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OPHTHALMOLOGICAL COMPLICATIONS WITH THEIR MODIFIED AND NON MODIFIED RISK FACTORS ASSOCIATED WITH DIABETIC RETINOPATHY IN T2DM PATIENTS IN HYDERABAD

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Abstract

Objective: Ophthalmological Complications with their Modified and non-Modified risk factors associated with Diabetic Retinopathy in T2DM Patients in Hyderabad. **Study Design:** Descriptive Cross-sectional study. **Setting:** Sindh institute of ophthalmology and visual sciences (SIOVS) Hyderabad **Period:** September 2021 to march 2023. **Material & Methods:** 300 patients presenting at the diabetic clinic of SIOVS Hospital aged between 40-80 years DR with type II diabetes for ≥ 10 years (HbA1C). History including age, gender, DM duration. Eye examination done by ophthalmologist to observe the DR grades. **Results:** Mean age of the patients was 61.06 and SD (7.81). Diabetic duration with 17.76 mean & 6.68 SD. Mean of HBA1c was 9.8 ±1.5. There was no significant association between history of smoking and diabetic retinopathy. There was significant association of diabetic retinopathy and age, gender, diabetic duration, HBA1c, hyperlipidimia, hypertension, family history, vitamin D. **Conclusion:** Diabetic retinopathy is strongly associated with male gender, longer duration of diabetes and poor glycemic control.

Keywords: Diabetes; Non- Proliferative; Proliferative; Retinopathy.

INTRODUCTION

Diabetes mellitus (DM) is most common prevalent metabolic complication. It has reached epidemic proportions worldwide, put forth a considerable burden on healthcare services [1] Diabetic retinopathy (DR) is a chronic complication of DM and a most important reason of blindness and vision comlications worldwide. [2] The satges of DR mild non proliferative irregularity of DR shows amplified in vascular permeability while new blood vessels are produced on retina in the case of proliferative diabetic retinopathy [3]. On the surface of retina, poor glycemic control impairs the progression of blood vessels, that may cause illustration illness, blurred vision,floaters, seeing double and even blindness that is mostly to observe type 2 DMs' micro-vascular complication during analysis .DR complication develops approximately 80% of T2DM.[4] The risk factors are related with progression of DR the most valuable factors are age,gender, duration of diabetes,hba1c, hypertension,high blood pressure, hyperglycemia [5] vitamin d, nephropathy [6]

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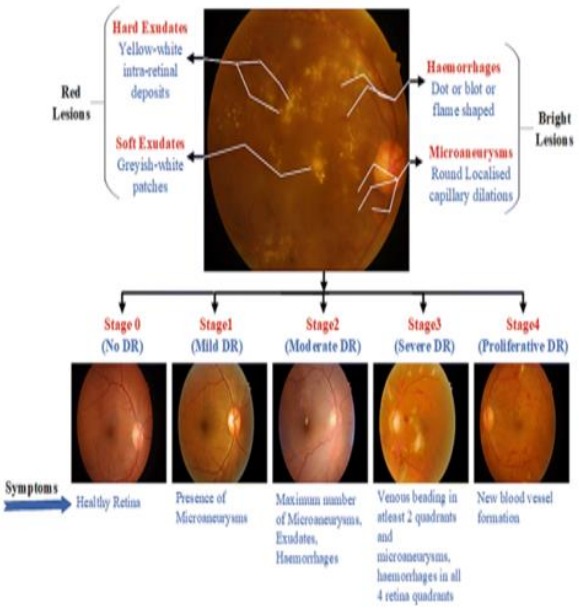
Classification of DR (figure: source Google)

Disease severity level	Abbreviations	Observable findings
1. No Apparent DR	NADR	No abnormalities
2. Mild Non-Proliferative DR	Mild NPDR	Microaneurysms only
3. Moderate Non-Proliferative DR	Moderate NPDR	More than just microaneurysms but less than severe nonproliferative DR
4. Severe Non-Proliferative DR	Severe NPDR	Any of the following: - More than 20 intraretinal hemorrhages in each of 4 quadrants - definite venous beading in 2+ quadrants - prominent intraretinal microvascular abnormalities in 1+ quadrant - No signs of proliferative DR
5. Proliferative DR	PDR	One or more of the following: - neovascularization - vitreous/ preretinal hemorrhage



METHODOLOGY

Patients of type 2 diabetes mellitus (DM) of both genders irrespective of duration of diabetes 10 or >10 years of age 40 to 80 visited SIOVS hospital Hyderabad. Study period between September 2021 to march 2023.

