بـــسم الله الرحمن الرحيـــم

Diurnal Variation of IOP

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Thesis

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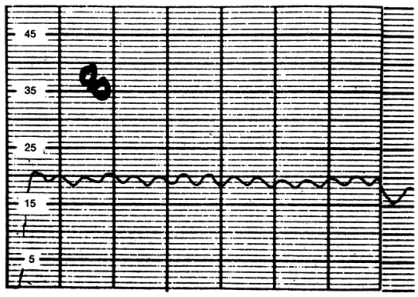
Aqueous humor dynamics

The intraocular pressure is pulsatile in nature, having a normal magnitude of 2mmHg



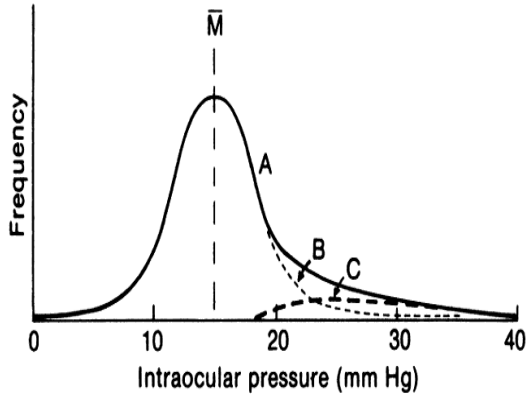
Tracing of IOP made with a pneumotonometer

(Leydhecker W, 1976)

The average intraocular pressure is around 15 mmHg.

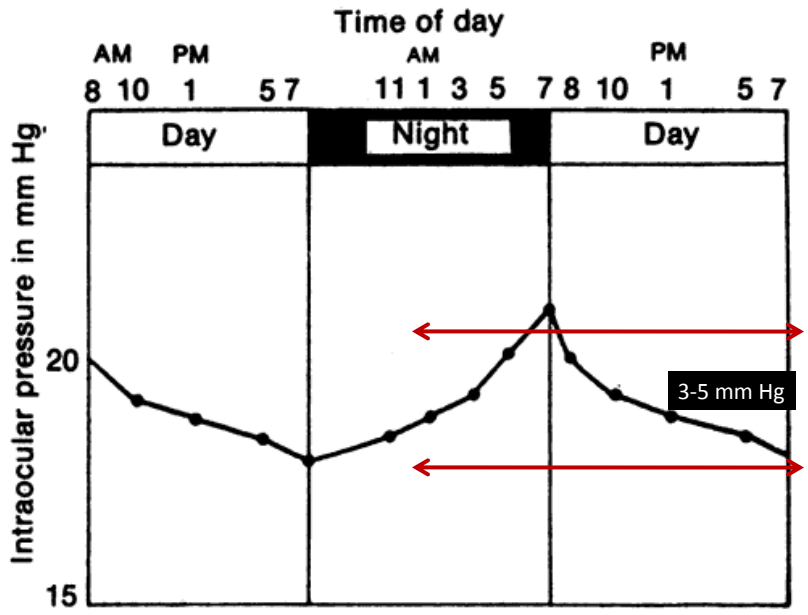
(*Hoskins HD et al, 1989*).

Population Data



16

- Data large epidemiologic study :
  mean IOP is @ 16 mmHg and SD of 3 .(Moses R& Hart W, 1987)

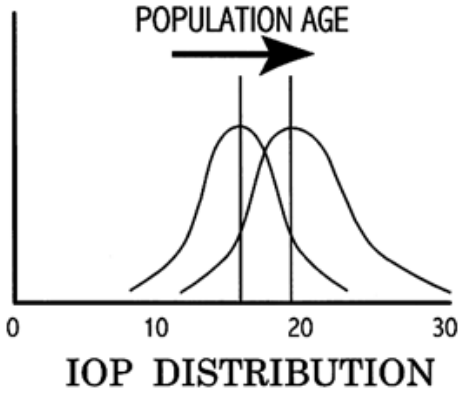


(Duke-Elder S: System of ophthalmology. Vol 4. The Physiology of the Eye and of Vision. London: Henry Kimpton, 1968.)

Factors influencing IOP

1- Genetic

2-Age



(Stamper, 2005)

Factors influencing IOP

3-Sex

4-Race

5- Change in body position

6-Systemic Factors : Hypertension- DM

7-Pregnancy

8-Smoking

Factors influencing IOP
(Ocular Related)

1-Axial Length

2-Laterality

3-Central Corneal Thickness

4-Corneal Curvature

5-Corneal anomalies

7-Others ocular conditions : squeezing

Aim of the work

To find out the pattern of diurnal variation among some Egyptian population.

Subjects and Methods

- 163 eyes of 86 :
  - of non-glaucomatous patients scheduled for ocular surgeries &
  - volunteers at RIO
- IOP was measured 5 times along one day (8am, 12pm, 4pm, 8pm, and 12am).

