The Current Clinical Practices for Prevention of Cardiovascular Disease Risk Factors in Type 2 Diabetes Mellitus

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ABSTRACT

BACKGROUND

India is one of the countries which has seen a rise in diabetes mellitus type 2 patient in last 2 decade. It is a known fact that patients suffering from diabetes mellitus have risk of developing many diseases like angiopathies and retinopathies. . The purpose of this study was to assess cardiovascular disease (CVD) risk factors and find out current clinical practices for prevention of cardiovascular diseases in diabetes type 2 patient attending diabetes out-patient department (OPD).

METHODS

This is a cross sectional study on 96 randomly selected patients who were diagnosed for diabetes mellitus type 2 for more than 3 months. CVD risk factors were studied using structured questionnaire about sociodemographic factors such as age, gender, family history, dyslipidaemia, hypertension, inactive physique, unsuitable food, excessive use of alcohol and all types of cigarettes; current medicines [anti-platelet medication, statins, angiotensin blocker, angiotensin converting enzyme inhibitors (ACEI)]; history of diabetes or CVD; time since diabetes is diagnosed; average number of times or frequency of follow-up and physical activity visits to health centres.

RESULTS

Present study shows abdominal obesity (84 %), unhealthy diet (86 %), physical inactivity (81%), dyslipidaemia (n = 68, 70.83 %), uncontrolled diabetes (63 %), hypertension (50 %) and age more than 60 years (41%) as the major cardiovascular diseases risk factors. Use of anti-platelet was present in 55 %; 74 % of hypertensives were using angiotensin receptor blockers (ARBs)/ACEI; 63 % of dyslipidaemia patients were using atorvastatin. This study showed that lifestyle modification has a sustained effect in preventing cardiovascular risk factors in type 2 diabetes patient.

CONCLUSIONS

Behavioural risk factors like unhealthy diet, physical inactivity, control of hypertension and hypercholesterolemia is a cause of concern in diabetes patient for preventing cardiovascular risk factor.

KEY WORDS

Type 2 Diabetes Mellitus, Clinical Practices and CVD Prevention.

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BACKGROUND

In world, India records highest incidences of type 2 diabetes (T2DM). T2DM affects around 78 million people in India.¹ Diabetic individuals have a two- to four-fold higher risk of coronary artery disease, which is equivalent to that of non-diabetic individuals who have had a previous myocardial infarction. One of the prime causes of death among diabetics is cardiovascular disease.²⁻⁴ According to studies, cardiovascular incidents occur six years earlier on an average in India than in other countries.⁵ Due to the comparatively younger age of commencement of cardiovascular issues, India is expected to lose 43.5 million disability adjusted life years by 2020, making coronary artery disease prevention within population at foremost risk, such as people with type 2 diabetes mellitus, a public healthcare priority.^{5,6}

Individual cardiovascular risk factors are assessed and managed appropriately, resulting in a considerable reduction in the occurrence of cardiovascular events. When all cardiovascular risk factors are addressed in people with T2DM, macro vascular events are reduced by about 53 %. As a result, the most effective technique for preventing cardiovascular problems in type 2 diabetes mellitus patients is a comprehensive risk evaluation and total risk reduction therapy.⁷

Several studies demonstrate void in the application of screening and therapy for management of cardiovascular disease risk factors among patients with type 2 diabetes mellitus, despite proof in favour of complete interventions and fairly inexpensive medication costs to prevent cardiovascular diseases among diabetics.⁸⁻¹⁰

This is more pronounced in rural India where the accessibility of healthcare is a challenge among rural Indian population with T2DM. Hence, this study was done to determine the current clinical practices for prevention of cardiovascular disease risk factors in type 2 diabetes mellitus from rural area of central India.

Aims and Objectives

1. To count the risk factors for cardiovascular disease in people with type 2 diabetes.
2. To analyse about the present day clinical strategies for preventing cardiovascular disease risk factors in people with type 2 diabetes.

METHODS

This cross-sectional study was conducted in tertiary care rural teaching hospital of central India. Study participants were patients over 18 years of age diagnosed with type II diabetes as based on American diabetes association (ADA) criteria or are currently on glucose-lowering medication and after consent. Seriously ill patients with type 2 diabetes mellitus, and women with gestational diabetes were excluded from the study. People with type 1 diabetes were excluded.

As no population-based studies on the prevalence of CVD risk factors in people with T2DM in rural India exist, we chose 50 percent prevalence of CVD as the maximum sample

size at the stated absolute precision of 10 % and 95 percent confidence level; the intended minimum sample size is 96.