Sample Size: Sample size was 300.The study was approved by the local ethical committee. After taking written and verbal consent from the patients, a structured proforma containing demographic features, duration of DM, level of Hba1c, vitamin D level was filled. Blood test reports were collected for analyses of data. Serum total cholesterol and LDL cholesterol,HDL,TGs, HbA1c . A detailed fundus examination was performed by slit lamp bio microscopy by consultant ophthalmologist.

Data Analysis: The results were evaluated using mean,std,st Error and percentage. The percentages were calculated for all the qualitative data including gender, age group, and diabetic retinopathy.

RESULTS

Mean of age of the patients was 61.06 SD (7.81) with 0.32 errors. Patients were distributed according to the age groups showing that 50 or <50 are 32 subjects (10.66%) 60 or <60 are 110 patients (36.66), 70 or <70 are 136 with (45.33%) and 80 or <80 are 22 patients with 7.33%. distribution of the patients across gender showed that 175(58.33%) were males while 125(41.66%) were females. Of the 300 patients with NPDR, 92(52.5%) were males while 62(49.6%) were females. 83(46.4%) of the patients

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with PDR were males while rest 63(50.4%) were females.Patients were divided according to positive or negative history of hypertension which showed that 244(81.33%) patients were hypertensive, 56(18.66%) of patients not suffered from hypertension. According to the duration of diabetes patients were divided into 33 patients with 10 or <10 years,67 with 20 or <20,75 with30 or <30 years and 124 patients with 40 or <40 years of diabetic duration with 17.76 mean & 6.68 SD 0.27 error .so the disease duration having highly impact on DR.

Control of diabetes was assessed by HbA1c levels. All percipients are distributed in to two groups <7 Hba1c 14 patients with 4.66% while >7 Hba1c patients were 286 with 95.33%. Mean of Hba1c 9.8 SD 1.5 with 0.06 errors. There was significant association between diabetic retinopathy and Hb1Ac levels. Nephropathy also related with DR. Urea in NPDR patients with mean 22.21 SD8.08 with error o.33, cretinine mean 0.88 SD 0.43 with 0.02 errors, while in PDR patient's urea mean 24.54±9.17 with 0.37 error, cretinine mean 0.94±0.45 with 0.02 error.

Another risk factor of DR is high systolic blood pressure. SBP mean 185± 19.57 while diastolic blood pressure means 102.7±8.26. Male smokers were 175 of which 25(14.21%) were nonsmokers, 85(48.57%) with moderate smokers and 65 (37.14%) were heavy smokers.There is not significant association of smoking on DR. It was noticed that in all DR patients vitamin D was deficient < 20 ng/mL. Vitamin DD mean 15.60±3.88 ng/mL with 0.16 error. Male average 15.56 ng/mL and female average was 15.30 ng/mL.NPDR patients mean (15.61±3.77 ng/mL) 0.15 error while in PDR mean (15.52±40.99 ng/mL) with 1.67 error. Serum lipid play very important role in progression of DR. hyperlipidimia in NPDR patients TGs (3.67±1.07mmol/L) 0.04 error,CHO (5.25±1.27 mmol/L) with 0.05 error,HDL (1.43±0.23 mmol/L) 0.01 error and LDL (3.82±0.68 mmol/L) 0.03 error. In PDR patients hyperlipidimia mean TGs (3.8±1.06 mmol/L) 0.04 error,CHO (5.42±1.3 mmol/L)0.05 error, HDL(1.39±0.25 mmol/L) 0.01 error, LDL(04±0.71 mmol/L) 0.03 SD error.

