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To Study the Intraocular Pressure and Blood Pressure Changes in Pre and Post-Menopausal Indian Women

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ABSTRACT
Normal Intraocular pressure (IOP) is an essential prerequisite for the eye to serve its function as a light gathering and transducer organ. Various physiological factors which include age, gender and hormonal variations may influence IOP in normal subjects and these effects sometimes may be marked and relatively sustained. The prevalence of hypertension is found to be 69.9/1000 urban Indian women which is one of the commonest cardiovascular disorder. This is chiefly contributed to the postmenopausal changes. With women, living longer than before, a majority would spend 1/3 of their life in the postmenopausal age. Among women, increasing IOP was more evident with age than men. Increased blood pressure is associated with modestly elevated prevalence of primary open angle glaucoma. So post-menopausal women were examined for IOP changes in relation to blood pressure and duration of menopause in comparison to pre- menopausal women.
Methodology: *A total of 240 females who were in the age group of 40 – 55 years, who were recruited for the study, were divided into two groups of 60 each: premenopausal and postmenopausal, based on their menstrual history. The Blood Pressure of the subjects was then calculated. IOP was recorded in all individuals and it was compared between the two groups by using Student 't' test. A P value of < 0.05 was considered as statistically significant.*
Results: *The results of the present study showed that there was a significant increase (Student 't' test, $p < 0.001$) in the IOP in the postmenopausal group as compared to that in premenopausal women. Systolic BP, Diastolic BP and Pulse Pressure were positively associated with the IOP in both pre and post-menopausal women. IOP was observed to increase with age and the years of attainment of menopause ('F' test $p < 0.001$).*
Keywords: *Intraocular Pressure, Menopause, Blood Pressure.*

Introduction

The WHO and the stages of reproductive aging workshop (STRAW) working group define menopause as the "permanent cessation of menses resulting from reduced ovarian hormone secretion that occurs naturally or is induced by surgery, chemotherapy or radiation". Menopause is the point in a female's life when she has not had a menstrual cycle for at least one year. Menopause is not a disease or an illness but a transition between two phases of a woman's life. It is an estrogen-deficient state resulting from the loss of

ovarian activity. It marks the end of the childbearing years of the female.

For most women menopause occurs at about age 50 but every woman's body has its own timeline. This would explain that while some women stop having their periods in their mid-forties others continue well into their fifties.[1-3]At the time of menopause a woman must readjust her life from one that has been physiologically stimulated by estrogen and progesterone production to one devoid of these hormones. The loss of estrogen often causes marked physiologic changes in the function of the body and the eye is no exception.[4-8]

About 60 million women in India are in the age of 55 yrs. With improved life expectancy among women, than before, a majority would spend 1/3 of their life in the postmenopausal age.[9] Increasing age decreases the physiologic reserve of eye and cardiovascular system which may manifest in the form of IOP and BP changes.[10] Knowledge of IOP in different stages of female sexual life would enable the screening for ocular hypertension and follow up of open angle glaucoma.[11] This work is undertaken to study the effects of systemic hypertension, parity and the duration of menopause on IOP changes in postmenopausal women, in comparison to premenopausal women. The link between high blood pressure and menopause is complicated. While there is great indication that blood pressure increases with menopause, there is not a clear understanding of why this happens.

Thus the study could help us to know whether post-menopausal women and patients with systemic hypertension need periodic ophthalmological evaluation for Intraocular pressure, so as to help in early detection and prevention of sequelae of glaucoma. Also any elevated IOP can be diagnosed as early as possible and proper prophylactic interventions can be applied to prevent blindness.

Methods

The present study was carried out in the Dewas City of Madhya Pradesh state (Gram bangar) from 1st July 2015 to 30 june 2016 (one year period). It is a cross sectional, comparative clinical study.

These were two comparative clinical studies comprising of two groups.

Group A: Premenopausal women of age group between 35-44 years. Group A will be divided into A1 – Normotensive Premenopausal and A2 – Hypertensive Premenopausal with 60 subjects in each A1 and A2

Group B: Postmenopausal women of age group between 45-54 years, who satisfy inclusion and exclusion criteria. Group B will be divided into B1 – Normotensive Postmenopausal and B2 – Hypertensive Postmenopausal with 60 subjects in each B1 and B2.

