Section: Optometry

Original Research Article

EFFECTS OF DIFFERENT YOGA BREATHING TECHNIQUES ON IOP

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ABSTRACT

Background: Glaucoma remains lead cause of blindness in worldwide. The modifiable risk factor is elevated intraocular pressure (IOP). While traditional medicine.is the standard of care, complementary practices like yoga and pranayama (breathing techniques) are being explored for their potential.to lower IOP through the modulation. This study aims to evaluate and compare the physiological impact of two specific breathing techniques on IOP in both healthy individuals: 1 Anulom Vilom (Alternate nostril breathing) 2 Adho Mukha Savansana (Head Down Position).

Materials and Methods: This research was an experimental and comparative analysis study of IOP measurements before and after the administration of these two yoga techniques. Participants will be categorized into two groups—anulom vilom pranyama and patients with adho mukha savansana—to establish safety profiles and quantify the pressure-lowering potential of each method.

Results: 120 participants were.enrolled in this study, 60 were Male and 60 were Female. Participants were equally divided into two groups 1. Anulom vilom pranayama n=60 2. Adho mukha svansana n=60.

Conclusion: This research seeks to provide evidence-based guidance for head-down positioning techniques rise IOP, alternate nostril breathing offering positive outcomes for reducing this effect into clinical glaucoma management. By establishing the safety and efficacy of these practices, the study will offer a non-invasive, cost-effective tool for individuals at risk of vision loss due to elevated ocular pressure.

Keywords: Autonomic Nervous System (ANS); Breathing Exercises (BE); Glaucoma; Intraocular Pressure (IOP); Yoga.

INTRODUCTION

Intraocular pressure is an important .key factor for normal functioning. of physiological eye health. It depends on aqueous humor production and trabecular meshwork drainage system. Normal IOP ranges 10-21mmHg if it is high cause glaucomatous optic nerve damage. Glaucoma is lead cause of blindness many people lose sight permanently. Usually treatment are topical medications, laser therapy and surgical process. Long-term medicines cause side-effects, patients don't take costly medicines regularly. Therefore cheap and non-pharmacological options are safe. Yoga is a non-pharmacological safe and less cost option to reduce IOP Breathing rate and Blood pressure. We choose one yoga position. and one yoga breathing technique to compare and analyze which one is better for glaucoma patients. This is a kind of breathing that includes the existence of one breath and the other (breathing in and breathing out); there is no breathing holding that is usually attributed to this type of breathing. It coincidentally is among the ways of synchronising the autopilot nervous system, and balancing the processes of cerebral. hemispheres (Stancak and Kuna, 1994; Telles et al., 2017).[1,2]

Yoga Poses (Asanas): It is worth pointing out that the researchers were eager to justify the fact that the action of the inverted poses (headstand, shoulder stand, forward bends) is much profound in the aid of IOP. Baskaran et al,[3] (2006) found that, healthy subjects were doubled twice in the IOP of Sirsasana (headstand) and the same was found when the

pressure. was reinstated to normalcy was achieved within two minutes when Sirsasana was substituted with the upright position. They also confirmed the four usual yoga postures, Jasien et al (2015) discovered that 60 seconds following the IOP had been raised in the glaucomatosis and normal eye position. It is also more safe in comparison with the patients with the glaucoma (Gallardo et al, 2006).[4,5]

Eye- exercise (Yoga): Gupta and Aparna (2019) have also determined that the IOP of the normative young adults in which the eye exercises were performed (palming, blinking, turning the eye and trataka exercises) had significantly. decreased (that is 16.93 +- 2.25 mmHg of right eye; p = 0.000). Even in the instance when the time interval of practising had been shifted between 5 and 10 minutes practising, these short-term effects could not be differing, as observed by Dimitrova and Tanceva (2017). The results were generalised to diabetics and glaucoma patients, and Ismail et al. (2021) found that the IOP dropped significantly, after the Jyoti Trataka.[6-8]

The breathing practices already has a variation of banks of IOP of various types. The breathing right nostril-left nostril too influenced the reduction of the IOP of the healthy members as Kulkarni et al. (2022) credited to the breathing left nostril yet the. impact was even stronger (0.6 +- 1.4 mmHg reduction). The additional nostril breathing also did not report anything in short term too and can be also compared to Paidimarri et al. (2021).[9,10]