DEMOGRAPHIC CHARACTERS

Risk factors	Mean value	ST Deviation	ST. Error
Diabetic duration	17.76	6.68	0.27
Age	61.06	7.81	0.32
Hba1c	9.8	1.5	0.06
NPDR Urea	22.21	8.08	0.33
NPDR Creatinine	0.88	0.43	0.02
PDR Urea	24.54	9.17	0.37
PDR creatinine	0.94	0.45	0.02
SBP	185	19.57	
DBP	102.7	8.26	
Vitamin DD NPDR Vit DD PDR Vit DD	15.60 15.61 15.52	3.88 3.77 40.99	0.16 0.15 1.67
NPDR TGs	3.76	1.07	0.04

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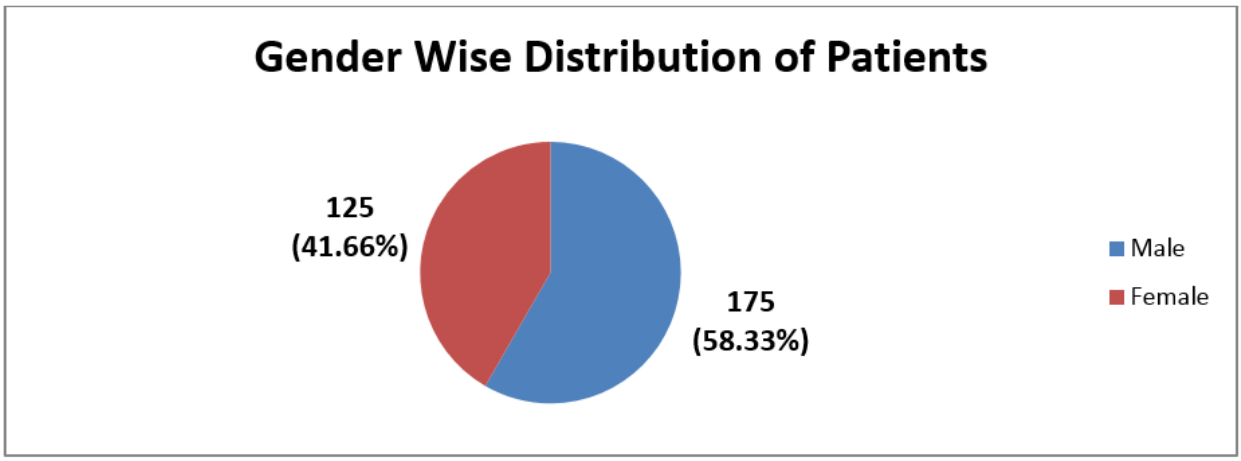
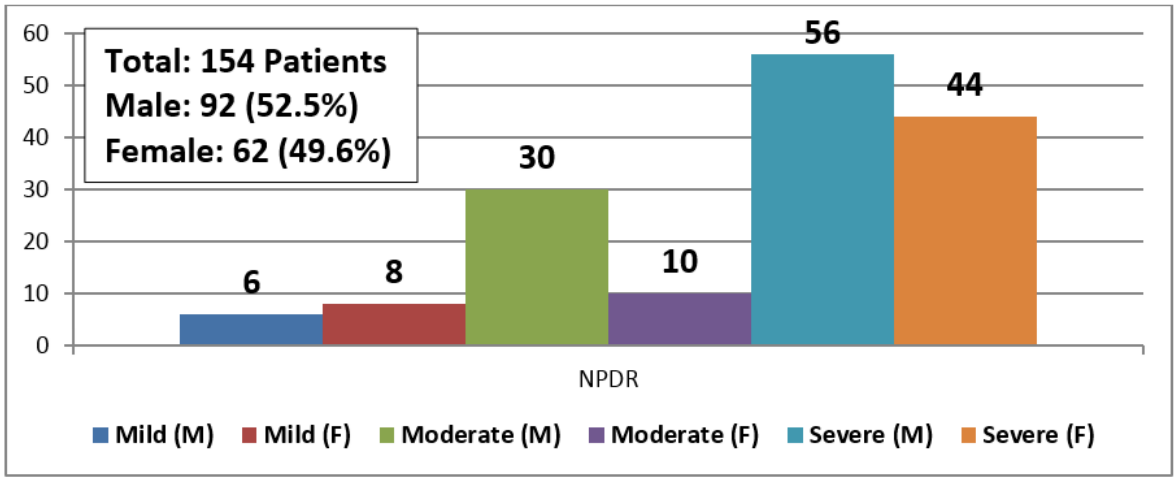
NPDR CHO	5.25	1.27	0.05
NPDR HDL	1.43	0.23	0.01
NPDR LDL	3.82	0.68	0.03
PDR TGs	3.8	1.06	0.04
PDR CHO	5.42	1.3	0.05
PDR HDL	1.39	0.25	0.01
PDR LDL	04	0.71	0.05



