**International Journal of Medicine Research**
**ISSN: 2455-7404**
**www.medicinesjournal.com**
**Volume 3; Issue 2; April 2018; Page No. 84-89**

# A case series study of prevalance of hypertension among type 2 diabetis mellitus patients

**Siddharth Shah, Ayush Jain, Mahendra C Parmar**
Department of Medicine, S.S.G. Hospital, Medical College, Vadodara, Gujarat, India

**Abstract**
This case series was undertaken to study the prevalence of hypertension among patients of type 2 Diabetes Mellitus and to study the prevalence of the other traditional risk factor of atherosclerosis among patients of type 2 Diabetes Mellitus.
175 Patients of type 2 DM from medical wards and Diabetic clinic of Sir Sayajirao General Hospital, Vadodara were studied. Systolic and diastolic blood pressures were measured by use of sphygmomanometer. Subjects were considered to have hypertension if they had been diagnosed as having hypertension, they are taking antihypertensive medication or if they are having blood pressure of 140/90 or more. Thorough history, clinical examination and appropriate lab investigations were done.
There is high prevalence (80.5%) of Hypertension in type 2 DM. Mean age of diabetic hypertensives were significantly higher than controls among both sexes. Hypertension is present in both obese and non obese type 2 DM, but greater amount in obese diabetic. Hypertension, significantly associated with adverse cardiac outcome in type 2 DM patients and also adverse renal outcomes in type 2 on patients.

**Keywords:** diabetes mellitus, hypertension, atherosclerosis

## 1. Introduction
Diabetes Mellitus is a syndrome characterized characterized by chronic hyperglycemia and disturbance of carbohydrate, fat and protein metabolism associated with absolute or relative deficiency in insulin secretion and / or insulin action.
When fully expressed, diabetes is recognized by fasting hyperglycemia, but the disease can also be recognized, during less overt stages and before fasting and post–prandial hyperglycemia occurs, most usually by the presence of glucose intolerance. Diabetes Mellitus may be suspected or recognized clinically by presence of characteristics symptoms such as excessive thirst, polyuria, otherwise unexplained weight loss or one or more of many complications associated with or attributable to the disease.
A major cause of both morbidity and mortality in patient of diabetes is due to its complications such as Diabetes foot, Diabetes polyneuropathy, Diabetes nephropathy, its contribution to atherosclerotic vascular disease.
Type 2 diabetes is a complex disease, featured by abnormalities of several risk factors of atherosclerosis, including plasma lipids, blood pressure, and the coagulation cascade. However, classic risk factors explain only a portion (25%) of the excess of cardiovascular risk in type 2 diabetes. The independent contribution of hyperglycemia was pointed out, although it is still debated. Another culprit could be insulin resistance, which is found in most patients with type 2 diabetes.
Accelerated hypertension is a major burden of Diabetes. It is known that the risk of advanced atherosclerosis and, the histopathological process underlying most clinical cardiovascular events, is fivefold higher in type 2 diabetic subjects than in nondiabetic individuals, even after adjustment for several confounders. Therefore, it is not surprising that the risk of coronary heart disease, cerebrovascular disease, and peripheral vascular disease is several-fold increase in type 2 diabetes and represents the leading cause of death in type 2 diabetes.
The present CASE SERIES was undertaken with following objectives:

1. To study the prevalence of hypertension among patients of type 2 Diabetes Mellitus.
2. To study the prevalence of the other risk factor (like age, sex, duration of diabetes mellitus, smoking, physical inactivity, obesity, impaired glycemic control and dyslipidemia.) of atherosclerosis among patients of type 2 Diabetes Mellitus.

