HBA1c
STATUS OF DIABETIC CONTROL IN URBAN FAISALABAD

ORIGINAL
PROF-1756

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ABSTRACT…Background: Type-2 DM is an epidemic globally and is the major heath problem. Public awareness has lead to increased screening and treatments. But unfortunately, control is very poor overall. People get treatment but do not check the advantages of treatment. **Objectives:** To see the success and accuracy of treatment of DM, this study was conducted. Diabetic control was assessed by HBA1C level. Design: Prospective study. **Setting:** Department of Medicine OPD of All major Hospitals Faisalabad. **Period:** From 01-03-2009 to 14-05-2009. **Methods:** This multicentric was carried out in different hospitals of Faisalabad. Total of 67 patients of both sexes and different age groups with Type-2 DM were evaluated for primary goal of control of DM by measuring HBA1C with point of care (POC) technology. Various secondary features ware also noted. **Results:** Total n = 67 males = 38 females = 29. Study revealed a poor control in all patients. Mean HBA1C in male was 85% and in female 87%. There were differences in HBA1C as regards to level of education, socio-economic status but there was no difference with regard to truncal obesity & type of transport used. **Conclusions:** DM control was very poor in all groups with respect to age, sex, and type of treatment. This is a matter of concern both to the patient and their attending physicians. Poor control has far reaching implications to the patients, society, and the family.

Key words: HBA1c, Diabetes Mellitus

INTRODUCTION

Type-2 Diabetes is an increasingly common chronic disease, effecting more than 150 million people worldwide and this number is expected to increase to 300 million by the year 2025. It is a progressive disorder characterized by insulin resistance associated with declining Beta-Cell function leading to multiple life threatening complications and morbidities, including micro and macro vascular complications. Because of the chronic disease and the significant morbidity and mortality associated with the vascular complications, type-2 diabetes has become a serious public threat with a heavy economic burden on the health care system. The dramatic increase in the incidence of type-2 diabetic has prompted efforts to identify subjects who are at increased risk of developing disease related complications. These complications correlate with the HBA1c levels as shown by Diabetes Control and Complication Trial (DCCT). Every one percent reduction in HBA1c lowers the risk of developing retinopathy, Nephropathy, and Neuropathy by 40%[1].

Hemoglobin A1c is an irreversible complex that forms when glucose binds to hemoglobin. The percentage of A1c is directly related to the average glucose level over the past 6 to 8 weeks. Blood glucose level from the past 30% to 50% of the total of A1c result[2]. The American Diabetes Association (ADA) recommends an A1c goal of less than 7%[3], while the American Association of Clinical Endocrinology recommends a goal of less than 6.5%[4]. About 20 % of people with diabetes are treated by diabetes specialists. These are fortunate to have a tight control measurement like A1c. The rest 80% or more are managed in the primary care setting with an average A1c greater than 8%[5]. Advances in access to physicians and patients A1c monitoring can benefit this largest group. Most of the cost of the diabetes---in suffering, in lost year of working capacity and in health care--- comes from its complications. Efficient glucose control and monitoring using HBA1c thus can reduce diabetes complications efficiently.

Objectives

Primary objective of the study was to use the single measurement of HBA1c by a portable easy to use standardized instrument to evaluate the control of diabetes mellitus in different groups of population in the district of Faisalabad. Secondary objective was to see

the effect of various variables like age, gender, obesity, educational and socio-economic status, type of treatment, etc on the HBA1c or degree of control.

MATERIAL & METHODS

It was a multi-centric prospective study designed to evaluate the control of type-2 diabetes mellitus in different groups of population. The groups of population were based on age, sex, educational status, socio-economic status, type of treatment (oral or insulin), truncal obesity and the type of transport they use. Patients earning rupees 15 thousand or less per month were included in low income group, rupees 16 thousand to 30 per month as middle income group while patients earning 30 thousand or more as high income group. Male patients with waist circumference greater than 102 cm (40inc) and female patients greater than 88cm (35inc) were categorized to have truncal obesity. A questioner was designed to collect the data from each patient. Consenting patients with diabetes underwent testing for HBA1c levels.

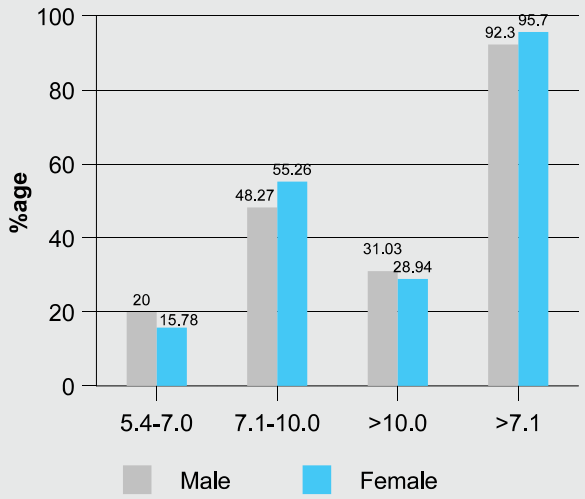
HBA1c was tested in the outpatient clinics by an instrument called A1C Now +. This instrument is National Glycohemoglobin Standardization Program (NGSP) certified. The purpose of NGSP is to standardized glycated hemoglobin test results so that A1C results are comparable to those reported in the DCCT where relationship to mean glucose and risk for vascular complications has been established. A1c Now + is portable, handheld device provides 99 % laboratory accuracy[6] which can be used in office and gives results in 5 minutes. HBA1c was checked in all centers with the same instrument.

