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Prevalence and Associated Risk Factors of Cardiovascular Disease among Type 2 Diabetes Patients in Lower Dir Pakistan

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Abstract

One of the most prevalent complications of type 2 diabetes mellites (T2DM) is cardiovascular disease (CVD) which is the major cause of death. This study aims to assess the incidence and associated risk factors of CVD among T2DM patients at selected hospitals of Tehsil Adenzia, District Lower Dir. A structured questionnaire is designed for the collection of data from type 2 diabetic patients. A total of 1360 subjects are selected from the study area. Data is analyzed by Minitab version 19. The prevalence of CVD among T2DM is 20.04% in the selected sample. The logistic regression model is used to identify factors associated with CVD in diabetic patients. The model shows that higher age, duration of T2DM, and treatment taken are significant risk factors for CVD among T2DM patients.

Keywords: Cardiovascular disease, Type 2 diabetes mellitus, higher age, duration of T2DM, treatment type.

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Title

Prevalence and Associated Risk Factors of Cardiovascular Disease among Type 2 Diabetes Patients in Lower Dir Pakistan

Abstract

One of the most prevalent complications of type 2 diabetes mellites (T2DM) is cardiovascular disease (CVD) which is the major cause of death. This study's aim is to assess the incidence and associated risk factors of CVD among T2DM patients at selected hospitals of Tehsil Adenzia, District Lower Dir. A structured questionnaire is designed for the collection of data from type 2 diabetic patients. A total of 1360 subjects are selected from the study area. Data is analyzed by Minitab version 19. The prevalence of CVD among T2DM is 20.04% in the selected sample. The logistic regression model is used to identify factors associated with CVD in diabetic patients. The model shows that higher age, duration of T2DM, and treatment taken are significant risk factors for CVD among T2DM patients.

Keywords: Cardiovascular Disease, Type 2 Diabetes Mellitus, Higher Age, Duration of T2DM, Treatment Type

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Contents

Introduction

Diabetes Mellitus (DM) is on the list of more severe diseases in terms of public health hazards worldwide. World Health Organization (WHO) reported that the incidence of type 2 diabetes mellitus (T2DM) increased rapidly in the last three decades globally (WHO, 2021). According to the IDF report the prevalence of T2DM in adults aged from 20 to 79 is 537 million. Moreover, their report reveals that one in every ten adults is suffering from T2DM. This prevalence rate is to be increasing rapidly in the near future.

T2DM has many complications, most of which are chronic. Cardiovascular disease (CVD) is one of the common complications of T2DM (Tracey et al., 2016). Similar to T2DM, the prevalence of cardiovascular disease (CVD) is rapidly increasing in the world. It is evident that diabetes is an independent risk factor for CVD. Diabetic patients are more prone to CVD than non-diabetic (Gu, CC and MI, 1999; Haffner, Cassells, 2003).

The prevalence of CVD in diabetic patients is an alarming point, as it is a major reason for premature disability, morbidity, mortality, and hospitalization (Khwaja et al.2007; Khwaja et al.2004). Type 2 diabetic patients with CVD complications have 2 to 8 times higher chances of mortality than those who have CVD without type 2 diabetes. (Malmberg, Yusuf and Gerstein, 2000). Moreover, the long duration of diabetes leads to the incidence of CVD in subjects already suffering from diabetes (Branch, et al., 2019; Petrie, Guzik, & Touyz, 2018; Hayward et al., 2015)

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Yao et al. (2023) conducted a study on the prevalence of CVD and its association factors. In their study, a total of 1765 diabetic patients are selected to examine the risk factors of CVD in diabetic subjects, such as long duration of diabetes, age, hyperlipidemia, and hypertension. They found a significant association between the prevalence of CVD and diabetes duration, age at diagnosis, hyperlipidemia, and hypertension. Raza et al. (2019) investigated significant factors associated with the incidence of CVD in diabetic patients. They point out that one of the associated risk factors is age greater than 40 years. Tamiru et al. (2010) determined the prevalence of cardiovascular risk factors in diabetic patients at the diabetic clinic of Jimma University Specialized Hospital. Canto et al. (2019) conducted a study on the complication of type 2 diabetes. According to their study, CVD is the major complication of type 2 diabetes. Wang et al. (2021) explore that the major risk factors for coronary heart disease (CHD) in patients with type 2 diabetes are obesity and hypertension. They used a multivariate logistic regression model for such analysis. Lehto et al. (2000) investigated that hyperlipidemia, obesity, smoking, hypertension, and other cardiovascular risk factors are commonly clustered in patients with diabetes.

Regassa, Tola, and Ayele (2021) investigated the incidence and significant risk factors associated with T2DM subjects.

