

Effect of Ascorbic Acid Enriched Drink on Intraocular Pressure among Weightlifters

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Abstract

Purpose: To find the effect of ascorbic acid on Intra-ocular pressure (IOP) among weightlifters before and during exercise. And after intake of ascorbic acid enriched drink.

Methods: This comparative cross-sectional study was conducted from November 2019 to May 2020 at Fitness Centers of Pakistan (Be fit gym, Al-fahad gym, Smarts health and fitness club, Golds gym). 90 males were included from age 18 to 35 years by purposive sampling. Group 1: Control group of 30 weightlifters. Group 2: Further divided into 2 sub-groups Case I 500 mg/250 mL and Case II 400 mg/250 mL (30 in each). In Case I we have given High concentration of ascorbic acid enriched drink (500 mg/250 mL) to 30 weightlifters. In Case II we have taken Low concentration of ascorbic acid enriched drink (400 mg/250 mL) to 30 weightlifters. The data was collected by self-designed performa. Data were analysed by using Paired t-test and Repeated measure ANOUVA test using latest version SPSS software.

Results: IOP was found significantly increased ($P = 0.000$) during exercise with the average mean \pm S.D of 21.866 ± 0.9732 and significantly reduced ($P = 0.002$) after 5 minutes of having ascorbic acid enriched drink with the average mean of 13.60 ± 1.734 and is seen more promising in younger group (20 - 25 years). IOP was again assessed after 6 hours of intake of drink and still had stable results with the average mean of 20.80 ± 0.925 .

Conclusion: There was significant difference of IOP measured during exercise and after intake of ascorbic acid enriched drink. The result concluded that IOP got reduced after intake of ascorbic acid enriched drink.

Keywords: Ascorbic Acid; Intraocular Pressure; Weightlifters

Introduction

Intraocular pressure (IOP) is a fluid inside the eye. It is a pressure created by continual renewal of fluids within the eye. IOP is an important aspect in the evaluation of those who are at the risk of glaucoma [1].

The fluid is produced by aqueous humour and its drainage is from trabecular meshwork. IOP is measurement of a force apply by Aqueous humour on the outer surface of eye. The eye has a jelly-like substance known as vitreous humor that fills most of the part of eye. The watery liquid is known as aqueous humor. In healthy eye equal quantity of Aqueous humour is entering and clearing out of the eye. The Aqueous humour pass out through drainage angle, in front of the iris. This equal flow maintains a stable pressure [1].

IOP is measured in millimetres of mercury. Normal IOP is usually 10 and 20 mmHg. The normal range of IOP is maintained throughout lives but there is some diurnal and seasonal variations [2].

Variation in pressure of during the whole day is called diurnal fluctuation. As tissue hardens with age, eye pressure increases slowly. For healthy eyes the IOP is elevated in the early morning from 6 am and 8 am, during clinic hours between 9 am to 6 pm. And minimum IOP occurred at midnight 3 am. This daily variation is a hormonal outcome on the eye. IOP increases slowly with age because tissues become hard that cause an higher resistance to the passing out of fluid out of the eye. In glaucoma higher variation in IOP take place during the day and throughout the year [3].

Low IOP is generally ranges from 8 mmHg - 5 mmHg. People get lower IOP due to a leak in the eye after any ocular surgery. In general eye can see fine but the symptoms of blurred vision may occur. When the IOP is lower than eye can tolerate it [4].

Elevated IOP is the main reason of glaucoma and treatment involves IOP reduction. It is important to know that IOP fluctuation reflects a short-term within hours or days or long-term variability occurring between months or even years [5].

The factor plays an important role in increase of eye pressure are Mydriasis, Blocked drainage, Anti-inflammatory drugs, Decreased flow of blood to optic nerve, Elevated BP [6].

Ocular hypertension is an elevated eye pressure (higher than 21 mmHg) associated with no other symptoms. Sometime IOP can be increased due to stress. IOP can be increased due to the emotional state of the person [7].

Emotional stress can affect IOP in patient with glaucoma however IOP was controlled with topical medications. But during emotional stress duration IOP was increased though using topical medications [8].

There are some people who can have high ocular pressure with no damage to vision and there are some people which may lose vision even if their eye pressure is in normal range. The raised IOP is the main problem and pathology of Glaucoma. Intraocular pressure is related to loss of ganglionic cells but others factors also plays a role (Robert,2014).

