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General Medicine

ROLE OF QT INDICES AS AN EARLY INDICATOR OF CARDIAC AUTONOMIC NEUROPATHY IN DIABETES MELLITUS PATIENTS

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ABSTRACT **Introduction:** Cardiovascular Autonomic Neuropathy (CAN) being one of serious complications of longstanding diabetes. CAN is an independent risk factor for cardiovascular mortality1. CAN is an impairment of autonomic control of the cardiovascular system. It is often overlooked both in diagnosis and treatment simply because it is mostly asymptomatic and there is no widely accepted single approach to its diagnosis2. **Objectives:** To calculate QT interval and its indices (QTc and QTd) in diabetic population and their correlation with CAN. **Methodology:** A cross-sectional study was performed on 150 diabetic patients attending OPD and IPD of SRG hospital by using random sampling technique and taking informed consent. A brief history and examination performed and CAN was diagnosed using Ewing and Clark tests and a 12 lead ECG was taken. Statistical analysis was done with $\chi 2$ test (p value < 0.05). **Results:** 56% patients were from less than 46-60 Years, 57% patients BMI was more than 25 kg/mt2, Mean duration of diabetes was 8.35 years. Mean QTc in CAN grade 0 was 390.23±8.24, in grade I was 401.36±10.39 and in grade 2 was 425.94±11.08, QTd in CAN grade 0 was 30.20±14.67, in grade I was 37.87±16.23 and in grade 2 was 55.34±14.32 both progressively increasing with the grade of CAN. **Conclusion:** Longer duration of diabetes was associated with higher grading of CAN, higher grading of CAN was associated with higher value of QTc and QTd.

KEYWORDS : Cardiac Autonomic Neuropathy, QTc, QTd, Diabetic Autonomic Neuropathy

INTRODUCTION:

Diabetes Mellitus (DM) is one of the most challenging public health problems in 21st century. the global burden of diabetes as per 2014 WHO Global report is more than 422 million people, of which one-third people are older than 65 years[2]. If nothing is done, the number of people with diabetes may rise to 629 million in 2045. DAN is a serious and common and life-threatening complication of diabetes. It affects various organs like heart, Gastro-intestinal tract, Genito-urinary organs and Skin. Amongst all most important is Cardiac Autonomic Neuropathy (CAN). **CAN** is one of the well-recognized complication of diabetes, it is said to occur when there is an impairment of autonomic control of the cardiovascular system and other causes of dysautonomia have been ruled out.[3] It affects around 8-15 % of newly diagnosed diabetic patients. CAN is an independent risk factor for cardiovascular mortality as stated in ACCORD trial.[1] Prevalence of CAN is at least 30% after 20 years of diabetes as seen in DCCT/EDIC cohort study.[4] The risk for CAN depends on the duration of diabetes and the degree of glycaemic control.[5] Currently, Cardiovascular autonomic reflex tests (CART) given by Ewing and Clarke are the gold standard for diagnosing CAN in persons with DM.[6] These tests are cumbersome and not easy to perform in every patient. Therefore, there is a need of simple, non-invasive bed side test to detect early autonomic involvement in diabetes. The QTc interval is considered as a measurement of myocardial depolarization and repolarization, which is influenced by central autonomic neural tone and kinetics of myocardial cells. Recently it has been observed that there is an inter lead variation in QT segment duration on a 12 lead ECG called QT dispersion (QTd). It is said to represent the regional difference in the myocardial recovery from excitability, as also seen in CAN.[7]

AIMS AND OBJECTIVES:

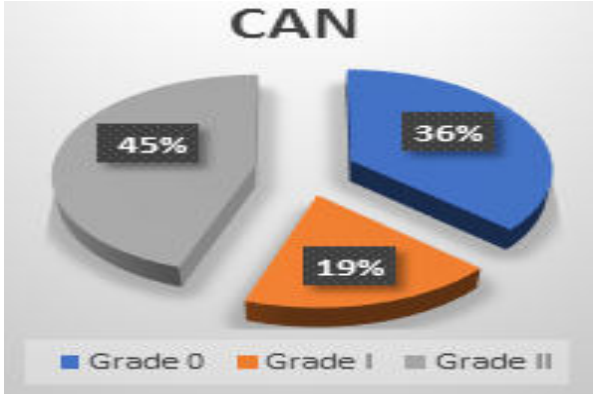
To calculate QT interval and its indices (QTc and QTd) in diabetic population and their correlation with CAN.