## 2. Material and Methods
### 2.1 Study Population and Area
Patients of type 2 DM from medical wards and Diabetic clinic of Sir Sayajirao General Hospital, Vadodara

### Selection of Study subjects
The inclusion and exclusion criteria were defined precisely as follows:

### Inclusion criteria
- Patient of age more than 40 & of both sex
- Patients previously or recently diagnosed as having type 2 DM proven through fasting and postprandial blood glucose levels according to WHO guidelines [1] (The current WHO diagnostic criteria for diabetes should be maintained fasting plasma glucose ≥ 7.0mmol/l (126mg/dl) or 2–h plasma glucose≥ 11.1mmol/l (200mg/dl), HBA1c ≥6.5).
- Patients on diet therapy and/or oral hypoglycaemic agents.
- Study duration was December 2013 to November 2014.

### Exclusion criteria
- Patients having DM secondary to pancreatitis, PCOS,

Glucocorticoid therapy etc. old, debilitated, severely ill, those who can't speak, altered mental status, unconscious, comatose patients
- Patient presented with Diabetic ketoacidosis,
- Patient of type 1 DM and diabetic patient on insulin therapy.

### 2.2 History and Clinical examination

After obtaining written informed consent, each patient enrolled in the study was asked in details history regarding the complaints pertaining to DM and its complication. All previous medical records of the patients were checked for the duration of DM, past and present medications, glycemic control, previous admissions, and presence of any known complication of DM.

Systolic and diastolic blood pressures were measured by use of sphygmomanometer. Subjects were considered to have hypertension if they had been diagnosed as having hypertension, they are taking antihypertensive medication or if they are having blood pressure of 140/90 or more. Search for presence of trophic changes, if any, was noted. All the peripheral pulsations were also checked.

Thorough examination of cardiovascular system, respiratory system, alimentary system, and central nervous system including that of the optic fundus was performed methodically. Diabetic renopathy was used as a marker of micro angiopathic complications of type 2 DM.

### 2.3 Laboratory investigations

Blood was drawn for routine check up for Haemogram, FBS, PP2BS, Blood Urea, Serum Creatinine, and Serum cholesterol. A routine and microscopic examination of urine was done.

## 3. Result and Data Analysis

**Prevalence of Hypertension in diabetic patients**

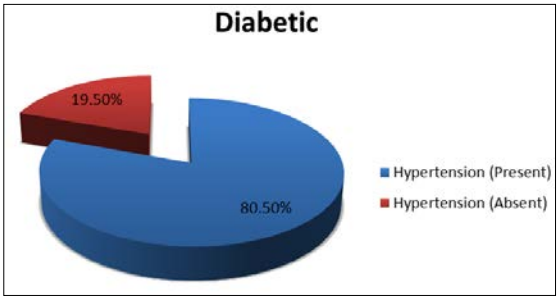


**Fig 1**

**Table 1:** Distribution of Hypertensive profile in study population

| Age Groups | Cases (Hypertension Present) | | | Control (Hypertension Absent) | | |
|---|---|---|---|---|---|---|
| | Male | Female | Total | Male | Female | Total |
| **41- 50** | 10 (7.75%) | 19 (14.78%) | 29 (22.48%) | 8 (17.39%) | 8 (17.39%) | 16 (34.78%) |
| **51- 60** | 25 (19.4%) | 18 (13.95%) | 43 (33.33%) | 5 (10.87%) | 5 (10.87%) | 10 (21.74%) |
| **61-70** | 20 (15.50%) | 20 (15.5%) | 40 (31%) | 7 (15.26%) | 10 (21.74%) | 17 (36.96%) |
| **>70** | 9 (7%) | 8 (6.20%) | 17 (13.79%) | 1(2.17%) | 2 (4.34%) | 3 (6.51%) |
| **Total** | 64 (49.61%) | 65 (50.39%) | 129 (100%) | 21 (45.65%) | 25 (54.35%) | 46 (100%) |

