



A Pilot Randomized Comparative Study of Short-Term Response to Yoga and Diet Intervention on Myopia among College Students

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| ARTICLE INFO | ABSTRACT |
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| <i>Article type:</i> Short Communication | Introduction: Uncorrected refractive error is the leading cause of vision impairment in India. Myopia is a common refractive error that can also be defined by a spherical equivalent (SE) ≤ -0.5 dioptre (D). To explore the combined effect of Yogic eye exercise and Diet compared with Yogic eye exercise in the management of myopia. |
| <i>Article History:</i> Received: 06 Oct 2022 Accepted: 10 Dec 2022 Published: 20 Dec 2022 | Method: In a comparative study, 28 students diagnosed with myopia were randomly assigned into two groups. Group A received a naturopathic diet protocol and Yoga eye exercises, and Group B received Yogic eye exercises. Improvement in myopia was assessed as the mean change in refractive error - Spherical equivalent (SE) from baseline. |
| <i>Keywords:</i> Myopia Refractive errors Diet Yoga Nutrition | Result: The mean SE values were reduced post-intervention in both groups. Within-group comparison of SE pre- and post-intervention showed a significant reduction in SE measures in Yoga and diet (Group A) for the right and left eyes at 95% CI with a p-value of 0.003 and 0.01 respectively. There were no significant changes in SE values in the Yoga-only group. When compared between groups, no statistically significant changes were observed in SE. Conclusion: The group that followed the diet combined with Yoga showed better improvement in pre- and post-assessments for both eyes. But when compared between the two groups there were no statistically significant changes in SE. Yogic eye exercise proved beneficial in both groups, but the results are better when combined with diet. The findings need to be verified further by conducting a large-scale placebo-controlled clinical trial with a wider population base on diverse age groups. |

► Please cite this paper as:

Panneerselvam NK, Leela TK, Ravi J, Ravi DV. A Pilot Randomized Comparative Study of Short-Term Response to Yoga and Diet Intervention on Myopia among College Students. *J Nutr Fast Health*. 2022; 10(4): 271-275. DOI: 10.22038/JNFH.2022.68306.1406.

Introduction

Uncorrected refractive error is the leading cause of vision impairment in developing countries, including India (1). Myopia, also known as short-sightedness or near-sightedness is a common refractive error caused due to excessive elongation of the eye which makes light focus in front of the retina instead of focusing on the retina, making the far-away objects look blurry (2). Short-sightedness can also be defined as spherical equivalent (SE) ≤ -0.5 dioptres (D). A systematic review by Sheeladevi et al, 2019 found that the prevalence of refractive error of at least (0.50 D of spherical equivalent) ametropia was 53.1%, of which myopia and hyperopia were 27.7% and 22.9%, respectively in India (3). A meta-analysis by Agarwal et al. 2020 showed that the trend of myopia prevalence in India over the

last four decades is increasing (4). Myopia is a complex multifactorial disorder regulated by interactions between genetics and the environment or lifestyle. But the rise in myopia prevalence is possibly related to environmental factors. The modern lifestyle and high visual demands that include long periods spent on online education and other near-work activities are considered the critical causative factors (5,6). Longer smartphone use increases the likelihood of ocular and visual symptoms like blurring of vision, dry eye, myopia, and ocular surface disease, particularly in children. (7,8). Refractive correction can be performed using prescription glasses, contact lenses, and surgery (9,10). Yoga practice is considered a potential application in those occupations requiring good visual perceptual sensitivity and it reduces ocular

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symptoms, visual strain, and discomfort (11,12). Studies have proven that regular yogic eye exercise has objective as well as subjective improvement in refractive errors. (13,14). Various researchers have proven that adherence to a healthy diet rich in micronutrients like vitamins, carotenoids, trace metals, and omega-3 fatty acids offers a valuable intervention against ocular diseases such as dry eye disorders, myopia progression, cataracts, glaucoma, diabetic retinopathy, or age related macular degeneration (15). Studies have shown that diet and Trataka (yogic eye exercise) individually have a beneficial effect on refractive errors but there is a lack of experimental studies on whether the combination of diet and Yogic eye exercises can be more effective than Yogic eye exercises alone in the management of refractive errors. Hence this study evaluates the combined effect of Naturopathic Diet & Yogic eye exercise compared with yogic eye exercise on myopia among College Students. We hypothesize that naturopathic diet and eye exercises are more effective than yogic eye exercise on myopia management.

