https://doi.org/10.29309/TPMJ/2024.31.03.7941

The Professional Medical Journal
www.theprofesional.com
2024, Volume, 31 Issue, 03

ORIGINAL ARTICLE

To assess the prevalence of undiagnosed type 2 diabetes mellitus in patients with acute coronary syndrome.

Quaiynat Amin Khan[1], Abdul Hameed Kiani[2], Nisar Ahmed[3], Tahir Ahmad Munir[4], Nasim Ilyas[5], Miss Abeer Tahir[6]

Article Citation: Khan QA, Kiani A, Ahmed N, Munir TA, Ilyas N, Tahir MA. To assess the prevalence of undiagnosed type 2 diabetes mellitus in patients with acute coronary syndrome. Professional Med J 2024; 31(03):351-356. https://doi.org/10.29309/TPMJ/2024.31.03.7941

ABSTRACT… Objective: To access the prevalence of undiagnosed type 2 Diabetes Mellitus in patients with Acute Coronary Syndrome. **Study Design:** Cross-sectional study. **Setting:** Department of Medicine, of Tertiary Care Hospital of Islamabad. **Period:** 17th July 2023 to 17th October 2023. **Methods:** WHO calculator was used to calculate the sample size and 100 subjects were selected fulfilling the inclusion criteria (Both male and female of age 18 to 65 years retained in ER or admitted with the diagnosis of ACS). Blood samples were obtained for baseline investigations including blood sugar and HBA1C. Results were entered on EXCEL Sheets and analyzed using SPSS V.20. **Results:** The data showed 47% males, 70% of the participants belonging to the age group 41-65 years ACS presenting with STEMI in 37%, 40% patients with NSTEMI and unstable angina was found in 23%. The Mean BMI was 27±3.2SD mean HBA1C level was 4.3±1.7SD and the mean FBG was 129±17.9SD. Among all the male patients, there were (27.65%) patients with undiagnosed T2DM while among all the female patients, (18.8%) were reported with undiagnosed T2DM. **Conclusion:** A high prevalence of undiagnosed DM was observed in ACS patients admitted to tertiary care hospital. Research work done in developing countries showed data which was consistent with our study, however, research data from developed world was in contrast to our study.

Key words: Acute Coronary Syndrome, Diabetes Mellitus, Noncommunicable Disease, Pakistan.

INTRODUCTION

Diabetes mellitus is considered a syndromic illness because it's a disorder affecting multiple organs. The exact cause of DM is not known; however, the basic defect is an absolute, partial deficiency of Insulin or cellular resistance to the Insulin action.[1] There are two main mechanisms of glucose entry into the cells depending upon the type of cells, some have Insulin-dependent entry of glucose others have insulin-independent entry of glucose into cells.[2]

Cell damage occurs mostly in cells in which insulin is not required for the entry of glucose into the cells, because of excessive formation of sorbitol. Poor utilization of glucose by the cells despite hyperglycemia, resulting in further increasing blood glucose causing more and more entry of glucose into cells which have glucose entry insulin independent.[3] More glucose in these cells leads to the production of sorbitol which is a large molecule that cannot cross the cell membrane ger trapped within cells and draws water into the cells because it is an osmotic agent causing cell swelling and ultimately cell death.[4]

The main types of DM are type I, II, and Gestational, and among them, type II is the commonest affecting the highest number of individuals irrespective of gender. DM is common worldwide, with initial trend in developed countries but recent data shows it is now equally prevalent in developing countries and Pakistan is no exception.[5] DM is coming under the heading of Non-communicable diseases (NCD) with no permanent cure only controlling glucose levels is a way forward in managing the disease and preventing the devastating complications.[6]

DM is ranked top among the major diseases

1. MBBS, Senior Medical Officer, Medical Staff Affairs Shifa International Hospital, Ltd.
2. MBBS, Senior Medical Officer, Medical Staff Affairs Shifa International Hospital, Ltd.
3. MBBS, FCPS, Assistant Professor Cardiology, Poonch Medical College. Rawalakot.
4. MBBS, FCPS, Professor Physiology, Bahawalpur Medical College, Bahawalpur.
5. MBBS, M.PHIL, MPH, Professor Biochemistry, Bahawalpur Medical College, Bahawalpur.
6. 3rd Year MBBS Student, Rawal Institute of Health Sciences. Islamabad.