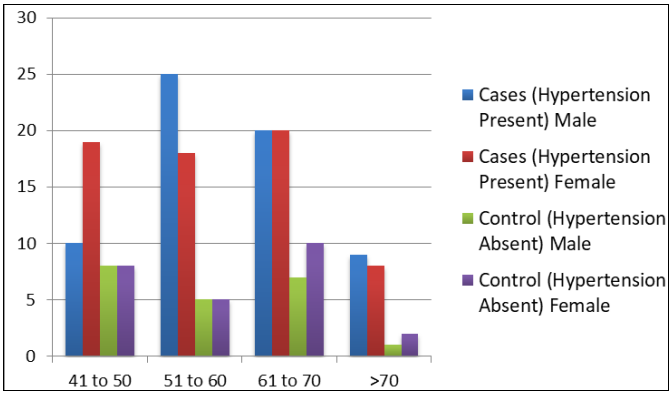


**Fig 2**

Among all the diabetic patients, 75.29% male & 72.22% female detected to have Hypertension clinically.

50.4% of cases were females as against 49.6% of males.

54.4% of controls were females as against 45.6% of males.

The mean age of the case group was 59.87 years and control group was 56.21 years.

**Table 2:** Comparison of study group with Hypertension and without Hypertension for age and sex distribution and duration of DM.

| Variables | Hypertension(Present) | Hypertension (Absent) | P value |
|---|---|---|---|
| **Age** | 59.87 | 56.21 | >0.05 |
| **Duration** | 7.51 | 5.18 | >0.05 |

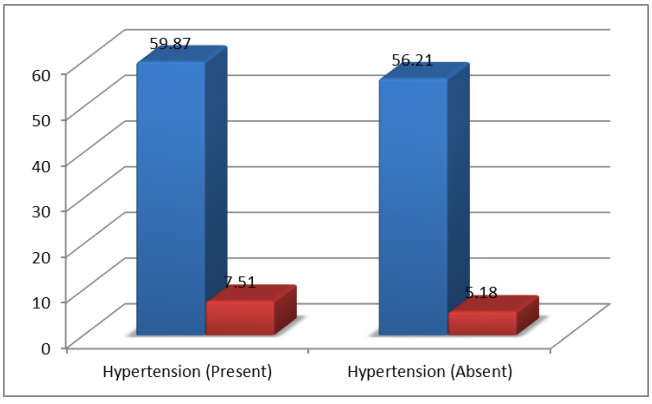


**Fig 3**

**Table 3**

| Sex | Male | Female | P Value |
|---|---|---|---|
| Hypertension (Present) | 64 | 65 | >0.05 |
| Hypertension (Absent) | 21 | 25 | >0.05 |

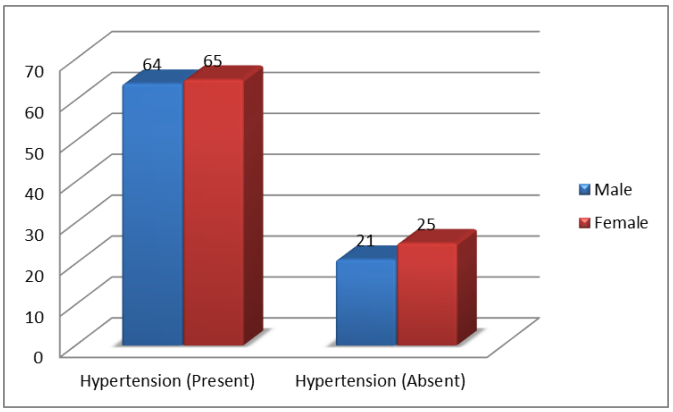


**Fig 4**

Mean value of age of patients without Hypertension is 59.87 & 56.21 years respectively which was statistically insignificant. Similarly numbers of male and female patients in both groups are 64 & 21 and 65 & 25 respectively. It was statistically in significant the mean duration of diabetics among the subjects with HYPERTENSION was 7.51 as compare to 5.18 years in subjects without HYPERTENSION, which was statically insignificant.

