THE EFFECT OF ALCOHOL CONSUMPTION ON LIPID PARAMETERS

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ABSTRACT

Background: *Though views of various authors have varied with regards to moderate alcohol consumption, they however agree that excessive alcohol consumption has a deleterious effect on the cardiovascular system. Dyslipidaemia has been implicated as risk factors for cardiovascular disease and mild to moderate alcohol consumption is said to be cardioprotective. The cardioprotective effect of alcohol has been debated upon, is it from the ethanol molecule or as a result of the presence of antioxidant in the alcoholic beverages? The study compared cholesterol parameters with daily quantity of alcohol in residents of Rumuekini community dwellers.*

Method: *Forty-one male subjects who consented to be part of the studies had their blood sample collected after an overnight fast. They were made to fill a questionnaire which provided information on their occupation, symptoms and history of alcohol consumption. The quantity of alcohol was assessed and the study population was divided into 3 groups; based on amount of daily alcohol consumption to mild, moderate and severe.*

Results: *Forty-one (41) men consented to be part of the studies, with mean age range from 19yrs to 91yrs with mean ± SD age of 34.49 ± 17.25yrs., mean ± SD systolic blood pressure of 128.10 ± 21.92mmHg and mean ±SD diastolic blood pressure of 77.20 ± 14.87mmHg, mean± SD daily value of alcohol consumed was 74.24 ± 43.34g/day, the mean ±SD of total cholesterol of 181.53 ± 41.43mg/dl, mean ±SD of triglyceride of 139.84± 40.18mg/dl, mean± SD low density lipoprotein of 79.34 ± 26.10 mg/dl and mean± SD of high density lipoprotein of 62.75 ± 13.54mg/dl. Excessive alcohol drinking was associated with lower total cholesterol LDL and TG when compared with mild consumers and moderate alcohol with higher HDL*

Conclusion: *In the index study we noted that alcohol generally reduced total cholesterol in a linear fashion, however this was at a summed effect of reducing LDL, increasing HDL and reducing TG. It is however important to note that the beneficial effect of these changes was best seen in those who took alcohol of 51-100g/day but even this benefit was at a cost of a high triglyceride level. Most of the drinkers consumed beer and local gin and non-admitted to taking red wine therefore the active molecule in this study was ethanol.*

Keywords*: Alcohol, Cholesterol, LDL, HDL, Triglycerides, Ethanol.*

INTRODUCTION

On the 20th of January 2022 the World Heart federation launched a new policy brief on the impact of alcohol on the Cardiovascular health myths and measures[1], which challenged the concept that moderate alcohol consumption was associated with a decrease in the risk of heart disease and described it as a myth. The policy therefore called for stricter measures on alcohol consumption and has blamed the remarkable rise in prevalence of cardiovascular diseases globally (almost a hundred percent in the past two decades)[1] partly to alcohol consumption. Over the years, studies[2-8] have confirmed the varied view of authors with regards to moderate alcohol consumption, they however agree that excessive alcohol consumption has a deleterious effect on the cardiovascular system. There is need to revisit this conflict in agreement with the recent action of the World Heart Federation. Race and ethnicity no doubt plays a significant part in disease pattern and presentation and response to various molecules. This series of studies seeks to evaluate and contribute to information on this very important topic.

Cholesterol numbers have been implicated as risk factors for cardiovascular disease and mild to moderate alcohol consumption is said to be cardioprotective[7,9]. The cardioprotective effect of alcohol has been debated upon, is it from the ethanol molecule[10] or as a result of the presence of antioxidants?[11]. In addition, excessive alcohol and other molecules in alcoholic beverages have been implicated in the adverse effect of alcohol on the cardiovascular system[12]. The index study compared cholesterol parameters with daily quantity of alcohol in residents of Rumuekini community dwellers.

