Original Research Article

A retrospective evaluation of the trend of prevalence of type 2 diabetes mellitus in different age groups in a tertiary care hospital

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ABSTRACT

Background: Diabetes has emerged as a global pandemic. It is one of the leading causes of death worldwide. This study was conducted to evaluate the trend of prevalence of diabetes in different age groups and understand the changing pattern in the age of onset of type 2 diabetes mellitus.

Materials and Methods: This was a retrospective, observational study carried out in type 2 diabetes patients coming to OPD for a period of 1 year from 1st January 2018 to 31st December 2018. The age of onset and year of onset of diabetes were noted. The data was analyzed and presented in the form of graphs and charts.

Results: A total of 976 patients with type 2 diabetes who visited OPD during the study duration were included in the study. Maximum number of patients were diagnosed in the years 2011-2015 (n = 318, 32.58%). There is an increasing trend of prevalence over the years. The average age of onset during 1991-1995 was 48.53 years which gradually decreases to 42.70 years in 1996-2000, followed by 41.98 years in 2001-2005, 39.5 years in 2006-2010, 35.79 in 2011-2015 and 36.14 in 2016-2018. Thus, there is a decreasing trend in the age of onset of T2DM.

Conclusion: The prevalence of T2DM is increasing and the age of onset is decreasing. Both the factors decrease the productivity years in the life of patient. This ultimately affect the economy of a country. Hence, measures should be taken to actively modify the lifestyle and improve the health of the population as a whole to fight against this tsunami of diabetes mellitus.

1. Introduction

According to the World Health Organization (WHO), Diabetes is a chronic, metabolic disorder characterized by elevated levels of blood sugars, which leads to serious damage to the blood vessels, heart, kidneys, eyes and nerves over time.[1] In 2019, the global diabetes prevalence is gauged to be 9.3% (463 million people). This diabetic prevalence is higher in urban (10.8%) than rural (7.2%) areas, and in high-income countries (10.4%) than low-income ones (4.0%).[2] Asia is facing an epidemic of diabetes. It is estimated that more than 80% of diabetics currently live in developing countries.[3] There are two main types of Diabetes Mellitus. Diabetes Mellitus (DM) type 1 and Diabetes Mellitus type 2. Type 1 diabetes (previously known as insulin-dependent diabetes mellitus or juvenile diabetes) is an autoimmune disorder in which there is loss of pancreatic β cells. Thus, insulin production is decreased. Type 2 diabetes (previously known as non insulin-dependent diabetes mellitus or adult-onset diabetes) begins with insulin resistance, a condition in which cells fail to respond to insulin properly. The blood levels of glucose increases even though insulin secretion is normal or more than normal (hyperinsulinemia). But, as the disease progresses, there are chances of development of a lack of insulin.[4] The most common cause of type 2 DM is a combination of obesity and sedentary lifestyle.[5] Some rare types of diabetes are 'maturity-

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onset diabetes of young' (MODY), pancreatectomy and 'gestational diabetes mellitus'.[6] The classical triad of symptoms of diabetes include polyuria, polydipsia and polyphagia. The symptoms are often mild in type 2 DM (T2DM), making it difficult to diagnose the disease in early stages.[5] Diabetes is known to cause many complications; both acute as well as chronic complications. Acute complications of diabetes include diabetic ketoacidosis and hyperosmolar (nonketotic hyperglycemic) coma. Both of these can be fatal if not treated promptly.[7] Serious chronic complications comprise diabetic nephropathy, diabetic retinopathy, cardiovascular disease, foot ulcers, stroke, diabetic neuropathy and cognitive deficit.[5,8] Thus, diabetes causes significant morbidity and mortality if left uncontrolled. The treatment of type 1 DM usually involves subcutaneous injections of insulin. Whereas the type 2 DM is usually treated by oral antidiabetic drugs. Metformin which belongs to the group biguanide is the drug of choice for the pharmacotherapy of T2DM.[6] Other oral antidiabetics include sulphonylureas like glibenclamide, glipizide; thiazolidinediones like pioglitazone, meglitinide analogues like repaglinide and α-glucosidase inhibitors like acarbose and voglibose. A few newer drugs have also been introduced in the market namely, dipeptidyl peptidase-4 inhibitors like sitagliptin, vildagliptin; sodium glucose cotransport-2 inhibitor like dapagliflozin and injectable glucagon-like peptide receptor agonists like exenatide and liraglutide.[6]

Age is an important risk factor in the pathophysiology of type 2 DM. The process of ageing increases the incidence of T2DM in the population. This can be linked to decreasing insulin sensitivity with increasing age. Hence, as the age progresses, we are at increased chances of developing T2DM. DM significantly decreases the productivity years of life[9] and hence the age of onset of DM plays a major role in determining the morbidity a patient may face. Earlier the age of onset, more are the chances of diabetic complications. Thus, in this study we have evaluated the trend in the prevalence of diabetes over the last two decades with the age of onset of type 2 DM as the sole factor.