Their study shows a 42.51% incidence of CVD in diabetic patients. They used a logistic regression model for assessing the risk factors. The model shows that higher age, obesity, hypertension, drinking alcohol, and experiencing microvascular diabetic complications were significant risk factors for the incidence of CVD among T2DM patients. Matheus et al. (2013) described the association between oxidative stress, poor glycemic control, markers of insulin resistance, and low-grade inflammation that have been suggested as putative factors linking DM and CVD.

Leon and Maddox (2015) pointed out that diabetes patients face some of the associated risk factors of CVD like dyslipidemia, hypertension, and obesity placing them at increased risk for cardiac events. They claimed that biological mechanisms associated with DM independently increase the risk of CVD in diabetic patients.

Einarson et al. (2018) reviewed the ten-year literature regarding the incidence of CVD among T2DM patients. They found that CVD affects approximately 32.2% of all persons with T2DM, globally. Moreover, they concluded that CVD leads to mortality among T2DM patients, accounting for approximately half of all deaths over the study period.

Some studies on the incidence of various diseases are conducted in the District Dir Lower, Khyber Pakhtunkhwa (Khan et al., 2022a; Haq et al., 2024; Haq et al., 2022;). This study investigates the incidence of CVD among T2DM patients. Moreover, the risk factors of CVD as a complication of TD2M are assessed. In past the studies have been conducted on T2DM in the study area (Akhtar et al., 2016; Khan et al. 2022b). However, they have assessed only the prevalence and complications of T2DM.

Material and Method

The present study determines the risk factors for the incidence of CVD among T2DM patients in Gulabad Hospital Gulabad and Tehsil Head Quarter Hospital Chakdara. A structured questionnaire is used to collect data from T2DM patients visiting to these hospitals. Minitab version 19 is used to analyze the collected data. The binary logistic regression model is used to identify the significant risk factors associated with the incidence of CVD among T2DM patients. The logistic regression model is effective when the response variable is categorical (Khan, Hussain, Ijaz, 2022; Khan, Haq, & Ali, 2022; Khan et al., 2022; Khan et al., 2022a; Khan et al. 2022b). The dependent variable which is the prevalence of CVD among T2DM patients is binary in nature, that is, whether the respondent has the CVD complication of diabetes or not.

Results

A sample of size 1360 is selected from the hospitals. Table 1 shows that the sample consists of 982 (72.22%) male and 378 (27.78%) female subjects. The prevalence of CVD is 20.07% among diabetic patients.

Table 1 further reveals that 204 (15.14%) of patients take proper treatment for diabetes, while 640 (47.051%) have not taken such treatment. Moreover, 506 (37.20%) are uncertain about taking proper treatment. These figures show that most of the diabetic people in the study area are not taking proper treatment for diabetes. Moreover, the Table shows that 280 (20.58%) patients have had diabetes from the last 1 to 4 years, 670 (49.26%) subjects prevalent to diabetes from 5 to 8 years, 410 (30.14%) persons suffering from diabetes from 8 years or above. In the study area, half of the diabetic population suffers from diabetes from 5 to 8 years.

Table 1

Some Characteristics of Selected Subjects.

Characteristic	Category	No. of Subjects	Percentage
Gender	Male	982	72.21
	Female	378	27.79
Prevalence of CVD	yes	273	20.07
	No	1087	79.92
Proper Treatment	Yes	204	15.14
	No	640	47.05
	Uncertain	506	37.20
Duration of Diabetes	1-4 years	280	20.58
	5-8 years	670	49.26
	> 8 years	410	30.14

Figure 1 reveals that 604 (44%) subjects have aged from 23 to 32, 264(19%) have aged from 33 to 42, 264 (19%) have from 43 to 52, and 75(6%) from age 53 to 62, 151(11%) have age 62 and above. Thus, the majority of selected subjects are of young age, that is, from 23 to 42 years.

Figure 1

Age of the respondents

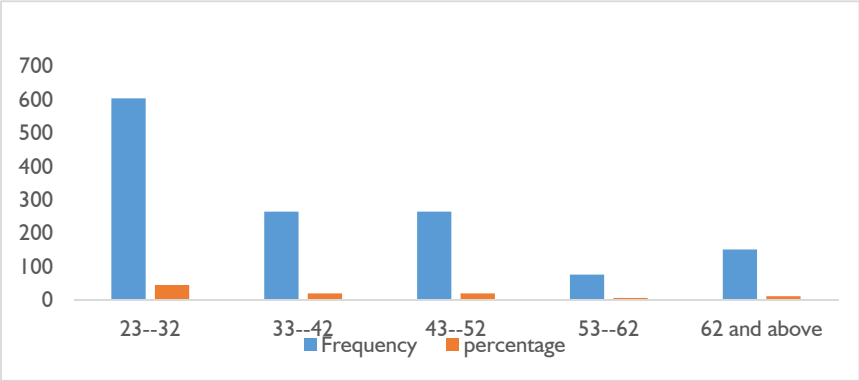
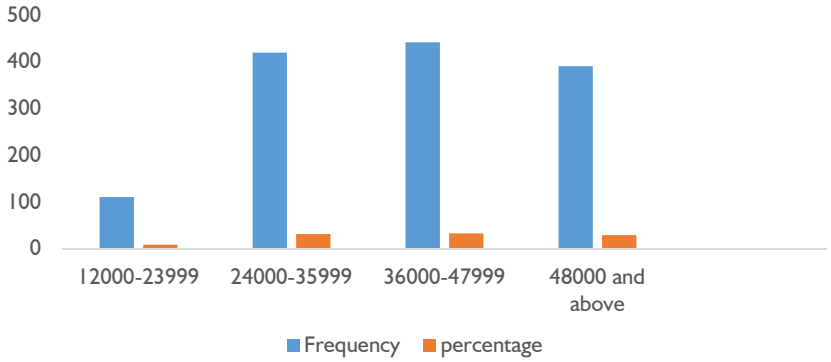