Correspondence Address:
Dr. Nasim Ilyas
Department of Biochemistry
Bahawalpur Medical College, Bahawalpur.
biochemistry.iimct@gmail.com

Article received on: 23/10/2023
Accepted for publication: 29/12/2023

causing high mortality and disability. DM requires lifelong treatment and monitoring of possible complications. In Pakistan, DM is very much prevalent with a rising trend inflicting considerable damage to physical well-being and economic loss both at individual and national levels.[7] The Pakistani health system had failed to manage communicable diseases and now had been overwhelmed by NCD. In Pakistan, out-of-pocket expenditure on health is the highest in the region of gross national income. Acute coronary syndrome (ACS) is a disease affecting the functioning of the heart resulting in wide-ranging disability and death in cases of severe disease.[8]

ACS is prevalent occurs the globe affecting both males and females. Initially, there was a higher prevalence of ACS in the developed world however now with the start of the 21st century it is equally prevalent in developing countries. DM is considered to be the precipitating factor for the incidence of ACS and exacerbating existing ACS. There has been incredibly high mortality and morbidity whenever there is a combination of DM and ACS. This study was planned to assess the undiagnosed DM in ACS patients admitted to tertiary care hospitals.

METHODS

A cross-sectional study was conducted at the tertiary care hospital of Islamabad over 15 weeks (17 – 07 – 2023 to 17 – 10 – 2023). WHO calculator was used to calculate the sample size and by simple stratified sampling technique was used for selecting 100 subjects, setting the inclusion criteria, (Both male and female of age 18 to 65 years retained in ER or admitted with the diagnosis of ACS), and exclusion criteria (Congenital, valvular heart disease, type I & gestational Diabetes mellitus, chronic illness like CLD and renal diseases). Ethical committee approval was obtained before the start of study from institutional ethical committee (IRB No. 0184-23, Dated:17-07-2023). and informed consent obtained from all participants. Preliminary investigation including ECG, Blood samples were obtained for base line blood chemistry (Cardiac enzymes, lipid profiles, BSF and HBA1C) performed. Results were entered on EXCEL Sheets and analyzed using SPSS V.20.

RESULTS

The demographic and general disease data showed 47% males, 70% of the participants belonging to the age group 41-65 years, ACS presenting with STEMI in 37% and prevalence of undiagnosed T2DM was 23%, details shown in Table-I.

Demographic Characteristics	Percentage (%)
Gender	
Male	47%
Female	53%
Age Category	
18-40 years	30%
41-65 years	70%
ACS Presentation	
STEMI	37%
NSTEMI	40%
Unstable angina	23%
Undiagnosed Type II Diabetes Mellitus	
No	23%
Yes	77%

Table-I. Demographic characteristics & general prevalence of diseases

Among all the male patients, there were (27.65%) patients with undiagnosed T2DM while among all the female patients, (18.8%) were reported with undiagnosed T2DM, details shown in Table-II.

Among all the patients in the age group 18-40 years, there were (43.3%) patients with undiagnosed T2DM while (56.2%) were not found with undiagnosed T2DM, details shown in Table-III.

Among all the patients with BMI ≤25/m2, there were (32.5%) patients with undiagnosed T2DM while among all the patients with >25 Kg/m2, (16.6%) were reported with undiagnosed T2DM details shown in Table-IV.

Among all the patients with STEMI, there were (32.5%) patients with undiagnosed T2DM while among all the patients with NSTEMI, (16.6%) were reported with undiagnosed T2DM details shown in Table-V.