**Table 4:** Comparison of study group with Hypertension & without of Hypertension for CAD risk factors:

| CAD Risk factors on ECG | Hypertension (Present) N=129 | Hypertension (Absent) N=46 | P value |
|---|---|---|---|
| | 46 | 9 | <0.0001 |

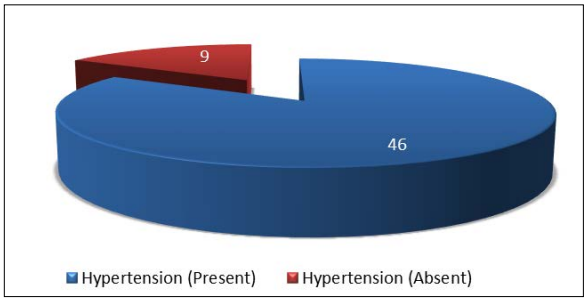


**Fig 5**

46 patients has CAD on ECG in subjects with Hypertension as compared to mere 9 subjects without Hypertension, which was statistically significant, with $\chi^2$ = 37.92 and P value <0.0001 by McNemar Test.

**Table 5:** Risk Factor Profile in Diabetic Patients with Coronary Artery Disease

| Category | | Number (%) |
|---|---|---|
| Total Prevalence | | 55/175 (31.43%) |
| Age in yrs | 40 – 50 | 11/55 |
| | 51 - 60 | 14/55 |
| | 61 – 70 | 19/55 |
| | >70 | 11/55 |
| Sex | Male | 27/55 |
| | Female | 28/55 |
| Over weight | | 23/55 |
| Obesity | | 15/55 |
| Hypertension | | 46/55 |
| Hypercholesterolemia | | 23/55 |
| Associated Nephropathy | | 12/55 |
| Associated Retinopathy | | 5/55 |

**Table 6:** Comparison of study group with HYPERTENSION with study group without Hypertension for micro albuminuria.

| Variable | Hypertension (Present) N=129 | Hypertension (Absent) N=46 | P value |
|---|---|---|---|
| MAU | 43 | 11 | <0.001 |

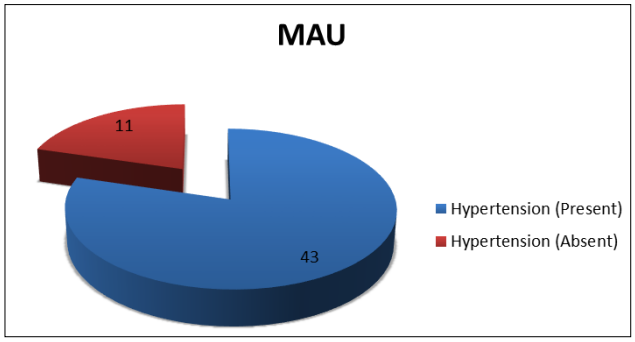


**Fig 6**

43 patients has MAU in subjects with Hypertension to mere 11 subjects without Hypertension which is statically significant with $\chi^2$ = 35.11 and P value <0.001 by McNemar Test.

**Table 7:** Comparison of study group with HYPERTENSION with study group without HYPERTENSION for renal function by S.creatinine evaluation.

| Variable | Hypertension (Present) N=129 | Hypertension (Absent N=46 | P value |
|---|---|---|---|
| S. Creatinine | 27 | 2 | <0.001 |

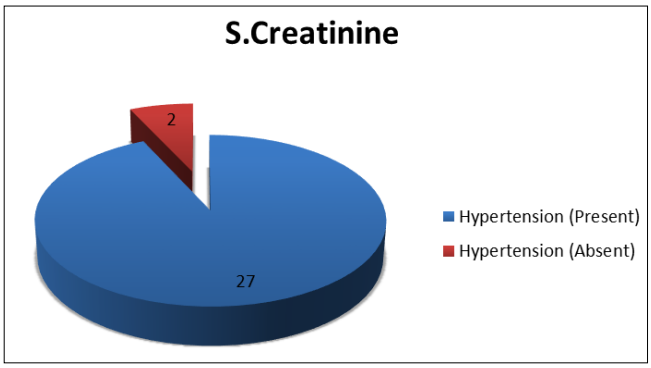


**Fig 7**

27 patients has renal involvement in subjects with Hypertension to mere 2 subjects without Hypertension which is statically significant with $\chi^2$ = 94.24 and P value <0.0001 by Mc Nemar Test.

