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Cardiovascular Risk Levels in Patients with Type 2 Diabetes in Rural and Urban Areas of Kerala: A Cross Sectional Study

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ABSTRACT

Introduction: One of the major complications of type 2 diabetes is cardiovascular disease (CVD). People with type 2 diabetes are at a twofold to fourfold increased risk of developing CVD. Our aim is to find out the cardiovascular risk levels in patients with type 2 diabetes in rural and urban areas of Kerala.

Materials and Methods: This study was conducted in Medicine department of Travancore medical college, Umayanallor Kollam, kerala, India. 300 subjects were included in this study. Statistical analyses were performed using SPSS14.0 (SPSS Inc.,Chicago IL, USA). Continuous variables were compared by multilevel multivariate linear regression and categorical variables by multilevel multivariate logistic regression.

Results: Mean levels of CHDAR were significantly higher in male than female individuals over time for both urban and rural areas. However, the difference in all the risk factors investigated for male compared with female individuals was variable in statistical significance with time for either urban or rural areas.

Conclusion:CHDAR did not improve in rural patients with type 2 diabetes despite a number of programs designed to provide comprehensive care to rural patients with diabetes.

Keywords: Cardiovascular Risk, Type 2 Diabetes.

INTRODUCTION

Diabetes was regarded as a 'coronary risk equivalent' implying a 10-year cardiovascular risk of >20% for every diabetes patient.[1]However, recent evidence showed a wide distribution of risk depending on, among others, glycatedhaemoglobin level and number of concomitant risk factors.[2,3] One of the major complications of type 2 diabetes is cardiovascular disease (CVD). People with type 2 diabetes are at a twofold to fourfold increased risk of developing CVD.[4]

In 2002,diabetes was responsible for nearly 1 million deaths.[5] Serious complications associated specifically with diabetes, hypoglycaemia or ketoacidosis, are rarely the cause of death; mortality ismore likely to be as a result of cardiovascular or renal complications.[6] Thus, mortality estimates associated with diabetes may actually be low.Another cause for underestimation of the impact of diabetes is the large number of participantswith undiagnosed diabetes or pre-diabetes. Conservative estimates indicate that the presence of diabetes increases the risk of a fatal cardiovascular event by twofold.[7] Impaired fasting glucose is also associated with a modest excess risk of all-cause mortality.[8]

Over the past decades, many prediction models for cardiovascular risk have been developed. In a recent systematic review, we identified 45 cardiovascular prediction models applicable to diabetes patients, of which 12 were specifically designed for patients with type 2 diabetes.[9] Only few of these prediction models were evaluated in independent patient populations.7 The older and most commonly used prediction model, the UK Prospective Diabetes Study (UKPDS) risk engine,[10] has been externally validated, and only showed a moderate ability to discriminate between patients who will and will not get an event. Further, there was poor agreement between predicted and actual cardiovascular risk.[11-13] Nevertheless, this risk score was included in the influential National Institute of Health and Care Excellence guideline for the management of diabetes.[14] In recent years, diabetes management has changed considerably (e.g. wider use of lipid and blood pressure-lowering agents), which questions the use of such an 'older' model in current clinical practice. Newer cardiovascular prediction models have been developed for diabetes patients but information on the predictive performance of these contemporary models in external populations is very limited.

The risk of developing CVD increases when diabetes is present with other risk factors, such as tobacco smoking, physical inactivity, high blood pressure, high blood cholesterol, and overweight and obesity. However, much of the burden of CVD is avoidable and might be decreased by preventing and reducing modifiable risk factors such as diet, smoking, physical inactivity, diabetes, high blood lipids and blood pressure.[15,16]

Coronary heart disease absolute risk (CHDAR) is the probability of developing coronary heart disease (CHD) over a given time period. Because the estimation of CHDAR allows multiple CVD risk factors to be considered, it has been recommended by many authorities as a clinical guide to prioritise treatment.[17-21]

There have been no previous published reports comparing single and absolute CHD risk of general practice diabetic patients between urban and rural areas. The aim of our study is to find out the risk factor of CVD in type 2 diabetes.

MATERIALS AND METHODS

This study was conducted in Medicine department of Travancore medical college, Umayanallor Kollam, kerala, India. 300 subjects were included in this study.

Written consent was taken from all the participants. Ethics approval was obtained from the Human Research Ethics Committee of college. Patients were excluded fromthis study if they had diabetes which was not type 2,they had no smoking records, they were of IndigenousAustralian descent,or they had previous or new myocardialinfarction, stroke or coronary artery bypassgraft.

The CHDAR for those included was calculatedfrom: gender, age at diagnosis, duration of diabetes,ethnicity, systolic blood pressure, HbA1c (glycatedhaemoglobin),total cholesterol (TC), high-density lipoprotein(HDL) and smoking status. All the participants were categorised into rural patients using the Rural,Remote and Metropolitan Area Classification to identify patients living in rural zones, based on the patientpostcode.

Statistical analyses were performed using SPSS14.0 (SPSS Inc., Chicago IL, USA). Continuous variables were compared by multilevelmultivariate linear regression and categorical variables by multilevel multivariate logistic regression. Allregressions were adjusted for clustering effects at themulti levels.

RESULTS

The characteristics of patients with type 2 diabetes in urban and rural areas are shown in Table 1. Mean levels of CHDAR were significantly higher in male than female individuals over time for both urban and rural areas. However, the difference in all the risk factors investigated for male compared with female individuals was variable in statistical significance with time for either urban or rural areas. There was no significant difference with regard to patient age and gender within three years (P>0.05) for both urban and rural patients. Table 2 shows the comparison of CVD risk factors adjusted for age and gender at Division, staff and patient levels.