2. Materials and Methods

This was a retrospective, observational study carried out in the medicine outpatient department of a tertiary care hospital. The duration of the study was one year from 1st January 2018 to 31st December 2018. The study was commenced after obtaining approval from institutional ethical committee. The study population included patients of type 2 diabetes mellitus. The inclusion criteria included patients of both genders and all ages diagnosed as type 2 diabetes mellitus and receiving treatment from the OPD. Also, only the patients who were ready to provide informed consent were included in the study. The patients with type 1 diabetes mellitus or other forms of diabetes such as

gestational diabetes mellitus were excluded from the study. Also, those who were not willing to give informed consent were excluded from the study.

The demographic details of the patients included in the study were noted in a pre-approved patient data sheet. Age of onset of diabetes was determined by patient's self-report of their age at diagnosis. We analyzed the obtained data for the age of onset of type 2 DM in individual patients. Also, the year of onset of DM was noted. The years of onset were divided in groups of 5 years and age of onset was grouped according to the decades. The average age of onset of diabetes during various year groups was also analyzed. The data was entered and evaluated using Microsoft Office Excel 2016. The trend of diabetes prevalence was thus obtained and the results were plotted using charts and graphs.

3. Results

A total of 976 patients were included in the study and result analysis. The earliest recorded case of type 2 DM in our study was diagnosed for the first time in the year 1991. There were a total of 34 patients who were diagnosed during the year group 1991-1995 as compared to 318 patients being diagnosed in year group of 2011-2015 and 248 in the 3 years from 2016-2018. Table 1 gives the details of the patients diagnosed during various year groups and the number of patients of different age groups diagnosed during those years.

As observed from the table, over the last two decades the maximum number of patients had age of onset during 31-40 years of age (n = 304) followed by 41-50 years of age (n = 292). Very few patients among the age group of below 20 years of age suffer from type 2 DM. Only 14 such patients were identified in our study. Figure 1 gives the age distribution of patients over the last two decades according to their age of onset and year of diagnosis.
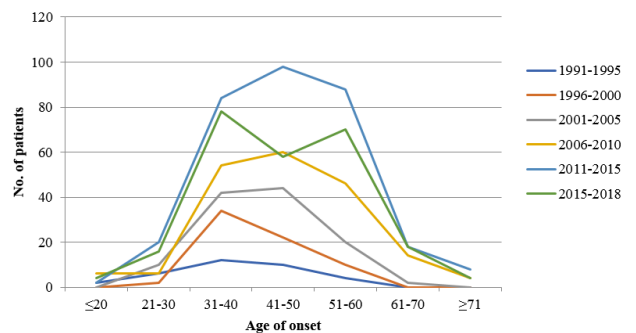
**Fig. 1:** Age distribution of Type 2 DM patients over the years (n = 976)

Figure 2 gives the average age of onset of the patients in each year group. The average age of onset of type 2 DM during the years 1991-1995 was 48.53 years. This average age has started to decrease over the next years and in the

Table 1: Age distribution of the patients over the different years (n = 976)

Year of onset	Age of onset of t2dm in the patient							
	≤20	21-30	31-40	41-50	51-60	61-70	≥71	Total
1991-1995	2*	6	12	10	4	0	0	34
1996-2000	0	2	34	22	10	0	0	68
2001-2005	0	10	42	44	20	2	0	118
2006-2010	6	6	54	60	46	14	4	190
2011-2015	2	20	84	98	88	18	8	318
2016-2018	4	16	78	58	70	18	4	248
Total	14	60	304	292	238	52	16	976

*Indicates the number of patients in the columns

years 2011-2015 it was observed to be 13 years lower than what it was initially, that is 35.79 years. Thus, there is a decrease in the average age of onset of type 2 DM in the patients over the last two decades.
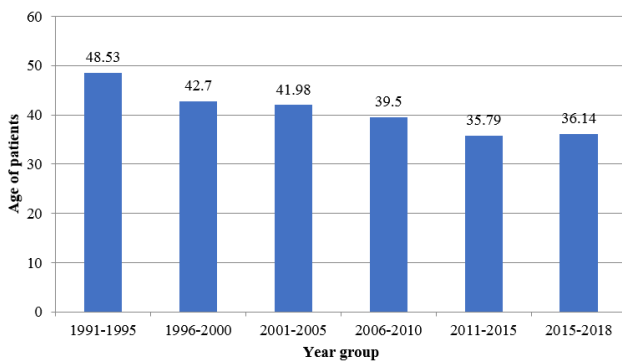
Fig. 2: Average age of onset of type 2 DM in study population (n = 976)