In a transitory basis, Morya et al. (2023) have made the comparative evidence and detailed comparison of ten yoga postures. with reference to Kapalabhati, Anulom Vilom, and meditation lower the IOP but Sirshasana, Bhastrika and pranayama poses raise the IOP of the body. The result of one of the studies is that IOP was low because of yoga/meditation and no walking, biking, and resistance training (Gillmann et al., 2021).[11,12]

The study included three groups of people: a group of healthy subjects who did the breathing exercise, a group of glaucoma patients who also did the breathing exercise, and a group of healthy subjects who did not do any breathing exercise and acted as a control. The IOP was measured before the breathing, right after the breathing, and again after a short rest. The main question of Paidimarri and her colleagues was: Can a few minutes of alternate nostril breathing change the IOP immediately? The answer to this question is very important for eye doctors and yoga practitioners who want to know whether pranayama affects eye pressure in the short term and whether it is safe for patients with glaucoma.

Sankalp, Dada, Yadav et al. (2022), published in the International Journal of Yoga. This study was done at the All India Institute of Medical Sciences (AIIMS) in New Delhi, one of the most respected medical institutions in India. The researchers designed a yoga-based lifestyle intervention (YBLI) for glaucoma patients. The intervention included two specific yoga-related eye exercises: extraocular muscle exercises, which involve moving the eyes in different directions in a controlled way, and modified Tratak Kriya (mTK), which is a traditional yoga practice of steady and focused gazing at a single point or object.[13,14]

The patients were divided into two groups. The intervention group did the yoga-based exercises for four weeks in addition to their standard glaucoma medicines, while the control group continued only their standard medicines. The IOP, the level of stress, and the quality of life of both groups were measured before and after the four weeks. The main question of Sankalp and his colleagues was whether these eye-based yoga exercises could reduce IOP and improve the quality of life of glaucoma patients when added to their standard treatment. This trial is important because it used a clear and well-planned yoga program in a proper clinical setting at a top institution.

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Zhou, Fricke and Sabel (2024), published in the EPMA Journal. This is a very recent study from Germany that tested a new concept called eye yoga in patients with primary open-angle glaucoma (POAG). The eye yoga program was designed specifically for glaucoma patients and combined eye movement exercises, focused gazing, meditation, and mindfulness practices into a single daily session. The patients practiced eye yoga for one hour every day for one month at home, guided by an audio recording.

The study compared an eye yoga group and a control group that read relaxing books for the same amount of time each day. The main things measured included the IOP, the size of the small blood vessels in the retina, and the visual field of the patients. The visual field is the full area that the eye can see at one time and is one of the most important measures of

glaucoma damage. The article by Zhou and her colleagues is particularly important because it looked not only at IOP but also at blood vessel changes and vision, making it one of the most complete and recent studies on this topic.

It is a cross-sectional study by Nayyar, Suresh Kumar, Rehman, Ichhpujani and Singla (2022), published in the Indian Journal of Ophthalmology. This study was done in a tertiary care hospital in India and involved 122 participants, half of whom were healthy controls and half were diagnosed with moderate or severe primary open-angle glaucoma. The researchers used three different glaucoma-specific questionnaires, namely the Glaucoma Activity Limitation-9 (GAL-9), the Glaucoma Quality of Life-15 (GQL-15), and the Viswanathan questionnaire, to measure how much glaucoma was affecting the daily life and activities of the patients.

The aim of Nayyar and her colleagues was to understand exactly which daily activities and tasks were most affected by moderate and severe glaucoma, and to what degree. This article is relevant to the yoga and IOP topic because it provides important background on the burden of glaucoma on patients' lives. If yoga-based practices can help lower IOP and slow the disease, they can also indirectly protect the quality of life of these patients. Understanding the full impact of glaucoma on daily life also shows why it is so important to develop safe and effective complementary therapies like yoga.

