Significance of proteinuria in type 2 diabetic patients treated at a primary health care center in Abha city, Saudi Arabia

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Summary

The aim of the present study is to describe the prevalence of proteinuria in a series of type 2 diabetic patients registered and followed up in the diabetes clinic of a primary health care center (PHCC) in Abha city, southern Saudi Arabia and to relate the proteinuria to some clinical manifestations. The study involved the files of 208 diabetic patients (118 females and 90 males). They were chosen from 475 files of diabetic patients receiving care in the PHC center of Shamasan in Abha City. The selection for this study was based on the fulfillment of certain criteria: type 2 diabetic patients, registered for at least 12 months and visited the clinic for at least once during that period. For each patient the age, sex, family history, diabetes duration, body mass index, the last readings of fasting blood sugar, total cholesterol level, systolic and diastolic blood pressure were used. Proteinuria was considered whenever the last and any of the preceding 3 urine analysis revealed it by the dipstick test provided the patient was not suffering on the day of the test from fever, urinary tract infections, other renal diseases or congestive heart failure. Further, the last recorded subjective evaluation of the treating physician concerning diet, drug and appointment compliance as poor or good was used. The mean age is 56.2 ± 8.8 years. The mean duration of diabetes was 9.6 ± 4.7 years, while the fasting blood sugar shows a considerably high mean of 218.0±72.0 mg/dl. The total cholesterol level on the other hand showed a slight high average of 233.7± 55.2 mg/dl. The mean systolic and diastolic blood pressure were within normal ranges (136.4±18.9mmHg and 87.5±10.8mmHg) respectively. The results of the three different types of compliance as scored by the treating physician. The poor scores dominate with 74%, 82.7% and 78.4% of patients' diet, drug and appointment compliances. Proteinuria is present in more than half of the patients (54.3%). The outcome of the logistic regression model for proteinuria showed that the significant factors were the poor glycemic control with an odds ratio (OR) of 3.13, diabetes duration (OR= 1.08 for every year) and diastolic blood pressure (OR= 6.11). The overall model prediction was 72.12%. Diabetic patients treated in the PHC level should be regularly monitored for microalbuminuria and not gross proteinuria to prevent progression to overt nephropathy which will eventually lead to ESRD. The risk increases with poorly controlled and hypertensive patients.