Figure 2 reveals the monthly income of the respondents. Both the number of respondents and frequency along with income level are shown. The Figure shows that the majority of the subjects have an income range from Rs. 36000 to Rs. 47999.

Figure 2

Income of the respondents



The binary logistic regression model is used due to the categorical nature of the response variable, that is, the prevalence of CVD among diabetic patients which has two categories, yes and no, that is, whether the respondent has a prevalence of CVD or not. Table 2 reveals the result of the fitted binary logistic regression model. The Table shows that age, duration of diabetes, and taking proper treatment are significantly associated with the incidence of CVD among T2DM patients

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Table 2

Result of Fitted Binary Logistic Regression Model

	Coefficient	SE of Co-efficient	VIF	P Value
Constant	-4.70	1.9000		
Higher Age	0.1238	0.0535	2.64	0.002
Long Duration	2.286	0.9850	4.16	0.050
No proper Treatment	2.052	0.8340	2.11	0.001

R-square = 0.32

Discussion

CVD among diabetic patients is prevalent in the study area. The risk factors associated with CVD among diabetic patients are increasing age, long duration of diabetes, and taking no proper treatment.

Diabetic patients are more prone to CVD as their age increases. This result is similar to Dal et al. (2019). According to the report of the Centers for Disease Control and Prevention (2011) increasing age is leading to the death of CVD patients with diabetes. Further, in the USA 68% of such patients having aged greater than 65 died. This indicates the higher ratio of death of CVD diabetic subjects due to increasing age.

In our study, the majority (approximately 50%) of the subjects have a 5 to 8-year duration of diabetes. In addition, 30% of the subjects suffered from diabetes for more than 8 years. This duration is considered long which is an alarming point for the people of the study area. According to Zoungas et al. (2014), the duration of diabetes causes atherosclerotic lesions, including intimal thickness and thin cap fibroatheromas, which lead to deleterious effects on small and large vessels and cause the incidence of CVD. Thus, those diabetic patients who have suffered from such diseases for a long are more prone to CVD. This result is a match to Branch et al. (2019), Petrie, Guzik, and Touyz (2018), and Hayward et al. (2015). Moreover, Yao et al. (2023) mentioned the long duration of diabetes is one of the main risk factors for the incidence of CVD.

Effective treatment of T2DM is crucial because it is the major risk factor of CVD which is the prevalent cause of mortality and morbidity. In our study, another significant factor associated with the incidence of CVD among diabetic patients is taking no proper treatment of diabetes. The patient who takes the diabetes disease light are more prone to CVD. T2DM can be controlled by proper treatment which may lead to reduce the prevalence of CVD, as T2DM is the risk factor of CVD. However, the relationship between treating DM and reducing CV is complex, because CVD-associated risk factors including hypertension, obesity, and dyslipidemia are prevalent in diabetic patients. Some researchers proved that several factors including increased oxidative stress, increased coagulability, endothelial dysfunction, and autonomic neuropathy are often present in patients with DM and may directly contribute to the development of CVD (Matheus et al., 2013). Our study showed a higher proportion of subjects are not taking proper treatment of DT2M. Thus, approximately half of the diabetic patients are not taking proper treatment. This may lead to chronic complications of T2DM including CVD which is the major cause of mortality.

Conclusion

This study shows the 20.04% incidence of CVD among T2DM patients in selected hospitals of tehsil Adenzia, district Lower Dir. The risk factors for the incidence of CVD in T2DM are increasing age, long duration of diabetes, and no proper treatment of T2DM. In order to minimize the risk of CVD in T2DM adults, the proper treatment of T2DM should be ensured. Moreover, special care should be taken for those subjects who have suffering from T2DM for a long time and have a higher age. T2DM patients should be aware of the complications of diabetes. The present study can be extended by increasing the sample size in the study area.

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