



## The awareness of diabetic patients to HbA1c as a predictive test for diabetic retinopathy

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### ABSTRACT

**Introduction:** Diabetes mellitus is global epidemic; it is estimate that about 171 million people suffering from this Disease throughout the world. The importance of eye examination of all diabetic patients at the time of diagnosis is to prevent the blinding complications of diabetic retinopathy. It further shows that age, gender, and glycemic control are associated with the onset and the progression of diabetic retinopathy

**Objective:** IS to evaluate awareness of HbA1c as a predictive test and its relationship with retinopathy in diabetic patients.

**Methodology:** A cross-sectional study was carried out on 400 diabetic patients, age above 30 years with history of diabetes mellitus not less than one year, with or without retinopathy attended Ghazi al-Hariri hospital for specialized surgeries and interviewed face to face by using detailed questioner.

**Results:** This study shows only (16.25%) of the population aware that increase HbA1c is associated with diabetic retinopathy.

There was statistical significant association regarding the awareness about the increased HbA1c is associated with diabetic retinopathy regarding the age groups (30-39), illiterate patients, and with the duration of DM.

The study showed that most of the participants were females, age between 50-59 years, of secondary high school education, and with a DM duration of more than ten years

**Conclusion:** The awareness of HbA1c as predictive test was very low. So it's Important to increase the knowledge of diabetic patient to the complications of DM retinopathy through TV, newspapers, health education, posters in all health centers and hospitals as this will motivate diabetic patients to actively engage in health seeking behavior for eye check-up.

This awareness and knowledge lead to a better understanding and acceptance of the importance of routine eye examinations for the early detection and treatment of eye diseases, thereby reducing the incidence of blinding disease and the development of an integrated health and social care pathway including further education and better communication between relevant parties, would help in reducing the prevalence of diabetic retinopathy.

**KEYWORDS :** HbA1c ;diabetes mellitus; diabetic retinopathy

### INTRODUCTION

Diabetes mellitus is a group of metabolic disease characterized by hyperglycemia resulting from defect in insulin secretion, insulin action or both [1].

Diabetes is complex, chronic illness requiring continuous medical care, because diabetic patient with time and poor control of diabetes will develop long term damage, dysfunction and failure of various organs especially the eye, kidney, nerves, heart, and blood vessels [2].

Diabetics are more likely to become blind 25 times of non diabetics, due to the development of diabetic retinopathy, and by the time when people develop symptoms of diabetes, eye diseases irreversible eye damage is very common so it is vital to increase the awareness about diabetic complications [3,4].

Maintain glycemic control can aid in the prevention of diabetic retinopathy so, the American diabetic Association (ADA) recommended HbA1c test should be less than 6.5 % as a target for good glycemic control. Higher level of HbA1c test was associated with micro and macro vascular complication [5].

Despite the high number of diabetic patients, data about the association between the awareness of HbA1c test and diabetic retinopathy are not available in many countries.

### Diabetic Retinopathy (DR):

Is refer to the retinal change that occur in diabetic patients, these change affected the small blood vessels of the retina, and can lead to vision lost through several pathway [6].

Diabetic retinopathy is the first cause of blindness in people between 20-64 years in the United States.

DR affects 3-4 % of the population (4.1 Million Individuals) [7, 8].

Retinopathy occur in nearly all the patients with type 1 DM, and about 80% of those with type II DM after 20 years from the onset of the disease.

The duration of the disease and the level of the blood sugar are the main causes of DR[9].

### Classification:

Diabetic retinopathy falls into two main classes: non-proliferative and proliferative. The word "proliferative" refers to whether or not there is neovascularization in the retina; early disease without neovascularization called non-proliferative diabetic retinopathy (NPDR). If the disease remains beyond control, PDR occur.

### Diabetic Eye Screening:

Screening is a way of detecting the condition early before any changes to vision. If retinopathy is detected early, treatment can stop it from getting worse, otherwise, by the time symptoms become noticeable, it can be much more difficult to be treated.

The Eye Screening Programmed should be performed on; patients aged 12 years old and above, patients with type I and II once a year and any patients develop sudden deterioration in the vision. [11].