Routine evaluation for lipids termed lipid profile is carried out after at least twelve (12) hours of fast or an overnight fast[12]. It is routinely used in Nigeria and measures, the total cholesterol, triglycerides, low density lipoprotein cholesterol (LDL- Cholesterol), high density lipoprotein cholesterol (HDL- Cholesterol). The HDL and LDL cholesterol derive their names from their carrier proteins, the lipoproteins. These lipoproteins vary in their density, functions and type of cholesterol they carry. The low-density lipoprotein transfer cholesterol from the liver to the blood stream and the HDL lipoprotein act as scavengers carrying cholesterol from the blood stream to the liver where they are converted to bile and excreted[13].

The protective action of HDL-cholesterol and ability to eliminate cholesterol is by a series of reactions. The HDL cholesterol interacts with ABCA1 receptors found on cells, resulting in an efflux of various cholesterol from the cells, this results in esterification by an enzyme Lecithin cholesterol acetyl transferase. (LCAT) and in the maturation of the HDL- cholesterol. The matured HDL are eliminated from the circulation by binding to a liver receptor called the SR-B1 after which the HDL is modified by exchange of the esterified cholesterol for another lipid a reaction that is mediated by a cholesteryl ester transfer protein (CETP). Reduction of CETP results in an increase in HDL[14].

Alcohol cardioprotective nature became an issue of interest after the publication the "FRENCH PARADOX"; this compared the prevalence of cardiovascular disease in the American population relative to the French population with alcohol as a risk factor for cardiovascular diseases. The French population had a lower prevalence of cardiovascular diseases amongst them and yet were heavier drinkers relative to the Americans[15].

Studies have confirmed the beneficial effect of alcohol consumption to the cardiovascular system, however over the years there is the debate on the protective elements or components of the alcohol, Some have put forth an argument for antioxidants and polyphenolic compounds; such as flavanols, monomeric and polymeric flavan-3-ols, highly coloured anthocyanins as well as phenolic acids and the stilbene polyphenol, resveratrol[16] rather than ethanol as the protective component in alcoholic beverages. Resveratrol prevents the prothrombotic effect of cholesterol, reduces the ability of LDL-cholesterol to undergo oxidation, which is a primer for atherosclerotic process. It also inhibits platelet aggregation[16].

On the other hand, Alcohol[17] is believed to offer protection by increasing levels of tissue plasminogen activator a serine protease enzyme with fibrinolytic properties. Levels of t-PA was found to be higher in drinkers when compared to non-drinkers[18]. Additional protection by alcohol on the heart from ischemia was by preconditioning[19]. These benefits were in addition to its effect on the different types of cholesterol[7,8]. Alcohol was said to be associated with higher HDL level by reducing the action of CETP and by reducing the level of LDL-cholesterol. This study set out to evaluate the effect of alcohol on the cholesterol types in alcohol consumers.

METHODOLOGY

It was a prospective, cross-sectional, community-based survey carried out in the town hall of Rumuekini, a suburban community in Rivers State, from August 2018 - September 2018, after consultation with the Community development committee of Rumuekini community and the Royal highness of the Rumuekini Community. Fifty subjects consented to be part of a study that evaluated cardiovascular disease in those who consumed alcohol. All were males as no female turned out to be part of the study. Forty-one (41) of the fifty returned the next day to have their blood sample collected after an overnight fast for cholesterol estimation. All respondents were duly counselled of the study protocol and consent obtained from each subject, care was taken not to judge them and confidentiality kept. They had their blood sugar assessed and diabetics were excluded from the study.

A questionnaire with details on biodata, occupation, type of alcohol, from which quantity of daily alcohol consumption estimated and history of smoking noted. This arm of the study had the study population divided into 3 groups; based on amount of daily alcohol consumption to Mild, Moderate and Excessive.

Cholesterol was estimated using a colour spectrophotometer. Data was collated on excel spreadsheet and analysed using Statistical Package for Social Sciences version 23(SPSS 23).