The most recent article is a quasi-experimental study by El-Sayad, Fareed, Ibrahim and Taman (2025), published in the Egyptian Journal of Health Care. This study was done in Alramad Hospital in Shebin Elkom, Menoufia Governorate, Egypt. The study recruited 64 adult patients with glaucoma and divided them into a study group that practiced alternate nostril breathing exercises and a control group that did not. The researchers used a range of instruments including physiological measurement tools, an anxiety questionnaire, and a glaucoma-specific quality of life questionnaire.The main aim of El-Sayad and her team was to find out what effect alternate nostril breathing has on the autonomic function, the IOP, and the quality of life of patients with glaucoma. This is one of the most recent and most directly relevant studies in this thesis, because it tests a specific and widely practiced pranayama technique in actual glaucoma patients and measures its effect on the eye pressure and autonomic function together. It also adds a quality of life dimension to the outcome measures, making it a comprehensive and clinically valuable study.

MATERIALS AND METHODS

The 4-Months experimental and analytical study was conducted at YOGA center in Multan. There are 120 participants in this research. Participants live in both rural and urban areas. The sample size was determined based on the research objectives and need for a representive sample. A sample size of 120 yoga participants give authentic data between Anuloma Viloma Paranyama and Adho Mukha savansana. Sample size calculated with this formula $n = [2\times (Z\alpha + Z\beta)^2 \times SD^2] / d^2$

Data analysis procedure: SPSS version 26.0 was used for statistical analysis. Frequencies, percentages, descriptive statistics, Crosstab were applied.

RESULTS

[Table 1] shows the descriptive statistics for age in 120 participants. The mean statistic age was 2.15 with a standard deviation of .741.

Table 1: Descriptive statistics for age

N	Valid	120
	Missing	0
Mean		2.15
Std. Deviation		.741

Table 2: Gender distribution of 120 participants

Gender distribution					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Male	60	50.0	50.0	50.0
	Female	60	50.0	50.0	100.0
	Total	120	100.0	100.0	

[Table 2] shows the frequency of 120 participants, 60 were female participants and 60 were male participants included in this study.

Table 3: Frequency of yoga breathing participants

Yoga breathing techniques					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Anulom	60	50.0	50.0	50.0
	Adho mukha	60	50.0	50.0	100.0
	Total	120	100.0	100.0	

[Table 3] shows the frequency of 120 participants, 60 were Anulom vilom participants and 60 were Adho mukha participant

Table 4: Cross tabulation for Breathing Rate Pre intervention by Yoga techniques

Count				
		Breathing rate pre		Total
		11-15	16-20	
Yoga breathing techniques	Anulom	17	43	60
	Adho mukha	14	46	60
Total		31	89	120

This [Table 4] shows the detail of participant Pre-breathing range who use anulom and adho mukha yoga techniques. 120 participants, 60 participants use anulom vilom techniques with different breathing ranges 11-15 participants are 17 other 16-20 range participants are 43. Other 60 participants use adho mukha yoga technique different breathing ranges 11-15 participants are 14 other16-20 participants are 46. This [Table 5] shows the detail of participant Post-breathing range who use anulom and adho mukha yoga techniques. 120 participants, 60 participants use anulom vilom techniques with different breathing ranges 8-10 participants are 32, 11-15 participants are 26, other 16-20 range participants are 2. Other 60participants use adho mukha yoga technique different breathing ranges 8-10 participants are 17 other 11-15 participants are 43 and 16-20 participants are 0.

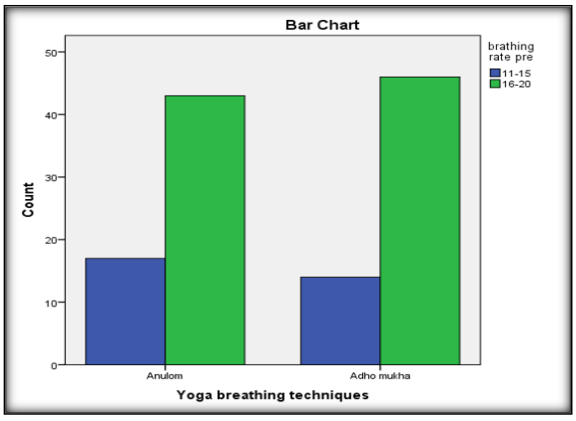

Figure 1: Clustered Bar chart for Yoga techniques, showing Pre Breathing Rate differences in Anulom vilom pranayama and Adho mukha svansana.