### Symptoms of Diabetic Retinopathy:

Diabetic patients usually do not experience symptoms until late in the course of the disease when treatment may be ineffective.

Late symptoms of DR vary depending on the cause, bleeding into the vitreous can cause sudden loss of vision. Macular edema and ischemia are two other mechanisms of decreased vision [12,13].

### Management of Diabetic Retinopathy:

The most important part of the treatment is to keep diabetic under control. In the early stages of diabetic retinopathy, controlling diabetes helps in preventing vision problems development. In more advance stages, when vision is affected or at risk, keeping diabetes under control can help in stopping the deterioration of the condition [14].

**Treatments for Advanced Diabetic Retinopathy:**

Laser treatment, eye injections, eye surgery.

**Preventing Diabetic Retinopathy:**

This can be done by controlling the blood sugar, blood pressure and cholesterol levels. This can be achieved by healthy lifestyle choices, although some people will also need to take treatment [15].

**Risk factors for diabetic retinopathy:**

1. Duration of DM, delayed diagnosis and treatment.
2. High blood sugar levels increase risk of retinopathy.
3. High blood pressure.
4. Pregnancy.
5. Smoking.
6. Hypercholesterolemia.
7. Anemia [16].

**Study design:**

Descriptive cross sectional study was conducted from 1 of March to 30 June of 2016, in Ghazi al –Hariri, hospital for specialized surgeries.

**Sampling Size:**

A convenient sample and sample size included 400 of diabetic patients.

**Inclusion Criteria:**

- 1) Thirty years of age of both gender.
- 2) Patients diagnosed with diabetes for more than one year.

**Exclusion criteria:**

- 1) Less than 30 years.
- 2) Patients diagnosed with diabetes less than one year.
- 3) Pregnant and children.
- 4) Any patient with retinopathy not because of diabetes mellitus.
- 5) Patients who were not able to participate.
- 6) Less than one year.

**Ethical consideration:**

Permission was obtained from the executive office of the Arabic Board for medical specializations by the administration order directed to Ghazi Al–Hariri hospital of specialized surgeries.

Respondent's permission was obtained before commencement of the interview by asking every participant if he / she want to answer the questions of the questionnaire after a brief explanation of the general purpose of the study and its objectives.

**Collection of data:**

The data was collected by direct interview with each diabetic patient who agrees to participate after the researcher explains to them the aim of the study by using special interview. A questionnaire that was design for the purpose of the study. The questionnaire was written in English but the interview was done in Arabic and included:

- 1- Socio-demographic information: this included patient's name, age gender (male or female), socioeconomic status, educational level, (illiterate, primary, secondary, above secondary).
- 2- Family history of retinopathy or any eye problems.
- 3- Measuring weight and height of the patients to calculate the BMI.
- 4- Measuring HbA1c level.
- 5- The cause that made each participant does fundoscopic examination
- 6- Time of the first and the last fundoscopic examinations, and

- the number of fundoscopic examinations.
- 7- Duration of DM, and its control and treatment.
- 8- Any history of smoking or alcohol.
- 9- If the patient has retinopathy.
- 10- Was the patient under endocrinologist follow- up.
- 11- The participant awareness about the fact that the increase in the level of HbA1C is associated with retinopathic complications.

**Pilot study:**

At the beginning of this work, a pilot study has been conduct at Ghazi al–Hariri hospital the objectives of pilot study were:

- 1- To determine the possible difficulties that the investigator may face during data collection.
- 2- To test the suitability of questionnaire form items, and to find any needed modifications.
- 3- To assess the need to conduct the questionnaire.

**Limitations of the study:**

Limitations during data collections were, short duration of data collection, in addition not all diabetic patients with inclusion criteria agreed to participate in the study.

**Statistical analysis:**

Each patient assigned a serial identification number. The data were analyzed using statistical package for social sciences (SPSS) version 20.

The categorical data presented as frequency and percentage tables

- Person's chi-square test was used to assess the association between the awareness of the patients and other categorical variables.
- The continuous variables were presented as, mean, and standard deviations.
- Independent t-test was used to assess the significant differences between continuous variables.
- P-value less than 0.05 were used as an alpha level of significance.