- History
  - age, sex, past or present history of any ocular surgeries, medication, or trauma.
- Ocular examination :
  - Visual Acuity :ranging from (6/6) - (3/60)
  - Slit-Lamp for anterior segment examination to exclude potential causes of high IOP.
  - IOP measurement using Goldmann applanation tonometer mounted on slit-lamp.

Results

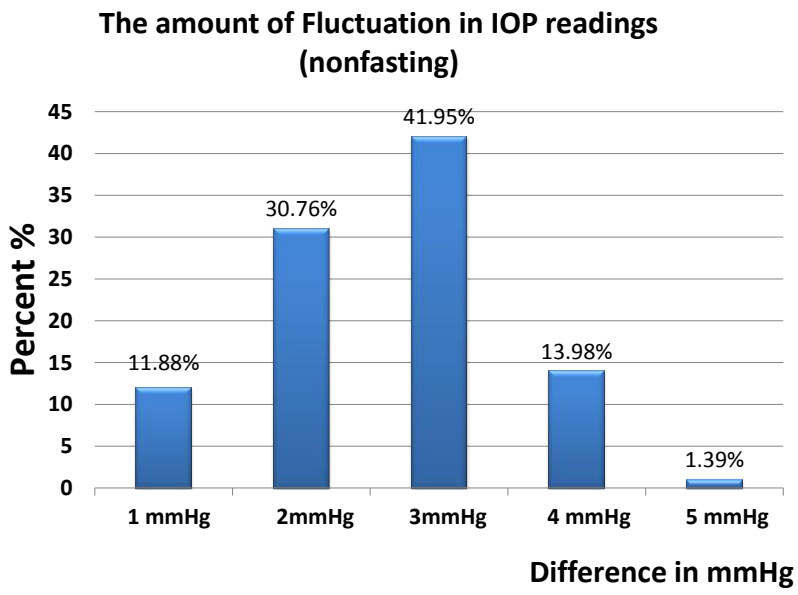
The mean IOP of the studied group all over the day was 16.4 mmHg (SD ±2.5)

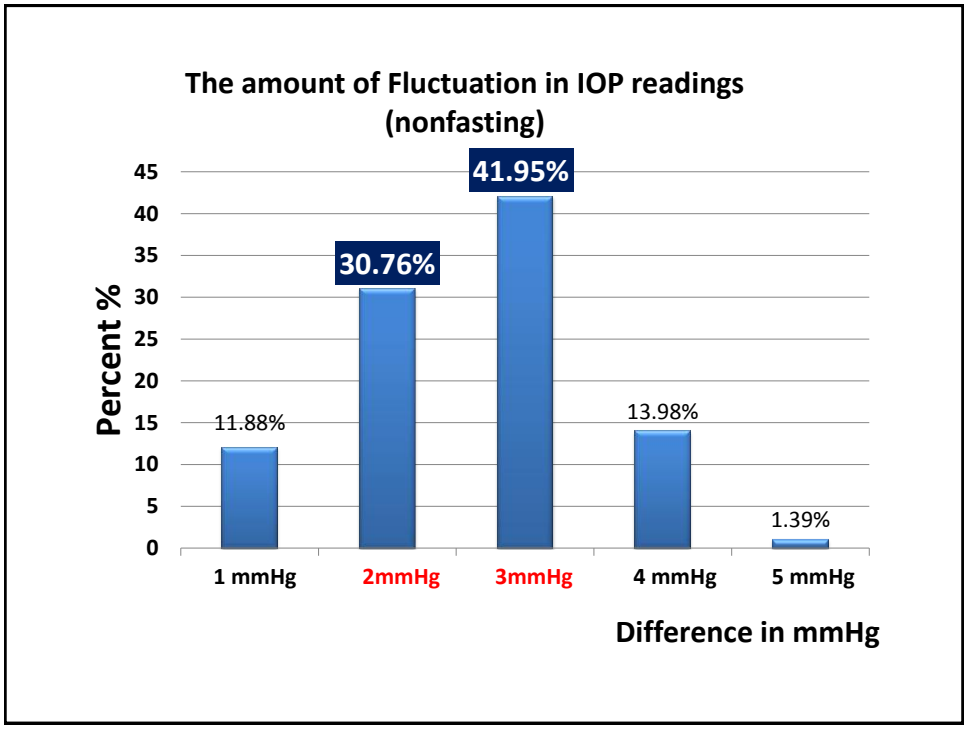
Patients were divided into 4 groups according to the age:

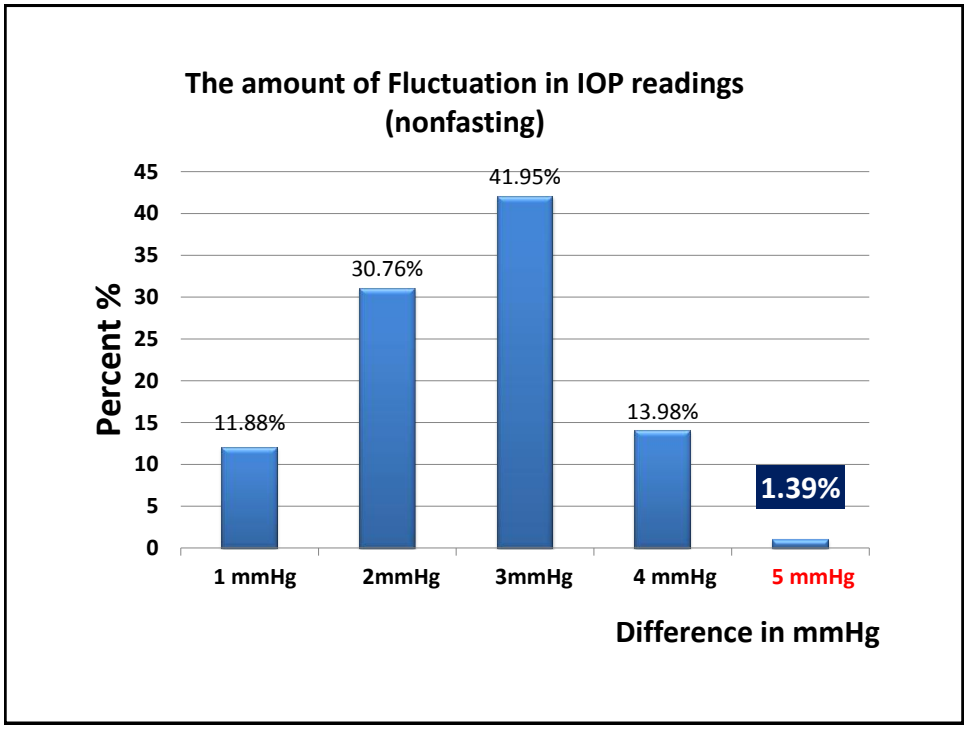
Group 1: age from 10- 30 years
Group 2: age from 30- 50 years
Group 3: age from 50- 70 years
Group 4: age from 70- 90 years

Group	Number of eyes	Mean IOP(mmHg)& SD
Group 1 (age from 10- 30 years)	16	17.3±1 .7
Group 2 (age from 30- 50 years)	18	16.6± 1.1
Group 3 (age from 50- 70 years)	90	15.9± 1.8
Group 4 (age from 70- 90 years)	39	14.4± 1.5

Table shows mean IOP among different age groups.




The amount of Fluctuation in IOP readings (nonfasting)
Percent %
45
40
35
30
25
20
15
10
5
0
11.88%
30.76%
41.95%
13.98%
1.39%
1 mmHg
2mmHg
3mmHg
4 mmHg
5 mmHg
Difference in mmHg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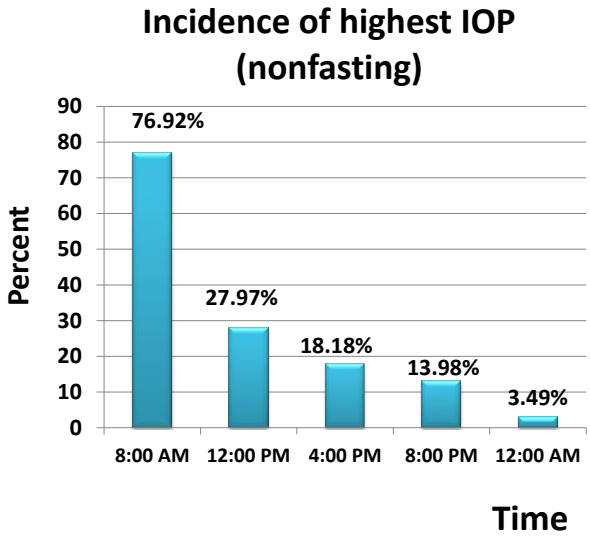
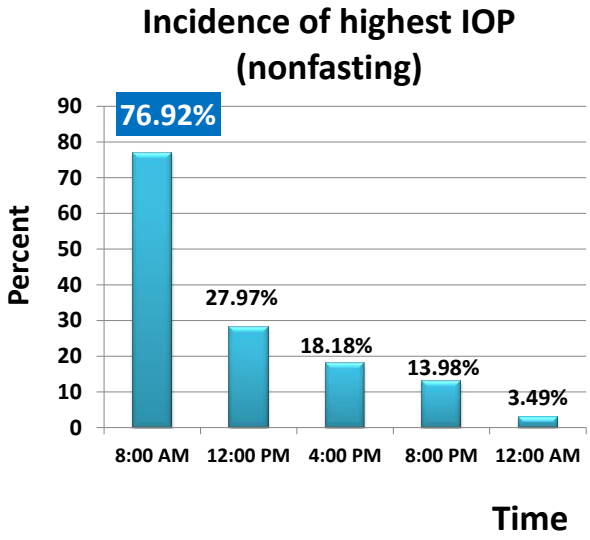

