



## SURVEY ON MAJOR MICRO VASCULAR COMPLICATION OF DIABETES MELLITUS TYPE 1(T1DM) PATIENTS IN DIFFERENT AGE GROUPS IN HYDERABAD AND JAMSHORO

TAHIRA JABEEN URSANI, FAHMIDA CHANNA, ABDUL RASOOL ABASI, JAWAID A. KHOKHAR AND SAMINA MALIK

Department of Zoology, University of Sindh, Jamshoro

### ARTICLE INFORMATION

#### Article History:

Received: 3<sup>rd</sup> June, 2019

Accepted: 20<sup>th</sup> August, 2019

Published online: 30<sup>th</sup> July 2020

#### Author's contribution

TJU designed study, FC performed all experiments, ARA analysis the results JAK & SM compiled the data.

#### Key words:

Diabetes; age group, hyperglycemia; Micro vascular Complications; Neuropathy; Nephropathy; Proteinuria; Microalbuminuria ;Urinary incontinence;

### ABSTRACT

Diabetes mellitus is a common medical condition known to have adverse effects on all system of human body. Diabetes mellitus (DM) is becoming a major threat to global public health. There were 382 million people who suffered from DM worldwide in 2013. Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia resulting from defects in insufficient insulin secretion, insulin action, or both. The type 1 diabetes mellitus (T1DM) is a multifactorial autoimmune disease which susceptibility is determined by a combination of genetic and environmental factors. Microvascular complications are specific to diabetes and related to longstanding hyperglycaemia. Both Type 1 DM and Type 2 DM are susceptible to microvascular complication. The risk of developing diabetic retinopathy or other micro vascular complications of diabetes depends on both the duration and the severity of hyperglycemia. The aim of this study was to evaluate the frequency major microvascular complication of different age group patients with diabetes mellitus type 1(T1DM) and was conducted in medical outdoor patient (OPD) of two main hospitals named as Civil Hospital Hyderabad and LUMHS Hospital Jamshoro from July 2018 –December 2018. Out of 410 T1DM patients 250 (61%) were males and 160 (39%) were females were enrolled in the present study. The present study concluded that total 410 Diabetic patients have major microvascular complications included 180 (44%) DR patients, 125 (30.4%) nephropathy patients and 105(25.6%) diabetic neuropathy patients. Out of 180 patient 120( 66.66%)males have DR and 60 (33.33%) females were DR. Out of 125 diabetic nephropathy patients 70 males(56%) were suffer and 55(44%) females. Out of 105 diabetic neuropathic patients 60(57%) males and 45 (43%) females. Out of 180 DR patients 117(65%) patients have NPDR & 63(35%) have PDR. Out of 125 DN patients 110 patients have proteinuria , 90 patients have swelling of hands ,feet & ankle , 95patients have swelling on eyes & 80 patients have confusion or difficulty to concentrate on work Out of 125 DN patients 100(80%) patients have microalbuminuria and 25(20%) patients have end stage renal failure(ESRD) .Out of 105 Diabetic neuropathy patients 100 have numbness , 95 have muscles weakness,90 have constipation sometimes diarrhoea ,65 have urinary incontinence.

## 1. INTRODUCTION

Diabetes mellitus is considered one of the main threats to human health in the 21st century. In developing countries, the prevalence of diabetes is increasing, where there are, as estimated by the World Health Organization (WHO), around 70 million people suffering from diabetes mellitus [1]. Changes in human behavior and lifestyle over the last century have resulted in a dramatic increase in the incidence of diabetes worldwide [2]. Diabetes is a metabolic disorder or a chronic condition where the sugar levels in blood are high. It is also defined as chronic disorders [3] of carbohydrate metabolism due to the lack of insulin result in the hyperglycemia and glycosuria. Anyone can be affected by this disease at any age. The type 1 diabetes mellitus (T1DM) is a multifactorial autoimmune disease [4], which susceptibility is determined by a combination of genetic and environmental factors. Diabetes mellitus is one of the most common chronic disorders of childhood [5]. Diabetes Mellitus is major chronic endocrine metabolic disorder known to have adverse effects on the overall human body. High blood glucose levels can result in brain dysfunction and it promotes the formation of sorbitol, which damages blood vessels and causes degeneration of the nerves, leading to neuropathy, which can lead to dementia or cognitive impairment [6]. The risk of developing diabetic retinopathy or other micro vascular complications of diabetes depends on both the duration and the severity of hyperglycemia [6]. There is an incidence of several complications with the long standing diabetes. Diabetes is associated with microvascular complications [7] such as nephropathy, retinopathy, and neuropathy.