BP and IOP has a positive relationship with each other. Increased blood pressure can also cause an increase in IOP. It is estimated that there should be an increase of 10 mmHg in blood pressure then IOP increases by 0.26 mmHg. High blood pressure can also cause hypertensive retinopathy by damaging retina and retinal circulation. It also increases the risk of heart disease and stroke [9].

Posture affects eye pressure the most. It is higher in lying position then in sitting position. Once IOP raised in lying position, it remains at that level until this position is maintained and does not fluctuate. And in the sitting position the IOP returns to the normal limit. Secondly intake of excessive water cause IOP to increase [10].

The exercises that increase intra-ocular pressure included Leg press, Bench press, Seated rows, Stomach crunches.

The intra-ocular pressure is evaluated during weightlifting. The important mechanism for IOP elevation includes Valsalva manoeuvre occurs due to closure of glottis and it is associated with expiratory effort and it Increases in intra thoracic venous pressure which is then transmitted to jugular, orbital vertex vein and then to Choroid [11].

When we want to evaluate a healthy eye ocular pressure, it is very important to be measured. The test that may be performed in evaluation IOP are Visual Field testing, Gonioscopy, Pachymetry, Evaluation of optic nerve head and Tonometry [12].

The vitamins and nutrients help in lowering IOP by taking them in foods, drink form or in supplements. Vitamin C is a necessary supplement that is mostly present in fruits and vegetables. Ascorbic acid is a potent reducing and antioxidant agent that functions in fighting bacterial infections, in detoxifying reactions. Human body needs ascorbic acid in the formation of collagen in fibrous tissue, teeth, bones, connective tissue, skin, and capillaries [13].

There are some factors that contribute in the reduction of Intraocular pressure are Eat a healthy diet, Limit your caffeine, Sleep with your head elevated, Take prescribed medicines [14-16].

Methods

A comparative cross-sectional study was conducted in Al-fahad gym and Smarts gym on 90 males with ages ranging from 20 - 35 years. This study was conducted from November 2019 to May 2020. Informed consent was taken from all the individuals. Subjects with no ocular pathology, disorder and systemic disease were included in the study. Comparative convenient sampling technique was used.

We have taken 90 weightlifters. And we have divided them into 2 groups.

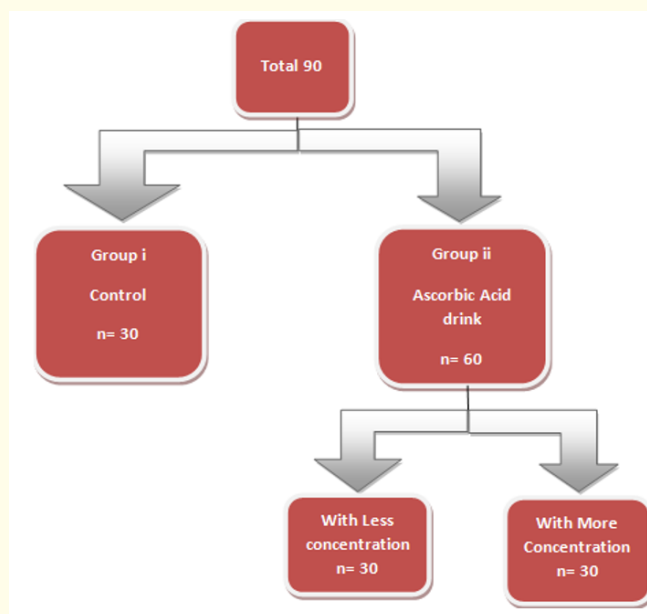


Figure A

Group 1 (Control Group): Control group of 30 weightlifters. Group 2: Further divided into 2 sub-groups Case I 500 mg/250 mL and Case II 400 mg/250 mL (30 in each). In Case I we have given High concentration of ascorbic acid enriched drink (500 mg/250 mL) to 30 weightlifters. In Case II we have taken Low concentration of ascorbic acid enriched drink (400 mg/250 mL) to 30 weightlifters.

Instruments that we used are Perkin's Tonometer, Alcaine 0.5% 15 ML eye drops, Antibiotics Eye Drops (Obradex), Fluorescein strips (Fluoro Touch Fluorescein Ophthalmic Strip Diagnostic 300 strips Box), Ascorbic Acid Drink (Orange Juice), Alcohol Swabs.