Incidence of highest IOP (nonfasting)
Percent
90
80
70
60
50
40
30
20
10
0
76.92%
27.97%
18.18%
13.98%
3.49%
8:00 AM
12:00 PM
4:00 PM
8:00 PM
12:00 AM
Time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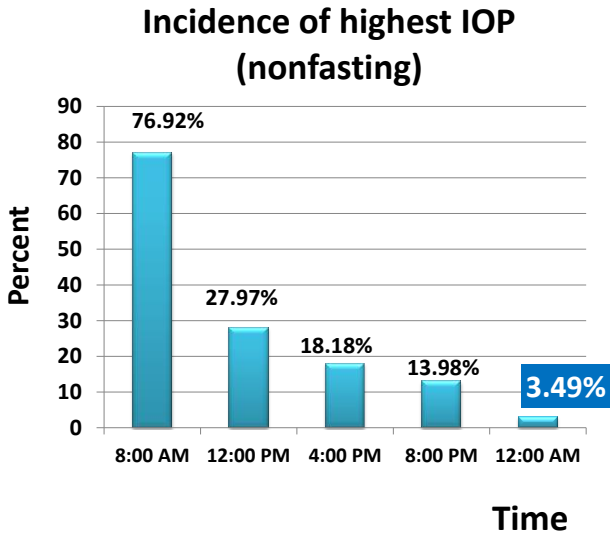
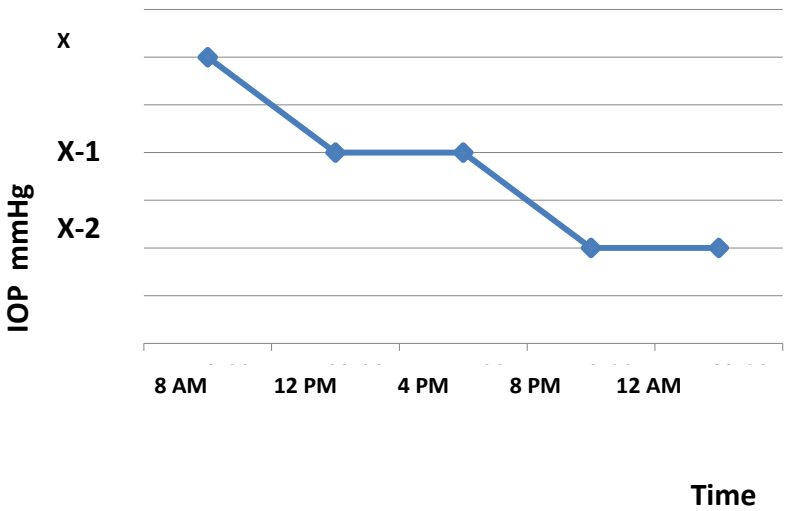
Time