**Table 8:** Risk Factor Profile in Diabetic Patients with Nephropathy

| Category | Number (%) |
|---|---|
| Total Prevalence | 29/175 (16.6%) |
| Age in yrs | |
| 40 – 50 | 6/29 |
| 51 - 60 | 3/29 |
| 61 – 70 | 13/29 |
| >70 | 7/29 |
| Sex | |
| Male | 14/29 |
| Female | 15/29 |
| Over weight /Obesity | 9/29 |
| Hypertension | 27/29 |
| Hypercholesterolemia | 11/29 |
| Associated CAD | 11/29 |
| Associated Retinopathy | 2/29 |

**Table 9:** Comparison of study group with Hypertension with study group without HYPERTENSION for retinopathy by D-fundus examination.

| Variable | Hypertension (Present) N=129 | Hypertension (Absent) N=46 | P value |
|---|---|---|---|
| **Dfundus** | 14 | 1 | <0.001 |

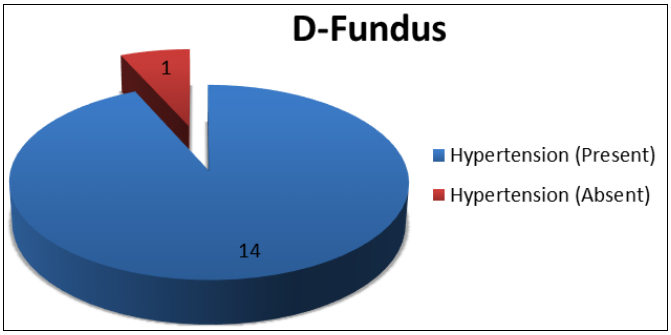


**Fig 8**

As shown in table 7 and figure 6, 14 patients has retinopathy in subjects with Hypertension to mere 1 subjects without Hypertension which is statically significant with $\chi^2$ = 98 and P value <0.0001 by McNemar Test.

**Table 10:** Risk Factor Profile in Diabetic Patients with Retinopathy

| Category | Number (%) |
|---|---|
| Total Prevalence | 16/175 (16.6%) |
| Age in yrs | |
| 40 – 50 | 4/16 |
| 51 - 60 | 5/16 |
| 61 – 70 | 4/16 |
| >70 | 3/16 |
| Sex | |
| Male | 10/16 |
| Female | 6/16 |
| Over weight /Obesity | 9/16 |
| Hypertension | 15/16 |
| Hypercholesterolemia | 4/16 |
| Associated CAD | 7/16 |
| Associated Nephropathy | 3/16 |

**Table 11:** Stages of Retinopathy

| | |
|---|---|
| **Non Proliferative Retinopathy** | 12/16 |
| Proliferative Retinopathy | 3/16 |
| Macular Edema | 1/16 |

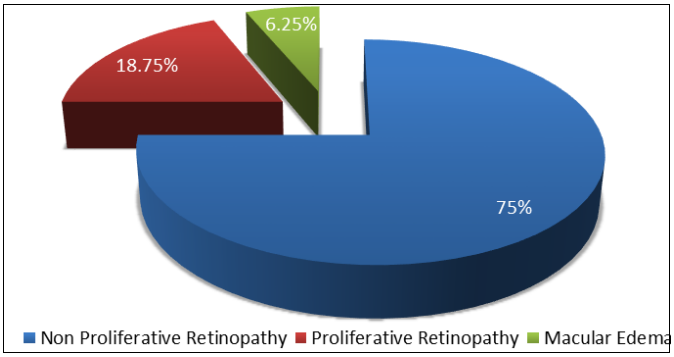


**Fig 9**

## 4. Discussion

Hypertension and diabetes coexist more commonly than predicted by chance. They act in a synergistic manner to markedly accelerate cardiovascular damage, which is in turn responsible for the premature diabetes and higher rates of mortality that afflict diabetics.