Keyword: ***Prevalence, Proteinuria, Type 2 diabetic patients.***

Résumé

Le but de cette étude est de décider la prevalence de la protéinurie dans une séries de 2 types des patients diabétiques inscrit et avec des soins post-hospitaliers dans une clinique des diabètes d'un centre des soins primaire (PHCC) dans la ville d'Abha en Arabie saudite du sud et d'établir un rapport entre la protéinurie et des manifestations cliniques. L'étude a concerne les dossiers de 208 patients diabétiques (118 du sexe féminin et 90 du sexe masculin). On les avait selectionné parmi 475 dossiers des patients diabétiques qui recoivent des traitements dans un centre PHC de shamasan dans la ville d'Abha. Le choix de cette étude était basé sur l'accomplissement de certains critères: Le type 2 patients diabétiques, inscrit au moins pendant 12 mois et fréquentent la clinique au moin une fois pendant cette période. Pour chaque patient, L'âge, sexe, histoire de la famille, durée des diabètes, indice de mass du corps, la derniere indication de la diète glucose sanguine faux total de cholestérol, tension artérielle systolique et diastolique ont été utilisés. On a étudié la protéinurie chaque fois que le dernier et n'importe quel de 3 analyse ont été utilisés. On a étudié la protéinurie chaque fois que le dernier et n'importe quel de 3 analyse d'urine précédant l'indique à travers la bandelette réactive à condition que le patient ne souffre pas de la fièvre infection urinaire, d'autres maladies rénales, ou congestion d'arrêt cardiaque. De plus on a utilizé la dernière évaluation subjective, notée par le medecin traitant concernant l'observation d'alimentation de la drogue et du rendezvous, comme mauvais ou bon. L'âge moyen est 56, 2 ± -8,8 ans. La durée moyenne des diabètes était 9, 6 ± 4,7 ans, tandis que la diète glucose sangui a indiqué un moyen bien élevé de 218,0 + -72,0mg/dl le taux total de cholestérol d'autre part, a montré un moyen peu élevé de 233,7 + -55,2 mg/dl. La tension artérielle systolique et diastolique moyenne étaient de l'ordre normal (136,4 + 18 gmmHg et 87,5 ± 10,8mmHg) respectivement. Les résultats de trios types différents d'obserations comme notés par le médicine traitant. Le mauvais scores domine avec 74%, 82,7% et 78,4% d'alimentation, de drogue et rendez vous observation des patients. La proteinurie est présente chez plus d'un demi des patients (54,3%). Le resultat des données logistiques du modele de la régression pour la protéinurie a montré que des facteurs importants étaient le mauvais controle glycémique avec un rapport bizarre (ou) de 3,13, durée diabetes, (ou = 1,08 chaque année) et tension artérielle diastolique (ou = 6,11). Dans l'ensemble, la prédiction du modele était 72,12%. Les patients diabétiques soignés au niveau du PHC devront etre regulierement surveillé pour la microalbuminurie et pas une grande protéinurie afin d'éviter la progression à la néphbropathie évident qui va finalement provoquer ESRD. Le risque s'accroit avec un mauvais contrôle et des patients atteints d'hypertension.

Introduction

Diabetic nephropathy is a frequent microvascular complication of both type I and type 2 diabetes mellitus. The

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kidney lesions whether diffuse or nodular are associated with the clinical syndrome of proteinuria, hypertension and progressive renal failure. The diagnosis of incipient nephropathy depends on the presence of persistent microalbuminuria which is defined as a urinary albumin excretion rate >30 mg/24 hours (20µg/minute) and <300 mg/24 hours (200µg/minute), regardless of how the urine has been collected[1]. Overt persistent proteinuria marks the onset of the clinical phase of diabetic nephropathy[2]. Diabetic nephropathy is the single most common cause of end stage renal disease (ESRD) world wide and it is estimated that 35% of patients admitted to renal replacement programs in the United States and 15% in Europe are due to diabetic nephropathy[3,4]. In Saudi Arabia, diabetes mellitus is becoming a major medical problem as a result of dramatic changes in the life style of the Saudi population.

A national survey identified prevalence as high as 50% of the population after the age of 50 years in some regions[5]. In addition some studies showed that 16-45% of the new cases of ESRD are due to diabetes[6,7]. Diabetic nephropathy was described in two hospital based studies relying on clinically detectable proteinuria. Thus, Fatani et al[8] found nephropathy in 11.4% of patients with type 2 diabetes while Famuyiwa et al[9] found that 18.2% of the patients with type 2 diabetics had nephropathy. Both studies adopted the positive albustix test for protein in urine.

The aim of the present study is to describe the prevalence of proteinuria in a series of type 2 diabetic patients registered and followed up in the diabetes clinic of a primary health care center (PHCC) in Abha city, southern Saudi Arabia.

The relation of proteinuria, detected by conventional methods, to some clinical manifestations and its value as an early detector of ESRD is discussed.