Methods and Materials

Study design

A comparative study was conducted with 28 students who were already diagnosed with

myopia within 5 previous years. Using a simple random sampling technique, all 28 students were randomly assigned to two groups 14 in each group. Group 'A' naturopathic diet and yoga therapy protocol were followed and Group 'B' followed only the yoga therapy protocol.

Inclusion and Exclusion

Participants taking medication for any diseases, or having undergone any surgery, including laser vision correction, within the last 5 years were excluded from the study. Since all participants included in this study were practicing general yoga as a part of their curriculum, none of the participants were exposed to the study protocol in both group and were matched for previous yoga exposure.

Assessment

After receiving informed consent, all the participants were assessed by an optometrist at the baseline for visual acuity, and diopter power was tested using Sennelln's Chart. The same procedure was repeated on the 30th day from baseline. Improvement in myopia was assessed as the mean change in Spherical Equivalent (SE) from the baseline. The SE is calculated using (spherical power plus 1/2 cylindrical power) (16).

Table 1. Diet protocol

| Day | 7:30 Pm | 8.30pm | 11.30pm | 1.00pm | 3.30pm | 6.00pm | 8.00pm | 9.00 Pm |
|------------------|-----------|----------|---------|--------|--------|--------|--------|-----------|
| Monday | BMJ | Raw diet | LHJ | MMJ | GJ | Soup | Fruits | Decoction |
| Tuesday | AGJ | Raw diet | LGJ | CJ | LJJ | Soup | Fruits | Decoction |
| Wednesday | Decoction | Raw diet | LMJ | B | GMJ | soup | Fruits | Decoction |
| Thursday | BGJ | Raw diet | LHJ | BCS | LGJ | Soup | Fruits | Decoction |
| Friday | AJ | Raw diet | LJJ | PS | MB | Soup | Fruits | Decoction |
| Saturday | AGJ | Raw diet | LGJ | MMJ | GJ | Soup | Fruits | Decoction |
| Sunday | Decoction | Raw diet | LJJ | WMJ | LHJ | Soup | Fruits | Decoction |

BMJ- Bermuda grass juice; **Raw diet**- green gram/ ground nut / Alfa alfa/ Pearl millet / Black chana sprouts + Raw vegetables (carrot, beetroot, onion, tomato, cucumber) + fruits (orange, pomegranate, guava, grapes, banana) + Dates+ grated coconut; **LHJ**- Lemon Honey Juice; **MMJ**- Muskmelon juice; **GJ**- Gooseberry Juice; **Soup**- Moringa Leaves (Clear)/ Pumpkin/ Amaranth / Cherry tomato / Carrot (Clear) / Tomato; Fruit bowl- Papaya+ Muskmelon+ Orange/ Papaya+ Grapes+ Guava/ Pineapple+ Pomegranate+ Orange/ Papaya+ Muskmelon+ Guava/ Watermelon+ Grapes+ Pomegranate; **Decoction**- Licorice Water/ Ginger Water/ Tulasi Water/ Coriander Water; **AGJ**- Ashgourd Juice; **LGJ**- Lemon Ginger Juice; **CJ**- Carrot Juice; **LJJ**- Lemon Jaggery Juice; **LMJ**- Lemon Mint Juice; **B**-Buttermilk; **GMJ**- Gooseberry Mint Juice; **BGJ**- Bottleboard Juice; **BCS**- Beetroot Carrot Smoothie; **LGJ**- Lemon Gooseberry Juice; **AJ**- Aloe vera Juice; **PS**- Papaya Smoothie; **MB**- Mint Buttermilk; **WMJ**- Watermelon Juice
Juice - 250ml; Raw vegetables & fruits- 400g; Decoction - 100ml