**Diabetic Retinopathy:** Diabetic retinopathy may be the most common micro vascular complication of diabetes. It is responsible for 10,000 new cases of blindness every year in the United States alone. The risk of developing diabetic retinopathy or other micro vascular complications of diabetes depends on both the duration and the severity of hyperglycemia [18]. Retinopathy is characterized by increased vascular permeability [8], by vascular closure mediated by the formation of new blood vessels neovascularization, on the retina and posterior surface of the vitreous. Diabetic retinopathy is a micro vascular disease, characterized by damage to the blood vessels and retina of the eyes. This condition occurs in both type 1 and type 2 diabetics. It can be classified as non-proliferative diabetic retinopathy and proliferative diabetic retinopathy or diabetic macular edema. In

diabetic retinopathy, the micro vessel supplying blood to the retina of eye is affected and can cause blindness. Retinopathy is related to high blood sugar level and obstructs the flow of oxygen to the cells of the retina. For the vision of eye, retina receives signals of light and sent them to the brain forming a three dimensional figure which is identified. Finally, it is sent back to the eye by which one can recognize the things around. This working mechanism of passing light through the retina is hindered by the high glucose levels. The initial stage of this disease is known as Non- proliferate Diabetic retinopathy whereas Proliferative diabetic retinopathy is the advanced form of diabetic retinopathy [9] in which new as well as weak blood vessels break and leak blood into vitreous of the eye causing floating spots in the eye. Gradually, the swollen and scar nerve tissue of the retina is totally destroyed and leads to retinal detachment. The ground cause for blindness among diabetes is due to the retinal detachment.

**Diabetic Nephropathy:** Diabetic Nephropathy [10] is a common and serious complication where kidneys [11] are damaged and fails to function. The reason is due to persistent high blood sugar level in the blood. In the early phase of nephropathy drugs and diet can control the condition. The condition when protein starts leaking in urine is called as micro albuminuria [12]. The common symptoms of kidney failure are fatigue, decreased appetite, nausea and vomiting. Anemia [13] may also be observed in diabetic nephropathy. It has been observed that about 30 to 40 % of Type I diabetics and 20 to 30% of Type 2 diabetics (T2D) develop moderate to severe kidney failure. Currently, diabetic nephropathy is the leading cause of chronic kidney disease in the United States and other Western societies. It is also one of the most important long-term complications in terms of morbidity and mortality in patients with diabetes. Diabetes is responsible for 30-40% of cases of end-stage renal disease in the United States.

**Diabetic Neuropathy:** Diabetes mellitus, a common metabolic disease with a rising global prevalence, is associated with long-term complications of peripheral nervous system and the central nervous system [14]. Diabetic neuropathy is a chronic micro vascular complication [15] affecting both somatic and autonomic peripheral nerves. It may be defined as the presence of symptoms or signs of peripheral nerve dysfunction in people with diabetes, after the exclusion of other causes of neuropathy. Neuropathy is the common complication of diabetes and is due to high blood sugar, chemical changes that occur in the nerves. Generally it starts in the nerves of feet as they

are the longest nerves and nourished with longest blood vessels of the body. This condition is called diabetic foot or diabetic peripheral neuropathy or distal symmetric neuropathy [16]. Diabetes can reduce the blood supply to the foot and gradually damages the nerves which carry sensation. Diabetic neuropathy can cause foot ulcers and foot infections as advanced complications in diabetic patients. Signs and symptoms of Diabetic Neuropathy include, decrease or no sweating, numbness, or tingling, and some sort of burning sensation, weakness [17]. Keeping in view the importance of type 1 Diabetes Mellitus (T1DM) as serious disorder the present research work was designed to document age wise patients suffering from major micro vascular complication of type 1 diabetes mellitus (T1DMCs) from two hospitals of Hyderabad and Jamshoro districts of Sindh-Pakistan.

