# HbA1c Awareness in Turkish Diabetic Population at a Tertiary Setting

## Üçüncü Basamakta Türk Diyabet Hastalarında HbA1c Farkındalığı

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**ABSTRACT Objective:** To assess the HbA1c awareness among Turkish diabetic patients examined at a tertiary eye center located in İzmir, Turkey. **Material and Methods:** A prospective, non-randomized study was carried out involving 750 consecutive diabetic patients examined at the Retina Unit of Dokuz Eylül University Ophthalmology Department. An oral questionnaire on HbA1c awareness and patients' general characteristics was read to the patients. Retinopathy status was evaluated by indirect ophthalmoscopy and contact lens biomicroscopy. HbA1c awareness was analyzed according to age, type and duration of diabetes, referral pattern, education level, diabetes care, severity of diabetic retinopathy and treatment type. **Results:** Overall, 109 of 750 patients (14.5%) acknowledged the importance of HbA1c. Statistically, patients under 40 years of age, type 1 diabetics, patients on insulin therapy, patients under supervision of an endocrinology department, patients with a higher education level and patients with no retinopathy had a higher level of awareness for HbA1c. **Conclusion:** Our study reflects that better strategies are necessary in Turkish diabetic patients to improve self-management in diabetes.

**Key Words:** Diabetes mellitus; diabetic retinopathy; hemoglobin A1c protein, human

**ÖZET Amaç:** Türkiye'nin İzmir ilindeki üçüncü basamak bir göz merkezine başvuran diyabetik hastalardaki HbA1c farkındalığının değerlendirilmesi. **Gereç ve Yöntemler:** Dokuz Eylül Üniversitesi Göz Anabilim Dalı Retina birimindeki 750 diyabetik hastayı içeren prospektif, non-randomize bir çalışma yapıldı. Hastalara genel karakteristik özellikleri ve HbA1c farkındalığıyla ilgili sözel bir anket okundu. Hastaların retinopati düzeyleri, indirekt oftalmoskopi ve kontakt lens biyomikroskopi ile değerlendirildi. HbA1c farkındalığı, yaş, diyabet tipi ve süresi, hastanın başvuru şekli, eğitim düzeyi, diyabet takibi, diyabetik retinopati düzeyi ve tedavi tipine göre analiz edildi. **Bulgular:** Yedi yüz elli hastanın 109 (%14.5)'u HbA1c'nin önemi hakkında bilgi sahibiydi. İstatistiksel olarak kırk yaşın altındaki hastalar, insülin kullanan hastalar, endokrinoloji kliniği tarafından takip edilen hastalar, daha yüksek eğitim düzeyi olan hastalar ve retinopatisi olmayan hastalar HbA1C konusunda göreceli olarak daha bilgiliydi. **Sonuç:** Çalışmamız, diyabetik Türk hastaların bireysel tedavilerini iyileştirmek için daha iyi stratejilere ihtiyaç duyulduğunu göstermiştir.

**Anahtar Kelimeler:** Diyabet; diyabetik retinopati; hemoglobin AIc protein, insan HbA1c

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The relationship between glycemic control and diabetes-related complications somewhat remained unproven until 1993. However, the Diabetes Control and Complications Trial (DCCT) and the United Kingdom Prospective Diabetes Study (UKPDS) clearly demonstrated that intensive glycemic management could achieve HbA1c levels close to 7%.[1,2] This level was defined as a treatment goal by the American Diabetes Association.[3]

Regular HbA1c testing became the principal method to track glycemic control in diabetic patients and it is a common assumption that patient awareness of recent and targeted HbA1c values plays an important role in modern diabetes management.

We conducted a prospective, non-randomized study to assess the awareness of HbA1c among Turkish diabetic patients examined at a tertiary eye center in İzmir, Turkey.

## MATERIAL AND METHODS

A prospective non-randomized study was carried out including 750 consecutive diabetic patients examined at the Retina Unit of Dokuz Eylül University Ophthalmology Department İzmir, Turkey between August 2006 and July 2007.

A member of our retina team read an oral questionnaire on HbA1c awareness and patients' general characteristics to the patients. Study participants who acknowledged that they understood HbA1c were expected to define it as an indicator of a patient's glycemic control over the preceding three months. Two retina specialists categorized the retinopathy level by indirect ophthalmoscopy and contact lens biomicroscopy at the time of examination. Chi-square test was used to compare HbA1c awareness among the patients.