To analyse the presence of cardiovascular disease risk factors, participants were interviewed using a systematic questionnaire on the current practices for prevention of CVD risk factors. Information regarding demographics was collected as well. The questionnaire will be pilot tested prior to data collection.

The institutional ethics committee accepted the protocol. Participants provided written informed consent and were promised of secrecy. Participants were interviewed in their native tongue (Marathi). Data was collected for presence of cardiovascular risk factors such age, gender, family history, dyslipidaemia, hypertension, absence of physical inactivity, poor nutrition, and inappropriate use of alcohol and cigarettes in all forms; the average number of visits to a health institution and most significantly, the duration after diabetes was diagnosed, as well as current medicine. Participant's use of preventive therapy for management of CVD risk factors was based on documents or prescriptions available with participants and use of medication for prevention of CVD risk factors. Use of preventive therapy for CVDs risk factor was considered if consumed medications like anti-platelet drugs, lipid lowering drugs and blood pressure lowering drugs. Intake of medications was noted by observing rapper of empty pills and prescription of diabetes was considered. Counselling advice and appropriate management of obesity (diet and physical inactivity or medication), tobacco use and alcohol dependence were given.

A 24-hour food recall provided information regarding the diet. A mercury sphygmomanometer was used to assess blood pressure, as per JNC VII protocol.¹¹

Weight (kg), height (m), waist and hip circumference (cm) were measured using World Health Organization (WHO) protocol. Waist hip ratio was calculated as per WHO protocol.¹²

CVD Risk Factor Definitions

Underweight - 18.5 kg/m², normal - 18.5 - 24.9 kg/m², overweight - 25.0 - 29.9 kg/m², and high risk > 30.0 kg/m² were the BMI classifications.¹³

A waist circumference of > 90 cm in men and > 80 cm in women, as well as a waist-to-hip circumference of 0.80 for women and 0.95 for men, was considered abdominal obesity.

Hypertension is defined as "blood pressure reading of 140/90 mm Hg or higher" as per JNC VII criteria or if the patient is on antihypertensive drugs.

Cholesterol levels are determined: < 200 mg/dl high density lipoprotein (HDL) levels < 50 mg/dl in men and < 40 mg/dl in women, triglyceride level < 150 mg/dl. Values above this were considered as uncontrolled cholesterol levels.

Nutrition risk factors were considered, if individual is consuming fruits less than twice a week and vegetables less than twice daily.

If the patient presently smokes or has previously smoked or consumed non-smoked forms of tobacco, smoking or tobacco intake was considered a risk factor.

Intake of more than one drink or > 10 g alcohol per day in women and two drinks or > 20 g alcohol per day for men and time interval between 2 drinks was regarded as negative health consequence of alcohol.

A participant was deemed physically active if he or she did at least 150 minutes of moderate-intensity activity each week, spread out over at least three days per week with no more than two days without exercise.

The existence of a cardiovascular disease risk factor was discussed with patients by their health care provider.

Sl. No.	Risk factor for CVD	Preventive Therapy
1	Obesity	Dietary & physical activities, anti-obesity drugs
2	Hypertension	ACE/ARB, CCB, Diuretics
3	Dyslipidaemia	Statin and any other
4	Tobacco	Counselling and nicotine pouch
5	Alcohol	Counselling and drugs
6	Glycemic control	Hb1ac
Preventive therapy of interest		

Data Analysis

Cardiovascular disease risk factors such as hypertension, dyslipidaemia, cigarette smoking, obesity, unhealthy diet, absence of physical activity, and cardiovascular disease in family were the key outcome variables. The prevalence of several risk factors in T2DM patients was calculated. The connection between risk factors and other predictors will be tested using the chi square (for categorical data) and the student's t-test (for continuous variables). The percentage of candidates who have ever had a full CVD risk assessment and are now on preventive treatment was calculated.