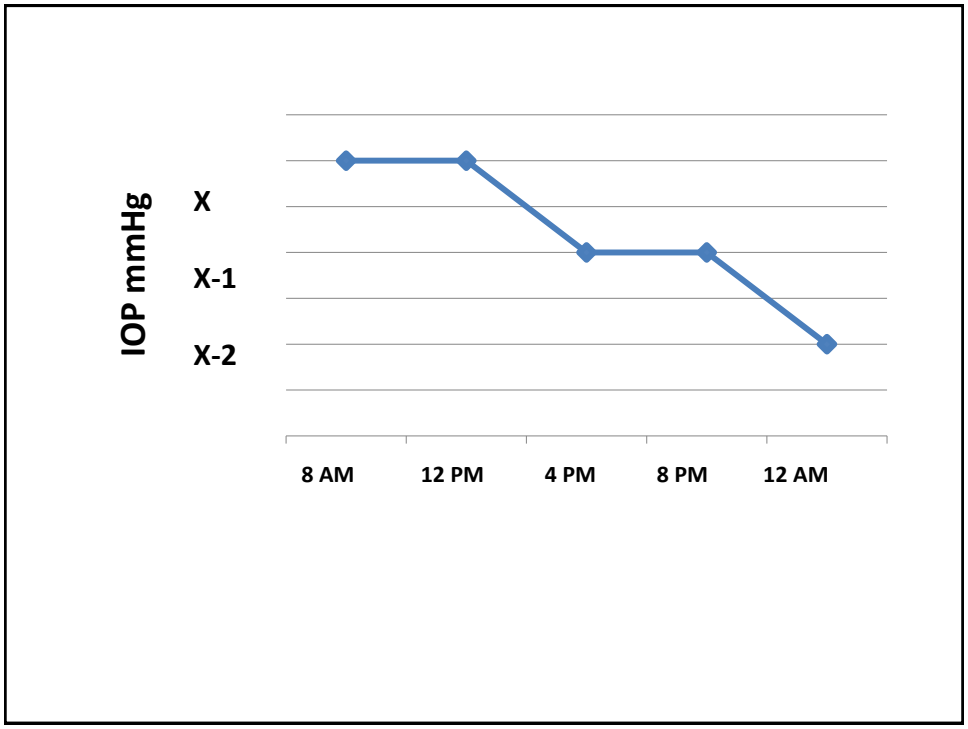


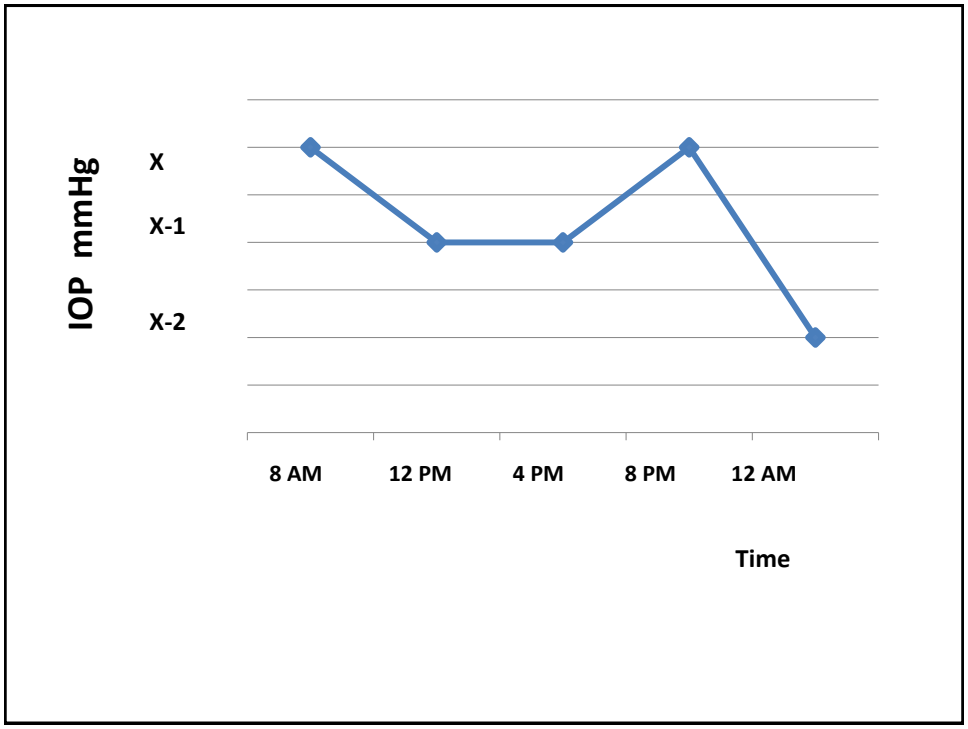
To find the pattern of fluctuation

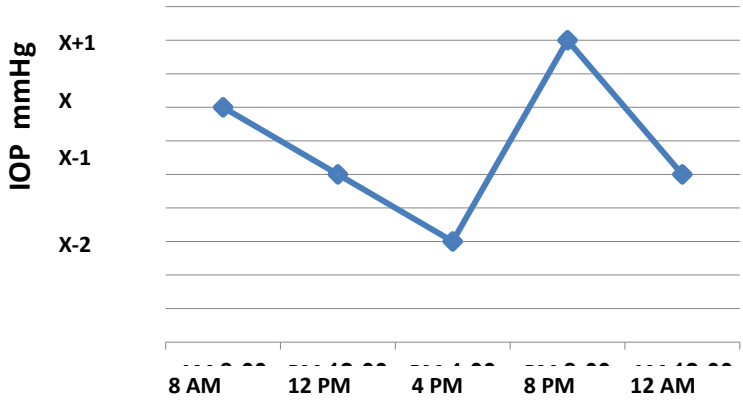
- The curve of IOP was drawn for each patient. Similar curves were grouped.
- There were **43 patterns** detected in the 163 eyes

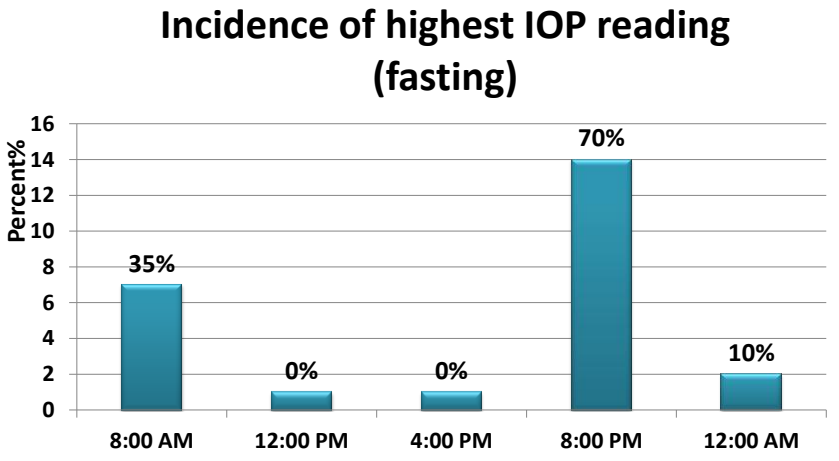
Following are patterns found in a larger number of cases.

