

Effect of Short-term Use of Oral Contraceptive Pills on Intraocular Pressure

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Pak J Ophthalmol 2019, Vol. 35, No. 3

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Purpose: To study the effect of short-term use of oral contraceptive pills on intra-ocular pressures of women of childbearing age.

Study Design: Observational case control study.

Place and Duration of Study: The study was conducted at Arif memorial teaching hospital and Allied hospital Faisalabad from October 2017 to March 2018.

Material and Methods: There were 100 female subjects, who were divided into two groups of 50 each. Group A, included females, who had been taking oral contraceptive pills (OCP) for more than 6 months and less than 36 months. Group B, included 50 age-matched controls, who had never used OCP. Ophthalmic and systemic history was taken. Careful Slit lamp examination was performed and intraocular pressures (IOP) were measured using Goldman Applanation tonometer. Fundus examination was done to rule out any posterior segment disease. We compared the intra ocular pressures between the two groups by using Student t test.

Results: Average age was 29.16 in group A and 27.74 years in group B. Average duration of using OCP was 14.9 months. Mean IOP in right eye was 13.08 ± 1.41 mm of Hg and 13.34 ± 1.27 mm of Hg in left eye in Group A. While, mean IOP in right eye was 11.72 ± 1.35 mm of Hg and in left eye was 11.92 ± 1.3 mm of Hg in controls. Significant difference was noted between the IOP of OCP group and controls. ($p = 0.000$).

Conclusion: OCP significantly increases IOP even when used for short time period.

Key words: Oral contraceptive pills, Intra-ocular pressure, Glaucoma.

Oral contraceptive pills (OCP) are commonly used throughout the world. These pills contain different compositions of estrogen and progesterone. Many side effects of OCP have been reported in literature. Ophthalmological adverse events are no exceptions. In one study, the incidence of ocular side effects was reported to be 1 in 230,000¹. Thromboembolic conditions associated with OCP can lead to retinal artery occlusion and neuro-ophthalmologic consequences can occur secondary to Cerebro-vascular accidents². Ophthalmic migraine and intolerance to contact lenses are also reported in literature³. The risk of complications increases in

smokers and in women older than 35 years. Primary open angle glaucoma and raised intra ocular pressures are also known side effects of OCP, when used for longer duration. It was reported by Wang et al that women taking OCP for more than three years had a two-fold increase in the risk of developing glaucoma⁴. However, in a recent study, it was found that OCP cause an increase in the central corneal thickness, which could be responsible for the higher intra ocular pressure readings in these patients⁵. Contrary to the increased risk of developing glaucoma with OCP, Newmann Casey et al have shown the protective effect of female sex hormones by decreasing intra ocular

pressure in post-menopausal women taking hormone replacement therapy^{6,7}.

Rationale of our study is to find out whether OCP are safe to use for a short period of time. We included subjects who had taken OCP for more than six months and less than 3 years. Paradoxical effect of female sex hormones in decreasing IOP is also discussed. The purpose of our study was to determine the effect of short-term oral contraceptive pills (OCP) on intra ocular pressure of women of childbearing age.

MATERIAL AND METHODS

The study was conducted at Arif memorial teaching hospital and Allied hospital Faisalabad from October 2017 to March 2018. It was a comparative observational study. Sample was collected using non-probability convenience sampling. One hundred female subjects were divided into two groups of 50 each. Group A, included females of childbearing age, who had been taking oral contraceptive pills for more than 6 and less than 36 months. Group B included 50 age-matched controls who had never used OCP.

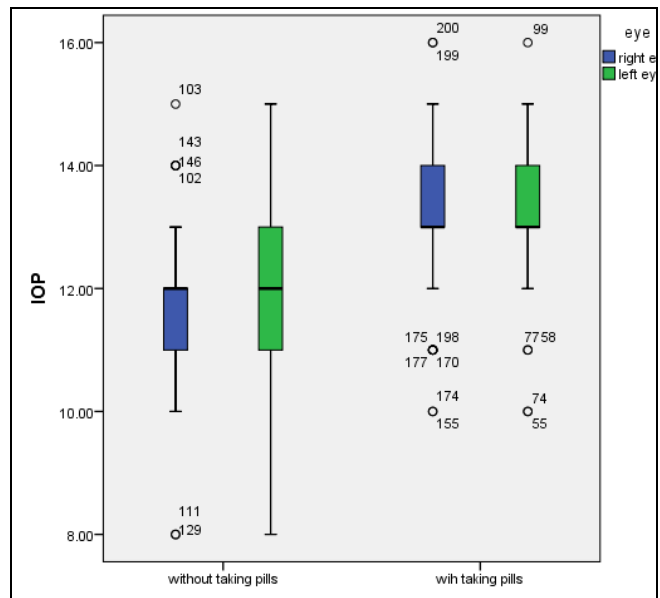
Inclusion criteria for the subjects were non diabetic and non-hypertensive healthy females, taking OCP for at least six months and not more than 3 years and for controls were non diabetic and non-hypertensive age-matched females who had never taken OCP. The following subjects were excluded from the study: females having any systemic and ocular disease, females with moderate to high refractive errors ($\geq +2$ hypermetropia and ≥ -2 myopia), post-menopausal women and girls of pre-pubertal age, subjects using any ocular or systemic drugs which might affect intra ocular pressures, and subjects with history of any blunt or penetrating ocular trauma.

