Also, by comparing the results statistically that showed there are significant differences between the mean values of urea, creatinine and glycosylated haemoglobin, where the value of p- value less than 0.05, as shown in Table (5).

Table (5): the average of urea, creatinine and HbA1c for normal /or abnormal samples

Parameter	Normal		Abnormal		P-Value
	Number	Mean ±SD	Number	Mean ±SD	
Urea (mg/dl)	21	29±6.44	27	52±5.1	< 0.05
Creatinine (mg/dl)	21	0.7±0.2	27	1.6±0.6	<0.05
Glycosylated Hb (%)	21	7.2±1.6	27	8.7±2.8	< 0.05

In this study, we found that the mean values of glycosylated haemoglobin for diabetes patients with high level concentration of urea and creatinine were (8.7 ± 2.8 %). While that normal level of urea and creatinine were (7.2 ± 1.6%). A similar study was done in Barak Shati – Libya in 2010, on the control and monitoring of diabetes among patients attending Barak General Hospital, using glycosylated haemoglobin control diabetes. The mean values obtained from glycosylated haemoglobin in patients with insulin-dependent diabetes mellitus was 9.63 ± 2.01% and independent insulin 8.55 ± 1.70%, it also showed the mean values of HbA1c for patients with insulin-dependent diabetes mellitus at 9.3 ± 2.02% and for non-insulin dependent diabetes mellitus at 8.9 ± 2.o4 % (Bin-Yehmid, 2005)**.**

Conclusion: The study concluded that patients having uncontrolled blood levels of glucose and even with appropriate treatment for the entire duration of diabetes, lead to the development of one of the complications of diabetes, such as kidney failure.

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