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The Crucial Role of Awareness and Education in Promoting Effective Diabetes Self-Management and Reducing the Risk of Complications

ABSTRACT

Objective: Disease awareness is a pivotal factor in the management of illness. In chronic and progressive conditions, such as diabetes mellitus (DM), this awareness can be as effective as pharmacological interventions. This study aimed to assess how aware diabetic patients are of the complications of their disease.

Methods: This cross-sectional survey included patients diagnosed with DM. A total of 14 survey questions, divided into 7 different categories, were directed at the patients. The singular questions evaluated the patients' awareness of the complications, while the associated-secondary questions aimed to inquire about the sources of their awareness.

Results: In this study, a survey was conducted with 300 diabetic patients, yielding a response rate of 90.2%. The mean age was 53.81 ± 9.87 years. The level of awareness of complications was high among all patients (80.5%). The awareness level of ocular-related complications was the highest, while that of neuropathy was the lowest (50%). When patients were categorized by educational status, education increased awareness but decreased adherence to combined drug use. The patients' doctors were identified as the most significant source of support for raising awareness of complications. This support was further enhanced by the educational level.

Conclusions: High levels of awareness of complications related to diabetes, still being primarily provided by doctors, and improvement of patients' educational status, can lead to a decrease in the number of patients with a poor prognosis. Therefore, increasing awareness of diabetes-related complications and improving patients' educational status may positively impact reducing the incidence of poor prognosis among diabetes patients.

Keywords: Diabetes Mellitus, Diabetic Complications, Disease Awareness.

Etkili Diyabet Öz-Yönetiminin Teşvik Edilmesinde ve Komplikasyon Riskinin Azaltılmasında Farkındalık ve Eğitimin Önemli Rolü

ÖZET

Amaç: Hastalık farkındalığı, hastalık yönetiminde önemli bir faktördür. Diyabet gibi kronik progresif bir hastalıkta bu bilinç ilaçlar kadar etkilidir. Bu çalışmada diyabetli hastaların hastalıklarının komplikasyonlarından ne kadar haberdar olduklarını değerlendirmek amaçlandı.

Gereç ve Yöntem: Bu anket çalışmasına diyabet tanısı olan hastalar dahil edilmiştir. Hastalara 7 farklı kategoride toplamda 14 anket sorusu yöneltilmiştir. Tekil sorular komplikasyonlardan haberdarlıklarını değerlendirirken, ilişkili-ikincil sorular ise haberdarlık kaynaklarını sorgulamakta idiler.

Bulgular: Üç yüz hastanın katıldığı çalışmada, cevap oranı %90.2 idi. Ortalama yaş 53.81 ± 9.87 idi. Tüm hastaların farkındalık düzeyi oldukça yüksekti (%80.5). Görme ile ilgili komplikasyonlarda farkındalık düzeyi en fazla iken nöropati ile ilgili olanlarda en düşük düzeyde idi (%50.0). Hastalar eğitim durumlarına göre kategorize edildiklerinde, eğitim durumu farkındalığı artırırken, kombine ilaç kullanımı uyumunu azaltıyor gibiydi. Hastaların komplikasyon bilinçlenmelerinde en yüksek yardımcı kaynak takip eden doktorları idi. Eğitim durumu ile bu destek daha da artmakta idi.

Sonuç: Diyabete bağlı komplikasyonların bilinçlilik düzeylerinin yüksek olması, bu bilincin halen doktorlar tarafından en üst düzeyde sağlanması ve hastaların öğrenim durumlarının iyileştirilmesi ile kötü prognozla seyreden hasta sayısını azaltacaktır. Bu nedenle, diyabetle ilişkili komplikasyonlar konusunda farkındalığın arttırılması ve hastaların eğitim durumunun iyileştirilmesi, diyabet hastalarında kötü prognoz insidansını azaltmada olumlu etki yapabilir.

Anahtar Kelimeler: Diyabet Mellitus, Diyabetik Komplikasyonlar, Hastalık Bilinci.

INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both (1). DM is caused by a combination of genetic and environmental factors, including obesity and physical inactivity (1). According to the International Diabetes Federation (IDF), approximately 463 million adults were living with diabetes in 2019, and this number is expected to rise to 700 million by 2045 (2). This progress is attributed to factors such as population aging, urbanization, and unhealthy lifestyles. If left uncontrolled, DM can lead to a wide range of complications, including cardiovascular disease, neuropathy, retinopathy, and nephropathy, all of which can have a significant impact on the quality of life of those affected (3).

Diabetes is a major public health concern due to its high prevalence, associated complications, and economic burden (4). Although diabetes is a manageable condition, it requires ongoing medical care and patient self-management to prevent and manage complications. Given the serious consequences associated with DM, there is a pressing need to raise awareness about the condition. Early diagnosis and effective management of diabetes are crucial to preventing or delaying the onset of complications (5). This requires a comprehensive understanding of the risk factors, clinical presentation, and diagnostic criteria for DM, as well as knowledge of the various treatment options available (1, 6-8).

In this study, we conducted an analysis of the awareness levels and expectations of individuals who have been diagnosed with diabetes with regard to complications. The analysis was conducted through the use of a concise survey. By increasing awareness and knowledge of DM, we hope to empower individuals to make informed decisions regarding their health and well-being, and ultimately reduce the burden of this condition on individuals, families, and society as a whole.

MATERIAL AND METHODS

This survey-based and cross-sectional research was carried out with individuals who had received a diagnosis of diabetes and who sought medical attention at the Department of Internal Medicine of Necmettin Erbakan University Hospital. Prior to the study, approval was obtained from the Non-Drug Research Ethics Committee of the current university under consent number 2019/1972. In addition to the survey forms completed by all participants, informed consent forms were duly procured to ensure that the participants had been fully informed of the research objectives and had provided their voluntary consent to participate. The study recruited participants who were 18 years of age or older and had a prior diagnosis of diabetes or were newly diagnosed with the condition. Participants with comorbidities or secondary diabetic conditions were not discerned for the purposes of the study. The patients' demographic and clinical data, as well as their concurrent laboratory results, were retrieved from the digital hospital records. The type of medication used for diabetes and educational status were also noted.

The survey comprised a total of 14 questions, each of which was closely interrelated. The survey questions were designed to investigate different types of complications. The first two questions focused on ocular complications, questions three and four were aimed at assessing renal complications, questions five, six, nine, and ten were designed to explore cardiovascular complications, questions seven, eight, eleven, and twelve were intended to investigate neurological complications, and questions thirteen and fourteen were focused on acute complications. Patient survey responses were scored using a binary scale for single-digit questions and a five-point Likert scale for even-digit questions. In addition, odd-numbered questions were aimed at assessing the patients' level of awareness regarding complications. In contrast, even-numbered questions sought to ascertain the source of the knowledge in the event of a positive response to the former questions (Figure 1).

