IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 9 Ver. 7 (September. 2018), PP 36-40
www.iosrjournals.org

Study of Age Wise Distribution of Electrocardiographic Changes In Patients Of Diabetic Nephropathy of Type 2 Diabetes Mellitus With Background Hypertension

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Abstract: *There is an increase in the prevalence of Type 2 Diabetes mellitus and its complications worldwide as well as in India. Type 2 Diabetes mellitus is no longer considered a mature onset disease. Trends from last two decades and even current trends have shown that Type 2 Diabetes and its complications can occur in younger age groups as well, than earlier believed. Type 2 Diabetes patients with Diabetic nephropathy and background hypertension have excessive cardiovascular mortality. It is thus important to know the distribution and prevalence of electrocardiographic changes in various age groups occurring in patients of Diabetic nephropathy especially in Type 2 Diabetes mellitus and with background hypertension whose prevalence is increasing in Indian population and also worldwide. The objective of this study was to find out the age wise prevalence of cardiovascular ailments in Type 2 Diabetic patients with nephropathy and background hypertension and to help clinicians with screening, diagnosis and timely decision making and also in future and ongoing research. The study was conducted over 100 patients with age ranging from 30-90 years and suffering from Diabetic nephropathy of Type 2 Diabetes with background hypertension attending the outpatient and inpatient services of RIMS, Ranchi, India. The patients were divided in four age groups of 30-45 years, 46-60 years, 61-75 years and 76-90 years. The study was approved by the ethical committee of the institute. The study showed that 74% of the patients had ECG changes. The age group 45-60 showed maximum abnormal ECG tracings (32/100) whereas age group 61-75 showed maximum percentage of abnormal ECG (80.46% of 36). 26% had normal ECG tracings. Thus, cardiovascular assessment is must in Type 2 Diabetes mellitus patients with nephropathy and background hypertension.*

Keywords: *Age wise distribution, Electrocardiography, Diabetic nephropathy, Type 2 Diabetes mellitus, Background hypertension*

Date of Submission: 02-09-2018 Date of acceptance: 18-09-2018

I. Introduction

The recent trends have shown that worldwide >360 million individuals will have Diabetes mellitus by the year 2030 with increase in the prevalence of Type 2 Diabetes in even younger age groups. Diabetes mellitus is a clinical syndrome characterized by hyperglycemia due to absolute or relative insulin deficiency. Hyperglycemia represents an independent risk factor for development of microvascular and macrovascular diseases. If untreated, hyperglycemia is associated with significant risk of microvascular diseases like diabetic nephropathy , retinopathy , neuropathy and to some extent dermatopathy. The prevalence of both types of diabetes varies considerably around the world. Type 2 diabetes is a major burden in health care facilities in all countries. Type 2 diabetes is now being observed in children and adolescents. Diabetic nephropathy is a complication of diabetes and is associated with increased cardiovascular mortality and decrease in quality of life. It is a major factor in development of chronic kidney disease and is the leading cause of End Stage Renal Disease. It is associated with development of other diabetes related complications. Type 2 Diabetes contributes about 99% of Diabetes in Indian population and only about 1% are Type 1. With increase of diabetic population in India and worldwide, it is obvious that incidence of diabetes related complications like nephropathy is going to be a formidable challenge to the medical fraternity. Cardiovascular cause is a major cause of mortality in Diabetic nephropathy. Study of prevalence of cardiovascular ailments in various age groups in Diabetic nephropathy patients would help in proper and timely intervention and reducing the mortality in Diabetic nephropathy patients.

II. Materials And Method

A resting standard 12 lead ECG was done and data collected over 100 patients attending outpatient and inpatient services in RIMS, Ranchi, India .The study was approved by the ethical committee of the institute. The study was carried between March 2016 and September 2017.The patients were divided in age groups of 30-45 years, 46-60 years, 61-75 years and 76-90 years. The patients fulfilled the criteria of Diabetic nephropathy, Type 2 Diabetes mellitus and background hypertension.

