ORIGINAL ARTICLE

The Relationship between Body Mass Index and the Pervasiveness of Ischemic Heart Disease in Patients with Type 2 Diabetes

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ABSTRACT

Background: The conversion from transmissible to non-communicable diseases has occurred for numerous years in all states of the biosphere, including emerging republics. Ischemic heart disease and diabetes mellitus complications belong to the second-most important group of diseases. In the current age, there has been a renewed debate about the importance of weight gain and obesity as risk factors for both diseases. The study aims to govern the association between the body mass index and the occurrence of ischemic heart disease in patients with type 2 diabetes.

Methods: This cross-sectional study was conducted in the medicine department of LUHS Jamshoro for the duration of six months, from November 2022 to April 2023. The study was directed at 300 patients with type II diabetes mellitus. Data was collected from medical records and then analyzed using SPSS with the Chi-square method.

Results: Out of 300 patients with type II diabetes mellitus, 120 were men and 180 were women. According to the findings of the present study, among patients with type-II diabetes mellitus, 41 (13.7%) had ischemic heart disease, of which 29 were female and 12 were male. The ischemic heart disease prevalence in youth is in 11 (26.8%), middle-aged and elderly 53.7% (22 out of 41 patients) and 19.4% (8 cases out of 41 patients), respectively.

Practical Implication: The study emphasizes the importance of customized screening and prevention programs for ischemic heart disease and type 2 diabetes, particularly for women. It suggests a gender-specific approach, requiring primary care physicians for early detection and management. Public health initiatives should increase awareness of the connection between these conditions.

Conclusions: Contrary to our conclusions, although the incidence of type II diabetes in obese and overweight patients is more advanced than in those with normal or low body weight, the incidence of ischemic heart complications in subjects with type 2 diabetes does not follow this trend. The varying body mass index and the incidence of coronary heart disease are higher in women than in men in the normal weight group.

Keywords: Obesity, Body mass index, ischemic heart disease, and type 2 diabetes

INTRODUCTION

According to the International Diabetes Federation (IDF), there were 41.5 billion people with diabetes in 2016, and this is predicted to increase to 650 million by 2045, increasing the risk of heart disease. [1-2]. Type 2 diabetes will not reduce its significant economic cost, even in countries that meet international targets.[3-4].

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It's not just the problem of high-income regions; it has affected the poorest parts of the world as well. Cardiovascular risk was increased in type II diabetics in comparison to non-diabetics, as in the Framingham study. Diabetics are four times more likely to develop cardiovascular disease than those without diabetes. The most common cause is multiple morbidities in them. In addition, these patients develop cardiovascular complications at a younger age and have a worse prognosis. It is known to be modifiable for coronary heart disease. The American College of Cardiology has listed obesity as a major risk factor for CAD. A 40-cohort systematic review found that obese patients did not have an increased risk of overall death or death from cardiac disease. These conclusions may be interpreted by the lack of discriminative influence of BMI to distinguish between lean body mass and body fat. (Gary et al., 2015)[7] found that men are at a higher risk of complications than women. Another study from the UK found that

even weight loss in men was associated with a lower risk of diabetes and therefore significant cardiac benefit in younger men[8-9]. There is currently a paradox about the role of obesity in the incidence of cardiovascular disease in diabetics, and future studies may examine this issue in more detail. Especially according to our work in this field in recent years, The latter is limited and, in addition to increased BMI and obesity, is traditionally mentioned as a risk factor for cardiac disease. There is no indication for the existence of recently reported paradoxes, so this study examines this issue. [11] The aim of the study is to determine the association between the body mass index and the occurrence of ischemic heart disease in patients with type 2 diabetes.

Diabetes is becoming more and more common in Pakistan, which can result in problems including ischemic heart disease. This strains the hospital infrastructure and has major financial effects on people and healthcare systems. Individuals with type 2 diabetes have an increased risk of cardiovascular conditions, such as ischemic heart disease. The precise association between body mass index (BMI) and ischemic heart disease in Pakistani patients is not well understood, yet. Obesity and cardiovascular disease, as well as gender differences in diabetes complications, have a contradictory link. It's also necessary to conduct limited research on Pakistani populations' obesity and cardiovascular risk. In order to develop preventative measures and interventions to lessen the increasing burden of cardiovascular problems connected to diabetes, it is imperative that these gaps be addressed.