MATERIALS AND METHODS:

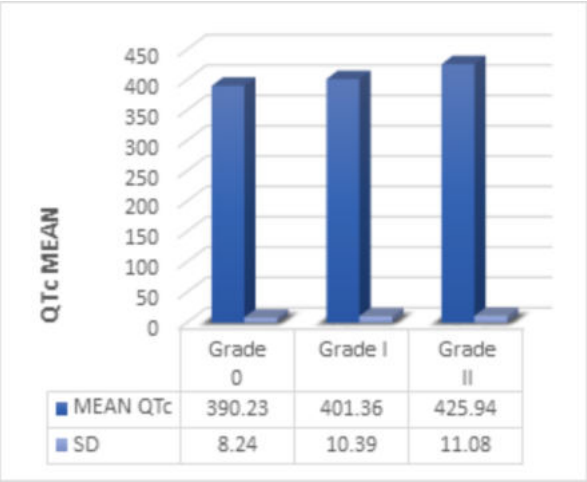
A cross-sectional study was performed on 150 diabetic patients including both type 1 and type 2, attending OPD and IPD of SRG hospital, Jhalawar, Rajasthan after taking informed consent. Sample collection was done using random sampling technique. Patients were diagnosed for DM using WHO criteria. Those who have documented comorbidities- CAD/IHD/ VHD/CHD/HTN, dyselectrolemia, Drugs causing QT prolongation, hypo and hyperthyroidism, fever and active infections, COPD and other chronic lung disorders, Parkinsonism and other movement disorders were excluded. Included patients were subjected to brief history and thorough examination using a predesigned Performa including various autonomic tests to diagnose CAN given by Ewing and Clarke (Gold standard). A standard 12 lead ECG was taken in supine position by using standardized ECG machine and QTc interval (max, min, mean) and QTd were calculated. QTc intervals were calculated using standard Bazett formula. Blood samples were drawn and various routine biochemical tests were performed to rule out exclusion criteria. Data was recorded in excel sheet and evaluated using Chi-square test on SPSS 27.0.1.0 (Trial version), (*p value* < 0.05).

RESULTS:

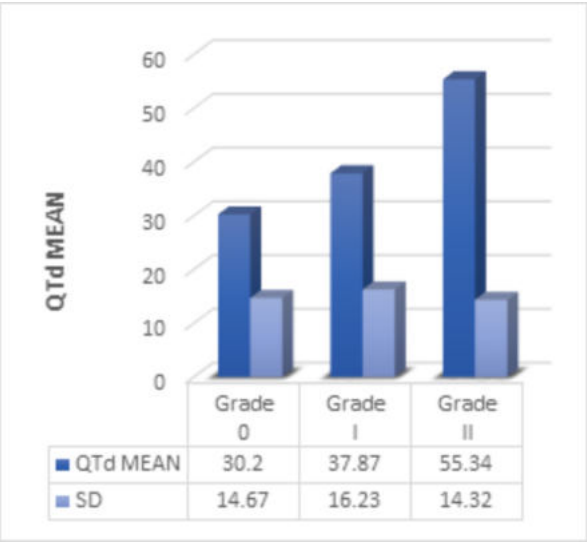
A total of 150 patients were included in the study with a mean age of 51.77±9.14 years and maximum patients 84 (56%) were between 46-60 years age group with a sex distribution of 54% females and 46% males. Patients had a mean BMI of 27.98±2.05 kg/m^2, with majority lying in more than 25 BMI group 86(57.33%) followed by 33(22%) in {18.5-22.9} BMI group and 31(20.67%) in {23-24.9} BMI group. Mean duration of diabetes in presenting patients was calculated as 8.35 years. In our study, 7.33% patients had diabetes for more than 15 years followed by 20% patients who suffered from diabetes for 10-15 years. In present study, Mean FBS was 135±25.45 mg/dl, Mean PPBS was 239.71±81.3 mg/dl and Mean Hb1Ac was 7.00±1.21%. Mean SBP was 135±7.07 mm of Hg and Mean DBP was 85±7.07 mm of Hg. Mean triglyceride was 149.75±46.67 mg/dl, Mean Total Cholesterol was 183.95±28.28 mg/dl, Mean HDL was 44.83±3.53 mg/dl and Mean LDL was 108.60±11.3 mg/dl. Out of 150, majority patients 67 (44.67%) had CAN of grade 2 followed by grade 0, 55(36.67%) and grade 1, 28 (18.67%) respectively.



