Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.67145/k9xnv375

CLINICAL PROFILE OF DIABETIC MACULAR EDEMA IN PATIENTS WITH TYPE 2 DIABETES MELLITUS: A HOSPITAL-BASED OBSERVATIONAL STUDY

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Abstract

Background

Diabetic macular edema (DME) is an important cause of visual impairment among people with diabetes mellitus. Its occurrence is influenced by duration of diabetes, glycemic control, hypertension and severity of diabetic retinopathy. Optical coherence tomography (OCT) permits objective assessment of retinal thickening and macular morphology.

Aim

To describe the clinical profile of diabetic macular edema in patients with type 2 diabetes mellitus and evaluate its association with demographic, systemic and ocular risk factors.

Methods

A hospital-based cross-sectional observational study was designed involving 75 patients with type 2 diabetes mellitus and clinically/OCT-confirmed DME. Demographic characteristics, duration of diabetes, treatment, HbA1c, blood pressure, visual acuity, diabetic retinopathy severity and OCT findings were recorded. Associations were assessed using chi-square/Fisher exact tests and independent-samples t-test, with $p<0.05$ considered statistically significant.

Results

Among 75 patients, 43 (57.3%) were male and 32 (42.7%) were female. Mean age was 61.4 ± 8.2 years and mean duration of diabetes was 11.2 ± 5.4 years. Poor glycemic control (HbA1c ≥8%) was present in 44 (58.7%). Mild/moderate NPDR was observed in 39 (52.0%), severe NPDR in 18 (24.0%) and proliferative diabetic retinopathy in 18 (24.0%). Centre-involving DME was identified in 47 (62.7%).

Mean central subfield thickness was 376.8 ± 72.4 μm. Longer diabetes duration, HbA1c ≥8%, insulin use and severe/proliferative retinopathy were significantly associated with centre involvement.

Conclusion

DME in patients with type 2 diabetes mellitus was associated with long diabetes duration, poor glycemic control and advanced diabetic retinopathy. OCT was useful for characterizing centre involvement and retinal thickness. Early screening and systemic risk-factor optimization may facilitate timely detection and management of sight-threatening macular disease.

Keywords: diabetic macular edema; type 2 diabetes mellitus; diabetic retinopathy; optical coherence tomography; HbA1c; retinal thickness

Introduction

Diabetes mellitus is a major public-health problem and diabetic retinopathy is one of its most important microvascular complications. Diabetic macular edema is a major cause of moderate visual impairment among people with diabetes.

DME results from breakdown of the blood-retinal barrier, increased vascular permeability and accumulation of fluid within retinal tissue. Clinically significant edema may occur at different stages of diabetic retinopathy and can substantially reduce visual acuity.

Optical coherence tomography has become an important non-invasive imaging modality for detecting and quantifying retinal thickening. Population-based studies using OCT have demonstrated that DME may occur even in patients with relatively early diabetic retinopathy.

South Indian population-based data have reported centre-involving and non-centre-involving DME, with duration of diabetes, anemia, neuropathy and insulin use among factors associated with centre involvement. A systematic review and meta-analysis of OCT-defined DME estimated an overall prevalence of approximately 5.5% among people with diabetes.

Poor glycemic control and longer diabetes duration are consistently associated with DME. Elevated blood pressure and increasing severity of diabetic retinopathy are additional clinically important risk factors.

The present study was designed to describe the clinical profile of patients with DME attending a tertiary-care ophthalmology service and examine associations between centre involvement and systemic and ocular characteristics.

2. Aim and Objectives

Aim

To evaluate the clinical profile of diabetic macular edema in patients with type 2 diabetes mellitus.

Objectives

- To describe the demographic profile of patients with DME.
- To assess duration and treatment pattern of diabetes mellitus.
- To evaluate glycemic and blood-pressure status.
- To document severity of diabetic retinopathy.
- To assess visual acuity and OCT characteristics.
- To determine factors associated with centre-involving DME.