Studying the prevalence of hypertension in diabetes gives opportunity to screen for risk factor and earlier treatment and prevention of progression and/or development of complications.

At the end of the study 80.5% of patients have HYPERTENSION out of all diabetic patients.

### Age

**Table 12**

| Age Groups | Male | | Female | |
|---|---|---|---|---|
| | Hypertension (Present) | Hypertension (Absent) | Hypertension (Present) | Hypertension (Absent) |
| 41 to 50 | 10 | 8 | 19 | 8 |
| 51 to 60 | 25 | 5 | 18 | 5 |
| 61 to 70 | 20 | 7 | 20 | 10 |
| >70 | 9 | 1 | 9 | 2 |
| Total | 64 | 21 | 65 | 25 |

Total numbers of patients were 175, out of which 85 were male and 90 were female patients.
Out of 175 patients 129 had hypertension.
40-50 year age group occupied 25.7%, 50-60 year age group occupied 30.3%, >60 year age group 32.6% and >70 year age group occupied 11.4% of population.
50-70 year age compromised largest group in the study also largest group with hypertension.
Out of 129 people who had hypertension 64 were male and 65 were female.
Out of 46 people without hypertension 21 were male and 25 were female.
Prevalence of hypertension was same in male and female.

**Table 13**

| Studies | Case (Age in years) | | Control (Age in years) | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| Present Study | 60.17 | 59.30 | 55.13 | 57.26 |
| Han *et al.* | 51.1 | 50.8 | 42.7 | 42.1 |

The mean age of male and female diabetic hypertensives is significantly higher than that of controls. Similar results were observed by Han *et al*. [1] and Sosenko *et al*. [2] It suggests that as mean age in population advances, the number of people with diabetes and hypertension also increases.

**Table 14**

| Age | CAD | Diabetic Nephropathy | Diabetic Retinopathy | Total No. of patients |
|---|---|---|---|---|
| 41 to 50 | 11 (**24.5**%) | 6 (**13.5**%) | 4 (**9**%) | 45 |
| 51 to 60 | 14 (**26.5**%) | 3 (**6**%) | 5 (**9.5**%) | 53 |
| 61 to 70 | 19 (**33.3**%) | 13 (**22.8**%) | 4 (**7**%) | 57 |
| >70 | 11 (**55**%) | 7 (**35**%) | 3 (**15**%) | 20 |
| Total | 55 | 29 | 16 | 175 |

End organs complication were found to increase with age and were in more patients who had longer duration of hypertension.

**Effect of Hypertension over various complications of diabetes mellitus**

**Table 15**

| | CAD | Diabetic Nephropathy | Diabetic Retinopathy |
|---|---|---|---|
| Hypertension Present | 46 | 27 | 16 |
| Hypertension Absent | 9 | 2 | 1 |
| p value | <0.0001 | <0.0001 | <0.0001 |

