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RESEARCH ARTICLE

ASSESSMENT OF PULSE PRESSURE IN TYPE 2 DIABETES MELLITUS

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ABSTRACT

Diabetes mellitus is frequently associated with cardiovascular risk factors such as hypertension and dyslipidemia. Early identification of risk factors of cardiovascular disease will decrease the morbidity in type 2 diabetes mellitus. This study was done to assess the prevalence of isolated systolic hypertension among type 2 diabetic population. 40 cases of type 2 diabetes mellitus with duration of 8 to 12 yrs and 40 controls of both males and females in the age group of 40 to 65 years were selected. Laboratory investigations like fasting glucose and blood pressure were taken. In the present study the levels of fasting glucose was high and widening of pulse pressure was found in the type II diabetics compared to controls. Thus this study suggests the importance of early detection of isolated systolic hypertension in type II diabetes mellitus and will reduce the prevalence of complications in diabetics.

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INTRODUCTION

A syndrome of chronic hyperglycemia due to insulin deficiency, resistance or both is known as diabetes mellitus (Jiezhong cnen *et al.,* 2008). The global prevalence of diabetes in 2010 is 6.6% (285 million) and it is expected to increase to 7.8% (438 millions) in 2030. In addition, there are 344 million people with IGT (impaired glucose tolerance) in 2010 which is predicted to rise to 472 million by 2030. Unfortunately, India tops the list with the largest number of diabetics (57 millions in 2010) which is expected to rise to 90 millions in another 20 years. The high prevalence is due to strong genetic predisposition, and also by the presence of low threshold levels for age and environmental risk factors for diabetes (Jayaram. 2011). The UKPDS identified a number of potentially modifiable risk factors for coronary artery disease in patients with diabetes like dyslipidemia, hypertension, hyperglycaemia and smoking (Turner, 1998). Clinical manifestations of atherosclerosis, including coronary artery disease, and peripheral arterial disease, will occur in 2 of 3 men and 1 in 2 women after age 40. Almost 60% of death is due to the cause of cardiovascular disease (CVD). Atherosclerosis is a chronic, progressive disease with along asymptomatic phase. Subclinical atherosclerosis is a latent precursor of clinical CVD, including myocardial infarction (MI) and stroke (Jennifer Robison *et al.,* 2009). (Stevan Haffner *et al.,* 1998) compared the seven year incidence of myocardial infarction among 1373 non diabetics with 1059 diabetics. They suggested that diabetic patients without previous MI had as high risk of MI as compared to non diabetic patients with previous MI. In the 1998 UKPDS 38 study a multicentric, randomised, controlled trial of hypertension in diabetics found that tight BP control in them reduced morbidity and mortality (Robert turner Rury Holman *et al.,* 1998). Hypertension is also a major risk factor for micro vascular and macro vascular complications. It is estimated that the prevalence of hypertension in Type2 diabetes mellitus ranges from 20% to 60% (American Diabetes Association) 2002, more than twice that seen in controls (Kjeld Hermansen *et al.,* 2008).

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MATERIALS AND METHODS

For this study, forty patients of type 2 DM with duration of 8 to 12 yrs, both male and female in the age group of 40 to 65yrs was the study group, selected from diabetic clinic Thanjavur Medical college. Forty normal subjects in the same age group

and sex was the control group. Detailed history was taken to exclude IHD, renal disease and acute illness. Laboratory investigations like fasting glucose, blood pressure was taken in sitting position, after 5mins of rest by using sphygmomanometer. Informed consent was obtained from all subjects prior to enrollment into the study. A proforma with detailed history of the subjects were filled. Height, weight, BMI were measured. Vital signs were recorded. Baseline investigations were done for all subjects, including fasting Blood Sugar, haemoglobin estimation, ECG. Blood pressure was recorded in all subjects, after 5 minutes of rest in sitting posture, in the left arm, using sphygmomanometer, with the apparatus at heart level. Blood pressure was recorded by both palpatory and auscultatory method to rule out auscultatory gap. Pulse pressure was calculated from the above recorded values using the formula Pulse pressure = Systolic BP - Diastolic BP. Statistical analysis was done using Epidemiological Information package (EPI, 2010) developed by Centre of Disease Control, Atlanta. All data were compared between the diabetics and the control groups using the software. Frequencies, percentages, mean, standard deviations were calculated. Chi-square test was used to test the significance of difference between variables. 'p' value less than 0.05 is taken to denote significant relationship.