After taken informed consent, pre structured, predesigned Performa was used to collect the baseline data for those subjects who satisfy the inclusion & exclusion criteria physical examinations of all subjects including measuring height, weight were done. BMI was also calculated. Vital parameters like heart rate, blood pressure were recorded. Pulse pressure and Mean arterial pressure was calculated. Blood Pressure was recorded using a standard sphygmomanometer with cuff applied to right upper arm in sitting position. Subject was made to sit comfortably for few minutes before the measurement was taken.

Intraocular pressure was recorded by using Schiotz Indentation Tonometer. The cornea was anaesthetized with 4% lignocaine drops. . IOP was recorded first in the right eye and then in the left eye. All the recordings were taken in the morning hours between 10 AM to 1 PM to maintain constancy of testing and to prevent any diurnal variations in IOP. After the procedure, a prophylactic antibiotic, Ciprofloxacin eye drops were instilled in both the eyes to prevent infections.

The collected data was compiled & tabulated using Microsoft Excel 2007 and analyzed using SPSS Version 20. Student't' test & Chi square test

has been used to find the significance of study parameters.

Results

The findings from the study indicates that Systolic blood pressure, Diastolic blood pressure were positively correlated to IOP and was statistically significant between pre and post-menopausal normotensive as well as hypertensive women.

Mean Iop According To Systolic Blood Pressure In Pre And Postmenopausal Women **(Table-1)**

	Systolic Blood Pressure	Subjects		IOP (mm Hg)	
		No.	%	Right (mean ± SD)	Left (mean ± SD)
PREMENOPAUSAL	< 120 mm Hg	28	23.3	14.43 ± 2.28	13.86 ± 1.67
	120-139 mm Hg	60	50.0	14.92 ± 2.43	14.62 ± 2.38
	140-159 mm Hg	32	26.7	16.81 ± 2.23	15.78 ± 2.45
	Total	120	100.0		
	ANOVA Tests			F=9.377 P=0.000***	F=5.626 P=0.005***
POSTMENOPAUSAL	< 120 mm Hg	20	16.7	15.40 ± 2.95	14.40 ± 3.50
	120-139 mm Hg	74	61.7	17.23 ± 3.51	15.99 ± 3.52
	140-159 mm Hg	26	21.7	20.85 ± 3.97	18.27 ± 2.36
	Total	120	100.0		
	ANOVA Test			F=15.214 P=0.000***	F=8.222 P=0.000***

Among premenopausal women with SBP < 120 mmHg, mean IOP was 14.43 ± 2.28 mmHg (right) and 13.86 ± 1.67 mmHg (left) in comparison to 15.40 ± 2.95 mmHg (right) and 14.40 ± 3.50 mmHg (left) in postmenopausal women. (Table 1)

With SBP > 140 mmHg, mean IOP among Postmenopausal women was 20.85± 3.97 mmHg (Right) and 18.27± 2.36 mmHg (left) when compared to 16.81± 2.23 mmHg (right) and 15.78± 2.45 mmHg (left) in pre-menopausal women. SBP was significantly correlated to IOP in both premenopausal (p = 0.000) and post-menopausal women (p = 0.000)

Table 2:- Mean Iop According To Diastolic Blood Pressure In Pre And Postmenopausal Women

	Diastolic Blood Pressure	Subjects		IOP (mm Hg)	
		No.	%	Right (mean ± SD)	Left (mean ± SD)
PREMENOPAUSAL	< 80 mm Hg	48	40.0	14.42 ± 2.12	13.71 ± 1.91
	80-89 mm Hg	44	36.7	15.18 ± 2.48	15.48 ± 2.53
	90-99 mm Hg	28	23.3	17.04 ± 2.35	15.39 ± 2.11
	Total	120	100.0		
	ANOVA Test			F=11.455 P=0.000***	F=8.960 P=0.000***
POSTMENOPAUSAL	< 80 mm Hg	42	35.0	16.55 ± 2.80	15.31 ± 3.40
	< 80 mm Hg	61	50.8	17.69 ± 4.07	16.38 ± 3.57
	90-99 mm Hg	17	14.2	20.65 ± 4.47	17.88 ± 2.87
	Total	120	100		
	ANOVA Test			F=7.277 P=0.001***	F=3.549 P=0.032*