Exclusion criteria

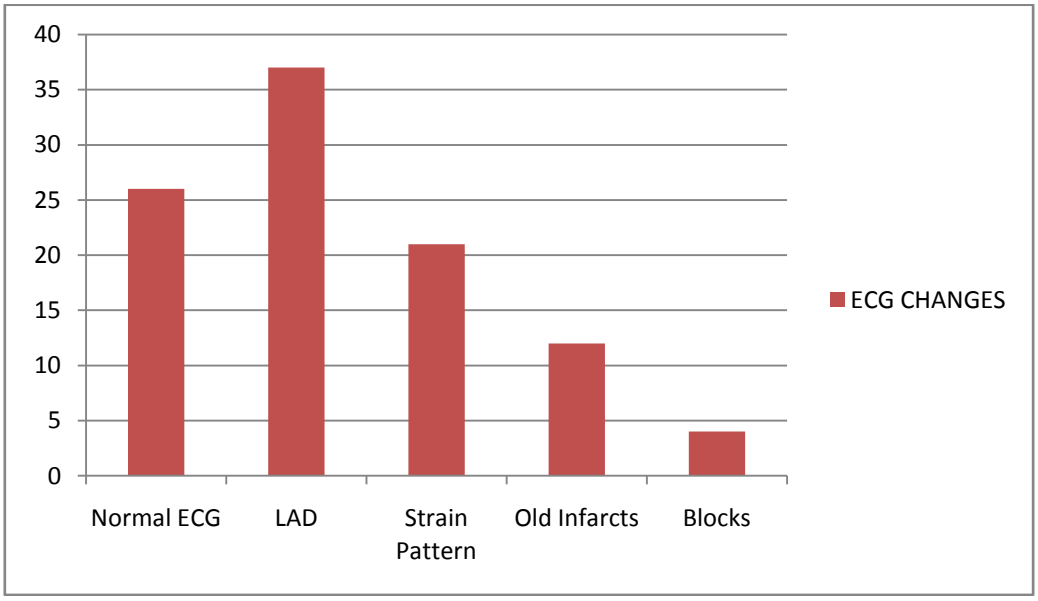
1. Type 1 Diabetes mellitus patients are excluded.
2. Patients without background hypertension (SBP >140 mm Hg and/or DBP >90 mm Hg) are excluded.
3. Patients with renal diseases without diabetes are excluded.

Limitations

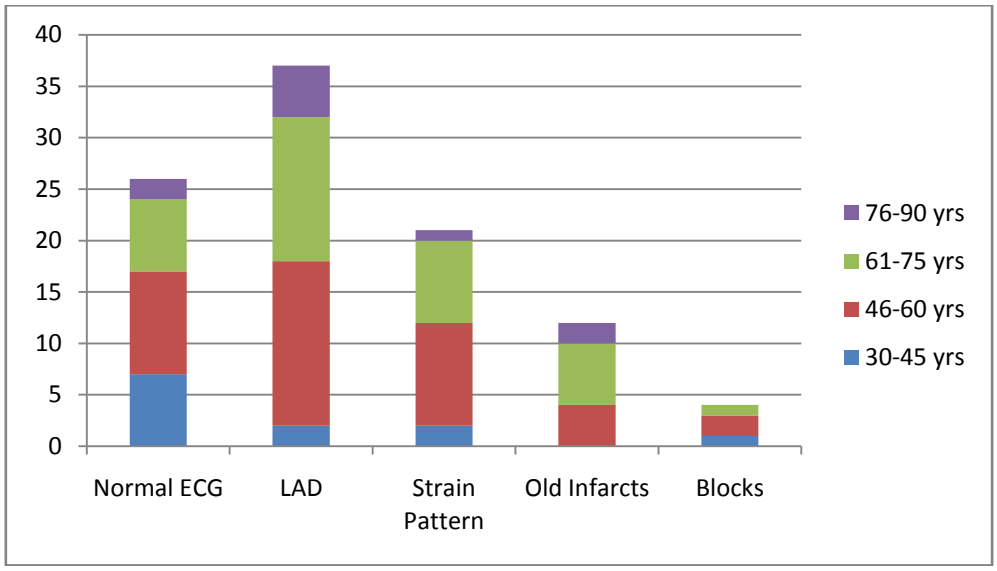
Our study was not free from limitations. Although Type 2 Diabetes mellitus have been reported now even in adolescents but none of the patients that we screened in our period of study were below 30 years of age. Similarly we could not get data of anyone >90 years. So the data of these age groups are missing in our study.