**Results**

The total sample studied was (400) patients; the highest proportion (35.6%) of participants age were (50–59) years, (55.5%) were females, (28%) had secondary school, (61%) were overweight, and in (47.1%); HbA1c level was (5.7%–6.4%).

From the total sample (83.75%) of diabetic patients were unaware that the increased level of HbA1c is associated with retinopathy. There were statistical significant association between the awareness about HbA1c, the age group of (30–39) years, and duration of DM < 5years, and there were no statistical significant association between the awareness of HbA1c, smoking, and alcohol.

Statistical significant association was found between the awareness of HbA1c and patients with HbA1c (4%–5.6%). There was no statistical significant association between the awareness of the HbA1C and the BMI

**Table (1) Distribution of diabetic patients according to socio –demographic characteristics**

Variables	NO.	%
<b>Age groups</b>		
30 - 39 years	24	6.0
40 - 49 years	95	23.7
50 - 59 years	142	35.6
≥60 years	139	34.7
<b>Gender</b>		
Male	178	44.5
Female	222	55.5
<b>Education level</b>		
Illiterate	88	22.0
Primary school	108	27.0

Secondary school	112	28.0
Above secondary school	92	23.0
<b>Total</b>	<b>400</b>	<b>100%</b>

Figure (1) distribution of the diabetic patient according to BMI, highest proportion (61%); over wight.

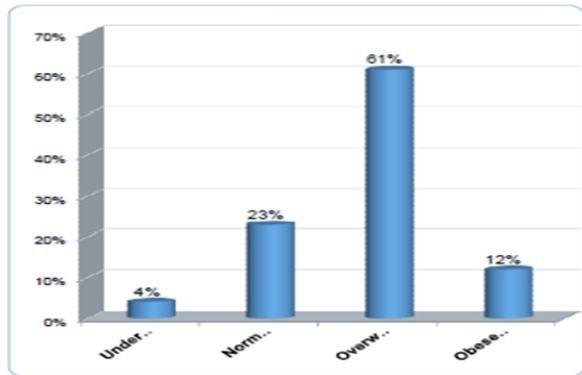


Figure (2) shows the distribution of diabetic patients according to the level of HbA1c, highest proportion (47.1%); HbA1c level (5.7% - 6.4%)

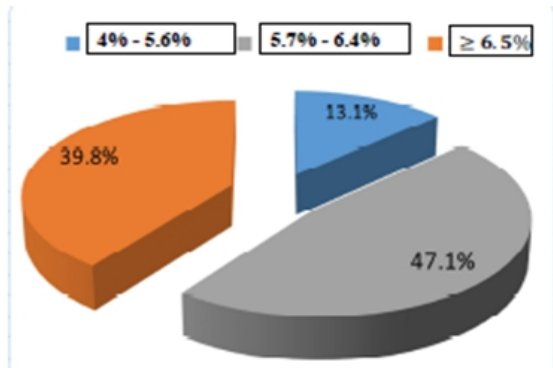


Table (2) Distribution of diabetic patients according to their awareness that increase HbA1c level is associated with retinopathy

Variables	No.	%
<b>Do you aware that increase HbA1c Associated with retinopathy?</b>		
yes	65	16.25
no	335	83.75
<b>Total</b>	<b>400</b>	<b>100%</b>

Table (3) Distribution of diabetic patient awareness about HbA1c relation with retinopathy according to different variable.

Variables	Aware (Total No.=65)		Not aware (Total No.=335)		p-value
	No.	(%)	No.	(%)	
<b>Age groups</b>					
30 - 39 years	4	16.7	20	83.3	0.027*
40 - 49 years	11	11.6	84	88.4	
50 - 59 years	17	12	125	88	
≥60 years	33	23.7	106	76.3	
<b>Duration of DM</b>					
<5 years	14	10.3	122	89.7	0.042*
5 - 10 years	21	16.9	103	83.1	
>10 years	30	21.4	110	78.6	
<b>Smoking</b>					
Yes	19	22.6	65	77.4	0.075
No	46	14.6	270	85.4	
<b>Alcohol</b>					

Yes	4	23.5	13	76.5	0.406
No	61	15.9	322	84.1	
<b>HbA1C</b>					
4% - 5.6%	15	28.8	37	71.2	0.029*
5.7% - 6.4%	28	14.9	160	85.1	

**Discussion**

Diabetic retinopathy status and lack of awareness are associated with poor control of HbA1C and blood pressure level [17].