RESULTS

A total of n = 67 patients were included in the study; out of them 38 were male and 29 female. The results were analyzed separately for male and female and then compared with each other.

Age distribution of male and female patient is shown in the figure 1. It shows that more than 75 % of the patients in both sexes were in the age range of 40 to 60 years, the most productive age of one's life.

Fig-1. Age distribution of male and female %age in patients



The mean age for male and female patients was 53.8 and 49.4 years respectively. Overall control of diabetes in both sexes is shown in table I.

Overall diabetes control was very poor in more than 90 % of male and female patients i.e HBA1c > 7.5. Only 10% patient fitted in the category of optimal control. A1c ranged from 5.4 % to 13 % in female and from 5.7 % to 12

Table-I. Overall control of diabetes in both sexes

HBA1C level %	No. of male patients	% of male patients	No. of female patients	% of female patients
5.4-7.0	6	20	6	15.78
7.1-10.0	21	48.27	14	55.26
>10.0	11	31.03	9	28.94
>7.1	38	92.3	29	95.7

% in male. Males did better but this was not statistically significant.

HbA1c level according to the educational status of both sexes are shown in table II.

Majority of the female patients 46.4% had primary education and exhibited the worst control. Male were more educated and had a slightly better control which was statistically significant.

Relationship of socio-economic status and HBA1c in both sexes is depicted in table III.

More than 75% of the patients in both groups belonged to low and middle income group. Men from low income group showed a very poor control (Mean HBA1c 9.03% while women from middle income group had mean HBA1C of greater than 9%).

The effects type of treatment diabetes in HBA1c levels are shown in table IV.

Majority of the male patients, 58 % were on insulin while 65 % of female were on oral hypoglycemics. Male showed no significant differences as regards to type of treatments while female patients did well on oral treatment (HBA1c 8.36) than a insulin treatment (mean HBA1c 9.02%) . This is quite significant.

Majority of the patients (84% in male and 70% in female) had truncal obesity but that did not have any impact on the control of diabetes. HBA1c levels according to transport used are depicted in table VI.

Table-II. Educational status and HbA1C Level

Education level	Mean HbA1C level (%)		SD		Min		Max	
	Male	Female	Male	Female	Male	Female	Male	Female
Up to primary level education	8.06	9.24 (13)	1.72	2.33	7.0	5.0	11	12.0
Up to secondary level education	8.56	8.88 (5)	1.40	2.71	6.5	6.0	11	13.0
Up to graduation and above	8.58	8.20 (10)	1.46	1.44	5.7	6.0	10.5	10.0

Table-III. Socio-Economic Status and HbA1C Level

Income level	Mean HbA1C level (%)		SD		Min		Max	
	Male	Female	Male	Female	Male	Female	Male	Female
Low income group	9.03	8.71	1.14	2.03	6.9	5.9	10.5	12.0
Middle income group	8.23	9.23	1.60	2.27	5.7	5.4	11.0	13.0
High income group	8.16	8.23	1.43	1.99	7.0	6.0	11.0	11.0

Table-IV. Type of Diabetic treatment and HbA1C Level

Type of diabetic treatment	Mean HbA1C level (%)		SD		Min		Max	
	Male	Female	Male	Female	Male	Female	Male	Female
Oral treatment	8.56 (17)	8.64 (17)	1.32	2.34	6.5	5.4	10.6	13.0
Insulin	11.57 (22)	9.18 (11)	1.55	1.77	5.7	6.0	11.0	11.0

Table-V. Truncal obesity and HbA1C Level								
Occurrence of truncal obesity	Mean HbA1C level (%)		SD		Min		Max	
	Male	Female	Male	Female	Male	Female	Male	Female
Absent	8.51 (34)	9.08 (18)	1.45	2.09	5.7	6.0	11.0	13.0
Present	8.78 (16)	8.43 (10)	1.47	2.20	6.5	5.4	10.6	12.0

Table-VI. Transport type and HbA1C Level								
Type of transport	Mean HbA1C level (%)		SD		Min		Max	
	Male	Female	Male	Female	Male	Female	Male	Female
Own / private	8.36 (20)	8.72 (16)	1.27	1.90	5.7	5.9	10.6	12.0
Public	8.66 (19)	9.02 (12)	1.62	2.44	6.5	5.0	11	13.0

Nearly half of male and female used their own transport and had no impact on HBA1c.

