Diabetic Retinopathy Among Young Adults with Diabetes in a Rural Setting in Bangladesh: A Descriptive Cross-Sectional Study

Rahat Anwer Choudhury[1*], Khondokar Anowar Hossain[2], Bijoy Kumar Saha[3], Munir Ahmed[4], Md Nazrul Islam[5]

[*1]Assistant Professor, Department of Ophthalmology, Diabetic Association medical College, Faridpur, Bangladesh.
Email: rahatac260@gmail.com,
Orcid ID: 0009-0000-9353-7509

[2]Professor, Department of Ophthalmology, Diabetic Association Medical Colllege and Hospital, Faridpur, Bangladesh.
Email: kahossainm16@gmail.com,
Orcid ID: 0009-0001-7508-0573

[3]Associate Professor, Department of paediatrics, Diabetic Association Medical Colllege and Hospital, Faridpur, Bangladesh.
Email: bijoysahadr@gmail.com,
Orcid ID: 0009-0009-0270-0311

[4]Country Director, Orbis International, Bangladesh.
Email: Munir.Ahmed@orbis.org,
Orcid ID: 0000-0003-1518-0254

[5]Dr Md Nazrul Islam
Assistant professor, Department of surgery Diabetic Association medical College Faridpur.
Email: nazruldr7@gmail.com
Orcid ID: 0009-0007-8776-5899

*Corresponding author

Abstract

Background: Diabetic retinopathy (DR) is one of the most important complications of type 1 diabetes mellitus, representing the leading cause of blindness in young adults. The aim of the study was to investigate the level of awareness and risk factors of DR in Young Adults with diabetes in the rural setting of Bangladesh. **Material & Methods:** The study was an observational and descriptive cross-sectional study. A total of 190 young adults DM patients were included in this study following the Fisher et al. 1991 formula. Study data were collected from January 2020 to December 2021. From type 1 diabetic enlisted patients under Faridpur diabetic samity attended for routine follow up in diabetic corner in Faridpur diabetic Association Medical College. **Results:** Half (48.9%) of diabetes patients aged between 6 to 18 years with a mean age of 19.03 ± 4.26 years, ranging from 6 to 29 years old. About 37.9% of patients were males and 62.1% of patients were females. The difference in age of DM patients by sex was found statistically significant at .02 level ($x2 = 43.22$, $df = 11$; Cramer's V = .35). The average blood sugar was14.36±2.59 (fasting) and 16.58±2.85 (meal) of the young adults. There was an association between the age of the young adults and fasting blood sugar ($x2=19.08$, $df=13$, Sig.=0.05), however, there is no association between the age of the DM patients and the level of blood sugar (after breakfast) ($x2=29.52$, $df=19$, Sig.=0.08). About 41% of patients' visual acuity (unaided) was 6/6-6/18 (16-20 years) and in the same age group, 5.3% of the young adults' unaided visual acuity was <6/18-6/60. About 26.2% (21-25 years) of unaided visual acuity was 6/6-6/18 and 2.6% had <6/18-6/60 VA. However, about 47.4% of the patients VA (aided) of the age group 16-20 years had <6/18-6/60, 29.50% had VA <6/18-6/60 (age group 21-25 years), 4.2% of the patient (26-30%) had <6/18-6/60 vision and same age group 1.1% had <6/60-3/60 vision after correction. Refractive error, allergic condition/itching/red, conjunctivitis, Watering, foreign body, ocular injury, Corneal ulcer, Myopia, and Astigmatism was common eye problems of the DM patients in our study. The majority of the patients were prescribed medicine, spectacles, and surgery. **Conclusions:** The blood sugar level among young adults is alarming and physical inactivity and obesity are the main risk factors for its development. Community-level awareness programs and establish models of healthcare transition from pediatric to adult care to ensure continuity of care and avoid patient disengagement.

Keywords:- Young adult, DM, DR, Blood sugar, Bangladesh.