RESULTS

Alcoholic beverages taken were classified into Beers**;** Star, Gulder, Guinness, Heineken, Harp, Legend. Gin (Local gins kai-kai), Palm wine, Whisky, Squadron. Beer was the most common drink. The amount of alcohol was estimated for beer 50g/cl[20], for whiskey as for liquor with a range of 20-40g/l[20], for local gin[40g/l][20]. Palm-wine was more difficult to estimate as the amount of alcohol varied with duration of stay after tapping. The range for total alcohol consumed was 15 to 190g/dl. The study population was divided into three groups based on the amount of alcohol consumed daily, mild alcohol consumption was defined as ≤ 50g/day, moderate: 51- ≤ 100g/day and as excessive alcohol consumption: > 100g/day.

Forty-one (41) men consented to be part of the studies, with age range from 19yrs to 91yrs and mean ± SD of 34.49 ± 17.25yrs. mean ± SD systolic blood pressure of 128.10 ± 21.92mmHg and mean ± SD diastolic blood pressure of 77.20 ± 14.87mmHg, mean± SD daily value of alcohol consumed was 74.24 ± 43.34g/day, the mean ± SD of total cholesterol(TC) 181.53 ± 41.43mg/dl, mean± SD triglyceride(TG) of 139.84± 40.18mg/dl, mean± SD of low density lipoprotein of (LDL)79.34 ± 26.10 mg/dl and mean± SD, high density lipoprotein(HDL) of 62.75 ± 13.54mg/dl.

Table 1: Clinical Parameters

Descriptive Statistics				
	N	Minimum	Maximum	Mean Std. Deviation
BMI(kg/m^2)	41	17.00	31.60	24.17 ± 3.67
SBP(mmHg)	41	100.0	205.0	128.10 ± 21.92
DBP(mmHg)	41	53.0	130.0	77.20 ± 14.87
AGE(yrs)	41	19.0	97.0	34.49 ± 17.25
QUANTITY/grams	41	15.0	190.5	74.24 ± 43.34
T.CHOLESTEROL(mg/dl)	41	121.0	308.0	181.53 ± 41.43
TG(mg/dl)	41	60.0	246.0	139.84 ± 40.18
LDL(mg/dl)	41	33.0	152.0	79.34 ± 26.10
HDL(mg/dl)	41	33.0	93.0	62.75 ± 13.54

BMI: Body mass index, SBP: systolic blood pressure, DBP: diastolic blood pressure, T-Cholesterol: Total Cholesterol, TG: Triglycerides, LDL: low density lipoprotein, HDL: high density lipoprotein.

Eighteen (43.9%) Students accounted for majority of the study population, followed closely by traders (22%) there was only one driver and one applicant. (See table 2). Sixteen (39%) were smokers