Statistical Analysis: The statistical analysis employed in this study utilized SPSS (version 26) to determine appropriate tests for comparisons based on the normality or skewness of the continuous data, with consideration given to sample sizes exceeding 30 in each group. Specifically, the independent t-test and one-way ANOVA were utilized for normally distributed data, while the Mann-Whitney U and Kruskal-Wallis tests were utilized for non-normally distributed data. In addition, Pearson correlation was employed for normally distributed data correlations, and Spearman correlation was utilized for non-normally distributed data correlations. Furthermore, the chi-square test was used for all categorical data comparisons. Reliability analysis of the survey responses was assessed by calculating Cronbach's alpha via the correlation matrix, with a reliability threshold of 0.7 or higher deemed acceptable (9). The appropriateness of the responses for exploratory factor analysis was evaluated using the KMO and Bartlett's tests. All analyses were deemed statistically significant at a threshold of $p < 0.05$.
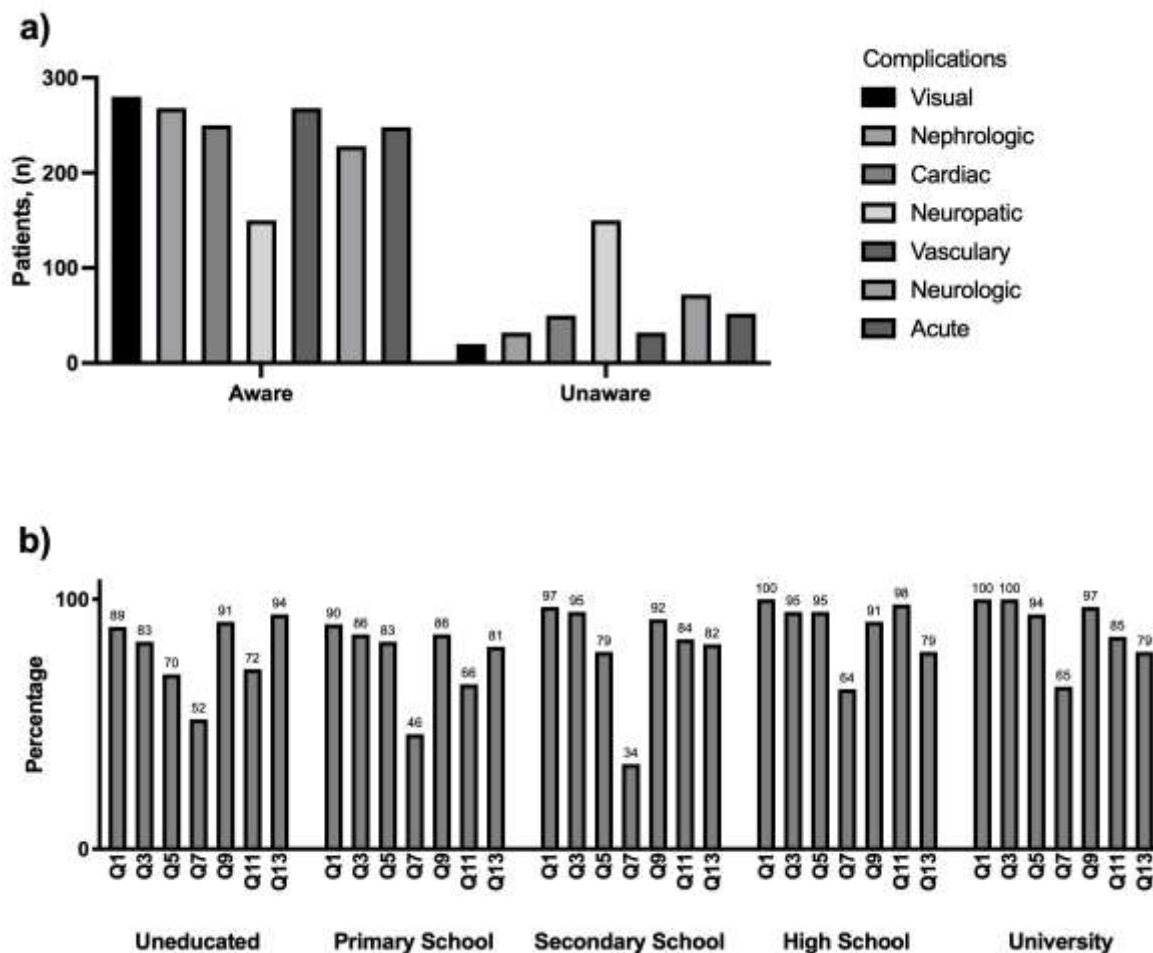
Figure 1. **a)** The awareness levels of all patients regarding diabetes-related complications; **b)** The distribution of complication awareness levels among patients based on their educational status.

RESULTS

In our study, we conducted a survey among a sample of 300 patients with DM and achieved a response rate of 91.2% and a completion rate of 90.2%. The mean age of the population was 53.81 ± 9.87 years and 166 of them were female (55.3%). The median age of onset of diabetes for all patients was 6 (3 - 12) years. Overall, 182 (60.7%) patients were using oral antidiabetic drugs (OAD), 78 (26.0%) were using insulin, and 40 (13.3%) were using both OAD and insulin in combination. The patients' clinical characteristics and laboratory values, classified based on their educational levels, are presented in Table 1.

