

VITAMIN D DEFICIENCY AS AN EMERGING RISK FACTORS FOR DIABETIC MELLITUS FROM DISTRICT HOSPITAL HYDERABAD

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Abstract

Deficiency of Vitamin D (Vit D) has been recognised as a common nutritional disorder and recognised as a contributing factor to poor glycemic control and development of complications in those with Type 2 Diabetes Mellitus (T2DM). To find out the prevalence of Vitamin D deficiency and its clinical characteristics in T2DM attending District Hospital Hyderabad. The cross-sectional, observational study was carried out at Civil Hospital Hyderabad and Jeejal Maa Hospital, between July, 2024 and April, 2025. Finally, 62 patients with T2DM were recruited and the demographic parameters, vitamin D status, as well as clinical parameters, were assessed with a structured questionnaire and laboratory investigations were carried out. The samples were collected from 2 hospitals, Civil Hospital Hyderabad (62) & Jeejal Maa Hospital (30) which represents 51.6% & 48.4% respectively from the two hospitals. Twenty-five (40.3%) patients were diagnosed with vitamin D deficiency and 37 (59.7%) had normal vitamin D. Sixty per cent of the vitamin D deficient patients were female (n = 15) while 40 per cent were male (n = 10). The 60–70-year age group had the largest prevalence of vitamin D deficiency (48 %), followed by the 50–60-year age group (32 %) and the 40–50-year age group (20 %). The most common symptoms reported by vitamin D deficient patients were fatigue, joint pain, overweight condition, slow wound healing and mood disorders, where the last two were more common. Based on results, vitamin D deficiency is a prevalent condition in the aged and in women with T2DM and might be a risk factor for poor clinical outcomes. Vitamin D should be part of routine screening in people with diabetes and vitamin D should be supplemented and lifestyle changes made to improve glycemic control and prevent diabetes-related complications. Multicentre studies on a larger scale are recommended to validate these results and reinforce evidence on the use of vitamin D in the care of Type 2 Diabetes Mellitus.

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a main global health problem related with severe complications, with cardiovascular disease, nephropathy, retinopathy, and neuropathy. In addition to its role in bone metabolism, vitamin

D has also been found to play a role in insulin secretion, insulin sensitivity, and immune regulation. Vitamin D deficiency has been associated with dysregulated glucose metabolism, higher insulin resistance and lower glycaemic control in individuals with T2DM. Vitamin D

deficiency is very common in Pakistan even in the presence of plenty of sunshine, due to various factors including limited exposure to the sun, dietary factors, obesity and sedentary lifestyle. Although there is a significant association of low serum vitamin D level with Type 2 Diabetes Mellitus reported from several studies, however local data is limited in Hyderabad, Sindh. Hence, this study was conducted to find the prevalence of vitamin D deficiency in Type 2 Diabetes mellitus (T2DM) patients attending Civil Hospital Hyderabad and Jeeja Maa Hospital, Hyderabad and to see the demographic and clinical parameters associated with vitamin D insufficiency.

A study by Alzahrani et al., (2024) found that 83.7% of all Type 2 Diabetes Mellitus patients had a vitamin D deficiency, with older age, overweight, higher HbA1c and higher fasting blood glucose identified as risk factors. Wang et al. (2019) found that patients with Type 2 Diabetes Mellitus had significantly lower vitamin D levels than healthy controls, and that vitamin D deficiency was linked to increased insulin resistance via activity of the NF- κ B inflammatory pathway. According to Hidayat (2010) vitamin D deficiency is prevalent among elderly patients, of whom 78.2% were hypovitaminosis D, especially obese women with Type 2 Diabetes Mellitus. There was an inverse association between serum vitamin D [25(OH)D] level and glycaemic control indicated by higher levels of HbA1c, which were shown to be independently associated with lower vitamin D [25(OH)D] levels by Zoppini et al. 2013 in patients with Type 2 Diabetes Mellitus. Vijay et al. (2023) found that 74.1% of Type 2 Diabetes Mellitus patients were vitamin D deficient; especially females and overweight patients, making routine screening, supplementation and healthy lifestyle practices crucial. Based on the study of Karau et al, 2019, 38.4% of Type 2 Diabetes Mellitus had Vitamin D deficiency with poor glycaemic control and high prevalence of hypertension and obesity. The prevalence of vitamin D deficiency was high among diabetic patients, as Bener et al. (2016) reported that about one-third of the Type 2 Diabetes Mellitus patients were vitamin D