DISCUSSION

On the basis of the results of the study, we conclude that the level of HBA1c were significantly higher in all groups of population. Both male and female patients of higher income group had significantly lower HBA1c levels. The difference in the level of mean HBA1c was in the range of 0.54% to 0.93%. This can be explained on the basis of their being selective in diet, higher social class, and health consciousness. Females with higher education and an oral treatment of diabetes had also lower HBA1c levels. Perhaps the oral treatment was associated with better treatment compliance than insulin treatment and educational status reflected their better disease understanding and effect of control on their well-being. Male with primary education depicted a better control of their disease as shown by a low mean HBA1c. This was perhaps because of males of this class usually are laborers and do a lot of manual work. Presence and absence of truncal obesity and the type of transport used by the patient did not show any significant difference in the level of HBA1c in both male and female patients.

HbA1c is measure of the degree in to which hemoglobin is glycosylated in erythrocytes expressed as a percentage of total hemoglobin concentration. It reflects the exposure of erythrocytes to glucose in irreversible time and concentration dependent manner. HBA1c levels provide indication of the average blood glucose concentration during the pre-ceding 2 to 3 months, incorporating both pre and post prandial blood glucose levels.

A great deal of research had established that HBA1c level is a crucial test for use in the assessment of diabetic patient's degree of glycaemic control. Many major studies have proved that a decrease of one percent in HBA1c level shows significant reduction in diabetic complications. DCCT showed a 30% to 35% decrease in the risk of retinopathy, nephropathy and neuropathy per 1% decrease in HBA1c level in type 1 diabetic patients[7]. Kumamoto study showed a 30% to a 38% reduction in the risk of retinopathy, nephropathy and neuropathy per 1% decrease in HBA1c level in type 2 diabetic patients[8]. United Kingdom Prospective Diabetes Study (UKPDS) showed a 28% decrease in the risk of retinopathy per 1% decrease in HBA1c level in type-2 diabetic patients[9]. Wisconsin Epidemiological Study of Diabetic neuropathy and cardiovascular disease in HBA1c level disease[10]. Although HBA1c may be lowered by rapid erythrocyte turnover and altered in certain haemoglobinopathies, it provides an excellent tool for assessing overall diabetic control. However, several limitations to the acceptance as a absolute guide to the level of control of a given patient has been recently recognized[11].

In the UKPDS, the relationship between glycosylated hemoglobin values and fasting plasma glucose showed a wide confidence interval, with in HBA1c of 7 % corresponding to fasting plasma glucose of 149mg/dl, with a 95 % confidence interval of 83 to 212mg/dl. In the DCCT, patients whose HBA1c was higher than expected relative to their glucose level, had a higher rate of developing retinopathy and nephropathy, suggesting that either protein glycation may vary for a given degree of glycaemia and may contribute to differing rate of development of complications or that patient with higher HBA1C for a given mean glucose may have unrecognized glycaemic variability.

Of interest, in patient diabetes, the post prandial glucose level is most strongly correlated with HBA1c than is the fasting glucose[12]. Population studies provide strong evidence that the two hours post prandial glucose level is most strongly related to mortality than the fasting level[13]. The risk of microvascular endpoints also increases with post prandial glucose level[14]. The potential adverse effects of post prandial hyperglycemia include increased GFR and renal plasma flow, increase retinal blood flow, impaired endothelial vasodilatation, increased procoagulative processes, and increased oxidative stress.

Thus, although HBA1c is currently the principle tool for assessing diabetes control, one must continue to measure fasting and post prandial glucose levels, in the determination of individual glycaemic risk.

Life style changes and treatment with metformin both reduce the incident of diabetes mellitus in person at high risk. The life style intervention is more effective than metformin[15]. So a diabetic patient's education about life style is always important in achieving better hyperglycaemic control.

CONCLUSION AND RECOMMENDATIONS

On the basis of our study, we conclude that type 2 DM is not well controlled in most patients in the district of Faisalabad and author advocate that the patients as well as their attending doctors need to be educated more about the management of the disease and more frequent at least HBA1c once in every three months, checking of their HBA1c level and proper record should be maintained to keep a watch on the degree of control which will help us in preventing or delaying the complications of the disease.

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Article received on: 28/02/2011 Accepted for Publication: 04/07/2011 Received after proof reading: 12/08/2011

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Article Citation:
Yahya K.M, Iqbal K, Yahya H. Status of diabetic control in Urban Faisalabad as measured by HbA1C. Professional Med J Sep 2011;18(3): 430-435.

Our imagination is the only limit to what we can hope to have in the future.

(Charles F. Kettering 1876 - 1958)