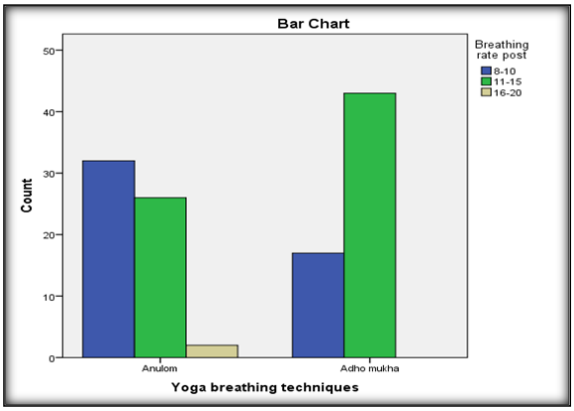

Figure 2: Clustered Bar chart for Yoga techniques, showing Post Breathing Rate differences in Anulom vilom pranayama and Adho mukha svansana

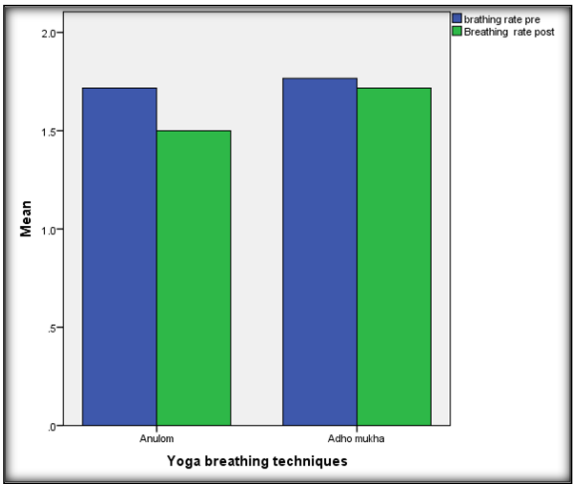

Figure 3: Clustered Bar chart for Yoga techniques, showing Pre-Post Breathing Rate differences in Anulom vilom pranayama and Adho mukha svansana.

Table 5: Cross tabulation for Breathing Rate Post intervention by Yoga techniques

Count					
		Breathing rate post			Total
		8-10	11-15	16-20	
Yoga breathing techniques	Anulom	32	26	2	60
	Adho mukha	17	43	0	60
Total		49	69	2	120

Table 6: Cross tabulation for Intraocular Pressure Pre intervention by Yoga techniques

Count				
		Pre IOP in right and left eye		Total
		11-14	15-20	
Yoga breathing techniques	Anulom	8	52	60
	Adho mukha	11	49	60
Total		19	101	120

This [Table 6] shows the detail of participant Pre-intraocular pressure who use anulom and adho mukha yoga techniques. Total of 120 participants, 60 participants use anulom vilom techniques with different IOP 11-14 participants are 8 other 15-20 participants are 52.
Other 60 participants use adho mukha yoga technique with different IOP 11-14 participants are 11 other15-20 participants are 49.

Table 7: Cross tabulation for Intraocular Pressure Post intervention by Yoga techniques

Count						
		Post IOP in right and left eye				Total
		8-10	11-15	16-20	21-25	
Yoga breathing techniques	Anulom	37	23	0	0	60
	Adho mukha	0	1	12	47	60
Total		37	24	12	47	120

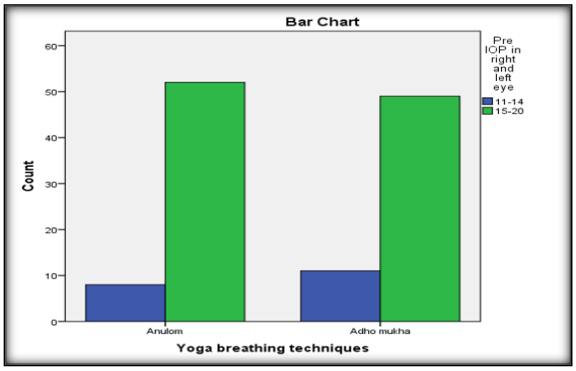

Figure 4: Clustered Bar chart for Yoga techniques, showing Pre Intraocular pressure differences in Anulom vilom. pranayama and Adho mukha svansana.

[Table 7] shows the detail of participant Post-intraocular pressure who use anulom and adho mukha yoga techniques. Total of 120 participants, 60 participants use anulom vilom techniques with different IOP 8-10 participants are 37, and 11-15 participants are 23.

Other 60 participants. Use adho mukha yoga technique with different IOP 11-15 participants are 1,16-20 participants are 12, other 21-25 participants are 47.