The obtained Cronbach's alpha coefficient of 0.769 for the survey questions used in the reliability test indicates a moderate to a high level of internal consistency reliability. The overall awareness rates among the survey responses for complications were determined to be 80.5%. Upon evaluating the affirmative responses given to single-numbered questions that revealed the awareness of seven distinct complications, in accordance with the educational status of the participants, the following results were obtained: 78.6% for those who have not acquired literacy, 76.8% for primary school

graduates, 80.5% for middle school graduates, 88.8% for high school graduates, and 88.6% for university graduates.

The survey responses indicate that patients demonstrated the highest awareness regarding complications associated with vision or blindness (93.3%) (Figure 1a). In contrast, the lowest level of awareness was observed for neuropathy-related complications (50%) (Figure 1a).

When the selectivity features of the survey questions were evaluated, it was observed that respondents who use both OAD and insulin, in question 9, exhibit a higher level of awareness compared to those who solely use OAD or insulin. Upon evaluating the selectivity of the questions with regards to educational status, it was observed that uneducated respondents displayed a higher level of awareness in providing "positive" responses to the first question, which pertained to visual complications (Figure 1b). Similar results were obtained in question 5, which inquired about cardiovascular complications (Figure 1b). In question 11, which inquired about neurological complications, individuals who completed primary school education could be considered more aware than other groups (Figure 1b).

Table 1. Clinical characteristics and prominent laboratory results of patients

Educational status	Uneducated (n = 46)	Primary school (n = 140)	Secondary school (n = 38)	High school (n = 42)	Postgraduated (n = 34)	p value
Age, year	60.72 ± 10.43	55.72 ± 8.52	52 ± 8.92	47.52 ± 7.68	46.38 ± 8.50	**0.001**
Gender, F / M, n (%)	34 (73.9) / 12 (26.1)	82 (58.6) / 58 (41.4)	23 (60.5) / 15 (39.5)	18 (42.9) / 24 (57.1)	9 (26.5) / 25 (73.5)	**0.001**
DM, year	10.5 (7 – 18.5)	7.5 (3.25 / 15)	5 (3 – 9.25)	3 (2 – 6)	2 (1 – 6.25)	**0.001**
DM treatment						
OAD, n (%)	19 (41.3)	76 (54.2)	23 (60.5)	36 (85.7)	28 (82.4)	**0.001**
Insulin, n (%)	13 (28.3)	46 (32.9)	12 (31.6)	2 (4.8)	5 (14.7)	**0.002**
OAD + Insulin, n (%)	14 (30.4)	18 (12.9)	3 (7.9)	4 (9.5)	1 (2.9)	**0.003**
Laboratory results						
Glucose, mg/dL	212.34 ± 45.39	209.92 ± 38.31	176.63 ± 45.12	189.85 ± 27.52	171.39 ± 46.72	0.067
HbA1c, %	8.61 ± 2.42	8.73 ± 1.92	8.17 ± 3.52	8.06 ± 1.57	7.93 ± 2.58	0.238
Creatinine, mg/dL	1.13 ± 0.27	1.12 ± 0.38	0.98 ± 0.47	0.97 ± 0.15	0.90 ± 0.25	0.173
Hemoglobin, g/dL	13.25 ± 0.28	13.73 ± 0.62	13.16 ± 0.59	13.82 ± 0.21	13.13 ± 0.53	0.538
TSH, mIU/L	3.34 ± 1.34	3.03 ± 1.92	3.29 ± 0.97	3.61 ± 1.84	3.49 ± 1.95	0.632
LDL, mg/dL	124.2 ± 33.5	132.5 ± 25.9	119.7 ± 39.5	116.6 ± 28.5	109.2 ± 23.8	**0.032**

The data are presented as mean and standard deviation or median and percentiles. The p-values were calculated using One-Way ANOVA and Chi-square test to compare all groups. **CAD**, Coronary artery disease; **CKD**, Chronic kidney disease; **DM**, Diabetes Mellitus; **F**, Female; **LDL**, Low-density lipoprotein; **M**, Male; **OAD**, Oral antidiabetic drug; **TSH**, Thyroid stimulating hormone.