## RESULTS

Characteristics of the study group were summarized in Table 1. Overall, 109 of the 750 (14.5%) patients acknowledged the importance of HbA1c. The distribution of patients who were aware of HbA1c in relation to the patient characteristics was demonstrated in Table 2.

There was no statistically significant difference between males and females regarding HbA1c awareness (p= 0.670). Mean age was 58 years (Age range, 14-87 years). The mean age of patients who were aware of HbA1c was 52 ± 14 years. While 20 of 46 (44%) patients who were younger than 40 years of age understood HbA1c, 89 of 704 (13%) patients older than 40 years of age acknowledged the importance of HbA1c (p= 0.000). Age distribution and HbA1c awareness was elucidated in Figure 1. Twenty-four of 52 (46%) type 1 diabetics were aware of HbA1c whereas only 85 of 698 (12%) type 2 diabetics recognized HbA1c (p= 0.000). No statistically significant difference was noted when duration of diabetes was compared to HbA1c awareness (p= 0.05). Seventy-three of 421 (17%) who were on insulin treatment understood HbA1c. On the other hand, 36 of 329 (11%) patients on oral antidiabetics recognized the importance of HbA1c (p= 0.014). The patients who were monitored by an endocrinologist had the best percentage of

**TABLE 1:** The baseline characteristics of the study patients.

| | Number of patients (percentage) |
|---|---|
| Age | 58 (14-87) |
| Gender | |
| Male | 330 (44%) |
| Female | 420 (56%) |
| Referral pattern to retina unit | |
| Endocrinology consultation | 253 (34%) |
| Referral from another health unit | 194 (26%) |
| Return patient | 187 (25%) |
| New ophthalmology patient | 116 (15%) |
| Type 1 diabetes | 52 (7%) |
| Type 2 diabetes | 698 (93%) |
| Duration of diabetes | |
| < 5 years | 136 (18%) |
| 5-10 years | 142 (19%) |
| 10-15 years | 172 (23%) |
| 15-20 years | 144 (19%) |
| > 20 years | 156 (21%) |
| Present insulin use | 421 (56%) |
| Medical care by; | |
| Endocrinology clinic | 283 (38%) |
| Internist | 268 (36%) |
| General practitioner | 51 (7%) |
| No medical care | 148 (20%) |
| Education | |
| University | 132 (18%) |
| High school | 168 (22%) |
| Elementary school | 380 (51%) |
| No education | 70 (9%) |
| Diabetic Retinopathy Status | |
| No Retinopathy | 245 (33%) |
| Nonproliferative | 226 (30%) |
| Proliferative | 279 (37%) |

**TABLE 2:** Various characteristics of patients who were aware of HbA1c and the result of statistical analysis within the groups.

| | Number of the patients (percentage) | p |
|---|---|---|
| Age | | |
| <40 years | 20/46 (44%) | p= 0.000 |
| ≥40 years | 89/704 (13%) | |
| Gender | | |
| Male | 50/330 (15%) | p= 0.670 |
| Female | 59/420 (14%) | |
| Referral pattern to retina unit | | |
| Endocrinology consultation | 50/253 (20%) | p= 0.005 |
| Referral from another health unit | 15/194 (8%) | |
| Return patient | 27/187 (14%) | |
| New ophthalmology patient | 17/116 (18%) | |
| Type 1 diabetes | 24/52 (46%) | p= 0.000 |
| Type 2 diabetes | 85/698 (12%) | |
| Duration of diabetes | | |
| < 5 years | 16/136 (12%) | p= 0.05 |
| 5-10 years | 32/142 (22%) | |
| 10-15 years | 20/172 (12%) | |
| 15-20 years | 19/144 (13%) | |
| > 20 years | 22/156 (14%) | |
| Patients on insulin | | |
| Yes | 73/421 (17%) | p= 0.014 |
| No | 36/329 (11%) | |
| Medical care by; | | |
| Endocrinology clinic | 68/283 (24%) | p= 0.000 |
| Internist | 25/268 (9%) | |
| General practitioner | 1/51 (2%) | |
| No medical care | 15/148 (10%) | |
| Education | | |
| University | 51/132 (39%) | p= 0.000 |
| High school | 31/168 (18%) | |
| Elementary school | 25/380 (7%) | |
| No education | 2/70 (3%) | |
| Diabetic Retinopathy; | | |
| No Retinopathy | 54/245 (22%) | p= 0.000 |
| Nonproliferative | 31/226 (14%) | |
| Proliferative | 24/279 (9%) | |