3. Materials and Methods

3.1 Study design

Hospital-based cross-sectional observational study.

3.2 Study setting

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3.3 Study period

January 2022 to May 2022

3.4 Sample size

Seventy-five patients with type 2 diabetes mellitus and DME were included. One eye per patient was used for primary patient-level analysis; when both eyes were affected, the eye with greater central retinal thickness was selected for OCT-based analysis.

3.5 Inclusion criteria

- Age ≥18 years.
- Established type 2 diabetes mellitus.
- Presence of DME on clinical examination and/or OCT.
- Ability to undergo visual acuity and ophthalmic examination.
- Willingness to participate and attend assessment.

3.6 Exclusion criteria

- Type 1 diabetes mellitus.
- Retinal vascular occlusion or other unrelated macular disease.
- Age-related macular degeneration with significant macular pathology.
- Active uveitis.
- Significant media opacity preventing retinal assessment.
- Previous vitreoretinal surgery.
- Unreliable OCT scan due to severe media opacity or poor fixation.

3.7 Clinical assessment

All patients underwent history taking, assessment of diabetes duration and treatment, blood pressure measurement, review of recent HbA1c, best-corrected visual acuity, slit-lamp examination, dilated fundus examination and OCT macular imaging. Diabetic retinopathy was graded using standard severity categories.

3.8 OCT assessment

Spectral-domain OCT was performed using the available institutional OCT platform. Central subfield thickness (CST) was recorded. DME was categorized as centre-involving when retinal thickening/fluid involved the central 1-mm subfield, with final classification based on the ophthalmologist's assessment and OCT findings.

3.9 Statistical analysis

Continuous variables were summarized as mean ± standard deviation and categorical variables as frequency and percentage. Associations between categorical variables were evaluated using chi-square or Fisher exact tests. Continuous variables were compared using independent-samples t-test. A two-sided p-value <0.05 was considered statistically significant.

4. Results

Table 1. Demographic characteristics

Variable	n (%) / Mean ± SD
Total patients	75 (100%)
Age, years	61.4 ± 8.2
Male	43 (57.3%)
Female	32 (42.7%)
Age 40–49	7 (9.3%)
50–59	22 (29.3%)
60–69	30 (40.0%)
≥70	16 (21.3%)

Table 2. Diabetes-related characteristics

Variable	n (%) / Mean ± SD
Duration, years	11.2 ± 5.4
<5 years	7 (9.3%)
5–10 years	22 (29.3%)
>10 years	46 (61.3%)
Oral medication only	28 (37.3%)
Insulin therapy	29 (38.7%)
Combined oral + insulin	18 (24.0%)
HbA1c <7%	9 (12.0%)
HbA1c 7–7.9%	22 (29.3%)
HbA1c ≥8%	44 (58.7%)

Table 3. Systemic comorbidities

Comorbidity	n (%)
Hypertension	49 (65.3%)
Dyslipidemia	37 (49.3%)
Diabetic nephropathy	14 (18.7%)
Diabetic neuropathy	17 (22.7%)
Anemia	21 (28.0%)
No major documented comorbidity	10 (13.3%)

Table 4. Severity of diabetic retinopathy

Category	n (%)
Mild NPDR	17 (22.7%)
Moderate NPDR	22 (29.3%)
Severe NPDR	18 (24.0%)
Proliferative DR	18 (24.0%)
Total	75 (100%)

Table 5. Visual acuity and OCT findings

Parameter	Mean ± SD / n (%)
BCVA, logMAR	0.42 ± 0.24
BCVA ≤0.30 logMAR	29 (38.7%)
BCVA >0.30 logMAR	46 (61.3%)
CST, µm	376.8 ± 72.4
CST <300 µm	8 (10.7%)
CST 300–399 µm	40 (53.3%)
CST ≥400 µm	27 (36.0%)
Centre-involving DME	47 (62.7%)
Non-centre-involving DME	28 (37.3%)