INTRODUCTION

Diabetic retinopathy is a leading cause of severe sight loss in people of working age. Although effective treatments are available, their success is dependent on early detection and timely referral. Diabetic retinopathy screening effectively reduces the risk of sight loss; however, screening attendance is consistently below recommended levels.[1] Evidence shows that the prevalence of DM in rural areas is high (9.5%) compared to urban (7.35%) settings.[2] The increasing prevalence of DM is closely linked to the prevalence of DR. Diabetes Mellitus is considered as a global epidemic because currently around 463 million (2019) people are suffering from DM and it's expected that the figure will reach to 700 million by 2045.[3] The alarming fact is that the number of DM in children and young adults is increasing rapidly and it is estimated that around 1.1 million children and young adults (<20 years) have diabetes and every year 128, 900 new cases are added globally.[4] The number of people with DM in Bangladesh was 5.10 million in 2013 and around 10 million in 2016. The increasing prevalence of DM is closely linked to the prevalence of DR. The prevalence of type 1 diabetes mellitus increases with age, and the overall incidence of the disease may be increasing.[5] Although the incidence of type 2 diabetes in children is increasing and there are no accurate data on children with this disorder. Diabetic retinopathy (DR) is one of the most important complications of type 1 diabetes mellitus, representing the leading cause of blindness in young adults. The risk factors for the development of DR include long duration of diabetes, poor glycemic control, hypertension, hyperlipidemia, genetic predisposition, overweight, and family history of diabetes or its complications are common risk factors.[6] This study's aim was to investigate the level of awareness and risk factors of DR in Young Adults with diabetes in the rural setting of Bangladesh.

MATERIAL AND METHODS

Study Design: This is an observational and descriptive cross-sectional study. A pre-designed questionnaire was used to collect data from the DR Young Adults and a total of 190 patients were included in this study following the Fisher et al. 1991 formula. Study data were collected from January 2020 to December 2021.

Setting: The study was conducted at Diabetic Association Medical College, Faridpur,Bangladesh.

Methods: Hospital-based data were gathered from the DM patients, who came for treatment. A format was developed for the purpose. From type 1 diabetic enlisted patients under Faridpur diabetic samity attended for routine follow up in diabetic corner in Faridpur diabetic Association Medical College. A purposive sampling method was used to recruit the DM and DR patients. We included Young Adults aged 6 to 29 years with a history of DM.

Data Collection, Quality Control, and Data Management: The study data were collected over a period of 12 months (January 2020 to December 2021) using an interview schedule that included the following variables:

socioeconomic, demographic, Knowledge Attitude & Practice (KAP) on DM and DR, and Clinical Information. We from the beginning remained alert about the quality of data. There was a two-day session with all persons involved with the study for a clear understanding of the study goal and every item of format and interview schedule. The study format and interview schedule were given to ophthalmologists and public health for determining content validity. Their comments were incorporated in finalizing the research instruments. The filled-in formats and interview schedules were edited immediately after the collection. Again, data were cleaned before analysis. SPSS statistical package was used for analyzing the data.

Data Analysis: Survey data was first edited and coded and then entered into the computer for analysis. Both univariate and bivariate tables were used for analysis. The data were analyzed using the Statistical Package for Social Science (SPSS). Data analysis included frequency distribution, cross-tabulation, co-relation and association, and statistically significant tests between variables (X2, p-value, and CI).

Ethical Consideration: Ethical clearance for the study was obtained from the Diabetic Association Medical College, Faridpur, Bangladesh. Written and verbal consent was obtained from each participant after explaining the purpose and nature of the research. Participation in the study was on a voluntary basis and participants were informed their right to quit/refuse their participation at any stage of the study if they do not want to participate. Moreover, the confidentiality of the information was assured by using an anonymous consent form.

RESULTS

The study revealed that apparently half (48.9%) of diabetes patients aged between 6 to 18 years with a mean age of 19.03 ± 4.26 years, ranging from 6 to 29 years old, which means half of the DM patients were teenagers (children) and 50% were young adults. A total of 72 male (37.9%) and 118 female (62.1%) DM patients were included in this study. All these statistics indicate that the majority of the patients were females. Does this mean females receive diabetes far more than men of the same age? The probable explanation can be those females possibly are not more involved with hard physical activities and their family is also not more aware of their health early stage of their life. The difference in age of DM patients by sex was found statistically significant at .02 level (x2 = 43.22, df = 11; Cramer's V = .35). The average blood sugar was 14.36±2.59 (fasting) and 16.58±2.85 (meal) of the young adults.