awareness (24%), whereas 9% of the patients who were monitored by an internist, 10% of the patients who received no medical care and 2% of the patients who were followed by a general practitioner understood the meaning of HbA1c (p= 0.000). Considering the education status, the most informed group was the group of patients with a university degree (39%) (p= 0.000). While 54 of 245 (22%) who had no retinopathy were aware of HbA1c, 31 of 226 (14%) patients with non-proliferative and 24 of 279 (9%) patients with proliferative retinopathy understood the relevance of HbA1c (p= 0.000).

## DISCUSSION

Education for diabetes self-management is an essential component of diabetes treatment. The ideal HbA1c level should be targeted during the treatment course and the patient should acknowledge the importance of HbA1c.

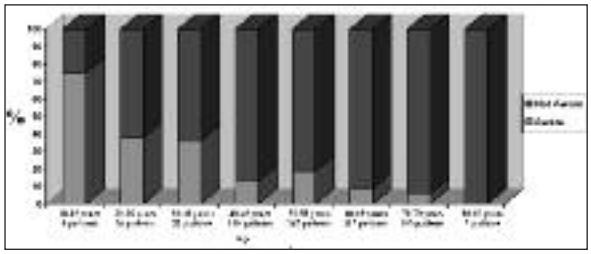

**FIGURE 1:** Distribution of age and percentage of HbA1c awareness.

Several studies were performed to investigate the HbA1c awareness previously. Harwell et al conducted a telephone survey among diabetic patients in a rural-fee-for-service practice and a community health center in USA.[4] Seventy-five percent of 200 survey respondents reported having one or more HbA1c tests performed in the past year. However, only 24% of those who reported having a test remembered the actual value. The authors concluded that people with diabetes were aware of their previous HbA1c testing but did not interpret the values accurately in relation to their own glycemic control.

Heisler et al examined 1) the frequency and correlates of knowing one's most recent HbA1c test result and 2) whether knowing one's HbA1c value was associated with a more accurate assessment of diabetes control and better diabetes self-care understanding, self-efficacy and behaviors related to glycemic control.[5] In a survey including 686 US adults with type 2 diabetes, 66% of participants reported that they did not know their last HbA1c value and only 25% accurately reported that value. Respondents who knew their HbA1c values reported better diabetes care understanding and assessment of their glycemic control than those who did not.

Mehrotra et al assessed the perception patterns regarding methods for testing blood glucose and metabolic control by direct interview method in 793 patients with type 2 diabetes in India.[6] Awareness regarding the importance of microalbuminuria, lipid profile and HbA1c was observed in 24.1%, 15.5% and 7.6% of the patients, respectively. A positive impact of education on overall knowledge levels was observed.

Do et al conducted a study on 150 adult diabetic patients by the help of an oral questionnaire on the awareness of HbA1c at a tertiary retina center in USA.[7] Among the 150 subjects, 76 patients (51%) understood the concept of HbA1c. They also found out that patients with no retinopathy were more aware of HbA1c than patients with nonproliferative or proliferative retinopathy.

Although individiuals who referred to a retina service are more apt to having diabetic retinopathy compared with the general diabetic population and likely are at greater risk for several systemic diabetic complications, a minority of diabetic patients (14.5%) understood the meaning of HbA1c in our study group. Comparison of the HbA1c awareness rate in our study with that reported in previous papers from various countries such as India and USA, revealed that socioeconomic level of the countries correlated with the HbA1c awareness.[6,7] In summary, patients under the age of 40 years, type 1 diabetics, patients on insulin therapy, patients under the supervision of an endocrinology department, patients who have a higher education level and patients with no retinopathy were more aware of the concept of HbA1c. Our study clearly reflects that Turkish diabetic patients need better strategies to improve self-management of diabetes.

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