

Effect of Alcoholic Red Wine on the Amplitude of Accommodation of Young Adults

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ABSTRACT

This study was carried out to determine the effect of alcoholic red wine on the amplitude of accommodation of young adults. Fifty young adults with a mean age of 22.90 ± 2.2 and a mean weight of 66.94 ± 9.91 kg were used for this study. All the subjects had a normal body mass index (BMI) of between 20 and 25. The amplitude of accommodation was measured before and 60 minutes after ingestion of 100ml of red wine containing 13.5% alcohol. Statistical analysis with SPSS version 17 showed that the mean AA before the ingestion of alcoholic red wine was 15.60 ± 2.95 and the mean AA after ingestion of red wine was 12.41 ± 3.63 . This result was statistically significant using the paired sample T- test at 95% confidence interval and 0.05 level of significance; $t(49) = 8.337$, $p(0.000) < 0.05$. This study showed that alcoholic red wine interferes with accommodative ability, and hence will affect visual performance.

Keywords: Red wine; alcohol; accommodation; vision

INTRODUCTION

Red wine is an alcoholic beverage made from fermented grapes; it is a type of wine made from dark colored grape varieties. The actual color of wine can range from intense violet, typical of young wines through brick red mature wines and brown for older wines¹. It has a biphasic (psychoactive and depressant) effect on both the higher and lower centers of the central nervous system (CNS). It acts primarily on nerve cells within the brain thereby interfering with communication nerve cells from the peripheral nervous system (PNS). Its effect on the CNS is either inhibitory or excitatory, hence it depresses behavioral centers and increases self-confidence; slows down sense processing activities resulting in blurred vision, poor smell, touch etc. and it also inhibits thought process thereby making one not to think clearly². Heavy alcohol consumption has shown to have a damaging effect on the cellular processes that

create bone tissue and long term alcoholic consumption at high levels increases the frequency of fractures³. Moderate consumption of alcohol may also be beneficial to Bone Mineral Density (BMD) in men⁴. The anticoagulant properties of wine may have the potential benefits of reducing the risk of blood clots that can lead to heart disease. Heavy drinkers put themselves at a greater risk for heart disease and developing potentially fatal cardiac arrhythmias. Excessive alcohol consumption can cause higher blood pressure, increase cholesterol level and weakened heart muscles. The main cause of heart attack and the pain of angina is the lack of oxygen caused by blood clots and atheromatus plaque buildup in arteries. The alcohol in wine has anticoagulant properties that limit blood clotting by making the platelets in the blood less prone to stick together and reducing the levels of fibrin protein that binds them together¹. One of the short-term effects of alcohol is impaired mental function, which can cause behavioral changes and memory impairment. Long term effects of heavy drinking can inhibit new brain cell development and increase the risk for developing major depressive disorders. Another potential role of alcohol in the body may be in stimulating the release of the chemical acetylcholine which influences brain function and memory⁵. There are several potential causes of so-called “red wine headaches”, including histamines/tyramines and the breakdown of some phenolic compounds in

wine that carry the chemical messenger for serotonin⁶. One culprit that is regularly dismissed by allergists as an unlikely cause of red wine headaches is sulfites which are used as a preservative in wine⁷. Harding⁸ stated that wine, like other alcoholic beverages, is a diuretic which promotes dehydration that can lead to headaches (such as the case often experienced with hangovers). During near tasks, different parts of the brain are activated in sequence and this involves frontal cortex, thalamus and occipital visual cortex². The antioxidant and anticoagulant properties of wine may have a positive benefit in slowing the effects of macular degeneration that causes vision to decline as people age⁶. Consuming alcohol can have a short-term negative effect on vision for a low blood alcohol level. Visual performance is less affected by the visual changes than by alteration in brain functions⁹. Some ocular effects of heavy drinking of alcohol include slow pupil reactions, decreased contrast sensitivity and redness.

Amplitude of accommodation is the maximum amount of accommodation or focusing ability that the patient can exert in response to a near target¹⁰. Accommodation allows targets to be made clear over a large range of distances. It is expressed in dioptres, as the difference between the far point and the near point measured with respect either to the spectacle plane or the corneal apex or some other reference point. The amplitude of accommodation gradually falls

with age, and causes patients over the age of about 40 years to have difficulty with near work and require reading glasses. Measurement of the amplitude of accommodation can help to identify the appropriate reading add required to alleviate the patient's near reading problems. Amplitude of accommodation can be measured in the clinic using two methods. The push-up/push-down test which is quick and easy to perform. The second method involves increasing amounts of minus spherical lens power until distance vision blurs (Sheards technique).