For the majority of young adults (43.40%) fasting blood sugar range was 10-15, followed by 29.50% (16-20), 11.50% (6.5-9.5), 6.20% (26-30), 5.30% (21-25) and 4.20% (3.0-6.0) (Table-1). We found an association between the age of the young adults and fasting blood sugar (x2=19.08, df=13, Sig.=0.05), however, there is no association between the age of the DM patients and the level of blood sugar (after breakfast) (x2=29.52, df=19, Sig.=0.08). We assessed the visual acuity (unaided) of the young adults and Table-2 shows that 41% of visual acuity (unaided) was 6/6-6/18 (16-20 years) and the same age group 5.3% of the young adults unaided visual acuity was <6/18-6/60. About 26.2% (21-25 years) of unaided visual acuity was 6/6-6/18 and 2.6% had <6/18-6/60 VA [Table 2].

However, about 47.4% of the patients VA (aided) of the age group 16-20 years had <6/18-6/60, 29.50% had VA <6/18-6/60 (age group 21-25 years), 4.2% of the patient (26-30%) had <6/18-6/60 vision and same age group 1.1% had <6/60-3/60 vision after correction [Table 3].

The age group and vision of the patient after correction are statistically significant ($x2=21.25$, df=12, Sig.=0.04). In our data, we found that 25.1% of young adults used spectacle and 74.9% never used spectacle.
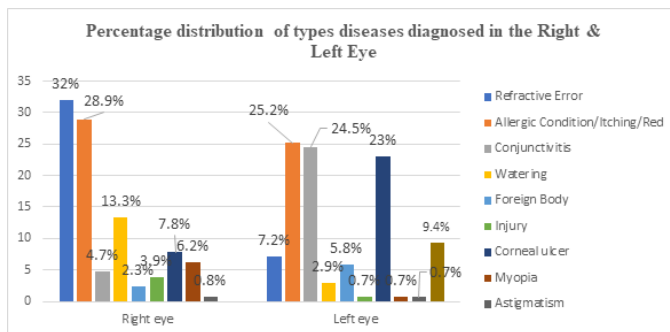

Figure 1: Percentage distribution of types of diseases diagnosed in the right & left eye of the patients.

The refractive error (32%) in the right eye, allergic condition/itching/red in the right eye (28.9%)

And the left eye (25.2%), conjunctivitis in the right eye (4.7%) & left eye (24.5%), Watering in the right eye (13.3%) & left eye (2.9%), foreign body in the right eye (2.3%) & left eye (5.8%), injury 3.9% (right eye) & .7% (left eye), Corneal ulcer 7.8% (right eye) & 23% (left eye), Myopia 6.2% (right eye) & .7% (left eye), Astigmatism .8% (right eye) and Hypermetropia in the left eye (.7%) were diagnosed diseases in the eyes of the young adults [Figure 1]. About 11.1% of the patients were prescribed medicine, 77.8% were prescribed spectacles, and 11.1% of the patients advised for surgery [Figure 2].
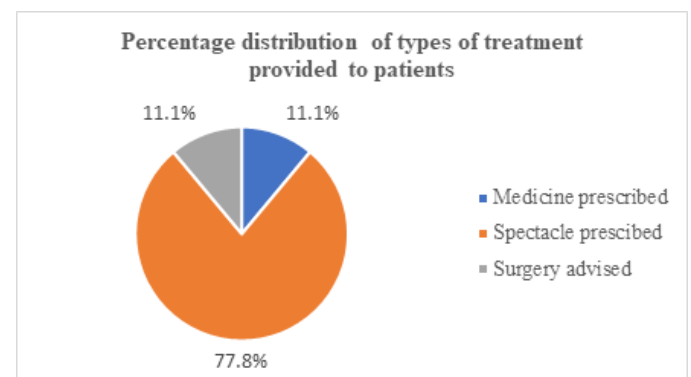