Intervention

Naturopathic diet protocol and yoga protocol for myopia was developed by the naturopathy experts. The protocol was reviewed and redesigned after taking the expert opinion. In Group 'A' students followed the naturopathic diet, which is a sattvic diet containing raw fruits and vegetables, juices, and veg soups (Table 1.),

and Yoga Protocol for 21 days (Table 2). Group 'B' students followed only the Yoga protocol for 21 days and had their routine food. (Table- 2). The naturopathic diet protocol includes raw fruits and vegetables, and juices, which are considered eliminative and soothing diets according to the naturopathy philosophy. The yoga protocol includes barefoot walking in grass,

eyewash using Triphala-soaked water, Jala neti (nasal irrigation using saline water), and Sutra Neti (passing a rubber catheter through the nose

and taking it via mouth as a means of clearing the nasal passage).

Table 2. Daily Yoga protocol

| Time | Yoga | Procedure | Duration | Repetition |
|-----------------|--------------|--------------------------------------|----------|--|
| 5.30 to 5.45 AM | | Bare Foot Walking | 15 mins | NA |
| 5:45 to 6.30 AM | Eye wash | Eyewash with Triphala soaked water | 5 mins | 2 times in each eye using an eyewash cup |
| | Jala Neti* | Saline nasal irrigation | 10 mins | 2 times in each nostril using Jala Neti pot |
| 6.45 to 7.00 AM | Sutra Neti** | Using rubber catheter | 10 mins | 2 times in each nostril |
| 7.30 to 8.00 AM | Sungazing | Early morning sun gazing and palming | 2 mins | 30 seconds gazing and 30 seconds break for 2 times |

*The tear ducts, which connect from the eyes to the nasal passage, get the same drawing out effect as the sinuses, resulting in a brighter, clearer sense of vision.

**Sutra-Neti. passing a rubber catheter through the nose and out of the mouth as a means of clearing the airway.

Ethics

Ethical clearance was approved by the Institutional Ethics committee and written informed consent was obtained from all the students participants before the study.

Data analysis

The data were analysed using IBM SPSS 20, the mean and variance of spherical equivalent were computed and the paired t-test was computed to find any statistically significant changes before and after intervention among the groups.

Results

The average age of the students was 22.4 years in Group A and 22.3 years in Group B. In Group A, all the participants were girls and in Group B, there were 3 boys and 11 girls. All the participants in both groups completed the 21-day intervention. The average SE values were computed and were reduced post-intervention in both groups. Following the normality test, since both the groups followed the normal distribution, paired t-test for SE was computed for both groups pre-and post-intervention. A significant reduction in SE measures was found in Group A for the right eye (p=.003) and the left

eye showed a reduction but not significant at 95% CI (p= 0.12). There were no statistically significant changes in SE values in Group B which followed only Yoga Protocol. For comparing the SE measure between the Group, A, and B, an independent sample t-test was used to assess the changes between group A and Group B pre-and post-intervention. The results suggested that changes in SE measure were not statistically significant compared between the two groups Table 3. Additionally, a paired-samples t-test was conducted to compare weight of the participants in group A before and after intervention. There was a highly statistically significant difference in the weight was observed before (M=60.84 kgs, SD=11.71) and after intervention (M= 57.94 kgs, SD= 10.73); t (13) = 8.2006, p = 0.001. Similarly, A paired-samples t-test was conducted to compare weight of the participants in group B before and after intervention with a statistically significant difference in the weight was observed before (M=54.65 kgs, SD=8.06) and after intervention (M= 53.71 kgs, SD= 7.37); t (13) = 2.5291, p = 0.025, but compared to group A lesser weight reduction has been observed in group B.