deficient. According to Zaharani et al. (2013), vitamin D deficiency was more common in females (94.8%) than males (93.0%) and 98.4% of Type 2 Diabetes Mellitus patients had suboptimal levels of vitamin D. Yan et al., (2014) reported that 63% of patients with Type 2 Diabetes Mellitus were vitamin D deficient and that vitamin D deficiency was also linked to impaired cardiac function, thus placing patients at greater risk for cardiovascular complications. In study of Daga et al., 91.1% of the young diabetic patients had the vitamin D deficiency as compared with the strong controls. Olt et al. (2015) reported that majority of patients with Type 2 Diabetes Mellitus were vitamin D deficient, but noted no significant correlation between the vitamin D levels with glycaemic control (HbA1c). Studies by Palomer et al. (2007) indicated that Vitamin D deficiency may be a risk factor for the development and progression of Type 2 Diabetes Mellitus by affecting insulin production and control of glucose, while the supplementation of vitamin D improves the glycaemic control in deficient patients. Senyigit et al. (2019) demonstrated that patients with Type 2 Diabetes Mellitus had considerably lower serum vitamin D levels than healthy controls, and serum vitamin D levels were strongly correlated with diabetic complications, such as coronary artery disease, nephropathy, neuropathy and retinopathy. Among Type 2 Diabetes Mellitus (T2DM) patients, Hong et al. discovered that vitamin D deficiency was very common and independently correlated with diabetic nephropathy, microalbuminuria, lower HbA1c and lower HDL cholesterol levels. It has been reported by Talaei et al. that 24% of Type 2 Diabetes Mellitus (T2DM) patients were vitamin D deficient, suggesting a role for vitamin D in insulin secretion and glucose metabolism. The high prevalence of vitamin D deficiency in patients with Type 2 Diabetes Mellitus (54.1%) compared to healthy controls (25.9%) by Khudayar et al. (2022) showed that vitamin D deficiency was significantly associated with T2DM. Bachali et al. that deficiency of Vit (D) can increase the risk of type 2 diabetes. Pajor et al. sums up that insulin resistance and risk of diabetes

are the results of Vit D inefficiency. Ahmed et.al (2020) highlighted Vit (D) insufficiency can be seen in patients of diabetes 2 while vit D3 causes diabetic retinopathy. Abdulhadi et.al (2019) studies that there is association between diabetes type 2 and vit D deficiency. When 1 get affected other can easily be disturbed. Angellotti et al. studied that diabetes type 2 has correlation with Vit D deficient patients. Henrique et al. noted that vit D deficiency is spreading everywhere and it can speed up the diabetes mellitus occurrence i.e. cardiovascular diseases are common because of diabetes type 2. Xiao et al. (2016) did research on that Vitamin D insufficiency was more common in diabetic type 2 patients especially those with diabetic nephropathy.

MATERIALS AND METHODS

Study Design

This is a hospital based cross sectional observational study to find out the prevalence of vitamin D deficiency among diabetic patients attending diabetic clinic of diabetic outpatient departments at Sarfaraz Hospital in Hyderabad, Sindh, Pakistan. The study was conducted at Civil hospital Hyderabad and Jeejal Maa hospital Hyderabad for a period of 10 months from July 2024 to April 2025 in the Out Patient Department (OPDs). Sixty-two Type 2 Diabetes Mellitus (T2DM) patients were selected for the study. Adults with T2DM, aged 40 years and older, attending the diabetic clinics during the study period, were eligible. The following were excluded: patients with Type 1 diabetes mellitus, patients with gestational diabetes, patients with any endocrine disorders involving vitamin D metabolism, and vitamin D supplemented for the last 3 months. A structured data collection form and patient's medical records were used in the data collection process. Demographic characteristics (age and sex), clinical information, duration of diabetes, presenting symptoms related to vitamin D deficiency, and laboratory findings were recorded. The molecular form of vitamin D (25-hydroxyvitamin D [25(OH)D]) was determined by relying on hospital laboratory reports. The primary outcome was vitamin D deficiency in patients of Type 2 Diabetes Mellitus

and the participants were classified as vitamin D deficient and non-deficient groups based on the laboratory reference value of the participating hospitals. Secondary outcomes referred to the age-wise and sex-wise distribution of vitamin D deficiency and common clinical signs of vitamin D deficiency were determined.