4. Discussion

The Diabetes mellitus has reached a pandemic proportion globally. It was estimated that there were approximately 415 million people living with diabetes aged 20-79 years in 2015. This number is expected to reach up to 642 million by 2040.[9] It is a chronic non-communicable disease which is characterized by high blood sugar levels. Type 2 diabetes mellitus, or adult-onset diabetes is a more common form of diabetes as compared to type 1 or juvenile diabetes mellitus. The basic pathology in type 2 DM is insulin resistance. This means that cells does not respond normally to the effects of insulin. Usually, insulin guides the entry of blood glucose into the muscles, liver and fat. When the cells are resistant to insulin, they don't take up the glucose from the blood to convert it into energy. This leads to increased blood glucose levels. Pancreas senses this high levels of glucose and secretes more insulin to bring the blood sugar levels to normal. Over time though, insulin resistance will worsen and even the increased insulin secretion won't be able to keep the blood sugar levels in check. Pancreas then will not be able to secrete more insulin and the blood sugar levels

will remain above normal. This is the condition which is then defined as type 2 diabetes mellitus. Obesity is a major risk factor for developing insulin resistance. According to American Diabetes Association, Diabetes is diagnosed when the levels of HbA1C ≥ 6.5% or fasting plasma glucose is ≥ 126 mg/dl or 2-h plasma glucose is ≥ 200 mg/dl during an oral glucose tolerance test (OGTT).[10] During the last few decades, cases of diabetes mellitus has been increasing manifold all over the world. The complications related to the diabetes are also at rise. Understanding the risk factors involved in the onset of diabetes helps us in preventing the occurrence of this chronic disease and its complications. Age is one of the most important risk factor in type 2 DM. With ageing, there is a decrease in insulin sensitivity and increase in insulin resistance.[11] In our study, we have analysed the change in pattern of age distribution and productivity years of life of type 2 DM over the last two decades.

In our study, we found that 31-50 years of age is the most common age of onset of diabetes in our population. We also found that prevalence of diabetes increased with increasing age which is similar to the findings published in an Iranian study.[12] This is also similar to findings of DECODA study group which found that among the Asian countries, prevalence of Diabetes was highest in India. Also, prevalence increased with increasing age and the peak prevalence age was 10 years younger than other Asian countries.[13] Type 2 DM is less common in ≤ 20 years of age group. Also, from the study it is quite evident that average age of onset of diabetes has significantly decreased in the last decade. Earlier, the average age which used to be about 45 years has now come down to 35 years in the last few years from 2011-2018. A similar trend of decrease in average age of onset has been observed in a retrospective study published by Koopman et al.[14] They analysed the data from the years 1988 to 2000 and reported a decrease in the mean age of onset from 52 years to 46 years.[14] This is in contrast to the findings of a study conducted in Saudi Arabia population which observed the mean age of diabetes in the female population to be 53.4 years and in male patients to be 57.5 years.[15] Also, a study published by Laakso et al. in 1985 observed that half of the type 2 DM were diagnosed

over the age of 64.[16]

This change in pattern in the age of onset of diabetes can be either due to an actual increase in the incidence of diabetes at younger age or it may be due to early detection and more stringent checks. More diagnoses now in recent years owing to better technological advances and more awareness in clinicians as well as patients. Also, the criteria for diagnosis of diabetes have become more stringent and physicians are able to detect it sooner. Incidence may have increased as the urbanization has increased the levels of stress and anxiety in young population. Also, the lifestyle has become more sedentary owing to the desk jobs and availability of better quality of life. This has led to an increased incidence of obesity and its consequent metabolic consequences.

There were certain limitations in our study which must be acknowledged. Firstly, the information about age of onset of diabetes was totally based on the patient's memory hence there is the question of the correct recall of the age at diagnosis. Also, we have not included the cases of prediabetes in our study which make a fair amount of diabetes cases in recent years.

5. Conclusion

In conclusion, we can say that there is a definite decrease in the age of onset of type 2 diabetes mellitus. This change can be due to increased public awareness leading to an early seeking of medical advice; better recognition of subtle symptoms of diabetes by physicians and stringent guidelines of diagnosis. Alternatively, it can reflect a true change in the age of onset at diagnosis which is of increasing concern as it decreases the productivity years of life in a patient and increases the risk of diabetic complications later in life. This will indirectly affect the economy. Thus, lifestyle modification is the need of the hour. Public awareness regarding healthy food and lifestyle including yoga, meditation and exercises in their routine is a must to fight against this tsunami of diabetes mellitus.

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7. Conflict of Interest

The authors declare they have no conflict of interest.

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