RESULTS

Characteristics	Total	Male (n = 58)	Female (n = 38)	P Value
Age; Mean (SD)	58.70 (9.34)	59.08 (9.59)	58.13 (9.04)	0.626
BMI; Mean (SD)	25.16 (3.83)	24.70 (3.88)	25.87 (3.69)	0.144
Waist circumference; Mean (SD)	95.53 (11.31)	97.34 (9.29)	92.76 (13.51)	0.05 (S)
WHR; Mean (SD)	0.96 (0.09)	0.97 (0.07)	0.95 (0.12)	0.323
HbA1c; Mean (SD)	7.36 (1.95)	7.02 (1.75)	7.91 (2.19)	0.02 (S)
Fasting blood glucose; Mean (SDD)	145.52 (50.72)	144.75 (54.06)	147.13 (45.81)	0.341*
PP blood glucose; Mean (SD)	241.08 (82.44)	238.71 (85.03)	244.71 (79.29)	0.729*
Mean duration of diabetes in years	8.05 (6.34)	8.34 (6.54)	7.59 (6.07)	0.571(NS)
Systolic BP; Mean (SD)	124.89 (15.07)	118.44 (13.48)	134.73 (11.79)	0.000 (S)
Diastolic BP; Mean (SD)	78.22 (9.17)	74.34 (9.21)	82.63 (7.23)	0.001 (S)
History of Hypertension; No (%)	46 (47.92%)	23 (39.65%)	23 (60.52%)	0.045 (S)**
Triglyceride; Mean (SD)	110.71 (20.15)	108.78 (20)	113.52 (20.31)	0.23*
Cholesterol; Mean (SD)	177.71 (24.69)	172.25 (24.88)	184.52 (23.09)	0.028 (S)*
HDL Cholesterol; Mean (SD)	39.36 (3.93)	39.13 (3.91)	39.71 (3.98)	0.439*
Table 1. Physiological Characteristics Type 2 Diabetes Population				

* Mann Whitney U test, ** Chi square test

Characteristics	Total No = 96	Male No=58 (60.42%)	Female No=38 (39.58%)	P Value
Fruit serving per week				0.319 NS
No	72 (75 %)	44 (75.86 %)	28 (73.68 %)	
Once	20 (20.83 %)	13 (22.41 %)	07 (18.42 %)	
Twice or more	04 (4.16 %)	01 (1.72 %)	03 (7.89 %)	
Vegetables serving daily				0.195 NS
No	9 (9.37 %)	7 (12.06 %)	2 (5.26 %)	
Once	67 (69.79 %)	42 (72.41 %)	25 (65.79 %)	
Twice or more	20 (20.83 %)	9 (15.51 %)	11 (28.94 %)	
Physical activity				0.11 NS
No	40 (41.66 %)	29 (50 %)	11 (28.94 %)	
Mild	39 (40.62 %)	21 (36.20 %)	18 (47.36 %)	
Moderate	27 (28.91 %)	8 (13.79 %)	19 (50 %)	
Tobacco use (any form)				0.000 (S.)
No	50 (52.08 %)	20 (34.48 %)	30 (78.94 %)	
Yes	46 (47.91 %)	38 (65.51 %)	8 (21.05 %)	
Alcohol *				0.205
No	72 (75 %)	40 (68.96 %)	32 (84.21 %)	
Yes – Once a month	8(9.08 %)	8 (13.79 %)	0	
Yes – Once in week	2 (1.92 %)	2 (3.44 %)	0	
Previous / past	4 (3.84 %)	4 (6.89 %)	0	
Table 2. Behavioural Characteristics of Type 2 Diabetes Population				

Values are No (%); If Not Stated

Above table no 2 shows that fruit intake and vegetable consumption among the study population was very less in both males and females and merely 4.16 % were consuming more than 2 servings of fruits in a week. Smoking as well as smokeless form of tobacco use was observed in 47 % participants, and 25 % reported use of alcohol.

Out of 96 participants, 40.62 % were doing mild physical activity like household activities and 28.91 % were performing 30 to 60 minutes of moderate-intensity aerobic activity daily like yoga.

Characteristics	Total	Male (n = 58)	Female (n = 38)	P Value
Age in years				
20 - 40	1 (1.04 %)	1 (1.72 %)	0 (0 %)	0.48 NS
41 - 60	55 (57.29 %)	31 (53.44 %)	24 (63.15 %)	
61 - 80	38 (39.58 %)	28 (48.27 %)	14 (36.84 %)	
> 80	2 (2.08 %)	2 (3.44 %)	0 (0 %)	
Waist circumference ¹	81	47	34 (89.47 %)	0.48 NS
Abnormal	(84.37 %)	(81.03 %)		
Normal	15	11	4	
	(15.62 %)	(18.96 %)	(10.52 %)	
WHR (Abnormal) ²	76	40	36 (94.73 %)	0.002 S
	(79.16 %)	(68.96 %)		
WHR (Normal)	20	18	2	
	(20.83 %)	(31.03 %)	(5.26 %)	
BMI				
< 18.5 (Underweight)	5 (5.20 %)	5 (8.62 %)	0 (0 %)	0.212 NS
18.5 - 22.9 (Normal)	22 (22.91 %)	15 (25.86 %)	7 (18.42 %)	
23 - 24.9 (Overweight)	24 (25 %)	12 (20.68 %)	12 (31.57 %)	
> 25 (Obesity)	45 (46.87 %)	26 (44.82 %)	19 (50 %)	
Diabetes ³				
Controlled	35 (36.45 %)	23 (39.65 %)	12 (31.57 %)	0.312 NS
Uncontrolled	61 (63.54 %)	35 (60.34 %)	26 (68.42 %)	
Hypertension ⁴				
Controlled	76 (79.16 %)	52 (89.65 %)	24 (63.15 %)	0.002 S
Uncontrolled	20 (20.83 %)	6 (10.34 %)	14 (36.84 %)	