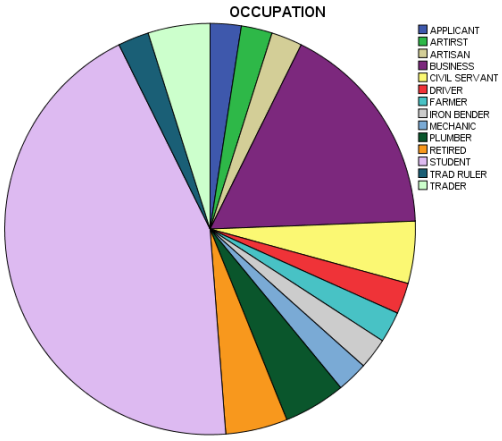


Figure 1: Occupation of Subjects

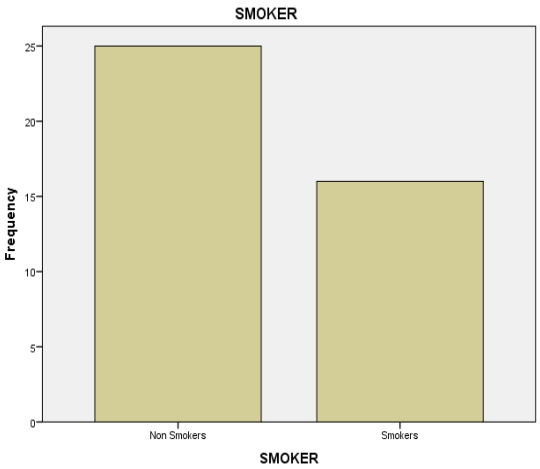


Figure 2: Smoking Status of Subjects

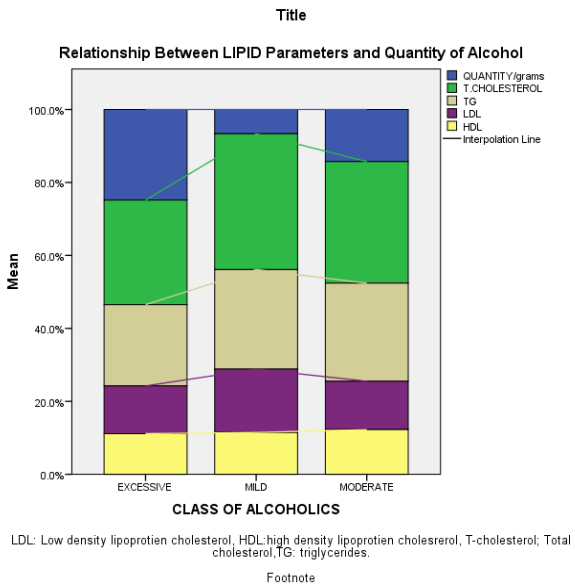
The mean± SD age (34.49 ± 17.25yrs.) of the study showed younger drinkers dominated the study population and from the table the excessive drinkers were of the younger age group with mean age ± SD (31.13 ± 12.38yrs) whilst majority of the moderate drinkers were middle aged with mean age ± SD (40.58 ± 21.56yrs). The mean± SD daily amount of alcohol for the study population was 74.24 ± 43.34g/day, with mean ± SD values for the mild consumers as 33.90 ± 13.17g/day and for the excessive daily consumers of alcohol as high as 142. 56 ± 0.23g/day.

TABLE 2: Comparisons of Means for Groups

Cardiovascular Parameters	Mild Alcohol Consumers n=15	Moderate Alcohol Consumers	Excessive Alcohol Consumers n= 8

		n=18	
AGE(yrs)	31.00 ± 14.20	40.58 ± 21.56	31.13 ± 12.38
BMI9kg/m^2)	23.97 ± 4.15	23.89 ± 3,69	24.97 ± 2.64
SBP(mmHg)	124.40 ± 18.91	132.00 ±27.24	126.25 ± 12.48
DBP(mmHg)	75.00 ± 9.55	80.67 ± 19.20	73.50 ± 11.36
PR(beats/min	73.60 ± 7.73	73.24 ± 10.65	74.37 ± 11.36
QUANTITY(g/day)	33.90 ± 13.17	76.58 ± 16.65	142. 56 ± 0.23
Total Cholesterol(mg/dl)	198.88 ± 45.78	183.64 ± 45.93	161.67 ± 34.18
TG(mg/dl)	144.25 ± 54.25	153.45 ± 40.73	125.67 ± 28.79
LDL(mg/dl)	87.38 ± 36.44	71.18 ± 12.32	73.83 ±23.68
HDL(mg/dl)	58.25 ± 14.92	66.09± 10.18	62.83 ± 20.84

BMI: Body mass index, SBP: systolic blood pressure, DBP: diastolic blood pressure, T-Cholesterol: Total Cholesterol, TG: Triglycerides, LDL: low density lipoprotein, HDL: high density lipoprotein.