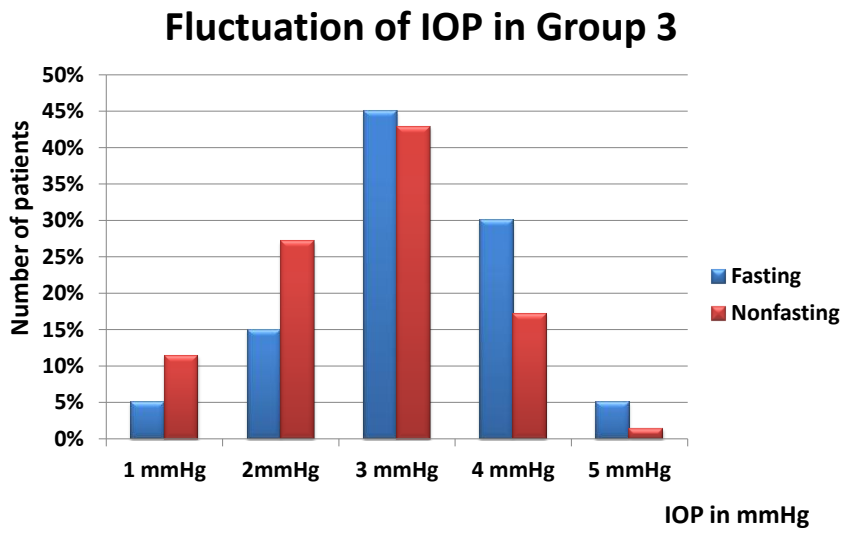



IOP mmHg
X
X-1
X-2
8 AM
12 PM
4 PM
8 PM
12 AM


IOP mmHg
X
X-1
X-2
8 AM
12 PM
4 PM
8 PM
12 AM
Time


IOP mmHg
X+1
X
X-1
X-2
8 AM
12 PM
4 PM
8 PM
12 AM
Time


Incidence of highest IOP reading (fasting)
Percent%
16
14
12
10
8
6
4
2
0
35%
0%
0%
70%
10%
8:00 AM
12:00 PM
4:00 PM
8:00 PM
12:00 AM
Time


Fluctuation of IOP in Group 3
Number of patients
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
1 mmHg
2mmHg
3 mmHg
4 mmHg
5 mmHg
IOP in mmHg
Fasting
Nonfasting

Discussion

E
CD
LIPD

Age

- The present study showed that the IOP decreases with age
- This does not agree with the generally accepted notion that IOP in the elderly is higher than that in the young adult, at least during the light/wake period ***(Shields et al, 2005)***
- This could be due to small sample size

RIGHT VERSUS LEFT

Right versus left

- Present study shows:
  - that in most of the time the difference between the two eyes was minimum (0-1 mmHg in 88%)&
  - a difference (2-4 mmHg) was only found in 12% of the studied group.
- Others:
  - The difference between the two eyes rarely exceeds 4 mmHg ***(Leske et al, 1997)***.

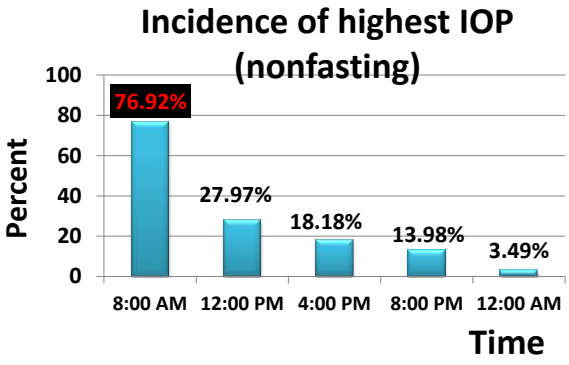
Highest reading

- ***Katavisto, 1964 :***
  1. the 'morning type' peak in the early morning,
  2. the 'day time' peak during the day
  3. the 'night type' peak during the night.
  4. the 'flat type' without obvious peaks.

Katavisto M. The diurnal variations of ocular tension in glaucoma. Acta Ophthalmol (Copenh)
1964, 78:1.

In the present study

- The variation of IOP over the day had a predominance of morning peaks .