METHODS

This cross-sectional study was conducted in the medicine department of LUHS Jamshoro for a duration of six months, from November 2020 to April 2021. The sample included all patients with type II diabetes mellitus registered in the family physician plan. The data of 300 patients with type II diabetes mellitus was collected from the medicine department. The data collection tool is performed using a review of physical as well as electronic health files available in the "hospital system" as well as diabetic patient care files under the title "Diabetes Management." The individuals are subjected to anthropometric examinations, screening, diabetes care, and its complications, including ischemic heart disease, based on age, sex, and care, according to middle-aged and elderly care programs. Body mass index was considered by dividing weight into kilograms per square meter of patient height by meters and based on the criteria of the National Heart, Lung, and Blood Association (NHLBI, Lung, and Heart National Institute). Blood and into 6 subgroups, normal weight, and Grade 1, 2, and 3 obesities were divided. Diabetes was confirmed according to the criteria of the American Diabetes Association, and ischemic heart disease is diagnosed by a family physician and referred to a cardiologist according to national guidelines and approval by a specialist, who then sends feedback. In cases of no feedback, subjects were evaluated by observing the total case summary and evidence of myocardial ischemia, including ECG, test stress, and cardiac interventions such as PCI percutaneous (coronary CABG and coronary intervention) and artery bypass graft surgery. Random telephone interviews were conducted with patients and their families to ensure the validity and reliability of the information. After data collection, the data were analyzed using SPSS version 23 for quantitative analysis. Chi-square and significant level were performed with 0.005 precision.

RESULTS

Out of 300 patients with type-II diabetes mellitus, 120 were men and 180 were women. Table 1 shows the proportion of patients with type-II diabetes mellitus in various age groups. According to the findings of the present study, among patients with type-II diabetes mellitus, 41 (13.7%) had ischemic heart disease, of which 29 were female and 12 were male.

Table 1: Age comparison of type 2 diabetic patients

Range	Youth	Middle-aged	Elderly	P value
Type-II diabetic patients	42	147	111	P 0.003

The ischemic heart disease prevalence in youth is in 11(26.8%) middle-aged and elderly is 53.7% (22 out of 41 patients) and 19.4% (8 cases out of 41 patients) respectively. Table 2 shows the number and percentage of patients with type-II diabetes mellitus with ischemic heart disease in different BMI groups (p = 0.004).

Table 2: Number and percentage of ischemic heart disease prevalence in type 2 diabetic patients according to body mass index

BMI	Under normal weight	normal weight	Overweight	Grade 1 obesity	Grade 2 obesity	Grade 3 obesity	Total
IHD patients	3(7.3%)	5(12.2%)	7(17.1%)	10(24.4%)	12(29.3%)	4(9.8%)	41

Table 3: Prevalence of ischemic heart disease among men and women with type 2 diabetes at different BMIs

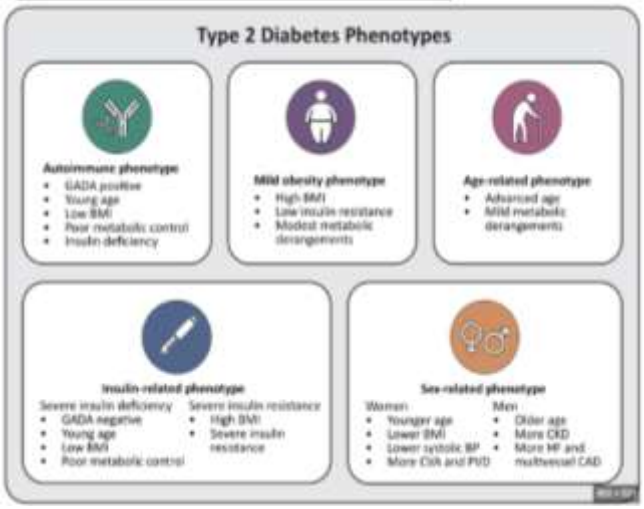
BMI	Under normal weight	normal weight	Overweight	Grade 1 obesity	Grade 2 obesity	Grade 3 obesity	Total
Type-II diabetic females	38(21.1%)	24(13.3%)	54(30%)	29(16.1%)	18(10%)	17(9.4%)	180(100%)
IHD in type-II diabetic women	4(13.8%)	2(6.9%)	6(20.7%)	8(27.6%)	5(17.2%)	4(13.8%)	29(100%)
Type-II diabetic males	8(10%)	14(17.5%)	21(26.3%)	19(23.8%)	7(8.8%)	11(13.8%)	80(100%)
IHD in type-II diabetic males	1(8.3%)	1(8.3%)	3(25%)	2(16.7%)	2(16.7%)	3(25%)	12(100%)