III. Observation And Result

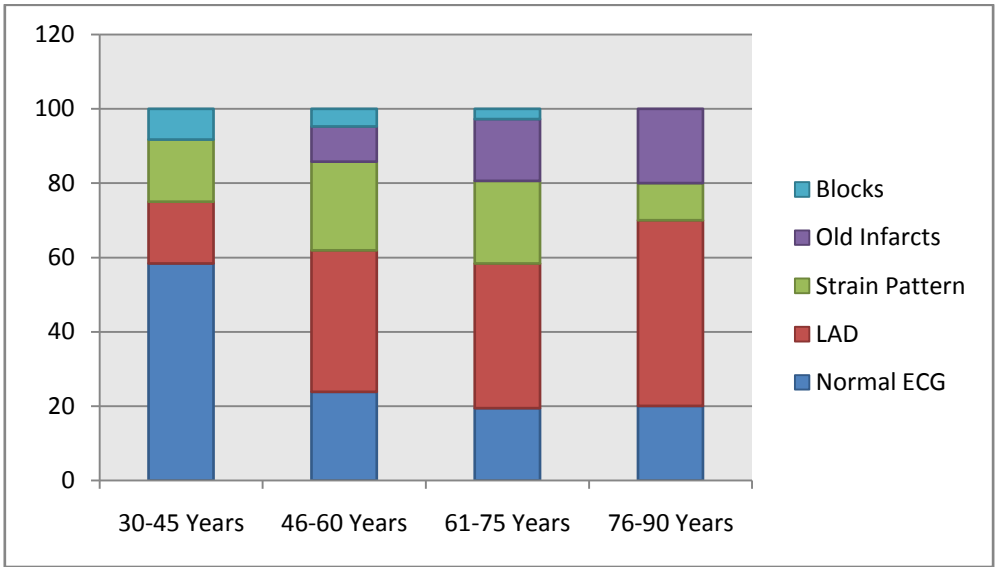
1. In the study conducted over 100 patients with Diabetic nephropathy and background hypertension in Type 2 Diabetes, 74% showed ECG changes.
2. Amongst these most common was Left axis deviation or LAD (37%), followed by Strain pattern(21%), Old myocardial infarcts(12%) and Blocks(4%). 9% showed QT_C prolongation which overlapped with the above findings.
3. 26% showed normal ECG tracings.
4. Left axis deviation or LAD was seen most commonly in age group 46-60 years (43.24% of total LAD).
5. Strain pattern was seen most commonly in age group 46-60 years (47.62% of total Strain pattern).
6. Old infarcts were seen most commonly in age group 61-75 years (50% of total Old infarcts).
7. Blocks were seen most commonly in age group 46-60 years (50% of total blocks).
8. In the age group 30-45 years, 58.33% showed normal ECG, 16.67% showed LAD and strain pattern each, 8.33% showed blocks but none showed old infarcts.
9. In the age group 46-60 years, 23.81% showed normal ECG, 38.10% showed LAD, 23.81% showed strain pattern, 9.52% showed old infarcts and 4.76% showed blocks.
10. In the age group 61-75 years, 19.44% showed normal ECG, 38.89% showed LAD, 22.22% showed strain pattern, 16.67% showed old infarcts and 2.78% showed blocks.
11. In the age group 76-90 years, 20% showed normal ECG, 50% showed LAD, 20% showed old infarcts, 10% showed strain pattern but none showed blocks.
12. Out of the 9 QT_c Prolongation cases, 3 each were found in the age group 61-75 and 76-90 years, 2 were found in age group 45-60 years and 1 case was found in age group 30-45 years.