Table 3. Cardiovascular Disease Risk Factors among Study Population

1 WHR abnormal > 0.95 in men and > 0.80 in women

2 WC abnormal > 90 cm in men and > 80 cm in women

3 Diabetes controlled HbA1c < 6.5 and uncontrolled $\geq$ 6.5

4 Hypertension controlled BP is SBP < 140 AND DBP < 90, Uncontrolled is SBP $\geq$ 140 and DBP $\geq$ 90

Above table describes prevalence of cardiovascular risk factors among study participants.

Obesity indicators like WC, WHR and BMI were abnormal in among 84 %, 79 % and 45 % respectively. Poor glycemic control was seen in among 60 % of study population. Age more than 60 years was present among 41% of study population and uncontrolled blood pressure was seen in 20 % of them. Women with higher WHR were more as compared to men (94 Vs 68) and there was high proportion of women with uncontrolled BP (36 % Vs 10 %).

Characteristics	Total	History of Hypertension	No History of Hypertension	P Value
Systolic BP; Mean (SD)	124.89 (15.07)	132.17 (15.47)	118.2 (11.19)	0.000(S)
Diastolic BP; Mean (SD)	78.22 (9.17)	80.21 (10.43)	76.4 (7.49)	0.04 (S)

Table 4. Mean Blood Pressure in Subjects with History of Hypertension

Above table no 4 shows characteristics of mean blood pressure in subjects with history of hypertension. Mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) of cases was 124.89 with SD 15.07 and 78.22 (SD 9.17)

respectively. Mean systolic blood pressure (SBP) in cases having history of hypertension was 132.17 with SD 15.47 and 80.21 with SD 10.43 respectively. Mean systolic BP (SBP) and diastolic BP (DBP) in cases having no history of hypertension was 118.2 with SD 11.19 and 76.4 with SD 7.49 respectively. Systolic BP having p value is 0.000 and diastolic BP having p value is 0.04.

Current Blood Pressure	Total (N = 96)	History of Hypertension (N = 46)	No History of Hypertension (N = 50)	P Value
Control ¹	76 (79.16)	28 (60.89 %)	48 (96 %)	0.000 (S)
Uncontrolled	20 (20.83)	18 (39.13 %)	2 (4 %)	

Table 5. Current Blood Pressure Levels in Subject with History of Hypertension

1 hypertension controlled BP is SBP < 140 AND DBP < 90, Uncontrolled is SBP ≥ 140 and DBP ≥ 90. Table 5 shows characteristics of current blood pressure levels in persons with history of hypertension. Out of 96 total cases, 79.16 % have control BP less than and 20.83 % have uncontrolled BP having p value 0.000.

Out of 46 cases having history of hypertension, 60.89 % have controlled BP and 39.13 % have uncontrolled BP. Out of 50 cases having no history of hypertension, 96 % have controlled BP and 4 % have uncontrolled BP i.e. newly diagnosed hypertension hence total hypertensive were 48.

HbA1C	Total (N = 96)	Male (N = 58)	Female (N = 38)	P Value
Less than 6.5	35 (36.1 %)	23 (39.65 %)	12 (31.57 %)	0.321
6.5 to 7.4	25 (26 %)	16 (27.58 %)	9 (23.68 %)	
7.5 to 8.4	15 (16 %)	10 (17.24 %)	5 (13.15 %)	
More than 8.4	21 (22 %)	9 (27.58 %)	12 (31.57 %)	

Table 6. Glycemic Control

Above table shows glycaemic control among study participants and its comparison between male and females. 10 subjects were having HbA1c more than or equal to 10 and among them 4 were males and 65 were females.