Study Instruments were Proforma, Slit lamp Bio-microscope, Applanation Tonometer and Ophthalmoscope. Verbal informed consent was taken from the participants. History included special emphasis on systemic and ocular diseases, use of topical or systemic drugs and use of OCP. Careful Slit

lamp examination was performed and intraocular pressures were measured using Goldman Applanation tonometer. Fundus examination was done to rule out any posterior segment disease. Data was recorded on specially designed proforma. Statistical analysis was done using ANOVA with SPSS version 21. Significance was set at ($p < 0.05$).

RESULTS

The average age of the patients was 29.16 years in group A and 27.74 years in group B. Average duration of using OCP was 14.9 months. The mean and standard distribution of IOP in the 2 groups is shown in table 1 and their distribution is shown in box and whisker plot is shown in graph 1. There was a significant difference between the IOP of both groups $p = 0.000$. Average Cup to Disc ratio was 0.29 in group A and 0.27 in group B and the difference was not significant ($p = 0.109$).



Graph 1: Showing a box-whisker plot indicating distribution of IOP in both eyes of group A (taking OCP) and group B (without OCP).

Table 1: Mean and standard deviation of IOP values.

Descriptive Statistics				
Group	Mean	Std. Deviation	N	
IOP RE	Without taking pills	11.7200	1.35586	50
	With taking pills	13.0800	1.41190	50
	Total	12.4000	1.53741	100

IOP LE	Without taking pills	11.9200	1.30681	50
	With taking pills	13.3400	1.27151	50
	Total	12.6300	1.46787	100

DISCUSSION

Intra ocular pressure is the only modifiable risk factor in primary open angle glaucoma (POAG). Different studies have shown contrasting results regarding the effect of OCP/female sex hormones (estrogen and progesterone) on IOP. There are also some studies, that showed the influence of female reproductive health on incidence of glaucoma⁸. American Academy of Ophthalmology (AAO) 2013 Annual Meeting reported that women using OCP for more than three years had two folds increased risk of developing glaucoma³. Later, similar reports were published showing that women using OCP for more than five years had a 25 percent increased risk of POAG^{9,10,11}. Our results showed that women using OCP for even less than three years had significantly raised IOP when compared with controls. Although the intra ocular pressures in our study were in the normal range and there was no significant difference in Cup to Disc ratio, yet these pressures may have detrimental effects on susceptible optic discs.

This contradicts the protective role of estrogens as found in other studies. According to Blue Mountain Study, women who had less exposure to estrogen in their lifetime were more prone to develop Glaucoma¹². It was shown that there was a 2-fold increased risk of POAG in women who had late age of menarche and early menopause before 45 years. Hence decreasing the exposure of estrogen to body tissues including optic nerve and retinal ganglion cells, which become more susceptible to damage. Similar results were shown by Nurses' Health study by Pasquale LR⁹. It was further supported by Vajaranant TS, who explained that estrogen deficient states lead to accelerated aging of the optic nerve hence making it more prone to glaucomatous damage¹³. This effect was explained by another research, which proved that estrogen-deprived optic nerve becomes more susceptible to mechanical stress caused by high IOP¹⁴.

It is a known fact that age related thinning of RNFL occurs by approximately 0.2% or 0.2 μm per year^{15,16}. Estrogen deprived optic nerve undergoes early aging changes making the optic nerve more prone to glaucomatous damage. Increased IOP with OCP and decreased with endogenous estrogen can be explained by the different chemical structure of

endogenous hormones from the OCP. Further studies are needed to prove this.

Another possibility of increased IOP with OCP can be explained by the fact that OCP results in decrease in the levels of normal estrogen which is considered to have a protective effect in glaucoma. This was further supported by Bayard's work, according to which, the normal circadian rhythm of estrogen is lost with OCP. This results in a false effect of deficient estrogen state¹⁷.

Another explanation of increase in IOP with OCP could be the increase in central corneal thickness (CCT) with estrogen use¹⁸. According to one study, IOP was increased around ovulation after the estrogen peaks¹⁹. OCP may have the same effect on the CCT, which might have given false impression of raised IOP. However, aging of optic nerve is also proposed as a cause of increased incidence of glaucoma in post-menopausal women²⁰.

The strength and importance of our study is that we have considered short duration of OCP, which was not addressed in earlier research works. This can be considered a pilot study and more elaborative inquest with multivariate analysis including the effect of OCP on CCT, IOP, RNFL and visual fields needs to be done. Limitations of our study were that no particular composition of OCP was studied. Different results in different studies might be due to variety of salts and combinations used in OCP. We also did not take into account CCT, OCT and Retinal Nerve Fiber Layer thickness.

CONCLUSION

OCP significantly increase IOP even when used for short time period. Women who are prone to develop POAG because of positive family history, advancing age, diabetes, myopia and smoking should have baseline tests of glaucoma before commencing OCP. These tests should be followed up on regular basis at least after every six months.

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