## **2. MATERIALS AND METHODS**

During the regular visits of OPD at two major hospitals named Civil Hospital, Hyderabad and LUMHS, Jamshoro were conducted to collect primary data from July to December 2018. Data were collected through self-developed Questionnaire in English version (Table-1). During visit oral consent was taken from the type 1 Diabetes Mellitus (T1DM) patients and predesigned questionnaire regarding the T1DM is being filled out by asking questions to the medical OPD patients of both hospitals. In total 410 major micro vascular complication of T1DM, patients of different sex age groups were surveyed from both of the above-mentioned hospitals from July to December 2018. Among those 410 patients (250males and 160 females) were included for thorough medical history, especially taking into account the duration of illness, chronic complications previous blood sugar records, dietary control and treatment record of the patients were taken. Blood pressure and random blood glucose readings for Diabetic patients (type-1) were recorded. Moreover, Oral consent was also taken from all the Diabetic patients. Patients with different ages of both sexes were also recorded with their controlled or uncontrolled diabetics based on blood glucose measurements either random or fasting. Questionnaire related to age group of the patients were designed and graphically represented by using "www.GraphPad Prism for Windows version. Statistical significance was determined by using SPSS Statistics were used to determine the significant effects. In addition, differences in the means of different variables between the age and hospital groups were tested using the t-test.

## **3. RESULTS**

The present study describes the analysis of the main variables surveyed in the survey questionnaire. Out of 410 T1DM patients of both gender of two different age groups (20-25 & 26-30 years) were surveyed during the study. Out of 410 T1DM patients 250 (61%) were males and 160 (39%) were females were enrolled in the present study. The present study concluded that total 410 Diabetic patients have major microvascular complications included 180 (44%) DR patients, 125 (30.4%) nephropathy patients and neuropathy patients 105(25.6%). Out of 180 patients 120( 66.66%)males have DR and 60 (33.33%) females were DR. Out of 180 DR patients 117(65%) patients have NPDR & 63(35%) have PDR. Out of 180 DR patents 125 (69.45%)patients vision loss gradually & 55 (30.55%)patients vision loss suddenly. Out of 125 diabetic nephropathy patients 70 males(56%) were suffer and 55(44%) females. Total 105 diabetic neuropathic patients 60(57%) males and 45 (43%) females.

## **4. DISCUSSION**

The object of this study determine the prevalence of major micro vascular complication of T1DM in both male and female of ages between (20-25 and 26-30) years at two major hospitals of District Hyderabad Sindh-Pakistan during July to December 2018. Diabetes Mellitus (DM) is multifactorial disorder leads to increase glucose in the blood because of impairment of insulin secretion and function, insulin function, or both. DM commonly developed at the age of forty. Anyone can be affected by this disease at any age. The type 1 diabetes mellitus (T1DM) or type 2 diabetes mellitus (T2DM) is a multifactorial autoimmune disease [4], which susceptibility is determined by a combination of genetic and environmental factors. Diabetes mellitus is one of the most common chronic disorders of childhood [5]. Diabetes Mellitus is major chronic endocrine metabolic disorder known to have adverse effects on the overall human body. High blood glucose levels can result in brain dysfunction and it promotes the formation of sorbitol, which damages blood vessels and causes degeneration of the nerves, leading to neuropathy which can lead to dementia or cognitive impairment disease [6]. The present study was based on survey and used routinely collected data through questionnaire by asking the questions from a defined population at a certain specific period of time in the local language which was then after converted into English language. These data were then examined in relation to the presence or absence of the diabetes disease under investigation or its severity with a view