RESULTS AND DISCUSSIONS

The observational records obtained during the routine visits of OPD of Civil and Jeejal Maa Hospital, Hyderabad in the present study. In this study, there were 62 patients included in the study. Of these, 32 (51.6%) patients were selected from Civil hospital Hyderabad and 30 (48.4%) patients were selected from Jeejal Maa hospital Hyderabad. Only slightly more than half of the subjects participated from Civil Hospital Hyderabad. In Type 2 Diabetes Mellitus, Vitamin D deficiency was seen to be highest in 60-70 years age group with 12 (48%) patients. The next highest group was the 50-60 years age group (8, 32%) followed by the 40-50 years age group (5, 20%). The age group of 60-70 years old also had the highest frequency of 17 (46%) patients, followed by 10 (27%) patients in the age group 40-50 years old and 10 (27%) patients in the age group 50-60 years old, with no Vitamin D deficiency seen in these patients. These findings showed that Vitamin D deficiency was more prevalent in older patients of Type 2 Diabetes Mellitus with a peak in the age group 60-70 years. The proportion of patients with Vitamin D deficiency and without Vitamin D deficiency in gender wise distribution was 15(60%) and 10(40%) respectively, indicating that Vitamin D deficiency was higher in female patients with Type 2 Diabetes Mellitus. Of the 19 patients who were not Vitamin D deficient, almost 54% were males and nearly 46% were females. Out of 15 females who are diabetic patients and Vitamin D Deficiency 66.66% have Joint pain, 66.66% have Fatigue, 53.33% have Mood swing, 46.66% Overweight and 53.33% Slow wound healing. Out of 10 males who are diabetic patients with vitamin D deficiency 90% have joint pain, 100% have fatigue, 0% have mood swings, 80% have overweight and 50% have slow wound healing. It

was observed that during this study those patient who have low Vitamin D deficiency can cause overweight, mood swing, fatigue, joint and muscle pain and some of them are not explained due to Vitamin D deficiency. The most common

cause which has observed during data collection is an Low sun exposure, Dietary deficiencies, Obesity reduced kidney function, poor glycaemic control

Table 1: Showing Gender wise distribution of patients.

Gender wise distribution of patients	Patients with vitamin D deficiency		Patients without deficiency	
	Frequency	Percentage	Frequency	Percentage
Male	10	40%	20	54%
Female	15	60%	17	46%

Table 1: shows that among patients with vitamin D deficiency, 60% (15) were females and 40% (10) were males. Among patients without vitamin D deficiency, 54% (20) were males and 46% (17)

were females. This indicates that vitamin D deficiency was more common in female patients than in male patients.

Table 2: Showing Vitamin D Levels in Male Diabetic patients

No	Age	Gender	Diabetic	Locality	V.D levels
1	70	Male	Type2	Urban	12ng/ml
2	69	Male	Type	Urban	14ng/ml
3	68	Male	Type	Urban	16ng/ml
4	67	Male	Type	Urban	18ng/ml
5	67	Male	Type	Urban	19ng/ml
6	66	Male	Type	Urban	18ng/ml
7	65	Male	Type2	Urban	17ng/ml
8	64	Male	Type2	Urban	16ng/ml
9	63	Male	Type2	Urban	17ng/ml
10	62	Male	Type2	Urban	15ng/ml

Table 2: shows the vitamin D levels of 10 male patients with Type 2 Diabetes Mellitus. All patients belonged to urban areas, were aged 62-

70 years, and had vitamin D levels ranging from 12 to 19 ng/mL, indicating vitamin D deficiency in all male diabetic patients.

Table 3: Showing Vitamin D deficiency Levels in female patients.