Table 3. Paired sample t-test of SE pre- and post-intervention for both eyes between groups

| Groups | Pre- and post-intervention* | Mean | Std. Deviation | t | Sig. (2-tailed) |
|-------------------------|-----------------------------|-------|----------------|-------|-----------------|
| Yoga and diet (Group A) | Right eye | .3839 | .4506 | 3.188 | .007 |
| | Left eye | .2232 | .4604 | 1.814 | .093 |
| Yoga (Group B) | Right eye | .0446 | .7462 | .224 | .826 |
| | Left eye | .0268 | .5637 | .178 | .862 |

Spherical equivalent= SE. *Paired sample t-test (p<0.05)

Discussion

As eyes are the most important sensory organs, this study was selected to find an effective line of

treatment for myopia through modifications in the lifestyle by incorporating healthy diet and daily practice of yoga. It was projected that the prevalence of myopia will increase by 10.53% in

the next 3 decades (2020 to 2050) across all ages (17). The average age of the participants selected for this study was 22.3 years who are of developmental age, as myopia is considered a more or less developmental anomaly. This study evaluated the combined effect Naturopathic Diet & Yogic eye exercise compared with only yogic eye exercise on myopia among College Students. Two groups of students with refractive errors participated in this study for 21 days, with one group following naturopathic diet along with yoga therapy (Group A) and another group practicing only yoga therapy (Group B). Over all we observed that the effect of intervention in both groups showed a minimal change in the spherical equivalent. Previous studies have stated that different eye exercises, including yogic kriyas elicited a greater effect on a refractive error by strengthening accommodation, which is the power of changing the focus of eyes for vision, and diet can be crucial in the prevention of myopia (12–15,18). Though both the group showed improvement in SE post-intervention, Group A showed a more statistically significant difference than group B, eliciting that diet and yoga showed better improvement on myopia than practicing Yoga alone. A study by Tiwari et al. on the effect of Bates eye exercise therapy vs. Trataka Yoga Kriya found a minimal reduction in eye power, which was attributed to the stress relief phenomenon of yoga, similarly the participant in this study who practiced Yogic eye exercise also observed the reduction in SE might be attributed to the same phenomenon. The mode of action of Trataka along with diet might be attributed to the ability of eye exercise on asthenopic features and also the low calorific diet respectively (14). A statistically significant difference was obtained in the right and left eye of Group A i.e., the Yoga and diet group who had an intake of a low-calorie diet, consisting of uncooked vegetables and fruits showed a statistically significant change only in both eyes. Though many studies found there was no direct association between nutrient intake and refractive errors, high carbohydrate intake is associated with myopia (19). The reduction in SE in group A might be associated with a low-calorie diet, further studies are warranted in this area. The limitations of the study include smaller sample size, short interventional protocol duration, and the controlled environment of the participants, the application of the intervention

to patients warrants further large-scale studies applied to the wider population diagnosed with myopia. This study did not follow-up the participants to find the long-term benefits of the interventions. We used only SE as the parameter for measuring the effect, other parameters can be used along while capturing the subjective changes among the participants in further studies.

Conclusion

The results from this study can be inferred has, the group that followed the diet combined with yogic eye exercise protocol showed better improvement in pre- and post-assessment in both eyes. When compared between the two groups there were no statistically significant changes in SE, from this finding we can infer that yogic eye exercises can be beneficial for myopia but when combined with a naturopathic diet the results are even better. The diet and yoga protocol had significant impact on weight of the participants pre and post intervention. The findings need to be verified further by conducting a large-scale placebo-controlled clinical trial.

Acknowledgement

I want to thank JSS Institute of Naturopathy and Yogic Sciences, and JSS Management for providing the required support to carry this research study.

Conflicts of Interest

The authors of this study wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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