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Prevalence and risk factors associated with primary open angle glaucoma in diabetic patients in a tertiary care centre

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Abstract
Primary open angle glaucoma is the most common form of glaucoma accounting for at least half of all the glaucomas. It is also known as chronic open angle glaucoma and chronic simple glaucoma. It is usually asymptomatic until significant visual field loss has happened. Patients usually present with considerable amount of visual field loss in one eye and advanced disease in the other eye. Diabetes Mellitus is one among the risk factors for POAG.

Objectives

- To study the hospital-based prevalence of POAG among the diabetic patients attending Sree Mookambika Institute of Medical Sciences (SMIMS), Kulasekharam.
- To study the risk factors associated with POAG.
- To screen all diabetic patients for glaucoma.

Methods: In this study, 181 diabetic patients, both insulin dependent and non-insulin dependent, attending Sree Mookambika Institute of Medical Sciences, who came directly to Department of Ophthalmology or who were referred here for evaluation, between December 2016 and August 2018 had been screened to rule out Primary Open Angle Glaucoma (POAG).

Results: The results of the study show a clear-cut evidence of increased incidence of POAG in diabetic patients, which was 5%. There is a significant association between age and POAG. No significant association was found between gender and POAG. No significant association was found between duration of DM and prevalence of POAG.

Conclusion: Primary Open Angle glaucoma is mostly asymptomatic until significant visual field loss has occurred. Patients usually presents with significant visual field loss in one eye and advanced disease in the other eye. It is associated with irreversible blindness. Thus, the public health importance of detecting undiagnosed and treatable glaucoma, as blindness has economic and societal consequences for the rest of an individual's life. Several studies have shown an association between POAG and diabetes. From my study, I came to a conclusion that there is a clear-cut evidence of increased incidence of POAG in diabetic patients, which was 5%. Study also showed significant association between age and POAG. However, no significant association was found between gender and POAG as well as between duration of DM and prevalence of POAG.

Keywords: Primary open angle glaucoma, diabetes mellitus, prevalence

Introduction

The discussion of an association between Diabetes Mellitus (DM) and Primary Open Angle Glaucoma (POAG) is not new. In 1971, Becker stated "Diabetes Mellitus occurs more commonly in patients with POAG than in non-glaucomatous populations [1]. Similarly, Glaucoma is more prevalent in patients with DM than in non-diabetic population".

Diabetes Mellitus has been suggested as one of the main risk factors of POAG along with other risk factors. Armstrong *et al* [2] have reported a prevalence of POAG of 4.1% in patients with DM. The prevalence of diabetes in POAG was 1.7%. Many studies have shown a higher prevalence of higher mean IOP and POAG among persons with diabetes compared to those without, and a higher prevalence of patients with abnormal glucose metabolism among patients with glaucoma than among the general population.

Case-control studies have also confirmed an association between diabetes and POAG. It is tempting to confirm DM as a definite risk factor for chronic open angle glaucoma, since diabetes causes microangiopathy, and compromise of microcirculation of the optic disc can possibly contribute to the development of glaucoma.

However, numerous studies including population-based studies have not found an association between DM and open angle glaucoma [3]. Population based prevalence data on correlation of glaucoma and diabetes in Asians are limited in number and of variable quality. Hence, my aim is to study the relationship between the two in our region.

Aims and Objectives

- To study the hospital-based prevalence of POAG among the patients with DM attending Sree Mookambika Institute of Medical Sciences (SMIMS), Kulasekharam.
- To study the risk factors associated with POAG.
- To screen all the diabetic patients for glaucoma.

Materials and Methods

a. Study design: Cross sectional study
b. Study setting: Diabetic patients attending Ophthalmology Out Patient Department of Sree Mookambika Institute of Medical Sciences, Kulasekharam during the decided study period.
c. Approximate duration of study: December 2016 and August 2018 (18 months)
d. Number of groups to be studied: 1
e. Detailed description of the groups: Only 1 group - Diabetic patients both insulin and non-insulin dependent attending Ophthalmology Out Patient Department of Sree Mookambika Institute of Medical Sciences, Kulasekharam during the decided study period.