No	Age	Gender	Locality	Diabetic	V.D Levels
1	70	Female	Urban	Type2	12ng/ml
2	69	Female	Urban	Type2	13ng/ml
3	68	Female	Urban	Type2	12ng/ml
4	67	Female	Urban	Type2	14ng/ml
5	66	Female	Urban	Type2	15ng/ml
6	66	Female	Urban	Type 2	13ng/ml
7	65	Female	Urban	Type 2	16ng/ml
8	65	Female	Urban	Type 2	15ng/ml

9	50	Female	Urban	Type 2	16ng/ml
10	49	Female	Urban	Type 2	17ng/ml
11	48	Female	Urban	Type 2	18ng/ml
12	44	Female	Urban	Type 2	17ng/ml
13	42	Female	Urban	Type 2	18ng/ml
14	41	Female	Urban	Type 2	19ng/ml
15	40	Female	Urban	Type 2	20ng/ml

Table 3: shows the vitamin D levels of 15 female patients with Type 2 Diabetes Mellitus. All patients were from urban areas, aged 40–70 years,

and had vitamin D levels ranging from 12 to 20 ng/mL, indicating vitamin D deficiency among all female diabetic patients.

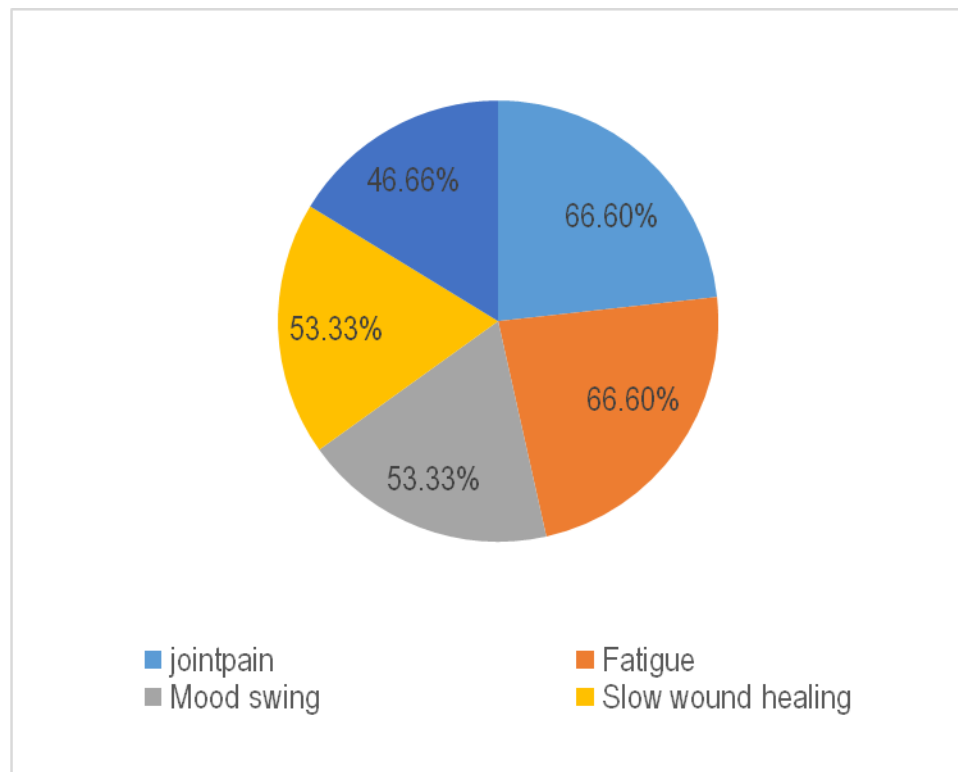


Figure 1: Showing Symptoms in Vitamin D deficiency in diabetic type 2 female patients.

Figure 1 shows the occurrence of symptoms between patients with vitamin D deficiency. Joint pain and fatigue were the most common symptoms, each reported by 66.6% of patients.

Mood swings and slow wound healing were observed in 53.33% of patients each, while overweight was reported by 46.66% of patients.

