International Journal of Research and Reviews in Pharmacy and Applied science

www.ijrrpas.com

EFFECT OF DECAFFEINATED COFFEE ON THE INTRAOCULAR PRESSURE OF YOUNG ADULTS

ESENWAH E.C, *AZUAMAH Y.C, OKONKWO K.

Department of Optometry Federal University of Technology, Owerri, Imo State, Nigeria

Department of Optometry Madonna University, Elele, Rivers State, Nigeria
+2348034933590

ABSTRACT

Decaffeination is the process of separating or reducing caffeine from the coffee beans, cocoa, tea leaves and other caffeine-containing materials in which it is naturally found. Decaffeinated coffee is the final product that emerges when a coffee bean has gone through a process to lessen the caffeine. This study was carried out to investigate the effect of decaffeinated coffee on the intraocular pressure (IOP) of young adults. One hundred and three subjects aged between 18 and 29 were used for this study. The mean age and weight (±S.D) of the subjects were 21.33±2.75 and 66.53±10.67 kg respectively. All the subjects had a body mass index (BMI) of within 20 to 25. Before ingestion of decaffeinated coffee, the mean IOP was 13.02±1.99 mmHg. After ingestion of decaffeinated coffee, the mean IOP became 12.02±2.01 mmHg. Statistical analysis using the SPSS statistical software with the Paired T-test at 95% confidence interval and 0.05 level of significance showed a significant effect of decaffeinated ($P<0.05$) on the intraocular pressure. Results obtained from this study though statistically significant, may not be clinically significant for therapeutic purposes. Decaffeinated coffee is however a welcomed alternative to regular coffee containing caffeine for young people with and at risk of developing glaucoma.

Keywords: Coffee, Caffeine, Decaffeination, Intraocular pressure, Glaucoma

1.0 INTRODUCTION

The coffee plant belongs to the family Rubiaceae and genera Coffea. It is a woody perennial tree which grows at higher altitudes. Seventy different species of the genera Coffea have been reported but most important are Coffea Arabica and Coffea canephora[1]. These two varieties differ in their taste, appearance, and between caffeine contents. As far as the composition of coffee is concerned, caffeine is no doubt considered as its major and active ingredient. Caffeine is a white crystalline xanthine alkaloid and psychoactive stimulant with a molecular structure $C_8H_{10}N_4O_2$[1]. Coffee has a stimulating effect on humans due to its caffeine content. It is one of the most consumed beverages in the world[2].Over 1000 chemical compounds have been found in coffee and they include caffeine, chlorogenic acid, deterpenes, and caffeol. Decaffeinated coffee beans are coffee beans that have gone through a process by which caffeine is removed from the beans itself. Coffee beans end up containing $1/40^{th}$ of the amount of caffeine after the process[3]. Some methods used in the decaffeination of coffee beans include the direct or conventional decaffeination method, the natural decaffeination method, water decaffeination and carbon dioxide decaffeination. The direct method of decaffeinating coffee beans is the most widely used technique[3,4].

Intraocular pressure is mainly determined by the coupling production of aqueous humour and its drainage through the trabecular meshwork located in the anterior chamber angle[5]. Factors influencing the maintenance of aqueous humour include the rate of formation of aqueous humour, the ease of outflow of aqueous humour and the pressure in the episcleral veins in which the canal of schlemm empties[6]. Intraocular pressure also varies with a number of other factors such as heart rate, respiration, fluid intake, systemic medication, and topical drugs[5]. A study conducted on the effect of age on the intraocular pressure showed no significant effect[7]. The normal IOP varies between 10 mmHg and 21 mmHg with a mean value of 16 mmHg[8]. A persistent IOP above 21 mmHg is at the risk of developing glaucomatous optic nerve atrophy, which leads to blindness[8,9]. A delicate balance between aqueous humour production, circulation and drainage must be maintained in order to keep IOP at a constant level[10]. Coffee consumption has been found to increase the intraocular pressure of healthy young adults[11].

2.0 MATERIALS AND METHODS

This study is an experimental analytic research carried out at Madonna University Teaching Hospital, Elele, Ikwerre Local Government Area, Rivers state, Nigeria. One hundred and three young adults of both gender aged between 18 and 30 years were used for this study. The intraocular pressure was measured on both eyes of each subject. The inclusion criteria were subjects of both gender between 18 and 30 years with a body mass index (BMI) of between 20 and 25 while the exclusion criteria were persons on medication, persons with systemic diseases like hypertension, diabetes etc., habitual alcohol drinkers, and those who are allergic to coffee. All those who passed the inclusion and exclusion criteria had their intraocular pressure measured and recorded using the Keeler Pulse air tonometer. Each subject was giving a cup of decaffeinated coffee containing 3.6g and diluted in 200ml of water. Forty-five minutes after ingestion, the intraocular pressure was measured again and recorded.

3.0 RESULTS AND DISCUSSION

One hundred and three subjects were used for this study. Tests were carried out on both eyes of each subject making up two hundred and six eyes. Table 1 shows the frequency distribution of the subjects that participated in this study. Table 2 shows the statistical values of the age and weight of

subjects. The mean age and standard deviation was 21.33±2.75. The minimum age was 18 and the maximum age was 29. The table also shows the mean weight and standard deviation to be 66.53±10.67 kg. The minimum and maximum weight was 45 kg and 77 kg respectively. The standard error mean (S.E.M) and the variance is also shown in the table. Table 3 shows that before ingestion of decaffeinated coffee, the mean IOP and standard deviation on the two hundred and six eyes tested was 13.02±1.99 mmHg. After ingestion of decaffeinated coffee, the mean IOP dropped to 12.02±2.01 mmHg.