Figure 2: Percentage distribution of types of treatment provided to patients

Table 1: Distribution of Blood Sugar (Fasting) by Age of the Patients

Level of Blood sugar (Fasting)	6-10 years n=6	11-15 years n=28	16-20 years n=90	21-25 years n=56	25-30 years n=10	Total n=190
3.0-6.0	-	-	2.0	2.20	-	4.20
6.5-9.5	1.50	-	5.0	5.0	-	11.50
10-15	1.0	6.0	20.0	12.40	4.0	43.40
16-20	1.0	5.0	15.50	5.0	2.50	29.50
21-25	-	1.0	3.30	1.0	-	5.30
26-30	-	2.50	1.20	3.0	-	6.20
x2=19.08, df=13, Sig.=0.05						

Table 2: Percentage distribution of visual acuity (unaided) of the DM & DR patients

Age Group (years)	6/6-6/18	<6/18-6/60	<6/60-3/60	<3/60	Total
6-10 years	6 (3.2%)	0	0	0	6
11-15 years	26 (13.8%)	2 (1.1%)	0	0	28
16-20 years	78 (41%)	10 (5.3%)	0	0	88
21-25 years	50 (26.2%)	5 (2.6%)	0	0	55
26-30 years	9 (4.8%)	1 (1.1%)	0	0	10
$x2=14.24$, df=9, Sig.=0.09					

Table 3: Percentage distribution of visual acuity (aided) of the DM & DR patients

Age Group (years)	6/6-6/18	<6/18-6/60	<6/60-3/60	<3/60	Total
6-10 years	6 (3.2%)	0	0	0	6
11-15 years	28 (14.7%)	0	0	0	28
16-20 years	90 (47.4%)	0	0	0	90
21-25 years	56 (29.5%)	0	0	0	56
26-30 years	8 (4.2%)	0	2 (1.1%)	0	10
$x2=21.25$, df=12, Sig.=0.04					

DISCUSSION

This is a descriptive cross-sectional study conducted at district-level hospital. A total of 190 young adults' data was collected and analyzed. Our study respondents aged between 6 to 18 years (48.9%) with a mean age of 19.03 ± 4.26 years, ranging from 6 to 29 years old. This age indicates that half of the DM patients were teenagers (children) and 50% were young adults.[7] The ratio of male (37.9%) was lower compared to female (62.1%) DM patients. The above statistics indicate that the majority of the patients were females. Does this mean females receive diabetes far more than men of the same age? The probable explanation can be those females possibly are not more involved with hard physical activities and their family is also not more aware of their health early stage of their life.[8] Even, parents or guardians of young adults are not much aware of the DM or DR of the patients. We found a strong association between the age of DM patients and sex. This statistical significance reveals that the number of DM patients is increasing with the age of the young population of Bangladesh.[9] The alarming fact is that such a gradual curve of DM and DR patients will create a big health burden in the country and will put pressure on our fragile health system. A study conducted by Al-Lawati (2017) and showed that the healthcare expenditures for people with diabetes are on average two times higher than people without diabetes and recommends lifestyle modification in the prevention of DM to reduce long-term health expenditure. In our study the average blood sugar was14.36±2.59 (fasting) and 16.58±2.85 (meal) of the young adults. We can't compare these findings with other Bangladeshi studies because there is no available study on it. We observed worse blood sugar levels in the 26 to 30 years age group and this may be their lack of awareness about young adults' health and no appropriate health intervention from the parents or guardians.[10] The age of the young

184

adults and fasting blood sugar are statistically significant and this reveals that the level of blood sugar is increasing with the increasing age of the young adults. This meant that young adults with DM do not follow the blood sugar control health guidelines and community-level DM and DR awareness programs either poor or absent.[11]

Refractive error, allergic condition/itching/red, conjunctivitis, Watering, foreign body, ocular injury, Corneal ulcer, Myopia, and Astigmatism was common eye problems of the DM patients in our study. A study conducted by Yarbağ et. Al. (2015) and found that common eye alignments like refractive error, allergic condition/itching/red, conjunctivitis, and watering are common complaints among newly diagnosed DM patients. The majority of the patients were prescribed medicine, spectacles, and surgery.[12]

Limitation of the study:

This study was conducted in a single center with small sample size and few parameters. So, to know more about the diabetic retinopathy among young adults with diabetes in a rural, the study should be conducted in multiple centers with a big sample size.