In group I First we instilled alkane drops and then apply fluorescein strip. Then we measured IOP before exercise. Then we let the weightlifter to do exercise for 15 - 30 minutes. Then we measured variation of IOP during exercise. Then IOP measured again immediately after exercise. And then we measured IOP after 6 hours of exercise. And the mean value of IOP in all the situation is taken and noted.

In group II First we instilled alkane drops and then apply fluorescein strip. Then we measured IOP before exercise. Then we let the weightlifter to do exercise for 15 - 30 minutes. Then we measured variation of IOP during exercise. Then IOP measured again immediately after exercise. Then after exercise we let the weightlifter to intake different concentrations of ascorbic acid enriched drink (500 mg/250 mL and 400 mg/250 mL). IOP measured again after 1 minute of intake of drink. And after 6 hours of intake of drink IOP was measured again. And the mean value of IOP in all the situation is taken and noted.

Results

The study included one hundred eighty eyes of 90 patients with ages ranging between 18 - 35 years (mean 25.23). Ninety subjects were male (N = 90) with the mean age of 25 years. On basis of our criteria these 90 males were divided into 2 groups. 30 in each group. Group 1 was the control group in which we just measured IOP before exercise, during exercise, after exercise and after 6 hours of exercise. Group 2 was subdivided into 2 groups the case I group in which we have given Ascorbic acid enriched drink with high concentration of ascorbic acid i.e. 500 mg/250 mL concentration and then measured IOP before exercise, during exercise, after exercise, after intake of drink and after 6 hours of intake of drink. Case II group in which we have given Ascorbic acid enriched drink with low concentration of ascorbic acid i.e. 400 mg/250 mL and then measured IOP before exercise, during exercise, after exercise, after intake of drink and after 6 hours of intake of drink.

Results were analysed by Paired t-test and Repeated measure ANOUVA test.

The variation of mean and standard deviation of IOP:

- IOP before exercise was 13.80 ± 2.091 .
- IOP during exercise was 22.83 ± 1.464 .
- IOP after exercise was 21.43 ± 1.251 .
- IOP after 6 hours of exercise was 20.80 ± 0.925 .

The highest mean value of IOP was during exercise in control group.

It means that IOP reduced after intake of ascorbic acid enriched drink I case I and case I results are highly significant because IOP reduced after intake of ascorbic acid enriched drink in different concentration (500 mg/250 mL and 400 mg/250 mL), When it was compared with the IOP during exercise. And P value was < 0.005 so results are significant according to this.

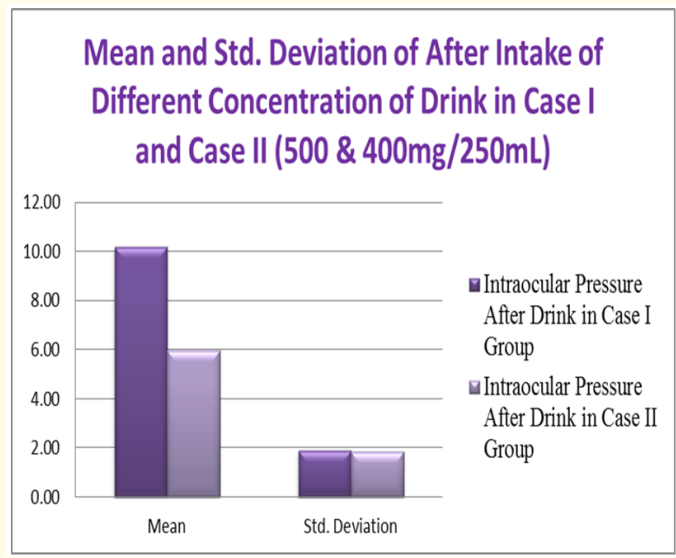


Figure 1: Shows graphical representation of change in IOP among weightlifters in case I with 500 mg/250 mL and case II with 400 mg/250 mL after intake of drink. IOP had markedly decreased in case II after intake of low concentration of ascorbic acid enriched drink then case I. And P value was < 0.005 so results are significant according to this.