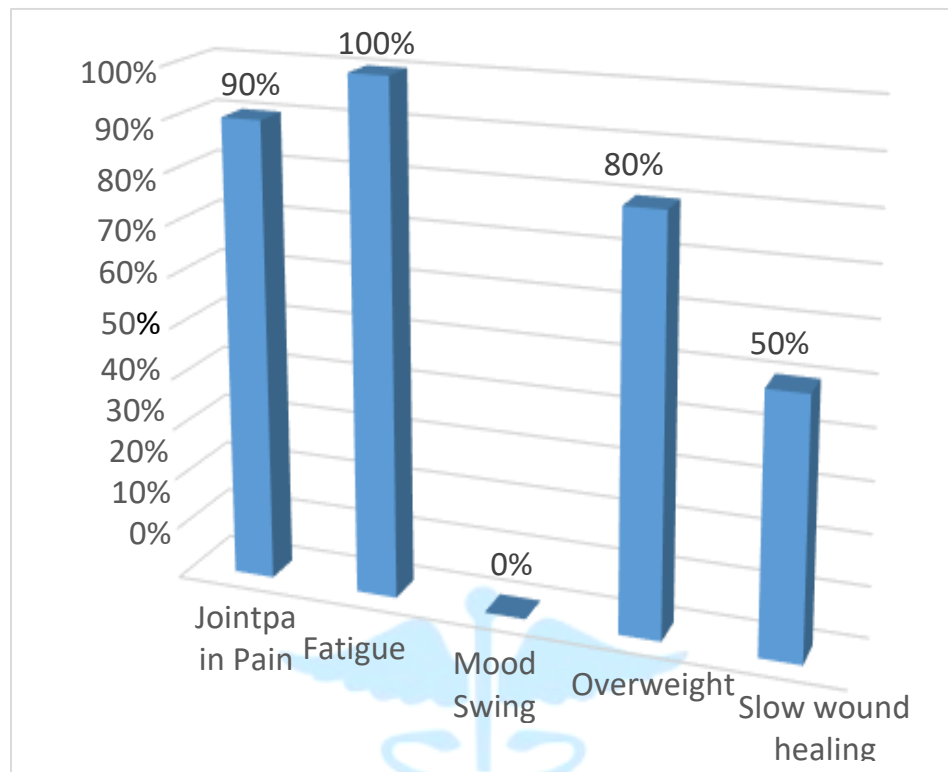


Figure 2: Showing Symptoms of Vitamin D deficiency in Diabetic type 2 male patients

Figure 2 shows the symptoms among the 10 male patients with vitamin D deficiency. Joint pain and fatigue were the most common symptoms, each reported by 9 (90%) patients.

Overweight was observed in 8 (80%) patients, while slow wound healing was reported by 5 (50%) patients. None of the male patients experienced mood swings (0%).