Regarding the age group, (35.6%) of patients were between (50-59) years, while (29.6%) of the same age group observed in Tien Y, in Singapore 2009 [18].

Majority of the sample studied in our research were female (55.5%), this is comparable with other studies like Wong G Liew, China 2008. [19], and Fox CS. USA. 2007 [20], this contribute to the conservative nature of the participants.

Regarding educational level the highest proportion of the participants had secondary school (28%). This is nearly comparable with the study of Wahab S,

Pakistan 2009 who showed that (25.3%) of his participant had secondary school educational level [21].

In our study the majority of the patients were overweight (61%), this is higher than the results of the study conducted in Kashia Jamil, Pakistan 2014, and in Chew YK, USA 2006, Which showed that the proportion of overweight were (37%) [23], and (25%) [24] respectively, on the other hand agrees with the study in Snieder H, UK 2001 (43.2%) [22].

The study showed that (47.1%) of the patients had HbA1c level equal to (5.6%-6.4%), this is nearly comparable to Zimmet P study 2001, which showed that the proportion was (46.5%) [25], on the other hand a study done by S. Ishida, USA, 2000, showed that the proportion was lower than this study [26].

Regarding awareness about the increase HbA1c and its association with retinopathy, the majority of the participants were un aware (83.75%), this is highest than the study observed by Lee See, UK, 2005, and the study conducted by Wani JS, India, 2003, in which the proportion were (43%)[82], (67%) [27] respectively. This may be due to low level of education of our patients toward the relationship between HbA1c and diabetic retinopathy.

Concerning the awareness about HbA1c and its relationship with retinopathy according to socio-demographic characteristics, the study showed that there was statistically significant association with age group of (30-39) years (0.0027), this is comparable with the study of Tapp RJ, USA, 2008, (0.002)[28]. while with study done by Wahab S, Pakistan, 2008, showed (0.03) the same age group were aware about this relationship [21].

The study also observed that the awareness about HbA1c relation with retinopathy according duration of DM was statistically significant in (<5) years duration of DM (0.042), this is comparable with the study conducted by Tham KY, Singapore, 2004, and disagree with Stuart A, 2004, [29,30]. this may be due to the poor knowledge about the role of the duration of glycemic managements.

Regarding the awareness about HbA1c relation with retinopathy according to the habits, the study showed no significant association with the smoking and alcohol, this agree with study done by Koste K, UK, 2013.[31].

Regarding the HbA1c level of (4 - 5.6%), the study showed that there was statistically significant association between the above level and retinopathy development (0.029). This agrees with study done in M. Bamashmus, India, 2009, and disagree with study done in Nathan DM, UK, 2007, [32,33], this could be due to the gross ignorance of the

role of HbA1c in the development of diabetic retinopathy among diabetic individuals.

### Conclusions

- 1) The proportion of the awareness of diabetic patients about the HbA1c test and its relation with DR was 16.25% while 83.75% were unaware.
- 2) Significant association between the awareness about HbA1c relation with retinopathy in 30–39 year, <5 year duration of DM patients with HbA1c level (4%–5.6%).
- 3) Highest proportion of participants were between (50–59) years, Female, and with a family history of retinopathy.
- 4) Most of participant had BMI (25– 30), and HbA1c level of (4%–5.6%).

### Recommendations:

1. A mass media programs like, television, radio, newspapers, and posters should be used to raise the educational level of the patients and the public regarding the association between the HbA1c level and the development of retinopathy.
2. Encourage the patient's self-monitoring, and other elements of self-care, may motivate the patients to adhere to their medications and to change their life style of living to a more healthy style, and to take part in the management of their disease.

### List of Abbreviations

(ADA) American diabetic association, (BMI) Body mass index (DM) diabetes mellitus, (DR) diabetic retinopathy, (F.B.S) fasting blood sugar, (HbA1c) glycated hemoglobin, (HT) hypertension, (NPDR) non proliferative diabetic retinopathy, (PDR) proliferative diabetic retinopathy, (WHO) World health organization

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