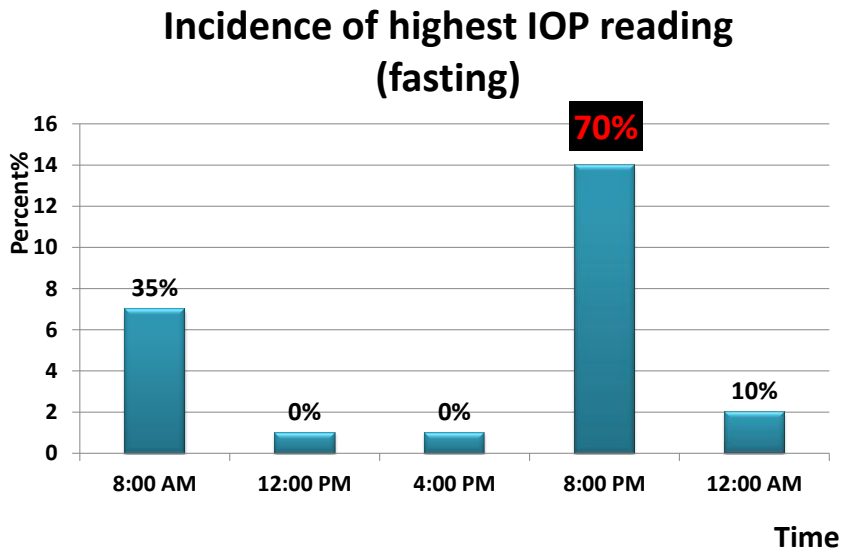


- This is in agreement with findings of others ***(Collaer et al, 2005)***.

"This morning peak"

- So probability of catching the high IOP is more in the morning.
- Measure IOP in the early working office hours rather than by the end of the day to catch the highest reading of the day.

HIGHEST READING WHILE FASTING !



fasting in Ramadan

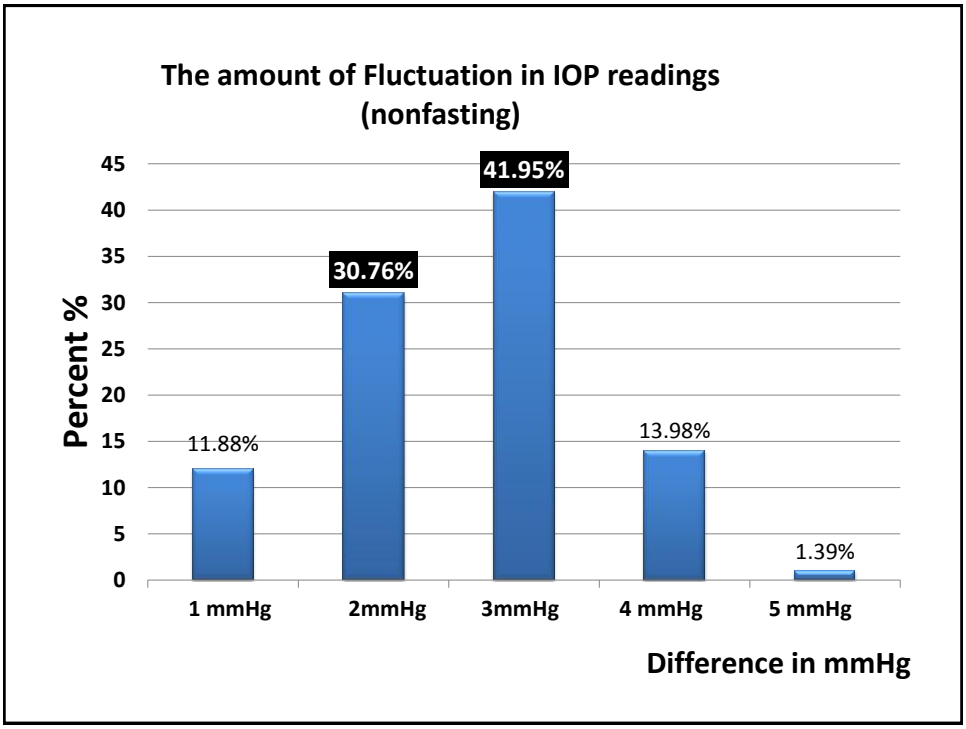
- The highest IOP was found to be at 8 PM (70%).
- Consider the effect of drinking water at time maghrib among Muslim glaucomatous patients.
  - Measurement
  - Drug therapy

FLUCTUATION
(FASTING VS NON FASTING)

(Dueker, 2005) : In normal individual IOP varies 2-6 mmHg over a 24 hours period

In the present study :