CAD prevalence was 31.5% in this study. Males and females were equally affected. Hypertension was associated significantly with CAD (p<0.0001).
This prevalence was somewhat higher to that reported from Chennai urban population study [3] (17.8%).
Diabetes research center from madras [4] reported prevalence of 11.4%. This high prevalence could be because of Asian Indian phenotype that is prevalent in Indians (obesity, hypertension, and dyslipidemias) and high insulin resistance in Indians.
The prevalence of Nephropathy was 16% with male and female equally affected. Hypertension was associated significantly with diabetic nephropathy.
Micro albuminuria was present in 90% in nephropathy group.
The prevalence reported by Vora *et al*. [5] was 7%.
Diabetic retinopathy was found in 9% of study group of which males affected more than females in this study.
This is higher than prevalence reported by Mohan *et al* from Madras[4] (7.4%) and Ram chandran *et al*. [6] (6.7%)
Prevalence of retinopathy in UKPDS [7] was 20-35%.
All these studies used fundus photography to evaluate retinopathy that resulted in high prevalence. The prevalence is lower in Indian as compared to western countries.
The presence of hypertension is independent predictor of complication of Diabetics.
Therefore, it seems that hypertension can strongly contributes to more divesting chronic complications of type 2 diabetics. This findings suggests that hypertension in type 2 diabetes deserves specific treatments targeting not hyperglycemia only.

## 5. Conclusion

The study was designed to observe prevalence of Hypertension in type 2 diabetic patients.
In this study, we recruited 175 patients of type 2 DM randomly, who were on oral hypoglycemic agents from those patients who admitted in medical wards and attending diabetic clinic in Sir Sayajirao Hospital, Vadodara. The salient observations of study were:

1. There is high 80.5 prevalence of Hypertension in type 2 DM.
2. Mean age of diabetic hypertensives were significantly higher than controls among both sexes.
3. Hypertension is present in both obese and non obese type 2 DM, but greater amount in obese diabetic.
4. Hypertension, significantly associated with adverse cardiac outcome in type 2 DM patients and also adverse renal outcomes in type 2 on patients.

Therefore, therapeutic options capable of aggressively controlling Hypertension might be considered in treatment of these patients. These options might results in both the control of hyperglycemia and Hypertension by acting on common roots of diabetes and atherosclerosis.

## 6. Limitation

In our study of 175 patients of type 2 Diabetes Mellitus, the following drawbacks inevitably remained.

1. The study involves a comparatively smaller number of patient (n=175) and in remains to be seen whether the observation seen by us truly reflection of the universe population data.
2. Other markers of atherosclerosis and hypertension like lower limb Doppler, renal Doppler and angiography study could not be performed to add to our body of evidence of morbidity due to atherosclerosis and hypertension.
3. Other factor affecting atherosclerosis and hypertension like plasma homocysteine levels, oxidant stress could not be confounding factor for the risk of atherosclerosis.
4. Because a screening of peripheral arteriosclerosis and renal atherosclerosis with Doppler was not performed in

all subjects examined in the present study, some of the patients with significant vascular lesions could remain undetected.

## 7. References


1. Han TS, *et al*. Associations of body composition with type 2 diabetes mellitus. Diabetic Medicine. 1998; 15:129-135.
2. Sosenko JM, *et al*. Plasma lipid levels at diagnosis in type 2 diabetic patients. Diabetic Medicine. 1993; 10:814-19.
3. Shanthirani CS, *et al*. Prevalence and risk factors of hypertension in a selected South Indian population--the Chennai Urban Population Study. J Assoc Physicians India. 2003; 51:20-7.
4. Viswanathan Mohan, *et al*. Epidemiology of Cardiovascular Disease in Type 2 Diabetes: The Indian Scenario. J Diabetes Sci Technol. 2010; 4(1):158-170.
5. JP Vora, *et al*. Responding to the challenge of diabetic nephropathy: the historic evolution of detection, prevention and management. Journal of Human Hypertension. 2000; 14:667-685.
6. Ramachandran, *et al*. Burden of type 2 diabetes and its complications – The Indian scenario. Current Science. 2002; 83(12):1471-1476.
7. Stratton IM, Kohner EM, Aldington SJ, *et al*. UKPDS 50: Risk factors for incidence and progression of retinopathy in Type II diabetes over 6 years from diagnosis. Diabetologia. 2001; 44:156-163.