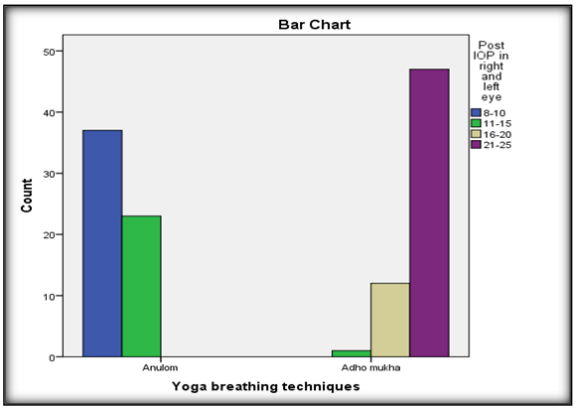

Figure 5: Clustered Bar chart for Yoga techniques, showing Post Intraocular pressure differences in Anulom vilom. pranayama and Adho mukha svansana.

Table 8: descriptive statistics for recovery time

Statistics		
N	Valid	120
	Missing	0
Std. Deviation		.793

[Table 8] shows. the descriptive statistics for recovery time in 120 participants. The standard deviation was .793

Table 9: descriptive statistics for recovery time

Recovery time					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	60	50.0	50.0	50.0
	1-6 min	35	29.2	29.2	79.2
	7-10 min	25	20.8	20.8	100.0
	Total	120	100.0	100.0	

[Table 8] Shows the detail of recovery time in anulom and adho mukha yoga techniques. Total of 120 participants, 60 participants in Anulom vilom show 50% recovery time other 60 participants ranges 1-6 minutes show 29.2%, 7-10minutes show 20.8%

DISCUSSION

This was an Experimental and Analytical study at Yoga center Multan, Pakistan to analyze and compare the effects of two yoga breathing techniques on Intraocular pressure. and Breathing rate. We recurited 120 participants were.enrolled in this study, 60 were Male and 60 were Female. Participants were equally divided into two groups 1. Anulom vilom pranayama n=60 2. Adho mukha svansana n=60. Starting from the time the study's description was approved. Participants enrolled with no ocular surgery, previous medication. and hypertension. They are willing to participate and follow Yoga-instructions. 18-45y participants showed different variations in Pre-Post yoga intervention. Pre and

Post-Yoga measurements. showed improvement after performing Anulom Vilom Pranyama. The mean breathing rate was decreased after the session, showing. improved and control relaxation responses. The mean IOP decreased as compared to baseline IOP. Intraocular pressure was recorded through a non-invasive Air puff tonometer and Breathing rate was detected by stethoscope This suggest that safe and beneficial to activate the parasympathetic nervous system which helps in lowering IOP Other Participants perform Adho mukha svansana showed different responses, the mean breathing rate was slightly decreased 2-5% per minute. IOP increased after the yoga session as compared to baseline IOP this increase is due to the head-down position which temporarily raise episcleral venous pressure and ocular blood flow in 2022, Kulkarni and colleagues carried out a study to examine how different nasal breathing methods, also called paranyama techniques, can effect iop in healthy people. Each participants practiced the assigned breathing activity for almost five minutes.All data was analyzed using IBM SPSS software 26.0. version all Mean and Standard deviation were calculated for pre-post yoga intervention measurement.

CONCLUSION

The current study. provides strong evidence that different yoga breathing techniques have different effect on intraocular pressure and. Breathing rate. The findings shows the Anulom Vilom Pranyama is safe for eye-health. because it reduce both IOP and BR. The findings of this study have important. suggestions for yoga instructor and people who practice yoga. The importance. of choosing the perfect yoga techniques, especially for people who have eye problems or at risk of glaucoma. People should avoid head-down position like Adho Mukha svansana if they have glaucoma. Because it slightly reduce breathing rate but high increase intraocular pressure due to episcleral venous drainage.

Recommendations

- Opthalmologist. have a chance to recommend. save position of yoga to control IOP.
- Ocular high blood pressure .and early glaucoma treats through specific breathing exercise like Anulom Vilom Pranyama,
- To risk of glaucoma., pateint should strictly avoid inverted pose. like Adho Mukha svansana.
- Conduct awareness sessions. in eye clinics about lifestyle modification for IOP control.

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