RESULTS

As seen in table 1 the diabetic group had a mean systolic BP is 148 ± 22 mmHg and the mean for non diabetics is 118±19.8 mmHg. The values of Systolic BP were significantly higher in diabetics than in non diabetics. The P value is < 0 .0001. The mean value of Diastolic BP in diabetics is 88.4 ± 9.7 mmHg and the mean for non diabetics is 79.2 ± 7.8 mmHg. The values of Diastolic BP were significantly higher in diabetic than in non diabetic. The P value is <0.0001. The mean for Pulse Pressure in diabetics is 60.4 ± 17.4 mmHg and the mean for non diabetics is 39.1 ± 19.2 mmHg. The values of Pulse Pressure were significantly higher in diabetic than in non diabetic. The P value is < 0 .0001.

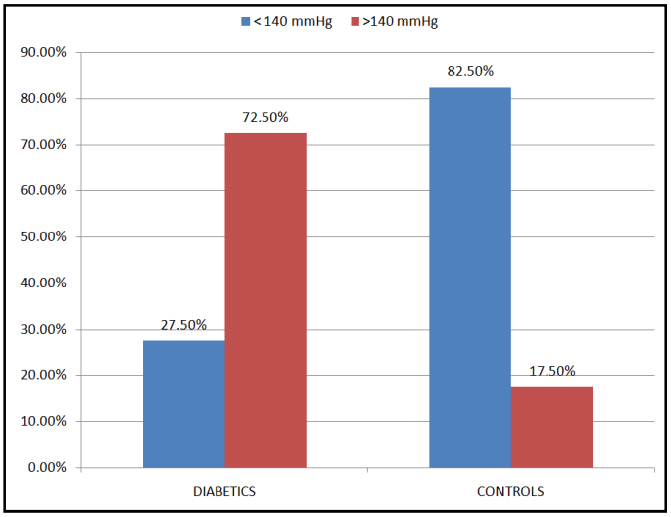
Table 1. Observation of all parameters

Parameters	N	Minimum	Maximum	Mean	Standard deviation
AGE (yrs)	80	39	70	58	8.4
Systolic blood pressure (mmHg)	80	90	180	148.8	22
Diastolic blood Pressure (mmHg)	80	60	102	88.4	9.7
Pulse Pressure (mmHg)	80	18	90	60.4	17.4

In control group 82.5% of non diabetics have systolic blood pressure value <140 mmHg and 17.5% have systolic blood pressure >140 mmHg. In study group 27.5 % of diabetics shows systolic blood pressure <140 mmHg and 72.5% shows systolic blood pressure >140 mmHg. The result shows most of the diabetics have raised values in their Systolic blood pressure than non diabetics. Among non diabetics 97.5% of them have diastolic blood pressure values < 90 mmHg whereas 2.5 % of them have > 90 mmHg. Among diabetic 47.5% of them have diastolic blood pressure values < 90 mmHg and 52.5% shows diastolic blood pressure value > 90 mmHg. The results shows increased diastolic blood pressure values in diabetic when compared with controls.