In our study, QTc mean in CAN grade 0 was 390.23±8.24, in grade I was 401.36±10.39 and in grade 2 was 425.94±11.08.



In our study, Duration of DM in CAN grade 0 was 6.45±1.73 years, in grade I was 6.69±1.66 years and in grade 2 was 10.02±3.02 years.



QTd in CAN grade 0 was 30.20±14.67, in grade I was 37.87±16.23 and in grade 2 was 55.34±14.32 which was found to be statistically significant with p-value <0.05.

DISCUSSION:

A study done by Khandelwal A et al[8] observed similar results to our study with sex distribution observed as 45.0% males and 55.0% females.

Also, a study done by Dinesh K Upadhyay et al[9] found mean ± SD age of the patient to be 56.9± 12.55 years which is close to mean age of our study (51.77±9.14) years.

Similarly, study by Singla A et al[10] observed that their most patients were of 50-60 years age group, also confirmed by many other studies like Khapreet et al,[11] Gupta RK et al[12] and Shah VN et al[13]

Mean BMI of patients was found to be (29.63 ± 6.1 kg/m^2) in Diez JJ et al[14] study which was comparable to our study results in which mean BMI was 27.98±2.05.

Long duration of diabetes and poor glycaemic control were found to be major risk factors in the study done by Maier et al[15] (2018), as was observed in our study also and it was also confirmed in a study by Hazi khan et al[16] stating that CAN was more prominent in cases whose known duration of diabetes was > 5 years.

Bonakdar and colleagues[17] compared QT interval parameters in patients with NSTEMI in two groups, patients with type 2 diabetes and non-diabetics. QTc and QTd were higher in the diabetic group, especially those who needed coronary angioplasty or had ventricular arrhythmias and also observed that in patients who died during hospitalization, QTd and QT max was higher, the study concluded that CAN is associated with increased risk of mortality and which can be seen early by QT indices abnormality and QT can be taken as an indicator for prognosis of a diabetic patient, in line with the conclusion of our study. A study by Pop Busui[18] confirmed that abnormal QTc interval is an indicator of sympathetic and parasympathetic nervous system dysfunction and is predictive of increased mortality and decreased survival with ventricular arrhythmias in diabetic patients.

CONCLUSION:

CAN in our study was 36.67% and that of symptomatic was 63.33%. Among those who were symptomatic, advanced disease was seen in 44.67%. Longer duration of diabetes was associated with higher grading of CAN. Higher grading of CAN was associated with higher value of QTc and QTd. There is a need for early diagnosis and prompt treatment of CAN to reduce mortality among diabetic patients for which QTc and its indices can be taken as an early indicator.

Source Of Support: Nil,

Conflicts Of Interest: None.

