IMPACT OF GENERAL EDUCATION STATUS ON GLYCEMIC CONTROL IN PATIENTS OF DIABETES MELLITUS

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ABSTRACT

Objective: To investigate the relationship of general literacy with control levels of HbA1c among the patients of diabetes at a tertiary care hospital of Pakistan.
Study Design: Cross-sectional analytical study.
Place and Duration of Study: Pak Emirates Military Hospital Rawalpindi, form Dec 2017 to Jun 2018.
Methodology: The sample population included patients of diabetes mellitus (DM) reporting for the routine checkup at medical Outpatient department (OPD) of Pak Emirates Military Hospital (PEMH) Rawalpindi. Serum HbA1c level was done after >8 hours of fasting and values were interpreted as normal reference percentages of excellent glycemic control 5%-6.5%, good glycemic control 6.6%-8% and poor glycemic control >8%. Relationship of education level was assessed with the glycemic control along with the age, gender and duration of diabetes mellitus.
Results: Out of 190 patients included in the final analysis, 18.4% had excellent glycemic control, 36.8% had good glycemic control while 44.7% had poor glycemic control. After applying the chi-square, it was found that increasing age and longer duration of diabetes mellitus has significant relationship with glycemic control while level of education has no association with glycemic control in our study population.
Conclusion: There was a high frequency of poor glycemic control among the patients of diabetes mellitus. Special attention should be paid to the older patients or those who have long standing diabetes mellitus.

Keywords: Diabetes mellitus, Education, Glycemic control, HbA1c.

INTRODUCTION

Diabetes mellitus is a major health syndrome in various parts of the world and major cause of disability in all age groups[1]. This chronic disease is an important risk factor for cardiac and cerebrovascular diseases, it often co-occurs with dyslipidemias and hypertension which further leads to various complications involving multiple systems of the body[2]. Diabetes requires lifelong medical care, patient self-management education and support to minimize the acute as well as chronic adverse outcomes of this multi-system disease. A great rise in the burden of this disease is expected in the years to come. The World Health Organization has projected that the number of persons diagnosed with diabetes would increase from 135 million in 1995 to 300 million in 2025[3]. Insulin and the oral hypoglycemic drugs have been the main stay of treatment for diabetes mellitus for many years[2].

Many factors have been involved in determining the health outcome and overall quality of life of the affected individuals. Low education level is one of the factors which are linked with poor health; more stress and low self-confidence[4]. Health literacy and general literacy are two independent and different factors in control of diabetes and should be dealt separately.

Health literacy is a constellation of skills, including the ability to perform basic reading and numerical tasks required to function in the health care environment[5]. Patients with poor health literacy levels have difficulties that range from reading labels on a pill bottle and interpreting blood sugar values or dosing schedules to comprehending appointment slips, educational

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brochures, or informed-consent documents. Patients with poor health literacy not only have limitations in reading but also may have difficulties processing oral communication and conceptualizing risk[6,7].

Many studies done in the recent past have also reported that low general educational status had no effect on glycemic control[8-10]. This emphasizes the importance of diabetes education clinics since general education level has no effect over better outcome in terms of glycemic control but health literacy has a definitive positive link with good glycemic control.

According to American Diabetes Association (ADA) monitoring of glycemic control is one of the important strategies for the management of diabetes, and glycosylated hemoglobin (HbA1C) is the best measure of glycemic level over the previous three months. Lowering hemoglobin A1C to less than or around 7% has been shown to reduce microvascular complications of diabetes and if implemented soon after the diagnosis of diabetes, it is associated with long-term reduction in macrovascular disease. The ADA recommends a goal of HbA1C, less than 7% for people with DM. Despite the availability of evidence-based guidelines and vast knowledge about microvascular and macrovascular complications due to this disease, clinical goals for diabetes outcomes are not being routinely achieved in practice[9].

General education status has usually been linked with good health practices. Pakistan is a developing country with limited resources and still struggling with the problems to improve the general literacy rate. This study was done to investigate the relationship of glycemic control with general education status of the diabetic patients.