Table 3 shows the findings of the present study on the number and percentage of patients with type-II diabetes mellitus with ischemic heart disease in men and women in terms of six groups of body mass index in general and in groups.

Table 4: Body Mass Index (BMI) Number of Patients Percentage with IHD

Underweight (<18.5)	100	25%
Normal Weight (18.5-24.9)	200	30%
Overweight (25-29.9)	300	40%
Obese (≥30)	400	50%

Type 2 diabetes mellitus phenotypes. BMI, body mass index; BP (Gouda et al., 2021)



DISCUSSION

In this study, the prevalence of type 2 diabetic patients who were overweight or obese was 25% and 33.7%, respectively, which is higher than their prevalence in the study of bankers and their colleagues in Mashhad, which was 21 and 25.7%[10–11]. In the study of Safaei et al., this rate was 42.5 and 27.2%, respectively, which is close to the present study in terms of overweight but is lower in terms of the prevalence of obesity and obesity in the study of al-Rahwi et al. In 2015, in Oman, it was 38.9 in both cases[12–13]. Based on the findings of the present study, the ischemic heart disease prevalence in patients with type 2 diabetes is 13.7%. In the orthopedic study, IHD was 9.4%[18].

In this study, the prevalence was 9.6% among women, which is more common than in men, where it is 4%. In addition, the prevalence of ischemic heart disease between the two sexes in middle age and old age is also different, and in type 2 diabetic women, the prevalence of ischemic heart disease in middle age and old age is almost the same. In the present study, although ischemic heart disease is most common in patients who are overweight, its prevalence in normal-weight people is not only low but slightly lower than the prevalence in patients with grade 1 obesity and patients with grade 2 obesity. The findings of the present study are more in line with the findings of recent studies, which are mainly conducted in developed countries[14–15]. An example in Asia is a study conducted in 2013 by Nagawa et al. In Japan, it was found that the prevalence of cardiovascular disease in non-obese subjects (BMI under 25 in their study) with visceral fat was similar to that of obese patients (BMI). In a public study of diabetic patients, according to Arhawi, the univariate inverse association of obesity with cardiovascular disease in patients is an interesting finding in contrast to another relevant study[16-17] and co-workers reported that diabetic patients with a BMI above 26 were in better physical condition than those with a normal weight and consequently had lower mortality rates[18–19].

As shown in Table 3, the overall distribution of ischemic heart disease in middle age in different BMI groups is almost plateau, and in normal-weight individuals, it is overweight or obese. While in the elderly, its prevalence is significantly higher in overweight people and in grade 1 obesity ($p = 0.003$). Also, the ischemic heart disease distribution in males and females with type 2 diabetes is dissimilar in groups with dissimilar BMIs. It is noteworthy that the prevalence of ischemic heart disease in women with a normal body mass index was 6.9%, and 8 out of 29 women with ischemic heart disease equals grade 1 obesity, and more than 5 women with grade 2 obesity and more, respectively.

However, in both men and women, the ischemic heart disease prevalence in overweight patients was higher than in normal-weight patients. The prevalence of ischemic heart disease, according to the findings of the present study, in men at higher levels of BMI than women is similar to that in 2015. It is the United States, with the difference that in diabetic men under the present study, the prevalence of ischemic heart disease is not low in normal underweight people[20–21].