to test hypothesis and look into associations between various factors. Studies was planned to carry the survey in the district Hyderabad of Sindh Province to find out the number of persons in both genders having of major micro vascular complication of T1DM . The risk of developing diabetic retinopathy or other micro vascular complications of diabetes depends on both the duration and the severity of hyperglycemia [7]. Retinopathy is characterized by increased vascular permeability [8], by vascular closure mediated by the formation of new blood vessels - neovascularization, on the retina and posterior surface of the vitreous. Diabetic retinopathy is a micro vascular disease, characterized by damage to the blood vessels and retina of the eyes. This condition occurs in both type 1 and type 2 diabetics. It can be classified as non-proliferative diabetic retinopathy and proliferative diabetic retinopathy or diabetic macular edema. In diabetic retinopathy, the micro vessel supplying blood to the retina of eye is affected and can cause blindness. Retinopathy is related to high blood sugar level and obstructs the flow of oxygen to the cells of the retina. For the vision of eye, retina receives signals of light and sent them to the brain forming a three dimensional figure which is identified. Finally it is sent back to the eye by which one can recognize the things around. This working mechanism of passing light through the retina is hindered by the high glucose levels. The initial stage of this disease is known as Non-proliferate Diabetic retinopathy whereas Proliferative diabetic retinopathy is the advanced form of diabetic retinopathy [9] in which new as well as weak blood vessels break and leak blood into vitreous of the eye causing floating spots in the eye. Gradually, the swollen and scar nerve tissue of the retina is totally destroyed and leads to retinal detachment. The ground cause for blindness among diabetes is due to the retinal detachment. Diabetic Nephropathy Diabetic Nephropathy [10] is a common and serious complication where kidneys [11] are damaged and fails to function. The reason is due to persistent high blood sugar level in the blood. In the early phase of nephropathy drugs and diet can control the condition. The condition when protein starts leaking in urine is called as micro albuminuria [12]. Studies available in the literature are both in the favors [13];[14] and ];[15] [16] .affecting both somatic and autonomic peripheral nerves. It may be defined as the presence of symptoms or signs of peripheral nerve dysfunction in people with diabetes, after the exclusion of other causes of neuropathy. Neuropathy is the common complication of diabetes and is due to high blood sugar, chemical changes that occur in the nerves. Generally it starts in the nerves of feet as they are the longest nerves and nourished

with longest blood vessels of the body. This condition is called diabetic foot or diabetic peripheral neuropathy or distal symmetric neuropathy. Diabetes can reduce the blood supply to the foot and gradually damages the nerves which carry sensation. Diabetic neuropathy can cause foot ulcers and foot infections as advanced complications in diabetic patients. Signs and symptoms of Diabetic Neuropathy include, decrease or no sweating, numbness, or tingling, and some sort of burning sensation, weakness etc [17].

## 5. CONCLUSION

The 410 T1DM patients of both gender of two different age groups (20- 25 and 26-30 years) were surveyed during the study. Out of 410 T1DM patients 250 (61%) were males and 160 (39%) were females were enrolled in the present study. Of the total T1DM patients, majority 244 (59.51%) had more than 15 years of duration of T1DM, followed by 102 (24.87%) more than 10 years and 64 (15%) up to 10 years. The present study concluded that total 410 Diabetic patients have major microvascular complications included 180 (44%) DR patients, 125 (30.4%) nephropathy patients and neuropathy patients 105(25.6%).Out of 180 patients 120(66.66%)males have DR and 60 (33.33%) females were DR.Out of 125 diabetic nephropathy patients 70 males(56%) were suffer and 55(44%) females. Out of 105 diabetic neuropathic patients 60(57%) males and 45 (43%) females.

## 6. CONFLICT OF INTEREST

All authors have declared that there is no conflict of interest regarding publication of this article.

## REFERENCES

- [1] David SK, Upadhayaya N, Siddiqui MK, Usmani AM (2010) Knowledge Discovery Technique for Web-Based Diabetes Educational System. *J Health Med Informat* 1: 102.
- [2] Zimmet P, Alberti KG, Shaw J (2001) Global and societal implications of the diabetes epidemic. *Nature* 414: 782-787.
- [3] Ramanathan K, Karthick H, Arun N (2010) Structure Based Drug Designing for Diabetes Mellitus. *J Proteomics Bioinform* 3: 310-313
- [4] Ribeiro C, de Alencar Mota CS, Voltarelli FA, de Araújo MB, Botezelli JD, et al. (2010) Effects of Moderate Intensity Physical Training in Neonatal Alloxan- Administered Rats. *J Diabetes Metab* 1: 107.