CONCLUSIONS

The blood sugar level among young adults is alarming and physical inactivity and obesity are the main risk factors for its development. Diabetic retinopathy is the most frequent complication in young adults and early detection is important to reduce the rate of DR. Community-level awareness programs and establish models of healthcare transition from pediatric to adult care to ensure continuity of care and avoid patient disengagements.

Recommendation

This study can serve as a pilot to a much larger research involving multiple centers that can provide a nationwide picture, validate regression models proposed in this study for future use and emphasize points to ensure better management and adherence.

Acknowledgements

REFERENCES

1. Cho NH, Shaw JE, Karuranga S, Huang Y, da Rocha Fernandes JD, Ohlrogge AW, et al. IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. Diabetes Res Clin Pract. 2018;138:271-281. doi: 10.1016/j.diabres.2018.02.023.

2. Rooney MR, Fang M, Ogurtsova K, Ozkan B, Echouffo-Tcheugui JB, Boyko EJ, et al. Global Prevalence of Prediabetes. Diabetes Care. 2023;46(7):1388-1394. doi: 10.2337/dc22-2376.

3. Andes LJ, Cheng YJ, Rolka DB, Gregg EW, Imperatore G. Prevalence of Prediabetes Among Adolescents and Young Adults in the United States, 2005-2016. JAMA

Pediatr. 2020;174(2):e194498. doi: 10.1001/jamapediatrics.2019.4498.

4. Chowdhury MZI, Anik AM, Farhana Z, Bristi PD, Abu Al Mamun BM, Uddin MJ, et al. Prevalence of metabolic syndrome in Bangladesh: a systematic review and meta-analysis of the studies. BMC Public Health. 2018;18(1):308. doi: 10.1186/s12889-018-5209-z.

5. Akter S, Rahman MM, Abe SK, Sultana P. Prevalence of diabetes and prediabetes and their risk factors among Bangladeshi adults: a nationwide survey. Bull World Health Organ. 2014;92(3):204-13, 213A. doi: 10.2471/BLT.13.128371.

6. Liew G, Michaelides M, Bunce C. A comparison of the causes of blindness certifications in England and Wales in working age adults (16-64 years), 1999-2000 with 2009-2010. BMJ Open. 2014;4(2):e004015. doi: 10.1136/bmjopen-2013-004015.

7. Klein R, Klein BE, Moss SE, Davis MD, DeMets DL. 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(4):520-6. doi: 10.1001/archopht.1984.01040030398010.

8. Sultan MB, Starita C, Huang K. Epidemiology, risk factors and management of paediatric diabetic retinopathy. Br J Ophthalmol. 2012;96(3):312-7. doi: 10.1136/bjophthalmol-2011-300169.

9. Chetthakul T, Likitmaskul S, Plengvidhya N, Suwanwalaikorn S, Kosachunhanun N, Deerochanawong C, et al. Thailand diabetes registry project: prevalence of diabetic retinopathy and associated factors in type 1 diabetes mellitus. J Med Assoc Thai. 2006;89 Suppl 1:S17-26.

10. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. Br J Ophthalmol. 2012;96(5):614-8. doi: 10.1136/bjophthalmol-2011-300539.

11. Al-Lawati JA. Diabetes Mellitus: A Local and Global Public Health Emergency! Oman Med J. 2017;32(3):177-179. doi: 10.5001/omj.2017.34.

12. Yarbağ A, Yazar H, Akdoğan M, Pekgör A, Kaleli S. Refractive errors in patients with newly diagnosed diabetes mellitus. Pak J Med Sci. 2015;31(6):1481-4. doi: 10.12669/pjms.316.8204.