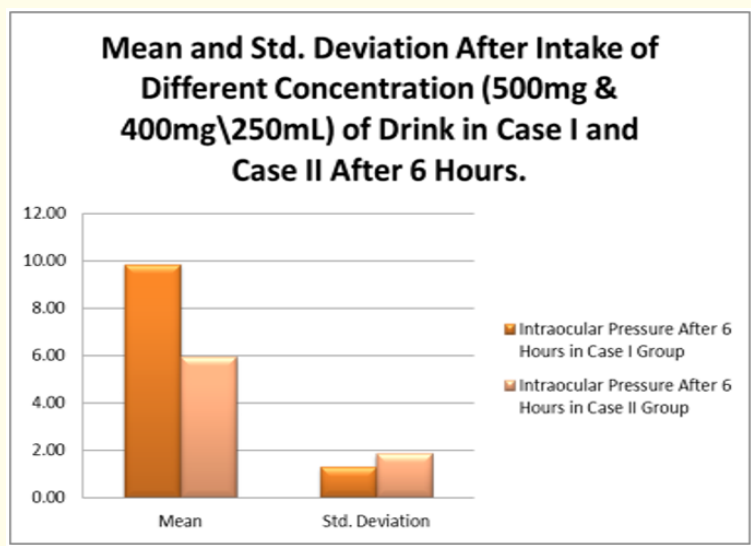


Figure 2: Shows graphical representation of change in IOP among weightlifters in case I with 500 mg/250 mL and case II with 400 mg/250 mL after 6 hours of intake of drink. IOP had markedly decreased in case II after 6 hours of intake of low concentration of ascorbic acid enriched drink then case I. And P value was < 0.005 so results are significant according to this.

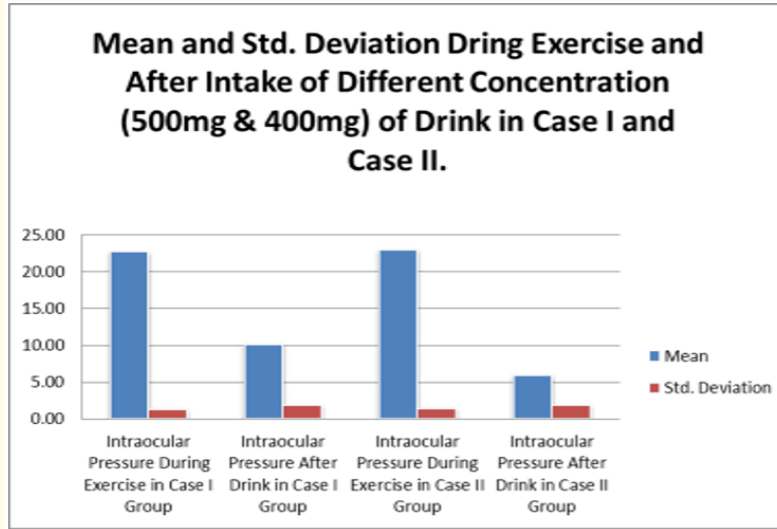


Figure 3: Shows graphical representation of change in IOP among weightlifters in case I with 500 mg/250 mL and case II with 400 mg/250 mL during and after intake of drink. IOP had markedly increased during exercise in both cases. And IOP had markedly decreased in case II after intake of low concentration of ascorbic acid enriched drink then case I. And P value was < 0.005 so results are significant according to this.

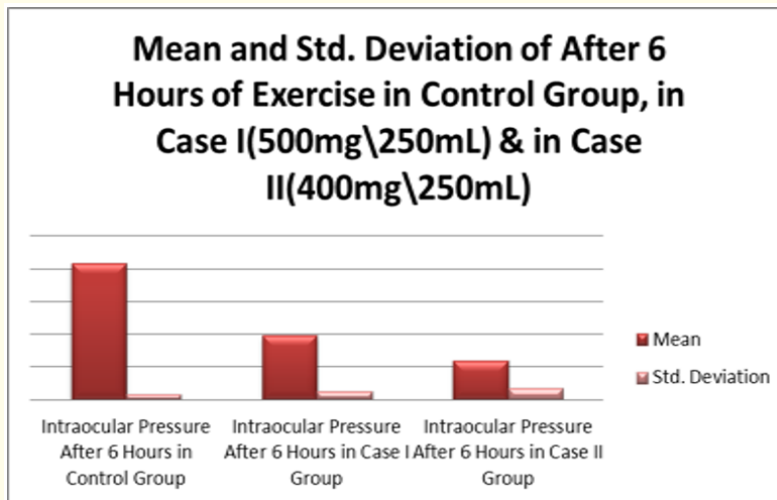


Figure 4: Shows graphical representation of change in IOP among weightlifters in control group, case I with 500 mg/250 mL and case II with 400 mg/250 mL after 6 hours of exercise. IOP had markedly decreased in case II after intake of low concentration of ascorbic acid enriched drink then case I after 6 hours of exercise. And P value was < 0.005 so results are significant according to this.