REFERENCES:

1. Pop-Busui, Rodica et al. "Effects of cardiac autonomic dysfunction on mortality risk in the Action to Control Cardiovascular Risk in Diabetes (ACCORD) trial." *Diabetes care* vol. 33,7 (2010): 1578-84. doi:10.2337/dc10-0125.
2. World Health Organization, Global Report on Diabetes. Geneva, 2016.
3. Melmed, S., Auchus, R. J.et al (2020). Williams Textbook Of Endocrinology; Chapter-34; 1349-1350.
4. Intensive Diabetes Treatment and Cardiovascular Outcomes in Type 1 Diabetes: The DCCT/EDIC Study 30-Year Follow-up. *Diabetes Care*. 2016;39(5):686-693. doi:10.2337/dc15-1990.
5. Dafaalla MD, Nimir MN, Mohammed MI, *et al,* Risk factors of diabetic cardiac autonomic neuropathy in patients with type 1 diabetes mellitus: a meta-analysis. *OpenHeart* 2016;3:e000336. doi: 10.1136/openhrt-2015-000336.
6. Rolim, Luiz Clemente et al. "Tests for early diagnosis of cardiovascular autonomic neuropathy: critical analysis and relevance." *Frontiers in endocrinology* vol. 4 173. 11 Nov. 2013, doi:10.3389/fendo.2013.00173.
7. Assessment of QT Interval and QT Dispersion for Prediction of All-Cause and Cardiovascular Mortality in American Indians. American Heart Association, Volume 101, Issue 1, 4 January 2000; Pages 61-66 ,doi.org/10.1161/01.CIR.101.1.61
8. Khandelwal A et al. A study of knowledge about the diabetes type I and II, among diabetic patients in Geetanjali medical college and hospital, Udaipur, Rajasthan, India. Int J Community Med Public Health 2016;3:1278- 81.
9. Dinesh K Upadhyay, Subish Palaian. Knowledge, Attitude and Practice about Diabetes among Diabetes Patients in Western Nepal. Rawal Medical Journal January 2008
10. Singla A, Sharma T, Kaeley N. Awareness of Diabetic Patients towards Diabetes Mellitus: A Survey Based Study. Natl J Community Med 2017; 8(10):606- 610.
11. KhapreMP, Mudey A, Goyal RC, Wagh V. Low awareness of diabetes affecting the clinical outcome of patient –A cross sectional Study conducted in rural tertiary care hospital. Int J Biol Med Res. 2011;2(3):627-630.
12. Gupta RK, Shora TN, Jan R, et al. Knowledge, Attitude and Practices in Type 2 Diabetes Mellitus Patients in Rural Northern India. Indian J Comm Health. 2015; 27(3): 327-33.
13. Shah VN, Kamdar PK, Shah N. Assessing the knowledge, attitudes and practice of type 2 diabetes among patients of Saurashtra region, Gujarat. International Journal of Diabetes in Developing Countries.2009;29(3):118-22.
14. Diez JJ, Sanchez P, Iglesias P. Prevalence of thyroid dysfunction in patients with type 2 diabetes. Exp Clin Endicrinol Diabetes,2011; 119:201–7. 10.1055/s-0031-1271691
15. Moţăţăianu, A., Maier, S., Bajko, Z. et al. Cardiac autonomic neuropathy in type 1 and type 2 diabetes patients. BMC Neurol 18, 126 (2018). https://doi.org/10.1186/s12883-018-1125-1.
16. Khoharo HK, Halepoto AW. QTc-interval, heart rate variability and postural hypotension as an indicator of cardiac autonomic neuropathy in type 2 diabetic patients. J Pak Med Assoc. 2012 Apr;62(4):328-31. PMID: 22755273.
17. Bonakdar HR et al. Comparison between QT Interval Parameters in Type 2 Diabetic and Nondiabetic Patients with NonP ST Elevation Myocardial Infarction. J Tehran Heart Cent. 2014;9(4):166-73. PMID: 25870641
18. Pop-Busui R. Cardiac autonomic neuropathy in diabetes: a clinical perspective. Diabetes Care 2010; 33: 434-41.