Gender	Undiagnosed T2DM				Total	P-Value
	No		Yes			
	Frequency	Percentage		Percentage		
Male	34	72.34042553	13	27.659574	47	0.346
Female	43	81.13207547	10	18.867925	53	
Total	100					

Table-II. Stratification of undiagnosed T2DM with respect to gender

Age	Undiagnosed T2DM				Total	P-Value
	No		Yes			
	Frequency	Percentage	Frequency	Percentage		
18-40 years	17	56.66666667	13	43.33333333	30	0.002
41-65 years	60	85.71428571	10	14.28571429	70	
Total	100					

Table-III. Stratification of undiagnosed T2DM with respect to age

BMI	Undiagnosed T2DM				Total	P-Value
	No		Yes			
	Frequency	Percentage	Frequency	Percentage		
≤25 Kg/m2	27	67.5	13	32.5	40	0.090
>25 kg/m2	50	83.3333333	10	16.666667	60	
Total	100					

Table-IV. Stratification of undiagnosed T2DM with respect to BMI

ACS Presentation	Undiagnosed T2DM				Total	P-Value
	No		Yes			
	Frequency	Percentage	Frequency	Percentage		
STEMI	27	67.5	13	32.5	40	0.090
NSTEMI	50	83.3333333	10	16.666667	60	
Total	100					

Table-V. Stratification of undiagnosed T2DM with respect to ACS presentation

DISCUSSION

Coronary artery disease (CAD) remains the biggest concern for the medical community across the world. A major chunk of the healthcare budget is spent on the management of CAD and a significant number of working hours are lost due to this disease. CAD have multiple risk factors such as smoking, DM, HTN, hyperlipidemia etc. among them DM remains the top most.[9] DM is prevalent in Pakistan like the rest of the world but the worrying aspect is that the graph is rapidly going upward and a large majority of cases are undiagnosed. In most cases, there is an accidental diagnosis of DM when patients report to the hospital for other illnesses such as ACS.[10]

There was a 1:1.3 ratio between males and females in our study in contrast to a foreign study having predominate males in comparison to females with a 1:4 ratios. A further higher ratio of 5.6:1, and 4.7:1 of male/female were reported by the Studies done in south Punjab (Pakistan) and Saudi Arabia respectively.[11,12]

23% of CAD patients were found to be diagnosed with DM in our work. A similar study done in China showed similar findings of 37% of CAD patients were diagnosed with DM during hospital stay.[13] These studies have highlighted the importance of proper medical history taking and base workup for detecting silent DM.[14]

A study done in the USA showed that CAD patients were subjected to FBS testing, 70% had >7 mmol but unfortunately[15], 56% were not further tested for HBA1C during the hospital stay to confirm the diagnosis of DM.[16] Our study showed that only 19% of CAD patients had FBS below 100mg/dl and 81% were either Diabetic or having impaired FBS.

Work-up for detecting DM, HBA1C levels helped make the diagnosis, with 40% diagnosed as confirmed cases of DM and 39% as pre-diabetes. Therefore, it can be concluded that 79% of CAD were either Diabetic or prediabetes and the rest of the 21% had normo-glycemia.[17] Studies done in Japan had the same study group but the detection of DM was much lower around 41%, the reason might be a better screening program so they had less chance of missing the diagnosis of DM.[18]

Our study showed a BMI of 27 + 3.2 and the stratification of T2DM with BMI, which was consistent with another Pakistani study which showed a BMI of 26.5 + 4.9 but didn't report on stratification of T2DM with BMI. A study done in KSA reported 74%, and 26% cases of STEMI and NSTEMI respectively and didn't report on UA, whereas our study showed 37%, and 40%, cases of STEMI and NSTEMI respectively and also reported 23% cases of UA.[19]