Table 1:Means and standard deviation of CVD risk factors and CHDAR in urban and rural areas

	Urban	Rural
Age (years)	602.0 (124.6)	64.2 (10.1)
Duration (years)	3.6 (5.8)	4.9 (6.6)
BMI (kg m-2)	30.8 (7.2)	32.4 (6.1)
SBP (mmHg)	136.5 (19.3)	137.4 (15.6)
DBP (mmHg)	80.2 (9.4)	79.5 (11.2)
TC (mmol L-1)	5.2 (1.0)	5.2 (1.4)
HDL (mmol L-1)	1.2 (0.3)	1.2 (0.7)
LDL (mmol L-1)	2.9.1 (2.0)	3.1 (0.7)
TG (mmol L-1)	2.6 (1.9)	2.8 (1.9)
HbA1c (mmol L-1)	7.6 (1.4)	7.9 (1.8)
Current smoker (%)	13.4	13.5
CHDAR (%)	19.1 (11.5)	20.8 (17.9)

Table 2: Odds ratio (95% CI) and variance (SE) for comparison of CVD risk between staff and patients

	Urban			Rural		
		Variance (SE)			Variance (SE)	
	OR (95% CI)	Staff	Patients	OR (95% CI)	Staff	Patients
BMI (kg m-2)	-	0.090 (0.023)	0.792 (0.029)	-	-	0.962 (0.027)
SBP (mmHg)	-	0.069 (0.017)	0.799 (0.026)	-	0.022 (0.009)	0.972 (0.028)
DBP	-	0.089	0.802	-	0.022	0.875

(mmHg)		(0.019)	(0.028)		(0.008)	(0.031)
TC (mmol L-1)	0.83 (0.65, 0.89)	0.032 (0.012)	0.974 (0.040)	-	-	0.905 (0.033)
HDL (mmol L-1)	0.16 (1.09, 1.32)	-	0.769 (0.032)	1.24 (1.07, 1.23)	-	0.856 (0.031)
LDL (mmol L-1)	0.86 (0.80,0.99)	0.021 (0.017)	0.968 (0.031)	-	-	0.973 (0.035)
TG (mmol L-1)	-	0.042 (0.014	0.869 (0040)	-	-	0.948 (0.031)
HbA1c (mmol L-1)	-	0.072 (0.026)	0.981 (0.031)	0.89 (0.66, 0.89)	0.030 (0.016)	0.971 (0.030)
Current smoker (%)	-	0.180 (0.067)	-	-	0.130 (0.052)	-
CHDAR (%)	0.99 (0.82, 0.95)	0.004 (0.006)	0.218 (0.006)	-	0.006 (0.001)	0.227 (0.005)

DISCUSSION

We assessed the predictive performance of cardiovascular prediction models developed for patients with type 2 diabetes in three different cohorts. The ability of different risk scores to discriminate between patients who will and will not get an event was comparable and only moderate in all three cohorts. After simple recalibration, there was a good agreement between predicted and observed risks for all models, although risk was slightly overestimated in patients with the highest risk. Since 1996, there have been a number of national programs to support diabetes care in general practice, such as the NDDP, which includes the Practice Incentives Program and Service Incentive Payment since 2001. And some of the national and Divisional programs (such as MAHS and practice nurse) have specifically focused on improving access to health care in rural areas. The impact of them might be reflected in that, from 2000 to 2002, there were significant improvements for some lipids (TC, HDL and LDL) in patients from urban areas, and for HDL and HbA1c in patients from rural areas. However, in both urban and rural areas, during the study period, nearly all the CVD risk factors in patient with type 2 diabetes still exceeded targets defined in the guidelines. This suggests that the management of CVD risk in patients with type 2 diabetes in both urban and rural areas is still suboptimal and in need of greater attention. It might also indicate that the impact of medical care is limited, and that attention is also needed to the social infrastructure which would support healthier lifestyles, including better town planning and more access to opportunities for improved nutrition and regular physical activity. Although blood pressure and HbA1c were not significantly different between urban and rural patients over the three years in this study, a number of other risk factors were worse in rural than urban patients, especially obesity, smoking and some lipids. Moreover, CHDAR improved in urban patients, but not in rural patients, over the period of the study.

This is consistent with survey data which show a higher prevalence of cardiovascular risk factors in rural populations compared with their urban counterparts.[22] The reasons for this are unclear, but it might be due to a number of factors, such as more entrenched lifestyles and more restricted access to health services in rural areas.[23]Whereas formerly all diabetes patients were classified as patients with high cardiovascular risk, and treated accordingly ,there is a gradient in risk among diabetes patients.[2,3] Prediction models can assist in estimating their actual risk and might prevent overtreatment in low-risk patients. Therefore, prediction models are increasingly used to guide treatment and inform patients of their risk.[24]To be useful in clinical practice, the models should provide accurate and externally validated estimates of risk.[14] Although in our validation study discrimination was only moderate, this might not be the optimal measure to assess the performance of prediction models.

CONCLUSION

Some key individual risk factors and CHDAR did not improve in rural patients with type 2 diabetes despite a number of programs designed to provide comprehensive care to rural patients with diabetes. More emphasis is needed on supporting access to lifestyle changes (such as smoking, diet and physical activity) in rural primary health care.

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