CONCLUSION

The type 2 diabetes prevalence in obese or overweight people is higher than in normal-weight or underweight people, but the ischemic heart disease prevalence is not consistent with this trend, and its prevalence in normal-weight people is higher. Not only is it not low, but it is slightly less than its prevalence in patients with grade 1 obesity and is much higher than patients with grade 2 and 3 obesity. This conclusion is in line with the results of recent studies, mostly conducted in developed countries, and reflects the recent fact that obesity plays a role, at least as an independent factor, in the development of IHD in patients with type 2 diabetes, especially in women. We suggest further studies, especially in the primary care unit. To ensure continuous monitoring of type 2 diabetes mellitus and ischemic heart disease with high mortality, morbidity, and burden on the health of the global community, the higher the angles, the better the leading angles of the method.

Implications: According on weight categories, the study emphasizes the significance of customized screening and prevention programs for ischemic heart disease (IHD) and type 2 diabetic mellitus (T2DM). It proposes a screening, diagnosis, and treatment strategy that is gender-specific, especially for women with type 2 diabetes. When it comes to the early detection, management, and prevention of chronic illnesses like T2DM and IHD, primary care physicians are essential. Because the death rate is so high, constant observation is essential. Public health initiatives ought to increase knowledge of the connection between T2DM, IHD, and obesity. For complete care, a multidisciplinary team effort between medical specialists is necessary. This multimodal approach can address the intricate interactions among obesity, type 2 diabetes, and IHD, thereby improving global health outcomes.

REFERENCES

1. Fisher DP, Johnson E, Haneuse S, Arterburn D, Coleman KJ, O'Connor PJ, O'Brien R, Bogart A, Theis MK, Anau J, Schroeder EB. Association between bariatric surgery and macrovascular disease outcomes in patients with type 2 diabetes and severe obesity. Jama. 2018 Oct 16;320(15):1570-82.
2. 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. Cardiovascular diabetology. 2018 Dec;17(1):1-9.
3. Daly B, Toulis KA, Thomas N, Gokhale K, Martin J, Webber J, Keerthy D, Jolly K, Saravanan P, Nirantharakumar K. Increased risk of ischemic heart disease, hypertension, and type 2 diabetes in women with previous gestational diabetes mellitus, a target group in general practice for preventive interventions: a population-based cohort study. PLoS medicine. 2018 Jan 16;15(1):e1002488.
4. Verma S, Mazer CD, Yan AT, Mason T, Garg V, Teoh H, Zuo F, Quan A, Farkouh ME, Fitchett DH, Goodman SG. Effect of empagliflozin on left ventricular mass in patients with type 2 diabetes mellitus and coronary artery disease: the EMPA-HEART CardioLink-6 randomized clinical trial. Circulation. 2019 Nov 19;140(21):1693-702.
5. Dale CE, Fatemifar G, Palmer TM, White J, Prieto-Merino D, Zabaneh D, Engmann JE, Shah T, Wong A, Warren HR, McLachlan S. Causal associations of adiposity and body fat distribution with coronary heart disease, stroke subtypes, and type 2 diabetes mellitus: a Mendelian randomization analysis. Circulation. 2017 Jun 13;135(24):2373-88.
6. Lyall DM, Celis-Morales C, Ward J, Iliodromiti S, Anderson JJ, Gill JM, Smith DJ, Ntuk UE, Mackay DF, Holmes MV, Sattar N. Association of body mass index with cardiometabolic disease in the UK Biobank: a Mendelian randomization study. JAMA cardiology. 2017 Aug 1;2(8):882-9.
7. Geng T, Smith CE, Li C, Huang T. Childhood BMI and adult type 2 diabetes, coronary artery diseases, chronic kidney disease, and cardiometabolic traits: a Mendelian randomization analysis. Diabetes care. 2018 May 1;41(5):1089-96.
8. Larsson SC, Bäck M, Rees JM, Mason AM, Burgess S. Body mass index and body composition in relation to 14 cardiovascular conditions in UK Biobank: a Mendelian randomization study. European heart journal. 2020 Jan 7;41(2):221-6.
9. Pandey A, LaMonte M, Klein L, Ayers C, Psaty BM, Eaton CB, Allen NB, de Lemos JA, Carnethon M, Greenland P, Berry JD. Relationship between physical activity, body mass index, and risk of heart failure. Journal of the American College of Cardiology. 2017 Mar 7;69(9):1129-42.
10. Pandey A, LaMonte M, Klein L, Ayers C, Psaty BM, Eaton CB, Allen NB, de Lemos JA, Carnethon M, Greenland P, Berry JD. Relationship between physical activity, body mass index, and risk of heart failure. Journal of the American College of Cardiology. 2017 Mar 7;69(9):1129-42.
11. Piché ME, Poirier P, Lemieux I, Després JP. Overview of epidemiology and contribution of obesity and body fat distribution to cardiovascular disease: an update. Progress in cardiovascular diseases. 2018 Jul 1;61(2):103-13.
12. Stenholm S, Head J, Aalto V, Kivimäki M, Kawachi I, Zins M, Goldberg M, Platts LG, Zaninotto P, Magnusson Hanson LL, Westerlund H. Body mass index as a predictor of healthy and disease-free life expectancy between ages 50 and 75: a multicohort study. International journal of obesity. 2017 May;41(5):769-75.
13. Sze S, Pellicori P, Kazmi S, Rigby A, Cleland JG, Wong K, Clark AL. Prevalence and prognostic significance of malnutrition using 3 scoring systems among outpatients with heart failure: a comparison with body mass index. JACC: Heart Failure. 2018 Jun;6(6):476-86.
14. Li Y, Schoufour J, Wang DD, Dhana K, Pan A, Liu X, Song M, Liu G, Shin HJ, Sun Q, Al-Shaar L. Healthy lifestyle and life expectancy free of cancer, cardiovascular disease, and