Sampling

a. Sample size of each group: n = 179
b. Total sample size of the study: n = = 1.96, p = 35% [1] q = (100-p) = 65 % d = 20% of p Methodology 63 n = (1.96) 2 x 35 x 65 / (7)2 = 178.36 ≈ 179
c. Scientific basis of sample size used in the study:
   A study conducted by Shankar *et al* [4] in 2009 screened a total of 5385 patients during a period of 12 months, of which 118 patients were identified as having POAG. This constitutes a prevalence of 2.71. While in the diabetic population of 151, twenty-one patients had OAG, constituting a prevalence of 13.9 in the diabetic population. Of the primary open angle glaucoma (POAG) patients with refractive error, 30.4% were seen to have myopia in the right eye and 32.1% in the left eye; 35% recorded hypermetropia in the right eye and 33% in the left eye.
   Using the formula, Zα 2 pq/d2 prevalence as 35% and 95% confidence interval the minimum sample size required for the study is 179.
   Sampling Technique: Convenient sampling
d. Inclusion criteria:
   - All documented diabetic cases attending Ophthalmology OPD of SMIMS giving consent for work up for the study.
   - IOP > 21 mmHg (by Schiotz tonometry) with visual field defects.
   - IOP > 21 mmHg (by Schiotz tonometry) with optic nerve head changes.
   - Optic nerve head changes with visual field defects. Methodology 64
   - Normal IOP with no visual field defects or optic nerve head changes, with asymmetry of IOP in both eyes of > 5 mmHg

e. Exclusion criteria:
   - Patients were excluded if the media remained hazy, with non-visualization of the disc
   - If the patient was not co-operative with the visual field parameters.
   - Closed angle on gonioscopy
   - Drug induced (corticosteroids)
f. Whether placebo is used in the study: No
g. Whether drug used in the study: No
h. If research is a clinical trial: No
   Parameters to be studied [If quantitative data mention the units of measurement]:
   a. Refraction using Snellen's chart
   b. Intraocular pressure (IOP) (mmHg) using Schiotz Tonometry (NCT)
   c. Perimetry (Visual field test) using Humphrey Field Analyser (HFA)
   d. VCDR (Vertical Cup-Disk Ratio) using 90D lens
   e. Gonioscopy using Goldmann 4 mirror glass gonio fundus lens Methodology 65
   f. Fasting blood sugar levels (mg/dL)
   g. Post-Prandial blood sugar levels (mg/dL)
i. Procedure (In detail):
   After acceptation of the thesis by the ethics committee, an informed consent will be obtained from all diabetic patients coming to the Ophthalmology OPD. A detailed ocular and medical history will be taken. A detailed general physical examination will be performed. Single reading blood pressure will be examined in each patient using a sphygmomanometer. Visual acuity for distance and near, Best Corrected Visual Acuity (BCVA) and IOP (using Schiotz Tonometer) will be recorded in every case. An elaborate slit lamp examination of the anterior segment will also be performed. Angle of anterior chamber will be assessed by Goldmann 4 mirror glass gonio fundus Volk lens. Perimetry will be assessed by Humphrey Visual Field Analyser (HFA) II - i series (manufactured by Carl Zeiss, Germany)
   Detailed fundoscopy including VCDR (Vertical Cup-Disk Ratio) using indirect ophthalmoscopy and slit lamp bio microscopy using 90D/78D Volk lens shall be performed in each case. All cases shall be examined for the presence or absence of glaucoma.
j. Sample collection and storage:
   Blood sample of not less than 5 ml needs to be collected under asepsis from anterior cubital vein using a sterile disposable syringe
k. Laboratory investigations:
   For assessment of fasting blood sugar values, glucose oxidase/peroxidase method is employed. Serum or plasma, free of haemolysis, may be used, mixed with Reagent that is ready to use, and analysed using AU 480 automated analyser.