Pharmacotherapy of DM Patients		No	Percent (%)
Current anti-diabetes medication	Biguanides	21	21.28
	Biguanides + Sulphonyl urea	68	70.83
	Biguanides + Sulphonyl urea+ insulin	3	3.13
	Biguanides + Sulphonyl urea + DPP IV Inhibitor	4	4.17
	Other combinations of above mentioned drugs	2	1.92
Anti-platelet	Aspirin	53	55.21
Anti-lipid agents	Atorvastatin	43	44.79
Antihypertensive Agents	ARB		
	ACE Inhibitors	32	69.56
	Calcium Channel Blockers	02	4.34
	Beta Blockers	12	26.08
	Any other	12	26.08

Table 7. Pharmacotherapy Used among Type 2 Diabetes participants

Out of 96 cases, 68 (70.83 %) were on combination of biguanide and sulphonyl urea. Aspirin was taken by 55.21 % cases while atorvastatin was only taken by 44.79 % cases. This shows that even after having dyslipidaemia as a major risk factor, statins were taken by very less number of cases. Among anti-hypertensives, ARB is taken by 69.56 % cases suggesting its good use in both hypertension prevention and cure.

Current Total Cholesterol	Total (N 96)	Anti-lipid Drug (N = 43)	No Anti-lipid Drug (N = 53)	P Value
Control (< 200 mg/dl)	59 (61.45 %)	39 (90.69 %)	20 (37.73%)	0.000 (S) chi ² 12.24
Uncontrolled (>= 200 mg/dl)	37 (38.55 %)	04 (09.31 %)	33 (62.26 %)	
Current HDL-C				
Controlled (< 50 mg/dl men and < 40 in women)	54 (77.08 %)	36 (83.72 %)	18 (33.97 %)	0.043 (S) chi ² 1.94
Uncontrolled (>=50 mg/dl and <=40 in women)	42 (22.91 %)	7 (16.27 %)	35 (66.03 %)	
Current Triglyceride				
Control (< 150 mg/dl)	60 (62.50 %)	39 (67.42 %)	21 (39.62 %)	0.056 (NS) chi ² 4.238
Uncontrolled (>= 150 mg/dl)	36 (37.5 %)	14 (32.58 %)	22 (60.38 %)	
Table 8. Dyslipidaemia in Type 2 DM				

Above table shows among 96 patients, 37 (38.55 %) have uncontrolled total cholesterol level having significant p value (0.00), 42 (22.91%) having uncontrolled HDL level having significant p value (0.043) and 36 (37.5%) have uncontrolled triglyceride levels.

CVD Risk Factor	Intervention Received for Prevention of CVD Advice / Treatment Received	No (%)
Tobacco use (n = 46, 47.91 %)	Counselling for tobacco cessation	20 (43.47)
Harmful use of alcohol (n = 24, 25 %)	Counselling cut down harmful alcohol use	10 (41.66)
Unhealthy diet (n = 74, 76 %)	Counselling for restriction of sweets in diet	72 (97.29)
	Counselling for calories restriction and protein intake	72 (97.29)
Physical inactivity (n = 79, 81 %)	Counselling for moderate to heavy physical activity > 30 min daily	74 (93.67)
BMI (n = 45, 46.87 %)	Counselling for weight reduction	30 (66.66)
Blood pressure (n = 48, 50 %)	Advice on low salt diet	44 (91.66)
	Prescribed antihypertensive drugs	46 (95.83)
Dyslipidaemia (n = 68, 70.83 %)	Advice on reducing saturated fats in diet	34 (50 %)
	Prescribed Lipid lowering agent	43 (63.23)
Uncontrolled diabetes (n = 61, 63.54 %)	Adherence to medication and regular follow/up (glycaemic control)	30 (49.18)
Anti-platelet therapy (n = 96)		53 (55 %)

Table 9. Prevention Strategies of CVD Risk Factor

Out of 46 tobacco users, only 43.47 were counselled regarding tobacco cessation techniques.

Out of 25 alcohol users, only 40 % were received alcohol abstinence counselling.

Even after diet counselling for weight reduction and diabetes in 97%, the unhealthy diet use was seen in 74 cases. Out of 68 patients with dyslipidaemia, only 43 received atorvastatin and 34 received diet counselling. Out of 61 uncontrolled diabetes population, only 30 received counselling regarding drug adherence and importance of good glycaemic control. Out of 96 total population, only 53 received anti-platelet regularly.