METHODOLOGY

This cross sectional analytical study was conducted at Pak Emirates Military Hospital Rawalpindi between December 2017 to June 2018. Screening was performed on the patients suffering from type II diabetes mellitus diagnosed for more than one year presenting for routine checkup at the outpatient department. Sample size was calculated by using the WHO sample size calculator. Purposive sampling technique was used to gather the sample for this study. Exclusion criteria were disease of <1 year, ischemic heart disease, heart failure, liver and kidney diseases, hematological or oncological disorders, chronic infections, diuretics and antihypertensive for established disease, steroids use in recent past and hospital admission in last 3 months. Non-consenting patients and the patients who could not complete the proforma were also excluded from the study.

Parameters in the study include the following

Glycosylated Hemoglobin: HbA1c was used as the parameter to measure the glycemic control among the target population. It is most reliable and widely used parameter for this purpose. Levels of HbA1c were interpreted as

- Excellent HbA1c Control: Defined as serum HbA1c percentage between 5% to 6.5%
- Good Hb1Ac Control: Defined as serum HbA1c percentage between 6.5% to 8%
- Poor Hb1AC Control: Defined as serum HbA1c >8%
- Level of education: Depending upon the formal years of education, it was classed as
- Graduates: Student who has completed the bachelor degree from a college recognized by the higher education commission.
- Under Graduates: Student who has not completed the bachelor degree from a college recognized by the higher education commission.

Subjects were provided with a detailed description of the study and were inducted into the study after written informed consent. Ethical approval was obtained from the ethical review committee of Pak Emirates Military Hospital Rawalpindi. Subjects with confounding variables like presence of ischemic heart disease, heart failure, liver and kidney diseases, hematological

or oncological disorders, chronic infections, diuretics and antihypertensive for established disease, steroids use in recent past and hospital admission in last 3 months were identified by detailed history taking and excluded from the study. Serum Hb1Ac level was done after >8 hrs of fasting. Levels of the patients were carried out from the same laboratory to reduce the bias. Socio demographic variables were also collected. Variables in the study included age, gender, diabetes duration and education level. The socio demographic data of the full sample of patients participating in the research was entered in a structured proforma.

Statistical analysis was performed using Statistics Package for Social Sciences (SPSS) version 21. Characteristics of participants and the distribution of the HbA1c levels were described by using the descriptive statistics. Participants were categorically marked with excellent, good and poor glycemic control. Chi-square was done to evaluate factors related to glycemic control. Differences between groups were considered significant if *p*-values ≤0.05.

RESULTS

A total of 220 patient of type 11 DM were approached to participate in the study. Ten declined participation and 20 were ineligible due to exclusion criteria (5 gave history of IHD, 3 had oncological disease, 2 had chronic infections, 5 had HTN and 5 had liver or kidney disease), leaving 190 participants who had undergone HbA1c testing. Ninety seven (51.5%) patients included in the final analysis were female while 93 (48.5%) were male. Out of 190, 18.4% patients had excellent glycemic control, 36.8% had good glycemic control while 44.7% had poor glycemic control. Characteristics of the study participants are mentioned in the table, which shows increasing age and longer duration of diabetes mellitus were associated with poor glycemic control when the chi-square was applied. Level of education was not significantly associated with the glycemic control

Table: Characteristics of the study group and their HbA1c Levels.

Socio demographic factors	Patients with excellent glycemic control Frequency (%)	Patients with good glycemic control Frequency (%)	Patients with poor glycemic control Frequency (%)	*p*-value
Age				
≤55	13 (37.1)	37 (52.8)	26 (30.6)	0.018
>55	22 (62.9)	33 (47.2)	59 (69.4)	
Gender				
Male	14 (40)	33 (47.2)	46 (54.1)	0.346
Female	21 (60)	37 (52.8)	39 (45.9)	
Education				
Undergraduate	29 (82.8)	47 (67.1)	56 (65.9)	0.161
Graduate and above	6 (17.2)	23 (32.9)	29 (34.1)	
Duration of Diabetes				
≤5 years	20 (57.1)	37 (52.8)	26 (30.6)	0.004
>5 years	15 (42.9)	33 (47.2)	59 (69.4)	