Methodology

The study involved the files of 208 diabetic patients (118 females and 90 males). They were chosen from 475 files of diabetic patients receiving care in the PHC center of Shamasan in Abha City. The routine practice is that all patients are to pay regular monthly visits to perform fasting blood sugar test, receive their medications, mention any complaint and treated for it and have a health education session by the treating physician. The morning urine is to be tested in the center every three months by the dipstick test for proteins. Patients are referred yearly to the secondary level hospital for the annual checkup where they should carry similar tests to those done in the center beside some liver and kidney function tests, ECG and ophthalmologic examination. Total 24 hours protein is supposed to be tested at the hospital but none of the patient has done it and only proteinuria diagnosed by the dipstick test was recorded in the files. The selection for this study was based on the fulfillment of certain criteria: type 2 diabetic patient, registered for at least 12 months and visited the clinic for at least once during that period. For each patient the age, sex, family history, diabetes duration, body mass index, the last values of fasting blood sugar, total cholesterol level, systolic and diastolic blood pressure were used. Proteinuria was considered whenever the last and any of the preceding 3 urine analysis revealed it by the dipstick test provided the patient was not suffering on the day of the test from fever, urinary tract infections, other renal diseases or congestive heart failure. Further, the last recorded subjective evaluation of the treating physician concerning diet, drug and appointment compliance as poor or good was used.

Descriptive statistics were applied and the significant factors introduced in a multiple logistic regression model. The dependent factor was the presence or absence of proteinuria while the independent factors were the glycemic control (acceptable up to 160 mg/dl), total cholesterol level (acceptable up to 200 mg/dl), gender, diabetes duration in years, systolic and diastolic blood pressure dichotomized into normal or high according to WHO guidelines for hypertension.

Results

Table 1 describes the relevant findings in the population of the study. It shows that the mean age is 56.2 ± 8.8 years. The mean duration of diabetes was 9.6± 4.7 years, while the fasting blood sugar shows a considerably high mean of 218.0±72.0 mg/dl. The total cholesterol level on the other hand showed a slight high average of 233.7±55.2 mg/dl. The mean systolic and diastolic blood pressure were within normal ranges (136.4±18.9mmHg and 87.5±10.8mmHg) respectively.

Table 1 Characteristics of the population of the study (n = 208)

	X ± SD	CI	Median	Minimum	Maximum
Age (Years)	56.2 ± 8.8	55.0 - 57.6	57.0	39.0	75.0
DM duration (years)	9.6 ± 4.7	8.9 - 10.2	8.0	1.0	23.0
Family members	8.3 ± 4.1	7.8 - 8.9	8.0	1.0	20.0
Fasting blood sugar (mg/dl)	218.0 ± 72.0	208.2 - 227.9	211.0	102.0	393.0
Cholesterol level mg/dl	233.7 ± 55.2	226.1 - 241.2	230.0	137.0	480.0
Systolic blood pressure mmHg	136.4 ± 18.9	133.8 - 138.9	130.0	110.0	180.0
Diastolic blood pressure mmHg	87.5 ± 10.8	86.0 - 88.9	90.0	70.0	111.0

Table 2 Compliance scores and results of urine protein in the population of the study (n = 208)

	No	(%)
Diet Compliance:		
Good	54	(26.0)
Poor	154	(74.0)
Drug compliance:		
Good	36	(17.3)
Poor	172	(82.7)
Appointment compliance		
Good	45	(21.6)
Poor	163	(78.4)
Proteinuria		
O	95	(45.7)
+	46	(22.1)
++	44	(21.2)
+++	23	(11.0)

Table 2 depicts the results of the three different types of

Table 3 Results of the logistic regression model with proteinuria as dependent factor

Independent variable	Exp (B)	95%CI Upper	Lower	Significant
Glycemic control	3.13	1.57	6.24	p<0.001
Cholesterol level	1.51	0.73	3.11	N. S.
Gender	1.31	0.67	2.57	N. S.
Diabetes duration	1.08	1.0	1.16	p <0.000
Diastolic BP	6.11	3.21	11.64	p < 0.001

Overall predicted = 72.12%

compliance as scored by the treating physician. The poor scores dominate with 74%, 82.7% and 78.4% of patients' diet, drug and appointment compliances. Proteinuria is present in more than half the patients (54.3%).

Table 3 shows the outcome of the logistic regression model for proteinuria. The significant factors were the poor glycemic control with an odds ratio (OR) of 3.13, diabetes duration (OR= 1.08 for every year) and diastolic blood pressure (OR= 6.11). The overall model prediction was 72.12%.