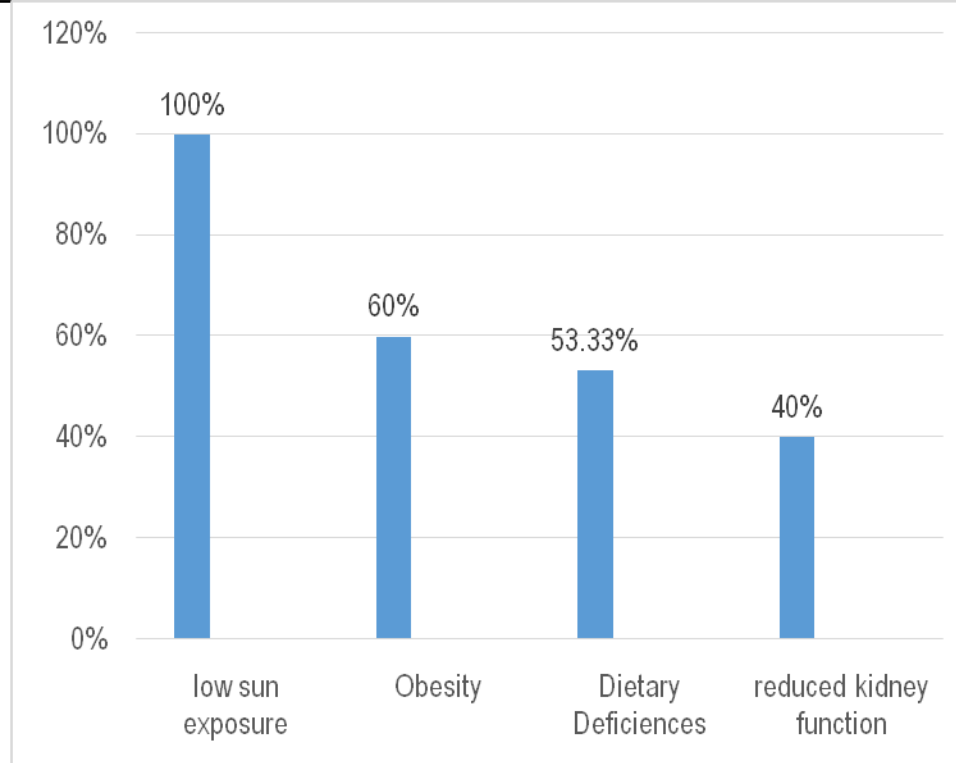


Figure 3: Showing causes of vitamin d diabetic type 2 female patients

The figure 3 shows that low sun exposure was the most common peril factor (100%), followed by obesity (60%), dietary deficiencies (53.33%), and reduced kidney function(40%) among the study participants. These findings suggest that insufficient sun exposure is the major contributor to vitamin D deficiency.

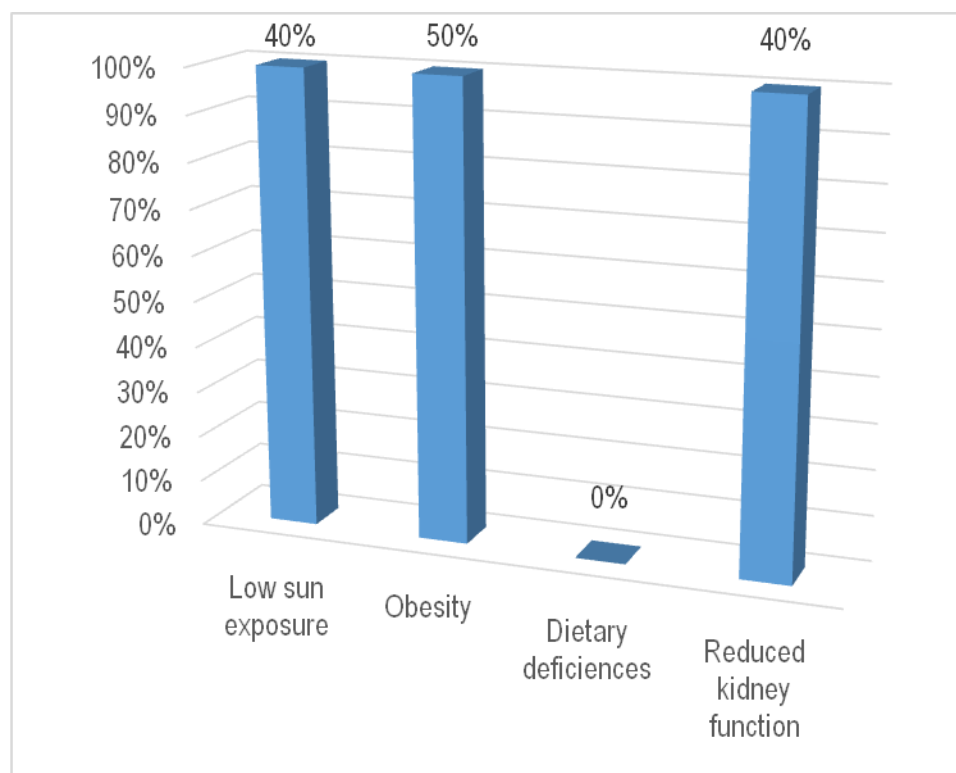


Figure 4: Showing percentage of causes of Vitamin D in diabetic type 2 male patients

The figure 4 shows that obesity was the most common peril factor (50%), while low sun exposure and reduced kidney function were each reported in 40% of patients. Dietary insufficiencies were not observed (0%) between the study participants.

DISCUSSION

This study aims at increasing our knowledge on vitamin D deficiency in type 2 diabetic patients. Adding on to it the impact on the body and management of vitamin D (VD) and HbA1c. Our goal is to enhance diagnostic methods, treatment, and management for vitamin D deficient people. For this purpose various parameters such as, age, gender, treatment stages for vitamin D level, treatment side effects, nutrition and symptoms of vitamin D deficiency were studied. The main aim of the present study was to find out the reasons for vitamin d levels in diabetic individuals, genetic autoimmune environmental factors so that condition of vitamin d level and its

symptoms can be managed with development of new and more effective treatments.