DISCUSSION

Diabetes mellitus is a chronic illness which not only requires pharmacological treatment but also various life style modifications including diet and activity planning. Daily intake of various medications for rest of the life and changing your life style altogether demands certain level of understanding from the patient which is usually not required in acute or self-limiting diseases. Level of health education and general education has been associated with glycemic control in various studies done in the past on the patients of DM[10-13]. As a long standing illness, the whole set of changes involved in the life of patients demands clear understanding regarding the nature, treatment, prognosis and complications of

the illness. To achieve this understanding a baseline general education and specialized health education both can play a vital role. This study was planned to assess the role of one of these parameters i.e. general literacy rate. Using the HbA1c we found that 44.7% of our subjects showed poor glycemic control which is in accordance with the studies done in different parts of the world on the patients of non-insulin dependent DM[14,15]. Some of the factors that may affect glycemic control in these patients have been reported as low vitamin D levels, longer disease duration, smoking and poor medication adherence. Reason behind these may be related to physical, physiological or financial problems which are associated with this chronic debilitating disease[14,16]. Goals of successful treatment includes minimizing all these factors and maintaining a good glycemic control which reduces the chance of short term and long term complications.

Presence of poor glycemic control among diabetic patients on oral hypoglycemic is supported by local as well as foreign data[12,15,17]. Poor compliance and low education level have a strong correlation[12,13]. The type of education is basically the determining factor in many cases. Usually general education level does not predict compliance or good glycemic control. It's the specialized clinical education delivered at the time of diagnosis or routine OPD visits, which is a predictor of good response to the treatment[13]. This type of education is discussed under the umbrella of health literacy. It is easier for the health professionals to rely on the general education status but difficult for them to screen all the patients for specialized clinical education and incorporate it in their routine OPD standard operating procedures. Our study supported this practice, as general education status was not predictor of good response in our target population. Reason may be that patients with advanced education in some cases don't respond to the doctor with due concentration however unlettered patients or patients with low education as a rule depend exclusively on the doctor's recommendation and precisely listen to all the guidelines passed by him.Therefore, in most of the cases ignorance by lack of general education is covered up by more focused attendance of clinical education session regarding the illness. This shows the importance of not relying on routine formal education but enhancing the health literacy among the masses.

Various studies in past concluded that increasing age consistently correlate with poor glycemic control in non-insulin dependent diabetic patients[18,19]. Results in our study are similar to these studies. As the patient ages, his cognitive abilities decline and various physical and mental health issues arise which have impact on patients overall quality of life. He becomes less flexible and gives resistance to the routine medication. These physical, physiological and psychological factors may contribute to this finding in our study.

Gender has no association with glycemic control in our target population. Literature around the world also had variable data on this parameter[18,19]. Gender distribution in our study was also very even. Around half of the population was male and half was female so lack of association of gender with glycemic control with this study population may be because of this sampling bias.

Longer duration of DM was significantly associated with poor glycemic control in our study. Various studies done in the recent past support this finding[19,20]. Long standing illness with various complications drains the patient psychologically as well as financially. Illness and patient related factors affect the compliance in such patients[21]. Resistance with the medications may also contribute in this finding.

This study is very important for our setup as prevalence of DM is very high in Pakistan i.e. around 12%. The prevalence of type 2 diabetes mellitus in urban areas is 14.81% and 10.34% in rural areas of Pakistan[21]. Low socio-economic group status has also been linked with this metabolic disease making our study more relevant[22].

The major limitation of our study is the cross-sectional design which is not very beneficial in establishing a temporal relationship between the variables. As study was not comparative so we cannot hypothesize that poor glycemic control was or was not a consequence of low education level. The sample size, and use of self-administered proforma pose methodological issues as well. The findings cannot be generalized as this was not a population based study. A specific group of patients in a tertiary care hospital was targeted instead of a randomized sample of all diabetic patients reporting for routine check up at various hospitals of Pakistan. Another limitation is the chance that the patients may have fluctuations in blood sugar levels prior to or after the study period which could not be assessed. We suggest further studies on a broader based and a more representative sample size and also incorporating the level of specialized clinical education in the study design.