The overall analysis of the responses regarding the source of awareness revealed that the highest source of knowledge was 47.5% from doctors, while the lowest was 2.7% from medical support teams (Figure 2a). The further representation of the sources of awareness according to educational status is presented in Figure 2b. Finally, the following logical correlations were identified. There was a positive correlation between age and diabetes duration ($p = 0.001$, $r = 0.534$), while education level was negatively ($p = 0.001$, $r = -0.461$) correlated.
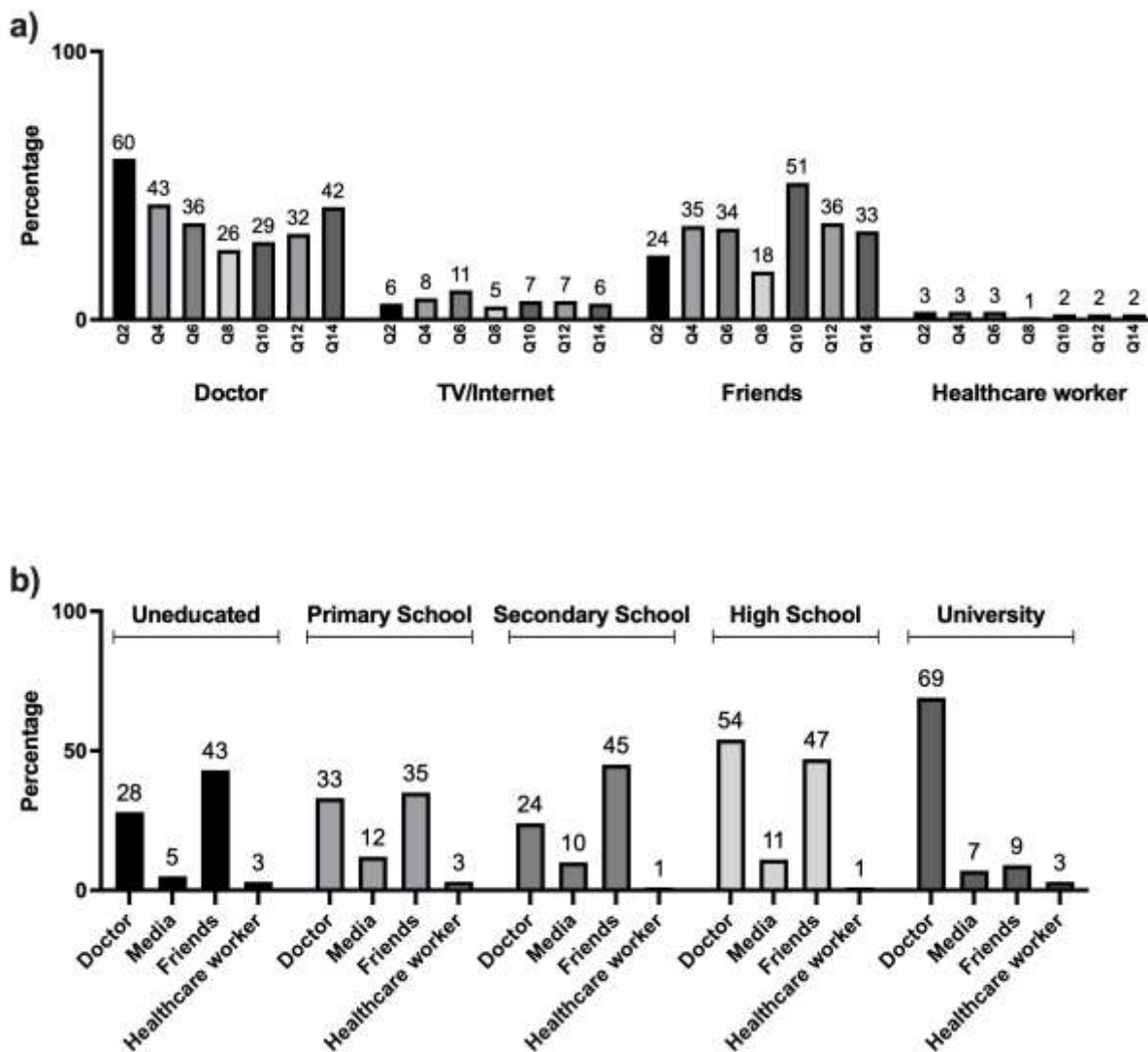

Figure 2. **a)** The sources of complication awareness among all patients; **b)** The components of complication awareness among patients based on their educational status.