In the nonfasting group (143patients) it ranges from 1-5 mmHg.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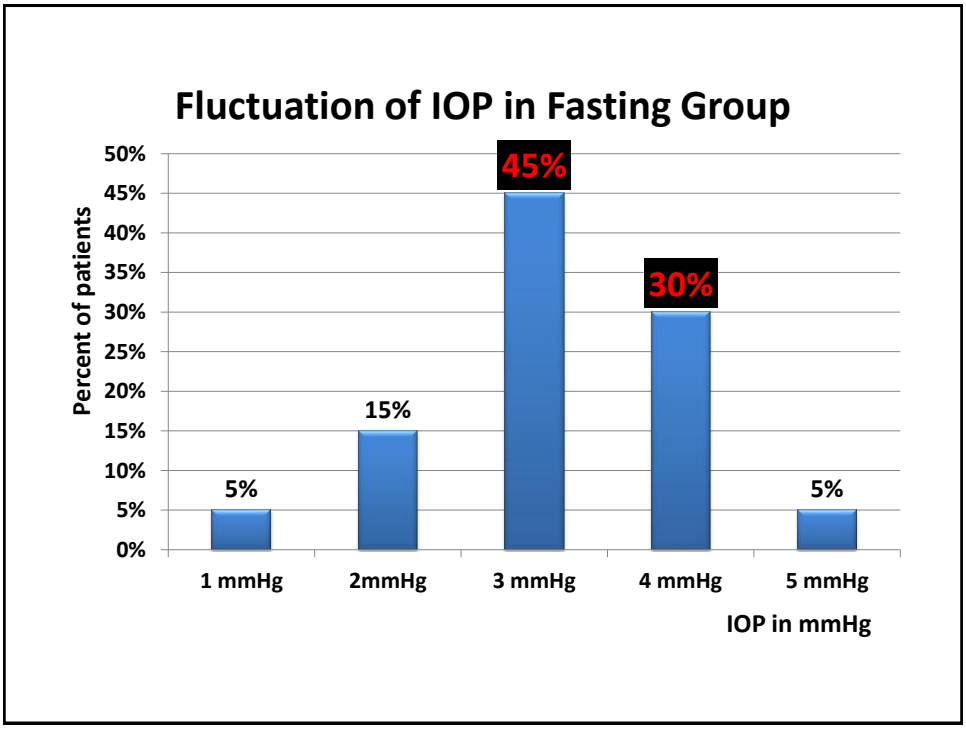
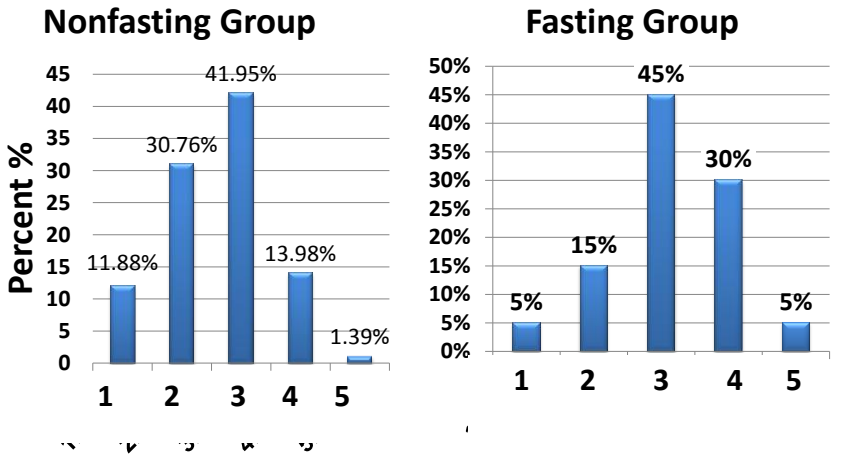
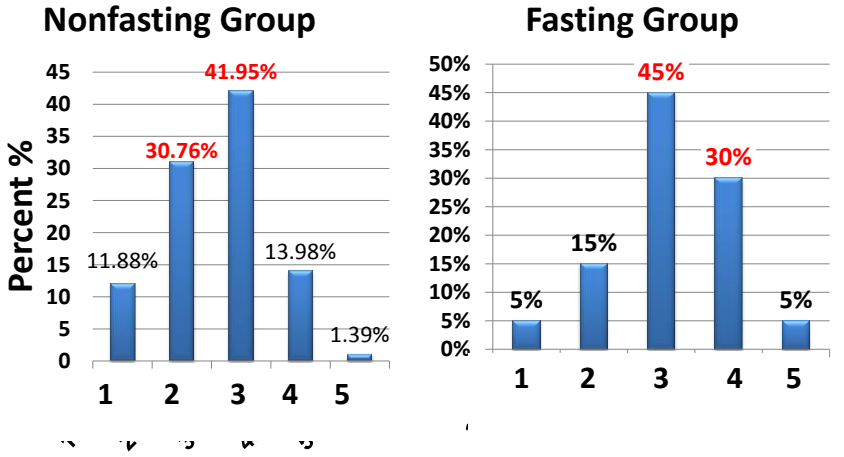
Difference in mmHg


Fluctuation of IOP in Fasting Group
Percent of patients
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
5%
15%
45%
30%
5%
1 mmHg
2mmHg
3 mmHg
4 mmHg
5 mmHg
IOP in mmHg

Fluctuation (fasting vs non fasting)



Fluctuation (fasting vs non fasting)



4 vs 8 pm

IOP at 8 PM compared to 4 PM in mmHg	*Fasting group*	*Nonfasting of group 3*
-3	0	1
-2	1	9
-1	1	28
0	2	23
1	2	4
2	3	1
3	6	3
4	4	1
5	1	0
Total number of cases	20	70

Thank You