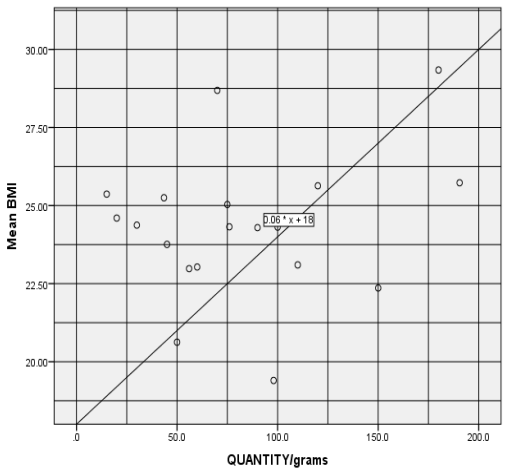


Figure 3: Relationship between Lipid Parameters and Quantity of Alcohol **Figure 4:** Relationship of Quantity of Alcohol with BMI

DISCUSSION

Rumuekini[21] is a suburban town in Obio/Akpor local government area of Rivers State, Nigeria. The proximity of this town to Choba, which is popular for the University situated in it; the University of Port Harcourt, makes it a residential hub for students. Hostel accommodations are not readily available due to the population of student attending the school. This explains for the large student percentage (43%) of the study population. Only one applicant in our study population also points to the fact that drinking is an expensive social habit, requiring a steady income to fuel it.

The small study population can be attributed to the social stigma attributed to alcohol consumption and this is the reason why females refused to be a part of the study.

The age range was very wide despite the small study population we recruited age as young as 19yrs and as old as 97yrs. In addition, the study identified smokers and non-smokers amongst the study population; smokers made up 39% of the study population. It is a notable fact that both social habits go hand in hand. 68.3% of the study population were single. This correlated with the number of students and could imply that the married were less likely to drink. This was also the report from some social platforms and studies[22,23].

Most drinkers admitted to taking beer, some Gin especially local gin whilst some admitted to whiskey. Only five were not specific and said all brands. For those it was difficult to quantify the amount of alcohol consumed and they were classified as excessive drinkers. No subject mentioned red wine, however red wine was probably represented by those who admitted to taking all brands, this is not surprising as wine is relatively more expensive.

The mean± SD age (34.49 ± 17.25yrs.) of the study showed younger drinkers dominated the study population and from the table the excessive drinkers were of the younger age group with mean age ± SD (31.13 ± 12.38yrs) whilst majority of the moderate drinkers were middle aged with mean age ± SD (40.58 ± 21.56yrs). The mean± SD daily amount of alcohol for the study population

was 74.24 ± 43.34g/day, with mean ± SD values for the mild consumers as 33.90 ± 13.17g/day and for the excessive daily consumers of alcohol as high as 142. 56 ± 0.23g/day.

This study also confirmed the findings of increase in BMI with excessive drinking (see table 2 and figure 4) as noted in other studies[24,25]. Just like the findings from the study on freshmen of a higher institution[25] the moderate class of drinkers had better BMI relative to mild and excessive drinkers.

The systolic and diastolic blood pressure were however higher in the moderate class of drinkers with daily consumption of 51-100g./day of alcohol. This may be accounted for by the population and mean age of the group.

The value of total cholesterol decreased in a linear fashion with alcohol consumption. The value for Triglycerides was seen to be highest amongst moderate consumers. The LDL cholesterol was lowest with moderate drinkers but was still significantly lower in the excessive drinkers when compared to the mild drinkers. The HDL cholesterol also was highest amongst the moderate drinkers when compared with values in the mild and excessive drinkers, yet higher in excessive alcohol than in mild drinkers.

CONCLUSION

In our study population we noted the effect that alcohol has on cholesterol types. Alcohol generally reduced total cholesterol in a linear fashion, however this was at a summed effect of reducing LDL, increasing HDL and reducing TG. It is however important to note that the beneficial effect of this changes was best seen in those who took alcohol of 51-100g/day but even this benefit was at a cost of a high triglyceride level.

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Disclosures: The authors have nothing to disclose.

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