Pie chart showing gender wise distribution



This graph showing the severity of the disorders in the patients

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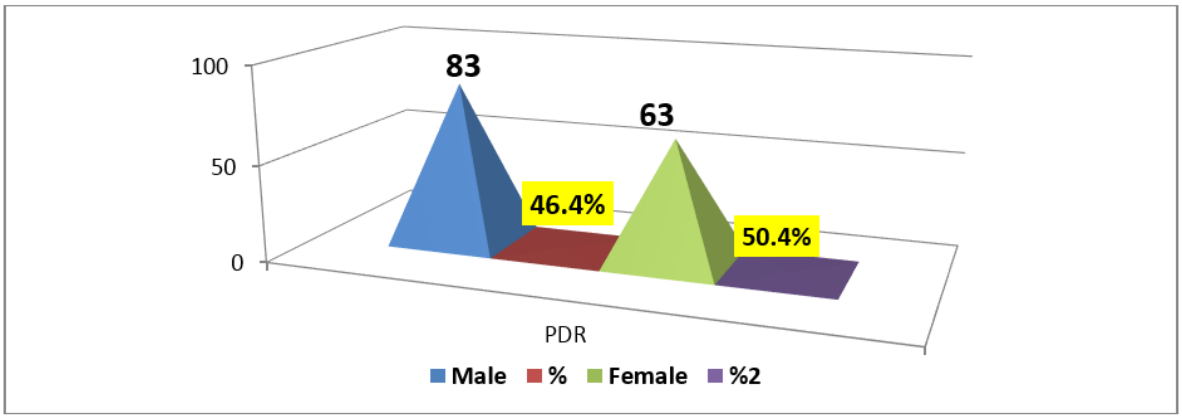

Graph show the percentage of male and female patients

DISCUSSION

Based on International Diabetes Federation (IDF) reports, approximately 537 million people had diabetes in 2021, and this rate is projected to increase to 643 million people by 2030 and 783 million by 2045.[1] Approximately 87.5% of people with undiagnosed diabetes live in low- and middle- income countries. Countries with a high prevalence of undiagnosed diabetes show an increased incidence of diabetic complications. [1] Undiagnosed or untreated complications will inevitably affect the patients' quality of life and become a burden for the health system.[7]

Diabetes mellitus is a universal predicament and diabetic retinopathy is a common complication of DM, complication with its worldwide prevalence of 34.6%.[8] moreover, DR prevelance in Pakistan ranging from 9.0% to 43.0%.[9,10] The risk factors gender, diabetic duration and age at examination, HbA1c, systolic blood pressure, cholesterol, triglyceride and HDL ,LDL,VITAMIN D level and nephropathy were found strongly correlated to progression and development of DR among T2DM from Kuwait by AlKharji et al.[11] However, another study by Chitrazall reported the effect of age is a main factor, hypertension, high level of HbA1c and male gender were autonomous main risk factors for DR progression. In our study there is significant association of DR with HbA1c level>7 .That is general observation that high HbA1c levels in DR patients with T2DM at diagnosis time. Many studies reported from various countries which present strong verification of association of high HbA1c with the progression of DR with various grades. [12, 13]). Our study showed that the retinopathy was found in all patients with mean duration of T2DM was 17.76±6.68 years.consequently the strong association was found between the diabetic duration and DR. Several other studies have also reported the duration of DM is major risk factor of DR development. [14]

Diabetic nephropathy (DN) and DR having common pathogenesis and similar risk factors [15, 16]. Srivastav et al. revealed that in DR, high serum urea and creatinine levels can smash up to the neural tissue of retina [17].Accoding to our study in all DR patients