Our study was consistent with an Indian study done in a tertiary care hospital having the same study group which highlighted that 43% of the CAD patients were diagnosed with DM on HBA1C levels. In my opinion, which I have observed after going through multiple studies conducted in developing countries showing similar results of high detection rates T2DM in CAD patients, the reason is simply a lack of routine annual medical checks and community-based screening programs.[20-22] Another reason is the lack of availability of medical facilities as in the Indian sub-continent 60-70% of the population is in rural which are far flung from mega hospitals and high-tech laboratories.[23,24]

CONCLUSION

A high prevalence of undiagnosed DM was observed in ACS patients admitted to tertiary care hospital. Research work done in developing countries showed data which was consistent with our study, however, research data from developed world was in contrast to our study.

ACKNOWLEDGEMENT

Thanks to all the respondents, Hospital staff and Doctors.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

1. American Diabetes Association. **Classification and diagnosis of diabetes: Standards of medical care in diabetes.** Diabetes Care 2019; 42 (Suppl. 1): S13-S28. Doi. org/10.2337/dc19-S002

2. Standl E, Khunti K, Hansen TB, Schnell O. **The global epidemics of diabetes in the 21st century: Current situation and perspectives.** Eur J Prev Cardiol. 2019; 26(2_suppl):7-14. doi: 10.1177/2047487319881021.

3. American Diabetes Association. **Diagnosis and classification of diabetes mellitus.** Diabetes Care 2014; 37(Suppl. 1):S81–S90L.

4. Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, et al. **Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition.** Diabetes Res Clin Pract. 2019; 157:107843. doi: 10.1016/j.diabres.2019.107843

5. Kumar, N., Verma, R., Chouhan, B., & Goyal, P. **Study of prevalence of undiagnosed diabetes mellitus in patients presenting with acute coronary syndrome.** The Journal of the Association of Physicians of India. 2022; 70(4):11-12.

6. Akhtar S, Nasir JA, Abbas T, Sarwar A. **Diabetes in Pakistan: A systematic review and meta-analysis.** Pak J Med Sci. 2019 Jul-Aug; 35(4):1173-1178. doi: 10.12669/pjms.35.4.194. PMID: 31372163; PMCID: PMC6659044.

7. Rashid M, Yaseen G, Ghaffar U. **Prevalence of acute coronary syndrome and various risk factors in acute stroke patients.** Cureus. 2020; 12(8): e9552. DOI 10.7759/cureus.9552

8. Uddin F, Ali B, Junaid N. **Prevalence of diabetic complications in newly diagnosed type 2 diabetes patients in Pakistan: Findings from national registry.** J Ayub Med Coll Abbottabad. 2018; 30 (4): S652-S658. PMID: 30838825.

9. Ferrannini G, Norhammar A, Gyberg V, Mellbin L, Ryden L. **Is coronary artery disease inevitable in type 2 diabetes? From a glucocentric to a holistic view on patient management.** Diabetes Care. 2020; 43(3):2001-2009.

10. Babar MZM, Majid A, Chaudhary AW, Baig MAR. **Atrio-ventricular block; Incidence of high degree atrio-ventricular block complicating acute myocardial infarction and its effects on in-hospital mortality.** Professional Med J. 2016; 23(8):1017-21. DOI:10.17957/TPMJ/16.3518

11. Rathi N, Balouch MZ, Kazi S, Ahmed S, mueed A, Shaikh AG. **Prevalence of first diagnosed atrial fibrillation in patients admitted with acute coronary syndrome and with impaired renal function with and without diabetes mellitus.** J. Pharm. Res. Int. [Internet]. 2021 May 12 [cited 2023 Oct. 19]; 33(28B):123-8. Available from: https://journaljpri.com/index.php/JPRI/article/view/2377

12. Alnemer KA, Alfaleh HF, Alhabib KF, Ullah A, Hersi A, Alsaif S, Taraben A, Hussein G, Butt M. **Impact of diabetes on hospital adverse cardiovascular outcomes in acute coronary syndrome patients: Data from the Saudi project of acute coronary events.** J Saudi Heart Assoc. 2012; 24(4):225-31. doi: 10.1016/j.jsha.2012.08.002.