Statistical methods of analysis

a. The data will be collected and entered into Microsoft Excel 2013
b. Significant level decided before starting of study: $p \leq 0.05$
c. Statistical tests to be used for data analysis: Chi square test, Student t test, Correlation
d. Software(s) to be used for the statistical analysis: SPSS

Software Trial Version 20.0

Results

Prevalence of POAG in diabetic population

The results of the study show clear cut evidence of increased incidence of POAG in diabetic patients, which was 5%

Table 1: Prevalence of POAG in diabetic population

POAG	Frequency	Percentage
Absent	172	95
Present	9	5
Total	181	100

Age

The distribution of age in the study population ranges from 40 to 70 years. The mean age of study participants was 52.82 years and a SD of 7.94 years.

Table 2: The mean age of study participants

Age characteristics (Years)	Values (N = 181)
Minimum	40
Maximum	70
Mean	52.82
Standard deviation	7.94

Table 3: Age and gender distribution in the study population

Age group	Male		Female	
	Frequency	Percentage	Frequency	Percentage
40-49	34	28.1	19	31.7
50-59	60	49.6	30	50
60-69	25	20.7	10	16.7
>=70	2	1.7	1	1.7
Total	121	100	60	100

Table 4: Duration of DM

Duration	Frequency	Percentage
<5 years	94	51.9
5-10 years	82	45.3
>10 years	5	2.8
Total	181	100

There is a significant association between age and POAG. No significant association was found between gender and POAG. No significant association was found between duration of DM and prevalence of POAG.

Discussion

The discussion of an association between Diabetes and POAG is not new. In 1971 Becker stated "Diabetes Mellitus occurs more often in patients with Primary Open Angle Glaucoma than in non-glaucomatous populations [1]. Similarly, Glaucoma is more prevalent in diabetic than in non-diabetic population". Considerable controversy exists in literature.

While several studies show an association between the two diseases, several others fail to show any significant association. Most of these studies were comparatively small, used differing definitions of glaucoma and were clinical, rather than community based. A prevalence of 3.11 from Rotterdam, 1.84 from Wisconsin and 2.12 from Australia have been reported. Armstrong *et al* [2] have reported a prevalence of POAG of 4.1 % in diabetic patients.

A community-based study conducted in Vellore, South India showed a prevalence of POAG of 1.7% [5]. My study shows a clear evidence of an excess of POAG in diabetic population, which is 5%. In this study it is found that there is no significant association between duration of DM and prevalence of POAG (p>0.05) while in few other studies showed a significant association between these two.

My study shows there is no significant association between gender and POAG (p>0.05) while few other studies show slight male predominance. On the contrary, there are studies also showing female predominance.

Mean age of my study participants were 52.82 years with a SD of 7.94 years. In this study it is found that there is a significant association while comparing age and Discussion 84 POAG (P<0.05). Study conducted by Kahn HA *et al* [56] in 1980 studied 255 patients,

156 F/99 M, in age 30 to 92 years, showed mean age of 70.9 years, which also had similar outcomes. In this study it is found that there is significant association between diabetic retinopathy and POAG (P<0.05). This suggests that at the time of annual screening of all diabetic patients for retinopathy, POAG screening is a very effective proposition provided a clear clinical benefit could be elicited. A screening test should ideally be relatively less expensive, simple, and quick to perform and if possible be capable of being administered by a non-specialist.

Due to restricted time period, various other factors that have been excluded in the exclusion criteria may or may not have significance in this type of study. To understand this better, longer duration and a significant sample population with timely screening is required.

Conclusion

Primary Open Angle glaucoma is mostly asymptomatic until significant visual field loss has occurred. Patients usually presents with significant visual field loss in one eye and advanced disease in the other eye. It is associated with irreversible blindness. Thus, the public health importance of detecting undiagnosed and treatable glaucoma, as blindness has economic and societal consequences for the rest of an individual's life. Several studies have shown an association between POAG and diabetes. From my study, I came to a conclusion that there is a clear-cut evidence of increased incidence of POAG in diabetic patients, which was 5%. Study also showed significant association between age and POAG. However, no significant association was found between gender and POAG as well as between duration of DM and prevalence of POAG.