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reported with high levels of urea and creatinine. Moreover, Zhuang et al. observed that grade of estimated glomerular filtration rate (eGFR) and creatinine level were also linked with DR stage and diabetic macular edema (DME) development [18]. In another study the vascular irregularity in DR is linked with damage renal function [19]. Furthermore, Austalian University of Melbourne was analyzing the association between DN and DR. The organization also found that alteration in the retinal vessels can expect the possibility of DN [20, 21]

Hypertension directly linked with age. A research reported that high systolic blood pressure has a considerable association with gender, family status, age [22]. In population-based studies the high systolic blood pressure (SBP) associated with DR [23,24], in some studies the relationship of diastolic blood pressure (DBP) presenting unimportant association of DBP with DR [23,25], Other studies observe BP or hypertension is one of the important risk factors of DR, but no one has observed the fact of association of hypertension , controlled level of SBP or DBP levels with DR. Many clinical examination have observed the consequence of controlled hypertension control for occurrence and progression of DR [26].

DR is the most widespread eye complication of DM, and hypovitaminosis D is revealed as main risk factors. Several studies, there is strong association between VD deficiency and high risk of developing DR. Even though the link between VDD and DR is clear.Another studies reported that vitamin D deficiency having strongly connected with DR. The 83% of the participants with DR had VDD. [27]

CONCLUSIONS

Diabetic retinopathy was significantly associated with male gender, duration of diabetes, older age, Hba1c, high cholesterol, high LDL, hyperlipidimia vitamin DD, hypertension and nephropathy. No association of smoking was found with diabetic retinopathy.

References

1) International Diabetes Federation. IDF Diabetes Atlas, 10th edn. Brussels, Belgium: 2021. Available at: https://www.diabetesatlas.org

2) Bourne RRA, Stevens GA, White RA, et al. causes of vision loss worldwide, 1990-2010: A systematic analysis. Lancet Glob Heal 2013; 1: e339–e349

3) Fong DS, Aiello L, Gardner TW, King GL, Blankenship G, Cavallerano JD, Ferris III FL, Klein R, American Diabetes Association. Retinopathy in diabetes. Diabetes care. 2004; 27(suppl_1):s84-7.

4) Klein R, Klein BEK, Moss SE, et al. The Wisconsin Epidemiologic Study of Diabetic Retinopathy. II. Prevalence and risk of diabetic retinopathy when age at diagnosis is less than 30 years. Arch Ophthalmol 1984; 102: 520–526.

5) McKay R, McCarty CA and Taylor HR. Diabetic retinopathy in Victoria, Australia: the visual impairment project. Br Ophthalmol 2000; 84: 865–870.

6) Gallego PH, Craig ME, Hing S, et al. Role of blood pressure in development of early retinopathy in adolescents with type 1 diabetes:Prospective cohort study. Bmj 2008; 337: 497–500.

ISSN: 1673-064X
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Vol: 66 Issue 12| 2023
DOI: 10.5281/zenodo.10390290

7) Chow EA, Foster H, Gonzalez V, et al. The disparate impact of diabetes on racial/ ethnic minority populations. Clin Diabetes 2012; 30: 130–133.

8) Shaikh MA, Gillani S, Yakta D. Frequency of diabeticretinopathy in patients after ten years of diagnosis of type 2 diabetes mellitus. J Ayub Med Coll Abbottabad. 2010; 22(3):158-160.

9) Wahab S, Mahmood N, Shaikh Z, Kazmi WH. Frequency of retinopathy in newly diagnosed type 2 diabetes patients. J Pak Med Assoc. 2008; 58(10):557-561.

10) AlKharji F, Alshemmeri N, Mehrabi L. Prevalence and risk factors for diabetic retinopathy among Kuwaiti diabetics. Kuwait Med J. 2006; 38(3):203-206.

11) Shichiri M, Kishikawa H. Long-term results of the Kumamoto Study on optimal diabetes control in type 2 diabetic patients. Diabetes Care. 2000; 23:21-29.

12) Rodriquez M, Kerrison JB, Alfaro DV. Metabolic control and diabetic retinopathy. Curr Diabetes Rev. 2009; 5:3-7.

13) Takao T, Ide T, Yanagisawa H. The effect of fasting plasma glucose variability and time-dependent glycemic control on the long-term risk of retinopathy in type 2 diabetic patients.

Diab Res Clin Prac. 2011; e40–e42.