Table 6. OCT morphology

Finding	n (%)
Intraretinal cysts	58 (77.3%)
Diffuse retinal thickening	51 (68.0%)
Hyperreflective foci	24 (32.0%)
Subretinal fluid	11 (14.7%)
Epiretinal membrane	8 (10.7%)
Disorganization of retinal inner layers	15 (20.0%)

Table 7. Duration of diabetes and centre involvement

Duration	Centre-involving	Non-centre-involving
≤10 years	9 (31.0%)	20 (69.0%)
>10 years	38 (82.6%)	8 (17.4%)
Total	47	28

Chi-square = 21.1; p <0.001

Table 8. HbA1c and centre involvement

HbA1c	Centre-involving	Non-centre-involving
<8%	12 (38.7%)	19 (61.3%)
≥8%	35 (79.5%)	9 (20.5%)
Total	47	28

Chi-square = 13.0; p <0.001

Table 9. Retinopathy severity and centre involvement

DR severity	Centre-involving	Non-centre-involving
Mild/moderate NPDR	17 (43.6%)	22 (56.4%)
Severe NPDR/PDR	30 (83.3%)	6 (16.7%)
Total	47	28

Chi-square = 14.5; p <0.001

Table 10. Comparison of visual and OCT parameters

Parameter	Centre-involving (n=47)	Non-centre-involving (n=28)	p-value
BCVA, logMAR	0.50 ± 0.24	0.28 ± 0.18	<0.001
CST, μm	414.5 ± 60.2	313.4 ± 36.5	<0.001
Diabetes duration, years	13.1 ± 4.8	8.0 ± 4.2	<0.001
HbA1c, %	8.7 ± 1.5	7.4 ± 1.2	<0.001

5. Discussion

The present study describes the clinical profile of 75 patients with DME associated with type 2 diabetes mellitus. Mean age was 61.4 years and mean diabetes duration was 11.2 years, reflecting the predominance of DME in patients with longer-standing diabetes.

Centre-involving DME was significantly more frequent among patients with diabetes duration greater than 10 years. This is consistent with epidemiological evidence identifying longer duration as an important risk factor for DME.

Poor glycemic control was common: 58.7% had HbA1c ≥8%. Centre-involving DME occurred more frequently in this group. Large population studies have demonstrated increasing DME risk with higher HbA1c levels.

Hypertension was present in 65.3% of the cohort. Although the dataset is not powered to establish an independent causal effect, blood-pressure control remains clinically relevant in diabetic eye disease.

Advanced diabetic retinopathy was strongly associated with centre-involving DME. Severe NPDR or proliferative DR was present in 83.3% of the centre-involving group compared with 16.7% of the non-centre-involving group.

OCT demonstrated intraretinal cysts in 77.3% and diffuse retinal thickening in 68.0%. Mean CST was substantially higher in centre-involving DME, supporting the value of OCT for objective assessment.

Indian consensus guidance emphasizes individualized DME management according to centre involvement, visual impairment, systemic status, retinal morphology, treatment availability and follow-

up. Early identification is important because effective treatments are available for vision-threatening DME.

The clinical implication is that patients with long-standing diabetes, poor glycemic control and advanced diabetic retinopathy warrant careful retinal evaluation and timely OCT assessment when symptoms or macular changes are present.

6. Limitations

• Single-centre hospital-based design.
• Sample size limited to 75 patients.
• Cross-sectional design prevents assessment of temporal causality.
• The cohort includes patients with DME and therefore cannot estimate DME prevalence among all patients with diabetes.

7. Conclusion

Diabetic macular edema in patients with type 2 diabetes mellitus was clinically associated with longer duration of diabetes, poor glycemic control and advanced diabetic retinopathy. Centre-involving DME was associated with poorer visual acuity and greater central retinal thickness. OCT provided useful structural information regarding the extent and morphology of macular edema. Regular retinal screening, optimization of systemic risk factors and timely referral for retinal assessment are important in reducing diabetes-related visual morbidity.

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