Discussion

Diabetic nephropathy continues to be a major challenge to nephrologists and primary care physicians as it is, at least in part a preventable condition. Protein in urine represents the earliest and most sensitive indicator of renal involvement. In some prospective studies, the risk of renal failure and of cardiovascular events was clearly predicted by albuminuria[10,11]. Several procedure for testing albuminuria have been proposed, including 24 h urine collections, overnight collection, short term collection in the clinic and random or early morning (first voided) urine[13]. It is agreed that a timed urinary albumin excretion rate, either a 24 h or overnight collection is clearly the most sensitive of assays[14]. However, precisely timed urine collections are impractical and inconvenient for many patients. Detection of microalbuminuria can be done by using especially sensitive strips that can detect level of urinary albumin as low as 20µg/dl. Alternatively, measurement of the albumin: creatinine ratio (>30 mg/g and <300 mg/g) indicates the presence of microalbuminuria and incipient diabetic nephropathy. Unfortunately, sensitive strips to detect microalbuminuria and measurement of albumin-creatinine ratio are not routinely done in the clinical practice at primary health care level and conventional dipsticks method of analysis is used instead. Moreover, an audit study for the quality of outpatient care provided to diabetic patients in a large health maintenance organization in the USA showed that 51% of patients did not have any type of urine protein detection test[12].

Proteinuria detected by conventional methods (dipstick) does not readily reveal low levels of albumin implying a high risk of late evolution of renal failure. This fact gave 'microalbuminuria' its considerable clinical importance.
This study, observing the need to introduce the technique of microalbuminuria detection for diabetic patients, undertook the conventional proteinuria test as an index of a defective diabetic care quality.

The prevalence of macroalbuminuria among the population of the study was very high (54.3%). A Saudi study performed in Riyadh, published in 1995[15] reported a rate for gross proteinuria of 37% among patients selected on the basis of showing micro or macroalbuminuria and or hypertension. It should be noted here that proteinuria of non diabetic origin which occurs in up to 25% of NIDD patients may contribute to this disparity[16]. Moreover it seems that ethnicity has some role. Thus, this rate is about 25% after 20 years of diabetes in Europeans while in Pima Indians and Japanese it reaches up to 50% after the same duration. A susceptibility factor, either genetic or shared environmental, appear to be critical in the pathogenesis of diabetic nephropathy[17]. However, one should also consider the degree of compliance to standard methods of urine collection in the PHC setting.

The mean duration of diabetes in the population of study was about 10 years which agrees with reports estimating the period of 10-15 years after diagnosis for appearance of macroalbuminuria. The patients were poorly controlled with a mean fasting blood sugar of 218.0 ±72.0 mg/dl as well as high mean total cholesterol level 233.7±55.2 mg/dl which goes in accordance with the poor compliance for drug, diet and appointment in this population. The mean systolic and diastolic blood pressures were in the upper normal range. From the logistic regression model, it is seen that those with poor glycemic control and high diastolic pressure beside the longer duration of diabetes are those having higher levels of proteinuria. This was verified in several previous studies[18,19]. In fact, hypertension was designed as both a promoter and a sequel of diabetic nephropathy[20,21]. This study indicates the need for introducing more sensitive tests to identify early signs of diabetic nephropathy at the level of primary health care centers. Early detection of microalbuminuria is an essential step to identify patients at risk and design intervention to prevent or delay progression to ESRD and major cardiovascular complications.

Conclusion

Diabetic patients treated in the PHC level should be regularly monitored for microalbuminuria to prevent progression to overt nephropathy which will eventually lead to ESD. The risk increases with poorly controlled and hypertensive patients. This entails considerable financial loss beside the moral obligation of saving lives. The practice of taking gross proteinuria as an indication of renal involvement does not comply with the perspective of prevention which, the PHC is by definition obliged to assume.

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