DISCUSSION

The present study aimed to assess the level of awareness among diabetic patients regarding potential diabetes complications and the sources of this knowledge. The results revealed that the awareness level of diabetes complications was considerably high, and patients predominantly acquired this information from their attending physicians. Moreover, the education level was found to have a negative impact on the duration of diabetes, and its effect on awareness was pronounced. An intriguing observation was that insulin use decreased as the education level of the patients increased.

Awareness regarding one's illness is likely to exert a favorable influence on the progression of the patient's medical condition. Numerous studies have noted the significance of diabetes patients possessing knowledge about their illnesses. Diabetes patients must take charge of their health by engaging in regular exercise, consuming a nutritious diet, and correctly administering their medications. Additionally, it is crucial for patients to monitor their blood glucose levels independently. Extensive research has evidenced that blood glucose monitoring aids in preventing diabetes-related complications (10). Disease progression in diabetes is contingent upon several factors, such as lifestyle habits, control of blood glucose levels, and consistent medical check-ups. Nevertheless, it is widely acknowledged that patients who possess knowledge about their illness are better equipped to

regulate their blood glucose levels and forestall diabetes-related complications (11).

In our study, characterized by a noteworthy level of awareness regarding complications, it was observed that educational attainment exerted a positive influence on awareness. Nevertheless, it was also found that educational awareness had a bearing on resistance to the utilized or preferred treatment modalities. Specifically, in patients with lower educational levels, it was ascertained that insulin-based or adjunctive treatment options could be applied with greater ease. However, despite both educational awareness and medication options, it was noted that the average A1c levels of the patients did not reach optimal values.

Another crucial finding that can be inferred from the survey results is that patients' physicians who monitor their condition are their primary source of enlightenment. Close to half of all patients selected their physicians as their top choice for this source, while the second most common source was the Internet. This underscores the continued importance of doctor-patient collaboration in chronic diseases such as diabetes. Communication pertaining to diabetes persists not only within the domain of preventive measures but also during the phase of complications, contingent upon the priorities of either the healthcare provider or the patient (12). Notably, during the pandemic, a physician-based survey revealed delays in patient referrals despite 32% presenting with symptomatic manifestations (13).

As diabetes is known to increase the risk of vascular complications, including diabetic neuropathy, it is crucial for patients to have a high level of awareness and knowledge about these potential complications (14). This is especially important as diabetic neuropathy can be irreversible, and it can also pave the way for other vascular complications. Thus, it is imperative for patients to be well-informed about this condition and the steps they can take to prevent or manage it (15). The survey responses indicate that patients are still susceptible to complications in this context. Regardless of their educational level, patients exhibit low levels of awareness on this topic. Thus, patients should be trained in the best possible way regarding this knowledge gap.

Upon initial inspection, one of the most salient limitations of our study was the uneven distribution of participants across various patient subgroups. Notwithstanding the appreciable number of individuals with limited educational attainment, namely those who only completed primary school, this observation did not exert a confounding influence on the statistical computations. Additionally, we employed robust controls to account for potential covariates to bolster the credibility and generalizability of our findings. Moreover, the high response and completion rates indicate a strong engagement from the participants, enhancing our findings' validity. Using a sufficiently large sample size and rigorous methodology further increases the reliability of our study. As a final observation, the absence of inquiry into the participants' comorbidities would not only pertain to diabetes alone but also allow for assessing the awareness levels about other concomitant diseases.

CONCLUSION

Based on our study of the level of awareness among diabetic patients regarding complications, we have observed a higher level of awareness than expected. While education level had a positive impact on awareness, this was not the case for medication choice in diabetes treatment. Physician education still plays a more critical role in raising awareness compared to social media campaigns. High awareness of complications, which constitute an essential step in the mortality of diabetes, will contribute to improvements in disease progression.

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