14) Tsilibary, E. C. (2003). Microvascular Basement Membranes in Diabetes Mellitus. *J. Pathol.* 200 (4), 537–546. doi:10.1002/path.1439

15) Wong, C. W., Wong, T. Y., Cheng, C. Y., and Sabanayagam, C. (2014). Kidney and Eye Diseases: Common Risk Factors, Etiological Mechanisms, and Pathways. *Kidney Int.* 85 (6), 1290–1302. doi:10.1038/ki.2013.491

16) Srivastav, K., Saxena, S., Mahdi, A. A., Kruzliak, P., and Khanna, V. K. (2015). Increased Serum Urea and Creatinine Levels Correlate with Decreased Retinal Nerve Fibre Layer Thickness in Diabetic Retinopathy. *Biomarkers* 20 (6-7), 470–473. doi:10.3109/1354750X.2015.1094142

17) Zhuang, X., Cao, D., Yang, D., Zeng, Y., Yu, H., Wang, J., et al. (2019). Association of Diabetic Retinopathy and Diabetic Macular Oedema with Renal Function in Southern Chinese Patients with Type 2 Diabetes Mellitus: a Single-Centre Observational Study. *BMJ Open* 9 (9), e031194. doi:10.1136/bmjopen-2019-031194

18) Pan, W. W., Gardner, T. W., and Harder, J. L. (2021). Integrative Biology of Diabetic Retinal Disease: Lessons from Diabetic Kidney Disease. *J. Clin. Med.* 10 (6), 1254. doi:10.3390/jcm10061254

19) Wong, T. Y., Shankar, A., Klein, R., and Klein, B. E. (2004). Retinal Vessel Diameters and the Incidence of Gross Proteinuria and Renal Insufficiency in People with Type 1 Diabetes. *Diabetes* 53 (1), 179–184. doi:10.2337/diabetes.53.1.179

20) Klein, R., Klein, B. E., Moss, S. E., and Wong, T. Y. (2007). Retinal Vessel Caliber and Microvascular and Macrovascular Disease in Type 2 Diabetes: XXI: the Wisconsin Epidemiologic Study of Diabetic Retinopathy. *Ophthalmology* 114 (10), 1884–1892. doi:10.1016/j.ophtha.2007.02.023

21) Ishtiaq S, Ilyas U, Naz S, et al. (2017). Assessment of the risk factors of hypertension among adult & elderly group in twin cities of Pakistan. J Pak Med Assoc. 67(11):1664-1669.

22) Ahmed N, Abdul Khaliq M, Shah SH, et al. (2008). Compliance to antihypertensive drugs, salt restriction, exercise and control of systemic hypertension in hypertensive patients at Abbottabad. J Ayub Med Coll Abbottabad. 20(2):66-69.

ISSN: 1673-064X
E-Publication: Online Open Access
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23) Freitas SRS, Cabello PH, Moura-Neto RS, et al. (2007). Combined analysis of genetic and environmental factors on essential hypertension in a Brazilian rural population in the Amazon region. Arq Bras Cardiol. 88(4):447-451.

24) Iqbal R, Ahmad Z, Malik F, et al. (2012). A statistical analysis of hypertension as cardiovascular risk factor. Middle East J Sci Res. 12(1):19-22.
25. Liu L, Quang ND, Banu R, Kumar H, Tham Y-C, Cheng C-Y, et al. (2020) Hypertension, blood pressure control and diabetic retinopathy in a large population-based study. PLoS ONE 15(3): e0229665. https://doi.org/10.1371/journal.pone.0229665

25) [25] Poon, M., Craig, M.E., Kaur, H., Cusumano, J., Sasongko, M.B., Wong, T.Y. and Donaghue, K.C. (2013) Vitamin D Deficiency Is Not Associated with Changes in Retinal Geometric Parameters in Young People with Type 1 Diabetes. Journal of Diabetes Research, 2013, Article ID: 280691.

26) Sajj, A.B., Zabeen, B., Khaled, M.Z., Choudhury, N. and Sharmin, T. (2023) Association of Vitamin D Deficiency with Diabetic Retinopathy in Young People with Type 1 Diabetes Mellitus. Open Journal of Ophthalmology, 13, 48-63.