(N=120)

Among pre and post-menopausal women with DBP < 80 mmHg, mean IOP was 14.42 ± 2.12 mmHg (right) & 13.71 ± 1.91 mmHg (left) and 16.55 ± 2.80 mmHg (right) & 15.31 ± 3.40 mmHg (left) respectively. With DBP > 90 mmHg, mean IOP among Postmenopausal women was 20.65 ± 4.47 mmHg (Right) and 17.88 ± 2.87 mmHg (left) in comparison to 17.04 ± 2.35 mmHg (right) and 15.39 ± 2.11 mmHg (left) in premenopausal women. DBP was statistically related to IOP in premenopausal (p=0.000) and post-menopausal (p=0.000) (table 3)

Mean IOP According To Parity In Postmenopausal Women (Table-3)

Years since menopause attained	IOP (mm Hg)	
	Right (mean±SD)	Left (mean±SD)
1 year	16.38 ± 3.31	14.81 ± 3.56
2 years	17.38 ± 3.93	15.96 ± 3.76
3 years	16.64 ± 2.87	15.65 ± 2.98
4 years	17.46 ± 4.63	15.95 ± 3.45
5 years and above	19.86 ± 2.96	18.10 ± 2.93
ANOVA test	F=3.595 P=0.008***	F=3.230 P=0.015**

*** highly significant

Women with history of attaining menopause for one year, had an IOP of 16.38 ± 3.31 mmHg (right) and 14.81 ± 3.56 mmHg (left). As menopausal age increases to five years and above, the mean IOP was 19.86 ± 2.96 mmHg (right) and 18.10 ± 2.93 mmHg (left). IOP increased significantly with menopausal age. (Table 3)

Discussion

The results of this study was found to be that, IOP was significantly higher in postmenopausal when compared to premenopausal women. IOP increased significantly as age advanced & the number of years of attainment of menopause increased. Systolic and Diastolic blood pressures were positively and significantly correlated with IOP. Other studies have also shown that women who had an early onset of menopause had a significantly higher risk of open angle glaucoma than those who attain menopause at a later age. So the hypothesis that female sex hormones protect against open angle glaucoma has been put forth. In the literature, there is an evidence for a direct effect of endogenous hormonal changes on aqueous humor circulation.[12,13,14,15]

Population based studies have shown that IOP is equal between the sexes in ages of 20 to 40 yrs .In older age group, an increase in mean IOP with age is greater in females than males. The use of hormone replacement therapy and the protective effect of endogenous hormones could explain the gender difference.[16-17]

After the age of 40 yrs there is a slight increase in mean IOP & standard deviation after each decade. This probably occurs due to age related reduction in aqueous outflow facility and a concomitant decrease in the aqueous production.[103] Studies have shown that IOP is higher among postmenopausal women when compared to premenopausal women.[11]

Population based studies like the blue mountain eye study have shown a positive correlation between IOP & parity.[11]. In this study, there was no statistically significant association between IOP and parity. Further studies correlating with hormonal assays may help in clearly establishing the correlation between IOP, blood pressure and duration of menopause.

Conclusion

IOP increases above 40 yrs of age in both pre and postmenopausal women.IOP increases as systemic blood pressure increases. Postmenopausal women are at increased risk of developing elevated IOP than premenopausal women. As the total number of years of attaining menopause increases, IOP also increases. It can be concluded that women in their menstrual transition period, need to be regularly monitored and screened for elevated IOP. Hypertensive women are more prone for developing elevated IOP / Ocular Hypertension, for which regular population based screening for elevated IOP is required. This can reduce the risk of development of glaucoma, which is one of the most commonest cause of irreversible blindness worldwide and in India.

This data will provide an opportunity to determine whether other physiological and systemic parameters influence the relationship to the disease like glaucoma in pre and post-menopausal women.

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