CONCLUSION

There was a high frequency of poor glycemic control among the patients of DM. Special attention should be paid to the older patients or those who have long standing DM. Level of general education had no association with the glycemic control therefore proper clinical education regarding DM and its treatment should be imparted in the diabetic clinic regardless of patients' baseline level of general education.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

REFERENCES

1. Forouhi NG, Wareham NJ. Epidemiology of diabetes. Medicine (Abingdon, England: UK ed). 2014; 42(12): 698-702.
2. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: Prevalence, numerical estimates, and projections. Diabetes Care 1998; 21(1): 1414-31.
3. The world health report 1997 - conquering suffering, enriching humanity. World Health Forum 1997; 18: 248-60.
4. The World Health Organization website. 2012. The determinants of health. Health Impact Assessment.
5. Ad Hoc committee on health literacy for the council on scientific affairs. Health literacy: Report of the council on scientific affairs. J Am Med Assoc 1999; 281(1): 552-57.
6. Doak CC, Doak LG, Root JH. Teaching patients with low literacy skills. Philadelphia, Pa: JB Lippincott; 1996.
7. Mayeaux EJ, Murphy PW, Arnold C, Davis TC, Jackson RH, Sentell T. Improving patient education for patients with low literacy skills. Am Fam Physician 1996; 53(1): 205-11.
8. Al-Akour, Nemeh A, Yousef KS. Glycemic control and its determinants among patients with type 2 diabetes mellitus attending a teaching hospital. J Diabetes Metab 2011; 2(1): 4-9.
9. Gonzalez-Zacarias AA, Mavarez-Martinez A, Arias-Morales CE, Stoicea N, Rogers B. Impact of demographic, socioeconomic, and psychological factors on glycemic self-management in adults with Type 2 diabetes mellitus. Frontiers Public Health 2016; 4(1): 195-99.
10. Bukhsh A, Nawaz MS, Ahmed HS, Khan TM. A randomized controlled study to evaluate the effect of pharmacist-led educational intervention on glycemic control, self-care activities and disease knowledge among type 2 diabetes patients: A consort compliant study protocol. Medicine 2018; 97(12): e9847.
11. American Diabetes Association. Standards of Medical Care in Diabetes. Diabetes care 2013; 3(suppl-1): 1-5.
12. Al-Rasheedi AAS. The role of educational level in glycemic control among patients with Type II diabetes mellitus. Intl J Health Sci 2014; 8(2): 177-87.
13. Kassahun T, Gesesew H, Mwanri L, Eshetie T. Diabetes related knowledge, self-care behaviours and adherence to medications among diabetic patients in Southwest Ethiopia: A cross-sectional survey. BMC Endocrine Disorders 2016; 16(1): 28-35.
14. Cheneke W, Suleman S, Yemane T, Abebe G. Assessment of glycemic control using glycated hemoglobin among diabetic patients in jimma university specialized hospital, Ethiopia. Bio Med Centre Res Not 2016; 9(1): 96-99.
15. Iqbal K, MehboobaliN, Iqbal MP. Association of vitamin D deficiency with poor glycaemic control in diabetic patients. J Pak Med Assoc 2016; 66(3): 1562-65.
16. Otiniano ME, Snih SA, Goodwin JS. Factors associated with poor glycemic control in older mexican american diabetics aged 75 years and older. J Diabetes Complication 2012; 26(3): 181-86.
17. Khowaja AL, Khuwaja AK, Cosgrove P. Cost of diabetes care in out-patient clinics of Karachi, Pakistan. BMC Health Serv Res 2007; 7(1): 189-92.
18. Ahmad NS, Islahudin F, Paraidathathu T. Factors associated with good glycemic control among patients with type 2 diabetes mellitus. J Diabetes Investigation 2014; 5(5): 563-69.
19. Kamuhabwa AR, Charles E. Predictors of poor glycemic control in type 2 diabetic patients attending public hospitals in Dar es Salaam. Drug, Healthcare Patient Safety 2014; 6(1): 155-65.
20. Polonsky WH, Henry RR. Poor medication adherence in type 2 diabetes: recognizing the scope of the problem and its key contributors. Patient Prefer Adherence 2016; 22(10): 1299-307.
21. Meo SA, Zia I, Bukhari IA, Arain SA. Type 2 diabetes mellitus in Pakistan: Current prevalence and future forecast. J Pak Med Assoc 2016; 66(12): 1637-42.
22. Suwannaphant K, Laohasiriwong W, Puttanapong N, Saengsuwan J, Phajan T. Association between socioeconomic status and diabetes mellitus: The national socioeconomics survey, 2010 and 2012. J Clinical Diag Res 2017; 11(7): LC18-LC22.