13. Liu J, Zhao D, Liu Q, Wang W, Sun J-Y, Wang M, Suo M. **Study on the prevalence of diabetes mellitus among acute coronary syndrome inpatients in a multiprovincial study in China.** Zhonghua Liu Xing Bing Xue Za Zhi. 2008; 29(6):526-9.

14. Petrie JR, Guzik TJ, Touyz RM. **Diabetes, hypertension, and cardiovascular disease: Clinical insights and vascular mechanisms.** Can J Cardiol. 2018; 34:575-84.

15. Laichuthai N, Abdul-Ghani M, Kosiborod M, Parksook W.W, J. Kerr S. **Newly discovered abnormal glucose tolerance in patients with acute myocardial infarction and cardiovascular outcomes: A meta-analysis.** Diabetes Care. 2020; 43(4):1958-1966.

16. Aronson D, Edelman ER. **Coronary artery disease and diabetes mellitus.** Cardiol Clin. 2014 Aug; 32(3):439-55.

17. ASLAN O , Mustafa T Y, Y. **Evaluation of myocardial damage in relation to HbA1c in patients with previously unrecognized diabetes presenting with STEMI.** BMJ. 2021; 21(3):134-7.

18. Fujihara K, Sone H. **Cardiovascular Disease in Japanese Patients with Type 2 Diabetes Mellitus.** Ann Vasc Dis. 2018; 11(1):2-14. doi: 10.3400/avd.ra.17-00109. PMID: 29682103; PMCID: PMC5882354.

19. Alguwaihes AM, Alhozali A, Yahia MM, Abdel-Nabi T, Hassan Hatahet M, Albalkhi NI, Al Sifri S. **The prevalence of cardiovascular disease in adults with type 2 diabetes mellitus in Saudi Arabia - CAPTURE study.** Saudi Med J. 2023 Jan; 44(1):57-66. doi: 10.15537/smj.2023.44.1.20220402.

20. Mehraj I, Yousuf IW, Aslam K, Masoodi S, Wani YY. **Association of HbA1c with prevalence and severity of coronary artery disease in diabetic and nondiabetic patients in Kashmir.** Asian J Sci Technol. 2014; 5(3):230-232.

21. Einarson TR, Acs A, Ludwig C, Panton UH. **Prevalence of cardiovascular disease in type 2 diabetes: A systematic literature review of scientific evidence from across the world in 2007-2017.** Cardiovasc Diabetol. 2018; 17(1):83. doi: 10.1186/s12933-018-0728-6. PMID: 29884191; PMCID: PMC5994068.

22. Dar MI, Beig JR, Jan I, Shah TR, Ali M, Rather HA, Tramboo NA. **Prevalence of type 2 diabetes mellitus and association of HbA1c with severity of coronary artery disease in patients presenting as non-diabetic acute coronary syndrome.** Egypt Heart J. 2020; 72(1):66. doi: 10.1186/s43044-020-00101-0. PMID: 32990846; PMCID: PMC7524918.

23. Weykamp C. **HbA1c: A review of analytical and clinical aspects.** Ann Lab Med. 2013; 33(6):393-400. doi: 10.3343/alm.2013.33.6.393.

24. Mohan V, Venkatraman JV, Pradeepa R. **Epidemiology of cardiovascular disease in type 2 diabetes: The Indian scenario.** J Diabetes Sci Technol. 2010 Jan 1; 4(1):158-70. doi: 10.1177/193229681000400121.

AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Quaiynat Amin Khan	Significant	
2	Abdul Hameed Kiani	Significant	
3	Nisar Ahmed	Significant	
4	Tahir Ahmad Munir	Significant	
5	Nasim Ilyas	Significant	
6	Miss Abeer Tahir	Significant	