DISCUSSION

Baseline Characteristics of Type 2 DM

Mean age of the patients was around 59 (9.34) years. In a multicentric ICMR-INDIA B study, mean age of type 2

diabetes mellitus in rural population of Maharashtra was 42 years (9.34). This may be due to selection bias as ours was hospital based study.

Variables in Mean	Present Study	ICMR-INDIAB
N	96	2667
Mean age (Yrs)	58.70 (9.34)	42 ± 15
Mean BMI	25.16 (3.83)	20.5 ± 3.8
Mean waist (Cms)	95.53 (11.31)	72.7 ± 11.7
Mean BP systolic (mmHg)	124.89 (15.07)	127 ± 18
Mean BP diastolic (mmHg)	78.22 (9.17)	77 ± 11
Mean HbA1c	7.36 (1.95)	5.8 ± 1.1

Table 10. Comparison of Our Study Findings with India's First Multi-centric-Epidemiological Study

As ours was hospital-based study, where patients seek advice at a later stage, their glycaemic control was poor, and mean duration of diabetes was more around 8 years.

Prevalence of Cardiovascular Disease Risk Factors

Our present study shows abdominal obesity (84 %), unhealthy diet (86 %), physical inactivity (81 %), dyslipidaemia (n = 68, 70.83 %), uncontrolled diabetes (63 %), hypertension (50 %) and age more than 60 years (41 %) as the major cardiovascular diseases risk factors among study participants.

In study done by A Gupta et al. among diabetes and non-diabetes, urban population shows high prevalence of key CVD risk factors like high blood pressure in 73 %, low high density lipoprotein cholesterol in 71 %, and smoke/ tobacco use of in 26 % people with diabetes.¹⁴

ICMR-INDIAB community-based study in rural population shows dyslipidaemia in 77 %, low HDL-C in 69 %, physical inactivity in 50 %, hyper triglyceridaemia in 20 %, hypercholesterolemia in 13 %, abdominal obesity in 15 % and poor glycaemic control in 50 % of the population.

The greater prevalence of abdominal obesity (84 %), unhealthy diet (86 %), physical inactivity (81 %), in patients of diabetes is a principal finding to come across and is parallel to studies which are done in past. This may be because of elderly rural population, low education status and sparse availability of resources.

Preventive Therapy Used to Prevent Cardiovascular Disease

Use of anti-platelet was present in 55 %, 74 % of hypertensives were using ARBs/ACEI, 63 % of dyslipidaemia patients were using atorvastatin.

In study done in tertiary hospitals by Sharma et al. it denotes that only 54 percent of eligible patients with coronary heart disease were recommended with a combination of four groups of medicines (aspirin, -blocker, ACE inhibitors or ARB and statins), while rates in secondary and primary care clinics were 28 % and 7 % respectively which is very low.¹⁵

Our study highlights that life style risk factors are more prevalent in the study participants. There is strong evidence that lifestyle modification (regular, moderate physical activity and healthy eating habits) reduces the incidence and mortality of cardio vascular disease events in people with and without established coronary heart disease. Studies have shown that there is up to 50 % and 10 – 20 % reduction in

relative risk of mortality in the general population by quitting smoking and engage in physical activity respectively employ a mixture of healthy dietary practises (low saturated fat intake, regular fish consumption, adequate fruit and vegetable intake, and low salt intake - together, a 15 – 40 % reduction). Lifestyle modification is cost-effective, similar to some traditional medication therapies, and gives pre-emptive advantages ahead of metabolic abnormalities, therefore it should be used as primary intervention of choice in all diabetic patients.

The rising prevalence of cardiovascular disease in India offers a significant challenge to the country's health-care infrastructure. The application of Western countries' knowledge on CVD reduction measures, on the other hand, renders a possibility to tackle the epidemic in India. The decrease in CVD mortality in Western countries was guided by community-level changes in major risk factors and medical therapies, with improvements in community-level risk factors like cigarette use, dyslipidaemia, and hypertension that has accounted for more than half of the reduction in mortality.¹⁶

CONCLUSIONS

1. The glycemic status is poorly controlled and treated in the study.
2. The study has also shown that participants with diabetes and abdomen obesity, hypertension and dyslipidaemia are quite prevalent cardiovascular risk factors.
3. Behavioural risk factors like unhealthy diet and absence of physical activity are high among the diabetes subjects.
4. Hypertension and hypercholesterolemia has been poorly controlled and is a concern in diabetic patients.
5. Prevention therapies are very poor and greatly needed for improvement in risk factor management and control in order to prevention of CVD in diabetes.

Data sharing statement provided by the authors is available with the full text of this article at jemds.com.

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