Statistical analysis using the SPSS statistical software with the Paired T-test at 95% confidence interval and 0.05 level of significance showed a significant effect of decaffeinated coffee ($P<0.05$) on the Intraocular pressure. Jiwani, et al. (2012) examined the effects of caffeinated and decaffeinated coffee consumption on intraocular pressure and found no significant difference in the base line IOP between the caffeinated and decaffeinated coffee ingestion. The mean change was 0.99±1.52. They concluded that consuming one cup decaffeinated coffee statistically decreases but does not clinically impact on the IOP value[12].

Results of this study show that consumption of decaffeinated coffee can reduce the intraocular pressure values. Although the reduction may not be clinically significant for therapeutic purposes, it is a welcomed alternative to regular coffee which has been found to increase the intraocular pressure[11,13,14]. Glaucoma patients and people at risk of glaucoma who are habitual coffee drinkers may find decaffeinated coffee as a healthier alternative to prevent an increase in intraocular pressure. As glaucoma causes irreversible blindness, good feeding habits and healthy lifestyle is essential towards preventing an increased intraocular pressure. Eye care practitioners can educate their patients on the benefits of taking decaffeinated coffee as an alternative to regular coffee. Further research however, is recommended on the intake of decaffeinated coffee for proper comparisons with the effects of caffeinated coffee.

4.0 TABLES

Age group	**Frequency**	**% Frequency**
16-20	47	45.63
21-25	49	47.56
26-30	7	6.80
Total	103	100

Table 1: This table shows the frequency and percentage frequency distribution of subjects used in the study. The subjects were grouped into three age groups

Parameter	Frequency	Mean	S.E.M	S.D	Variance	Minimum	Maximum
Age	103	21.33	0.27	2.75	7.54	18	29
Weight	103	66.53	1.05	10.67	113.76	45	77

Table 2: This table shows the statistical values of the age and weight of subjects. The statistical values include the frequency, mean, standard error mean (S.E.M), standard deviation (S.D), variance, minimum and maximum values.

IOP	Frequency	Mean	S.E.M	S.D	Variance
BEFORE	206	13.02	0.13	1.99	3.99
AFTER	206	12.02	0.14	2.01	4.03

Table 3: This table shows the frequency, mean, standard error mean, standard deviation and variance of intraocular pressure (IOP) values of subjects taken before and after ingestion of decaffeinated coffee

	Paired Differences					T	df	Sig. (2-tailed)
				95% Confidence Interval of the difference				
	Mean	Std. deviation	Std. Error Mean	Lower	Upper			
Pair 1 IOP1 – IOP2	.301	1.724	.120	.064	.538	2.506	205	.013

Table 4: This table shows the SPSS data output for testing the null hypothesis of the effect of decaffeinated coffee on the intraocular pressure using the Paired t-test. The table shows the P value to be 0.013. This value is less than the 0.05 level of significance and so the null hypothesis was rejected

REFERENCES

1. Ramalakshmi K, Raghavan B. "Caffeine in coffee: Its removal. Why and how?" Critical Rev. Food Sci. Nutrition1999; 39(5): 441–456.
2. VillanuevaCM, Cantor KP, King WD, Jouni JK, Cordier S, Lynch CF, et al. "Total and specific fluid consumption as determinants of bladder cancer risk". International Journal of Cancer 2006; 118 (8): 2040–47
3. McCusker RR., Goldberger BA, Cone EJ. Caffeine content of specialty coffees. Journal of Analytical Toxicology 2003; 27(7): 520-2.
4. Freedman ND. Association of coffee drinking with total and cause-specific mortality. New England Journal of Medicine2012; 366: 1891.
5. Chatterjee BM. Handbook of Ophthalmology. 6th ed. New Delhi: CBS publishers; 2008
6. Vaughan D, Asbury T, Riordan P. General Ophthalmology. 15th ed. Stanford:Appleton and Lange; 1999.
7. Iwuagwu FO, Ngumah QC. The effect of age on the Intraocular Pressure. Eye and Vision 2000;1(1):19-24.
8. Kanski JJ. Clinical Refraction.3rd ed. Oxford: Butterworth-Heinemann;1998.
9. Heijl T. Reduction of intraocular pressure and glaucoma progression: Results from the Early Manifest Glaucoma Trial (EMGT). Archives of Ophthalmology2003; 121: 48-56.
10. Gabelt BT, Kaufman PL. Adler's Physiology of the Eye. 10th ed. St. Louis: Mosby; 2003.
11. Azubuine JO, Durueke A, Nwakuche I. Coffee consumption increases intraocular pressure of healthy young adults. Journal of Nigerian Optometric Association 2012; 17(1): 13-17.
12. Jiwani AZ, Rhee DJ, Brauner SC, Gardiner MF, Chen TC, Shen LQ, et al. Effects of caffeinated coffee consumption on intraocular pressure, ocular perfusion pressure, and ocular pulse amplitude. Medical Hypotheses 2012; 56(2): 163-70.
13. Avisar R., Avisar E, Weinberger D. Effect of coffee consumption on intraocular pressure. Annals of Pharmacotherapy2002; 36(6): 992-5.
14. Ajayi OB, Ukwade M,Olajire B. Caffeine and intraocular pressure in Nigerian population. Journalof Glaucoma 2001; 10(1):25-31.