This study was carried out on young adults because from the age of 40, presbyopia begins to manifest and the amplitude of accommodation will begin to deplete due to natural changes in the eye that occurs with age¹¹. People below 18 years are considered minors and are not allowed to drink alcohol. Thus, young adults between 18 and 30 years were the population of choice to be part of this study. As many of these people drink alcoholic red wine, the effect it will have on their visual function including the amplitude of accommodation is of importance and hence, the need to carry out this study.

MATERIALS AND METHODS

This study was an experimental clinical study carried out at the eye clinic, Madonna University Teaching Hospital Elele, Nigeria. The inclusion criteria was all young adults

between ages 18 and 30 while the exclusion criteria involved persons with refractive errors, ocular and systemic pathologies, mental disorders, pregnancy, habitual alcohol drinkers, overweight and underweight persons and persons who are not willing to give a written consent. Instruments used for data collection include an ophthalmoscope, retinoscope, Snellen chart, weight scale, measuring scale, Royal Air Force (RAF) rule, red wine and disposable cups. A detailed case history was carried out on the subjects followed by external and internal examinations of the eyes to identify those who fell into the exclusion criteria. The weight and height were also measured and the body mass index (BMI) was calculated. Only subjects with the normal BMI of 20- 25 was selected. The baseline measurements of amplitude of accommodation were taken with the Royal Air Force (RAF) rule using Donder's push up technique. The subjects were then given 100ml of alcoholic red wine containing 13.5% of alcohol to drink. After 60 minutes, the amplitude of accommodation was measured again. Data was then uploaded into the SPSS version 17 statistical software for analysis.

RESULTS

Fifty subjects comprising 22 (44%) males and 28 (56%) females were used for this study. The minimum age of the subjects was 19 and the maximum age was 28 years with a mean age was 22.9 and a standard deviation of 2.23. The minimum weight was 53kg and the maximum

weight was 79kg with a mean weight of 66.94kg and a standard deviation of 9.92kg (table 2). Before intake of red wine, the minimum amplitude of accommodation (AA) was 8.25D; maximum AA was 22.22D; the mean AA was 15.60D and the standard deviation was 2.96D. After 60 minutes, the minimum AA became 4.25D; maximum AA, 20.00D; the mean AA, 12.41D and the standard deviation, 3.63D (table 3). From the SPSS data output for testing the null hypothesis using the paired sample T- test at 95% confidence interval and 0.05 level of significance; $t(49) = 8.337$, $p(0.000) < 0.05$. We therefore rejected the null hypothesis and accept the alternative. There was a significant decrease in the amplitude of accommodation 60 minutes after ingestion of alcoholic red wine.

DISCUSSION

The mean amplitude of accommodation (AA) declined slightly when compared to the value 60 minutes after ingestion of red wine. The baseline mean AA was 15.60 ± 2.95 while the mean AA after 60 minutes of ingestion of red wine was 12.41 ± 3.63 . This result was statistically significant when tested with the Paired sample T-test using SPSS version 17. Similar studies¹²⁻¹⁴ also showed a decline in AA with alcohol intake. Alcohol readily crosses the blood barrier to interfere temporarily with the communication signals of the nerve cells in the brain². This is because it acts as an

antimuscarinic agent thus blocking the release of neurotransmitter (Acetylcholine) at the cholinergic receptor that innervates the ciliary muscle, medial rectus and iris sphincter, thereby inhibiting accommodation, convergence and pupil constriction¹². These actions result in relaxation of the ciliary muscles and consequent decrease in accommodation. When accommodation is affected, other visual functions of the eye is also affected such as convergence ability and visual acuity. The person will not be able to focus properly at near and thus reading and other near tasks would be difficult. Moderate consumption of red wine can be tolerated by some persons but heavy consumption of the beverage should be avoided. People who consume alcoholic red wine are advised to abstain from reading and other activities that require the use of their eyes until the effect of the alcohol wears off.

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TABLES

Table 1 about here shows the age and gender distribution of subjects

Age	MaleFrequency (%)	FemaleFrequency (%)	Total Frequency	(%)
18-20	3	6	9	18
21-23	10	10	20	40
24-26	8	12	20	40
27-30	1	0	1	2
Total	22	28	50	100

Table 2 about here shows the statistical data of age and weight of subjects

Parameter	Min. value	Max. value	Mean	S.E.M	S.D	Variance
Weight (kg)	53	79	66.94	1.40	9.92	98.39
Age	19	28	22.90	3.16	2.23	4.99

Min – minimum; Max - maximum; S.E.M - standard error mean; S.D - standard deviation

Table 3 about here shows the amplitude of accommodation before and after alcoholic red wine intake

AA	Min. value	Max. value	Mean	S.E.M	S.D	Variance
Before	8.25	22.22	15.60	0.41839	2.96	8.752
After	4.25	20.00	12.41	0.51347	3.63	13.182

AA – amplitude of accommodation; Min – minimum; Max - maximum; S.E.M - standard error mean; S.D - standard deviation