- [5] Baş VN, Bideci A, Yeşilkaya E, Soysal AŞ, Çamurdan O, et al. (2011) Evaluation of Factors Affecting Quality of Life in Children with Type 1 Diabetes Mellitus. *J Diabetes Metab* 2: 154.
- [6] Alina S, Barbara R, Krzysztof G, Barbara G, Marek G, et al. (2011) Elevation of sE-Selectin Levels from 2-24 Months Following Gestational Diabetes is Associated with Early Cardiometabolic Risk in Non-Diabetic Women. *J Diabetes Metab* 2: 138.
- [7] Brownlee M (2001) Biochemistry and molecular cell biology of diabetic complications. *Nature* 414: 813-820.
- [8] Kodl, C. T and Seaquist, E. R. “Cognitive dysfunction and scope diabetes mellitus”. *Endocr Rev.* 29:494-511 (2008). [PMC free article] [PubMed]. [11]
- [9] da Silva SB, Costa JP, Pintado ME, Ferreira DC, Sarmiento B (2010) Antioxidants in the Prevention and Treatment of Diabetic Retinopathy – A Review. *J Diabetes Metab* 1: 111. 46.
- [10] Chowdhury TA, Dyer PH, Kumar S, Barnett AH, Bain SC (1999) Genetic determinants of diabetic nephropathy. *Clin Sci (Lond)* 96: 221-230.
- [11] Rossing P (2000) Risk factors in the progression of diabetic nephropathies. *Ugeskr Laeger.* 162: 5057-5061.
- [12] Lehmann R, Spinass GA (1995) Diabetic nephropathy: significance of microalbuminuria and proteinuria in Type I and Type II diabetes mellitus. *Praxis (Bern 1994)* 84: 1265-1271.
- [13] Thomas M, Tsalamandris C, MacIsaac R, Jerums G (2005) Anaemia in diabetes: an emerging complication of microvascular disease. *Curr Diabetes Rev* 1: 107-126.
- [14] Chen D, Huang H, Xing Y, Liu Y, Xu Y, et al. (2011) A New Vanadium Complex Improves the Spatial Learning and Memory by Activation of Caveolin–MAPK–CREB in pathway diabetic Mice *J Diabetes Metab* 2:114.
- [15] Heltianu C, Guja C (2011) Role of Nitric Oxide Synthase Family in Diabetic Neuropathy. *J Diabetes Metab* S5: 2. 55. Boulton AJ (1994) End-stage complications of diabetic neuropathy: foot ulceration. *Can J Neurol Sci.* 21: S18-22.
- [16] Boulton AJ (1994) End-stage complications of diabetic neuropathy: foot ulceration. *Can J Neurol Sci.* 21: S18-22.
- [17] Fong DS, Aiello LP, Ferris FL 3rd, Klein R: Diabetic retinopathy. *Diabetes Care* 27:2540–2553, 2004.

Table 1: Showing Diabetic Mellitus type 1 patients attending the medical OPD of Civil Hospital Hyderabad and LUMHS Jamshoro (n=410)

S. No.	Male Patients	Female Patients	% of male patients	% of female patients
1	250	160	61%	39%

Table 2: Showing the age of Type 1 diabetes mellitus (T1DM) patients (n=410)

Age group	No. of Patients	Percentage (%)
26-30	249	60.73%
20-25	161	39.2%

Table 3: Showing Diabetic Mellitus type 1(T1DM) patients attending the medical OPD of Civil Hospital Hyderabad and LUMHS Jamshoro having microvascular complication. (n=410)

Major micro vascular complication in T1DM patients	No. of Patients
Diabetic retinopathy	180
Diabetic nephropathy	125
Diabetic neuropathy	105

Table 4: Showing gender with percentage of Diabetic retinopathy (DR) patients.

Gender	Numbers of DR Patients	Percentage (%)
Male	120	66.66
Female	60	33.33

Table 5: Showing type wise number & % of DR patients (n=180)

Type of DR	Numbers	Percentage
NPDR	117	65%
PDR	63	35%

Table 6: Showing gender with percentage of Diabetic nephropathy (DN) patients

Gender	Numbers of DN Patients	Percentage (%)
Male	70	56
Female	55	44

Table 7: Showing Diabetic Nephropathy patients symptoms (n=125)

Symptoms	No. of Patients
Proteinuria	125
Swellings of feet, ankle and hands	110
Swelling of eyes	95
Confusion or difficulty concentrating	80

Table 8: Showing gender with percentage of Diabetic neuropathy patients.

Gender	Numbers of diabetic neuropathy Patients	Percentage (%)
Male	60	57
Female	45	43

Table 9: Showing Diabetic Nephropathy patients symptoms (n=125)

Symptoms	No. of Patients	Percentage %
Proteinuria	125	100
Swellings of feet, ankle and hands	110	80
Swelling of eyes	95	76
Confusion or difficulty concentrating	80	64