The study has emerged with patient's results that 62 patients who were suffering with type 2 diabetes and were presenting complaints of vitamin D insufficiency were seen in outpatient departments of Jejal Maa Hospital, Sindh, Pakistan and Civil Hospital Hyderabad. Sixty percent (15 out of 62) of the diabetics who were vitamin D deficient were females versus nearly 10 (40%) males. In Saudi Arabia, Alhumaidi found that vitamin D deficiency is quite common in Type 2 Diabetes Mellitus patients. The overall results of the study showed that 98.5% of the study participants were vitamin D deficient, with a mean serum concentration of 25(OH)D of 15.7 ± 7.5 ng/mL for diabetic patients and 11.1 ± 5.9 ng/mL for healthy non-diabetic participants. Hidayat et al. did a study on 78 participants (40 type 2 diabetes mellitus and 38 non-diabetics) in Indonesia. Despite regular outdoor activity, the majority of participants were female (66.7%), obese (44.9%) and almost 80% vitamin D

insufficiency. In the study, Subramanian et al. found that vitamin D deficiency was found to be very common in patients from North India with Type 2 Diabetes Mellitus and a lower male:female ratio was observed in their study. Olt et al. determined that 98.3% of the patients with Type 2 Diabetes Mellitus were vitamin D deficient, with most of them being male (73.4%). Saleem et.al It has been reported that 69 per cent of participants in Gujranwala, Pakistan were vitamin D deficient, which further pointed to high prevalence among the T2DM patient population compared to healthy people. Nasr et al. (2022) have conducted a cross sectional study in Saudi Arabia with 64 participants, 32 of whom had Type 2 Diabetes Mellitus while the remaining 32 were non diabetic. The study revealed that the vitamin D level was significantly lower in patients having Type 2 Diabetes Mellitus than the non-diabetic patients, which corroborates the association of vitamin D deficiency and Type 2 Diabetes Mellitus. Dhasa et al. (2019) found 70% of Type 2 Diabetes Mellitus patients were vitamin D deficient, while 40% of healthy controls were vitamin D deficient. The study also revealed that there was a link between low vitamin D levels and impaired glycemic control, which may mean that adequate levels of vitamin D can help to promote insulin sensitivity and the prevention of T2DM. Consistent with the present study, Usluogullari et al. (2015) observed a significant association between vitamin D deficiency and diabetic nephropathy as well as more severe microvascular complications in 557 patients of Type 2 Diabetes Mellitus. According to the researched of Isaia et al. that women with type 2 diabetes had considerably lower serum Vit D levels and calcium consumption than strong controls, suggesting a higher prevalence of vitamin D deficiency between diabetic patients. Muneer (2020) conducted a research and he found that Vitamin D and diabetes are inversely proportional.

CONCLUSION

The conclusion of this study is that patients with Type 2 Diabetes Mellitus (T2DM) attending the Civil and Jeejal Maa Hospitals, Hyderabad had

high prevalence of vitamin D deficiency. Female patients and individuals aged between 40-70 years were more likely to be vitamin D deficient. The most common symptoms were: Joint pain, fatigue, overweight, mood swings and slow wound healing. This is in line with the previous studies indicating association between low vitamin D and T2DM. Hence, it would be considered to screen for vitamin D deficiency, lifestyle modification, adequate sun exposure and Vitamin D supplementation in the comprehensive care of Type 2 Diabetes Mellitus patients as a routine.

AUTHORS CONTRIBUTIONS

Ishrat Fatima designed the study, data collection, analysis, statistical analysis, interpretation and manuscript writing. Ishrat Fatima planned the study, collected and analyzed the data, carried out statistical analysis, interpreted the findings, and drafted the manuscript. Dr. Naheed Shah supervised the research, had intellectual input in the study design and critically reviewed the manuscript and gave intellectual input throughout the study. Dr. Samina Malik helped with the study methodology, data interpretation and critically reviewed the manuscript for important scientific content. Sapna helped with data collection, literature review, editing of work and finally proof reading. All the authors read and approved the final version of the article and are accountable for any aspect of the work.

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AVAILABILITY OF DATA AND MATERIAL

The collected and analyzed data is available in the form of figures and tables

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The current study was checked and approved by the relevant team.

CONSENT FOR PUBLICATION

All authors have reviewed the manuscript and approved it for publication.

CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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