type 2 diabetes: prospective cohort study. bmj. 2020 Jan 8;368.
15. Zang H, Jiang F, Cheng X, Xu H, Hu X. Serum adropin levels are decreased in Chinese type 2 diabetic patients and negatively correlated with body mass index. Endocrine journal. 2018;65(7):685-91.
16. Chen GC, Arthur R, Iyengar NM, Kamensky V, Xue X, Wassertheil-Smoller S, Allison MA, Shadyab AH, Wild RA, Sun Y, Banack HR. Association between regional body fat and cardiovascular disease risk among postmenopausal women with normal body mass index. European heart journal. 2019 Sep 7;40(34):2849-55.
17. Liu G, Li Y, Hu Y, Zong G, Li S, Rimm EB, Hu FB, Manson JE, Rexrode KM, Shin HJ, Sun Q. Influence of lifestyle on incident cardiovascular disease and mortality in patients with diabetes mellitus. Journal of the American College of Cardiology. 2018 Jun 26;71(25):2867-76.
18. Aminian A, Zajichek A, Arterburn DE, Wolski KE, Brethauer SA, Schauer PR, Kattan MW, Nissen SE. Association of metabolic surgery with major adverse cardiovascular outcomes in patients with type 2 diabetes and obesity. Jama. 2019 Oct 1;322(13):1271-82.
19. Dégano IR, Marrugat J, Grau M, Salvador-González B, Ramos R, Zamora A, Martí R, Elosua R. The association between education and cardiovascular disease incidence is mediated by hypertension, diabetes, and body mass index. Scientific reports. 2017 Sep 28;7(1):1-8.
20. Arnold SV, Bhatt DL, Barsness GW, Beatty AL, Deedwania PC, Inzucchi SE, Kosiborod M, Leiter LA, Lipska KJ, Newman JD, Welty FK. Clinical management of stable coronary artery disease in patients with type 2 diabetes mellitus: a scientific statement from the American Heart Association. Circulation. 2020 May 12;141(19):e779-806.
21. Ades PA, Savage PD. Obesity in coronary heart disease: An unaddressed behavioral risk factor. Preventive medicine. 2017 Nov 1;104:117-9.