Paired t test mean of case I (500 mg/mL) and case II (400 mg/mL) is 10.200 and 5.967. Significant value for paired t test was 0.00. Repeated measure ANOVA of case I (500 mg/mL) and case II (400 mg/mL) is 1988.691 and 4025.943. Significant value for Repeated measure ANOVA was 0.00. All Weightlifters groups got benefit. IOP reduced after Intake of Ascorbic acid enriched drink in different concentration (500 mg/mL and 400 mg/mL).

Discussion

Ebeigbe, 2014	Our Study
A study performed with energy drink containing taurine and caffeine. Results were concluded that energy drink plays role in reduction of IOP.	In our research effects of ascorbic acid enriched drink containing extracted orange juice, citric acid, ascorbic acid and sodium benzoate with different concentration (500mg/250mL & 400mg/250mL) were recorded after 30 minutes of exercise on weightlifters. There was a mean decrease in IOP found statistically significant(0.00) at 0.5% level of significance.
Palikoff (2004)	Our Study
Palikoff accessed the effect of weightlifting on IOP in glaucoma patients, measured with pneumatonometer. Significant increase in IOP had seen in their research with 0.3 to 8.7 mmHg	Our study depicted variation of IOP among weightlifters with their IOP ranges in normal limits, it was measured with Perkins tonometer and IOP raised significantly with a mean of 22.83mmHg.
Ramos, 2017	Our Study
In 2017 Ramos determines the effect of two basic exercises with different loads on IOP. IOP was measured with Rebound tonometer. The exercises included are Jump squat and bench press. IOP was increased in both exercises. In jump squat the weight that lifted by subjects is 17 kg and in bench press the external weight was 17 kg. IOP was found increased in both exercises.	in our study we took weightlifters with bench press and stomach crunches exercises. IOP was measured before exercises. Then we let the weightlifters to do exercise for 30 minutes and then the IOP was measured during exercise and after exercise. IOP was found increased significantly with the mean of 22.83mmHg. Then weightlifters were given Ascorbic Acid Enriched Drink and then the IOP was measured after 5 minutes of intake of drink. The IOP instantly got decreased after intake of drink with the mean of 5.93 mmHg.

Figure B

Conclusion

The research reported in our thesis revealed that intake of ascorbic acid enriched drink (500 mg/250 mL and 400 mg/250 mL) induces significant decrease in IOP of weightlifters. However, after intake of Ascorbic Acid enriched drink we have observed the reduction in IOP even after 6 hours of intake of drink.

Weightlifters have greater IOP during exercise. It is of Valsalva Maneuver that Increases in intra thoracic venous pressure that is transmitted to jugular, orbital vertex vein and then to Choroid.

This alteration of reduction in IOP is more significant in weightlifters who intake Ascorbic acid enriched drink of 400 mg/250 mL as compared to those who intake Ascorbic Acid enriched drink of 500 mg/250 mL.

We concluded that instant decrease in IOP after intake of Ascorbic Acid enriched drink may not cause future problems related to High pressure.

Eye care professionals must be aware of this difference after intake of Ascorbic Acid enriched drink on IOP while examining patient with normal IOP, those who have glaucoma and those who are at risk of developing glaucoma. They must prescribe Ascorbic acid to attain instant results in glaucoma patients and those who are at a risk of developing glaucoma.

Recommendations

Role of ascorbic acid enriched drink on IOP. IOP instantly decreases by intake of ascorbic acid enriched drink. Ascorbic acid enriched drink has great effect on weightlifters when it is taken as energy drink. ascorbic acid enriched drink influences IOP even after 6 hours of intake of drink. By taking ascorbic acid aqueous drainage can be increased and hyaluronic acid viscosity can be reduced. People above 40 years of age should avoid weightlifting because mostly at this age chances of glaucoma increases. Proper Follow-up should be performed in regular weightlifters after every 6 months or 1 year. IOP should be measured after 2 - 3 days of intake of Ascorbic Acid Enriched drink as it stays in body for 2 - 3 days.

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