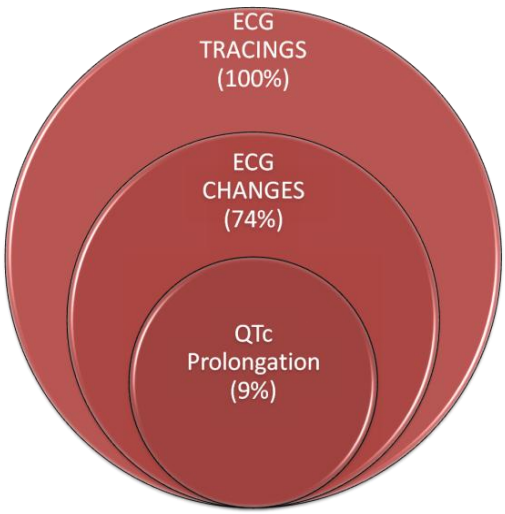
GRAPH SHOWING ECG TRACINGS IN 100 PATIENTS TAKEN FOR STUDY



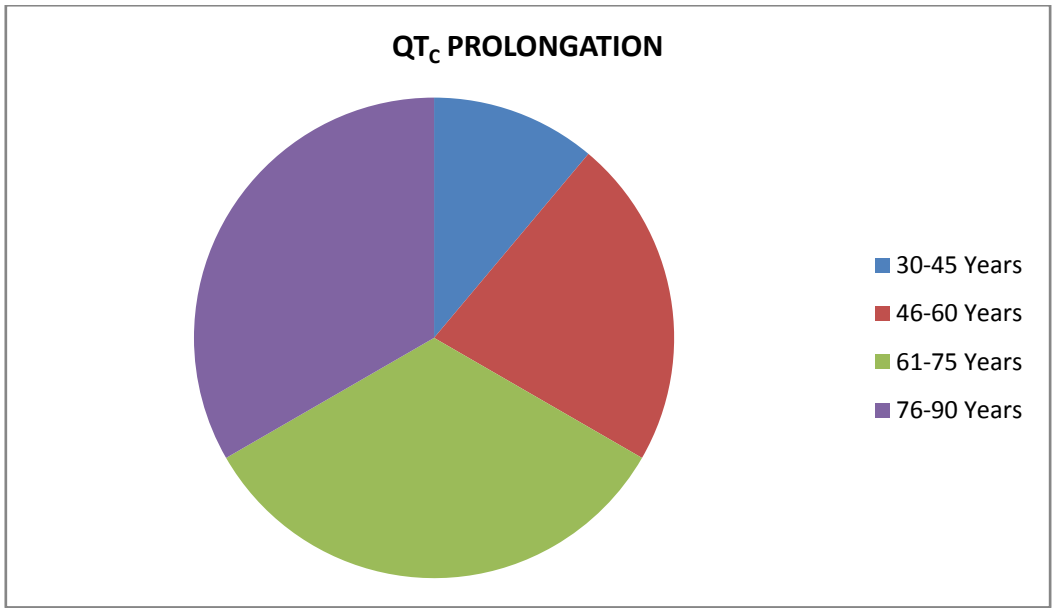
GRAPH SHOWING DISTRIBUTION OFAGE GROUPS IN VARIOUS ECG TRACINGS



GRAPH SHOWING DISTRIBUTION OF ECG TRACINGS IN VARIOUS AGE GROUPS



VENN DIAGRAM SHOWING INCLUSION OF QT_C PROLONGATION WITHIN THE ECG CHANGES



DISTRIBUTION OF QT_C PROLONGATION IN VARIOUS AGE GROUPS OF STUDY

IV. Discussion

Modern day lifestyle with increased stress and consumption of alcohol, smoking ,sedentary lifestyle with too much dependency on gadgets and machines are some major factors leading eventually to formation of advanced glycation end products(AGEs). This has led to Type 2 Diabetes and its complications in even younger individuals. The relationship between blood pressure and renal disease is complex. Hypertension may either be a cause or consequence of renal disease or it may be both. Hypertension and Diabetic nephropathy both can lead to cardiovascular ailments. The renal hemodynamic abnormality is similar in both Type 1 and Type 2 Diabetes mellitus. An early physiological abnormality is glomerular hyperfiltration associated with intraglomerular hypertension. This is accompanied by microalbuminuria which is the first clinical sign of Diabetic nephropathy.

Diabetic nephropathy is caused by both metabolic(hyperglycemia and hyperlipidemia) and hemodynamic (systemic and glomerular hypertension)alterations. Oxidative stress, inflammatory cytokines and endothelial dysfunction too plays a role. Oxidative stress consumes nitric oxide which prevents flow mediated dilation of blood vessels (endothelial dysfunction) subjecting the endothelium to injury. This leads to production of cytokines, acceleration of inflammation, worsening of blood vessel rigidity due to atherosclerosis and further impairment of flow mediated dilation and susceptibility to oxidative stress. Inflammation, endothelial dysfunction and oxidative stress forms a vicious cycle that leads to significant kidney damage and cardiovascular events.

V. Conclusion

The above findings suggest that cardiac assessment is must for evaluation of patients with Diabetic nephropathy in Type 2 Diabetes mellitus no matter what the age is. Although the majority of the cardiovascular ailments are still more prevalent in the age groups from 50 years and beyond but cardiovascular ailments show an increasing trend in even younger age groups as well. The present study again lays emphasis on cardiac assessment for early intervention and decreasing the mortality in age groups from adolescence to elderly in patients with Diabetic nephropathy and background hypertension in Type 2 Diabetes mellitus patients.

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