Table 2. Observation about systolic blood pressure

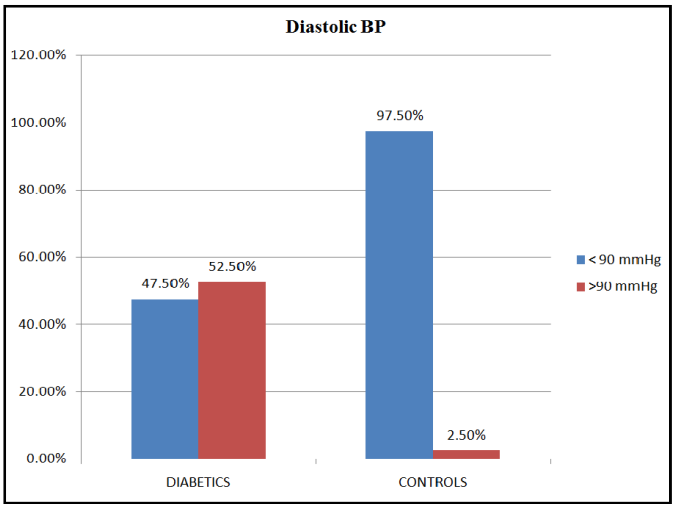
Group	No. of Cases	SYSTOLIC BLOOD PRESSURE			
		<140 mmHg		>140 mmHg	
		N	%	N	%
Diabetic	40	11	27.5	29	72.5
Control	40	33	82.5	7	17.5
P	<.0001				



Systolic BP

Table 3. Diastolic blood pressure in this study

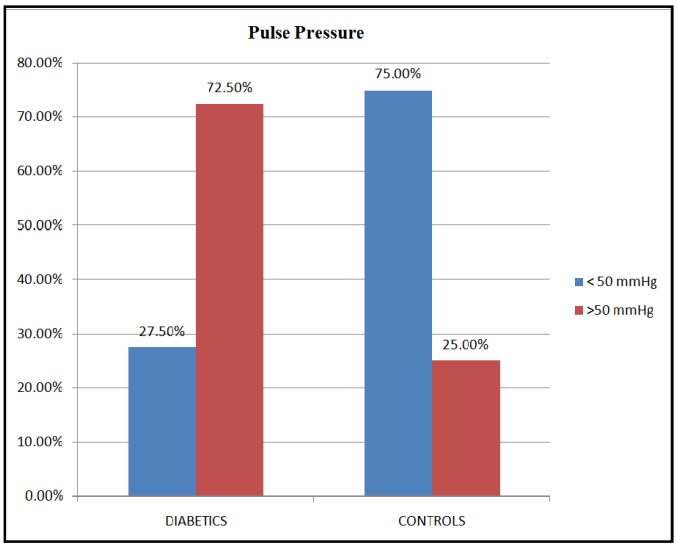
Group	No. of cases	Diastolic blood pressure			
		<90 mmhg		>90 mmhg	
		N	%	N	%
Diabetic	40	19	47.5	21	52.5
Control	40	39	97.5	1	2.5
P		<.0001			



75% of control group shows Pulse pressure <5 mmHg and 25% of them shows >50 mmHg. In study group 27.5 % of diabetic shows Pulse pressure <50 mmHg and 72.5% shows value >50mmHg.So the result shows that there is a definite increase in Pulse pressure in diabetics than control group

Table 4. Pulse pressure in this study

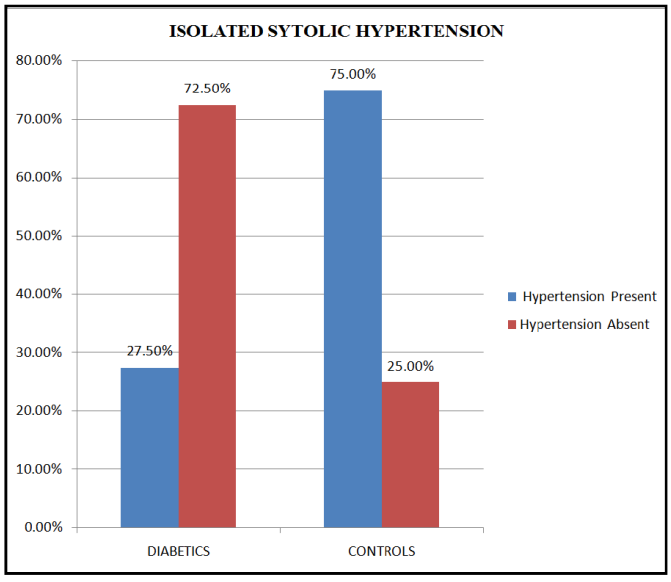
Group	No. of cases	Pulse pressure			
		<50 mmhg		>50 mmhg	
		N	%	N	%
Diabetic	40	11	27.5	29	72.5
Control	40	30	75	10	25
P		<.0001			



20% of the control group are hypertensives and 80% have normal blood pressure. In the study 75% of the diabetics have hypertension and 25 % are normotensives.The results shows that diabetics have raised blood pressure compared to control group.