References

1. Reddy M, Malleswari M, Sai Rani K. Prevalence Of Primary Open Angle Glaucoma in Diabetic Patients.IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)e-ISSN: 2279-0853, p-ISSN: 2279-0861 2017;16(6):147-151. www.iosrjournals.org
2. Armstrong JR, Daily RK, Dobson HL, Girard LJ. The Incidence of Glaucoma in Diabetes Mellitus*: A Comparison with the Incidence of Glaucoma in the General Population. American journal of ophthalmology 19601;50(1):55-63. https://doi.org/10.1016/0002-9394(60)90840-0
3. Tielsch JM, Katz J, Quigley HA, Javitt JC, Sommer A. Diabetes, intraocular pressure, and primary open-angle

glaucoma in the Baltimore Eye Survey. Ophthalmology 1995;102(1):48-53. https://doi.org/10.1016/S0161- 6420(95)31055-X
4. Shankar V, Shukla AK. Are patients with diabetes more susceptible to open angle glaucoma? OTE 2009;5(4):1-4.
5. Ramakrishnan R, Nirmalan PK, Krishnadas R, Thulasiraj RD, Tielsch JM, Katz J, Friedman DS, Robin AL. Glaucoma in a rural population of southern India: the Aravind comprehensive eye survey. Ophthalmology 2003;110(8):1484-90. https://doi.org/10.1016/S0161-6420(03)00564-5
6. Frezzotti R. The glaucoma mystery from ancient times to the 21st century. The glaucoma mystery: ancient concepts. Acta Ophthalmologica Scandinavica 2000 Dec;78(S232):14-8. https://doi.org/10.1111/j.1600-0420.2000.tb01081.x
7. Cohn HC. The history of filtering surgery. InNon-Penetrating Glaucoma Surgery 2003, P13-24.
8. Jain AV. Role of viscocanalostomy and sub scleral lake trabeculectomy in open. Jhansi 2003.
9. Serpell G. Sir William Mackenzie: sympathetic ophthalmia and glaucoma before ophthalmoscopy. ANZ journal of surgery 2009;79(12):926-9. https://doi.org/10.1111/j.1445-2197.2009.05146.x
10. Van Buskirk EM, Cioffi GA. Glaucomatous optic neuropathy. American journal of ophthalmology 1992;113(4):447-52. https://doi.org/10.1016/S0002-9394(14)76171-9
11. Dellaporta A. Historical notes on gonioscopy. Survey of ophthalmology 1975;20(2):137-49. https://doi.org/10.1016/0039-6257(75)90021-1
12. Lowe RF. A history of primary angle closure glaucoma. Survey of ophthalmology 1995;40(2):163-70. https://doi.org/10.1016/S0039- 6257(95)80006-9
13. Barkan O, Boyle SF, Maisler S. On the genesis of glaucoma: An improved method based on slitlamp microscopy of the angle of the anterior chamber. American Journal of Ophthalmology 1936;19(3):209-15. https://doi.org/10.1016/S0002-9394(36)91052-8
14. Barkan Glaucoma O. Classification, Causes, and Surgical Control: Results of Microgonioscopic Research. American Journal of Ophthalmology 1938;21(10):1099-117. https://doi.org/10.1016/S0002-9394(38)90805-0
15. Barkan O. Choice of Operation in Glaucoma: Based on Pathologic Anatomic Classification. American Journal of Ophthalmology 1941;24(7):768- 78. https://doi.org/10.1016/S0002-9394(41)93117-3
16. Barkan O. Narrow-angle glaucoma: Pupillary block and the narrow-angle mechanism. American journal of ophthalmology. 1954 Mar 1;37(3):332- 50. https://doi.org/10.1016/0002-9394(54)91762-6