Table 5. Observation about hypertension

Group	No. of cases	Hypertension			
		Present		Absent	
		N	%	N	%
Diabetic	40	30	75	10	25
Control	40	8	20	32	80
P		<.0001			



DISCUSSION

Pulse pressure is the arithmetic difference between systolic and diastolic blood pressures. Normally pulse pressure is in the range of 20 to 50 mmHg. Pulse pressure depends upon three factors: arterial volume, stroke volume, and arterial elastic constant. The high pulse pressure is indicative of systolic hypertension and indirectly determines decrease in elasticity of blood vessels (Indu khurana, 2006). (Amanda Adler *et al.,* 2000) (UKPDS36) prospective observational study found that incidence of complications was significantly associated with systolic BP. Each 10 mmHg decrease in mean systolic BP was associated with 12% reduction in risk for any complication related to diabetes, 15% for deaths, 11% for MI, and 13% for microvascular complications. In the present study the results indicate that subjects with diabetes mellitus of 8 to 12 years duration show a significant change in widening of blood pressure compared to controls.

Systolic BP

The mean ± SD of systolic BP is 142.2 ± 22 mm/Hg in the diabetic group. In the control group it is 118.2 ±19.8mmHg. The difference is statistically significant. (p = 0.0001). (Caroline Fox *et al.,* 2007) (The Framingham Heart study) found a significant rise in mean systolic BP (146 ± 26 mmHg) in diabetics, which is similar to the present study. (Mikael Kjaer Poulsen *et al.,* 2009) also found a significantly high Systolic BP (138 ±18) in diabetics compared to controls. (Ane Cecile Dale *et al.,* 2008) in a study in Norway found high systolic BP in diabetics which is similar to my study. (Amanda Adler *et al.,* 2000) have done the study in white Asian Indian and Afro- Caribbean UKPDS patients. They also found a significant rise in systolic BP which is similar to my study.

Diastolic BP

The mean ± SD of diastolic BP is 88.4 ± 9.7 mmHg in the diabetic group. In the control group it is 79.2 ± 7.8mmHg. The result is statistically significant (P= 0.0001). (Salvador Tranche *et al.,* 2005) have found a significant rise in diastolic BP (88.6 ± 8.9mmHg) in their study. **(**Guanminchen *et al.,* 2011) (Framingham study) have also showed raised diastolic BP (83.5 ± 11.1 mmHg) in diabetics compared to non diabetics.

Pulse Pressure

The mean ± SD of pulse pressure in diabetic group was 60.4 ± 17.4 mmHg and in the non diabetic group was 39.1 ± 19.2 mmHg. The difference is statistically significant (p= 0.0001). (Mikael Kjaer Poulsen *et al.,* 2009) , in a study showed raised Pulse pressure (59.2 ± 13.2 mmHg), have shown significant widening of pulse pressure which is similar to my study. (Salvador Tranche *et al.,* 2005) also have found a significant widening of pulse pressure (61.1 ±12.9 mm H) which coincides with my study.

Conclusion

In the era of modern medicine diabetic complications demand prevention and management. The measurement of BP in

diabetes mellitus in early stage is very useful to assess the cardiovascular risk and will help the patients to improve and reduce the morbidity and mortality. The present study found widening of pulse pressure in subjects with Type 2 diabetes mellitus. The early detection of this could offer feasible and cost effective ways to reduce the prevalence of complications in diabetics.

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Conflict of Interest- Nil

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Ethical Clearance- Obtained

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