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RESEARCH ARTICLE

SERUM LEVEL OF INTERLEUKIN-5 IS ELEVATED AMONG BEER DRINKERS IN NNEWI, ANAMBRA STATE

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ABSTRACT

Introduction*:** The role of Interleukin-5(IL-5) in immunity and its involvement in cardiovascular disease (CVD) is a subject of growing research. IL-5 plays a role in the differentiation and maturation of eosinophils and has atheroprotective effects. ***Objective: The levels of serum Interleukin-5, and CRP in beer drinkers in Nnewi, Anambra State., were assessed. ***Materials and methods*:** Questionnaires were used to understand the amount of daily and weekly beer bottles consumed by subjects, and obtain their socio-demographic information. 82 participants comprising of 41 beer drinkers, and 41 non-beer drinkers of similar age were recruited. IL-5 and CRP levels were determined by the Enzyme-Linked Immunosorbent Assay technique. ***Result*:** A significantly higher mean value of interleukin-5 (117.25 ± 1.50) of beer drinkers compared with nonbeer drinkers (46.85 ± 5.8) ($p<0.05$). was observed. No significant difference existed in the mean values of CRP of beer drinkers compared with the nonbeer drinkers ($p> 0.05$). A positive correlation was found between interleukin-5 levels and the frequency of beer consumption ($r= 0.279$) ($p=0.011$) while CRP levels showed no association ($r=-0.197$ and $p=0.077$) with the frequency of beer drinking. ***Conclusion*:** Interleukin-5 levels are elevated among beer drinkers. moderate beer consumption may increase systolic blood pressure and body mass index without obliterating its cardioprotective influence.

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INTRODUCTION

According to (Yuhei, 2010), alcohol has diverse impacts on the cardiovascular system. Numerous epidemiological studies have employed a J-shaped curve to depict the relationship between alcohol intake and total mortality, including the incidence of coronary heart disease (CHD), and they also include an inverse correlation at lower intake levels (Giovanni de Gaetano and Simona Costanzo, 2017). According to studies (Ronksley, 2011; Roerecke, 2012 and Gemes, 2016), moderate alcohol consumption has been linked to lower cardiovascular disease mortality because it is believed to have cardiometabolic protective effects while heavy drinking is associated with higher mortality. Heavy drinking contributes to several diseases and is one of the main global risk factors for poor health outcomes. According to the World Health Organisation (World Health Organisation Status Report on Alcohol Consumption, 2019) up to 19% of alcohol-related deaths occurred in 2016 as a result of cardiovascular diseases (CVD), which came in second to cancer and liver disease. An increase in high-density lipoprotein (HDL-C) is one of the most well-known and logical ways that alcohol promotes cardio-protective effects (Kerr, 2005, Zatu, 2014; Capurso, 2016; Huang, 2017). Alcohol intake may also influence CVD risk through the modulation of inflammatory parameters.

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Moderate alcohol intake is associated with decreased C-reactive protein (CRP) and leukocyte count, but there is an inverse association with heavy drinking (Imhof, 2001). Several studies have also shown that people who mainly drink red wine have a lower risk of cardiovascular disease than those who drink other kinds of alcoholic beverages such as beer, this is due to the antioxidant effect of the polyphenols it contains (Chiva-Blanch, 2013 and da Luz, 2018). High levels of alcohol and its metabolites may have direct effects that are inflammatory on the liver and cause the generation of free radicals, which increases lipid peroxidation and tissue inflammation. Through a series of pathways, alcohol can cause intestinal inflammation, which in turn causes inflammation and organ dysfunction throughout the body, particularly in the liver and brain. Increased bacterial loads and intestinal wall permeability are two mechanisms that might cause local and systemic consequences by reducing mucosal immunity and causing endotoxin release, respectively. By inhibiting Paneth cells, which generate antibacterial chemicals and are one of the intestine's major lines of defense against germs, alcohol also has an impact on mucosal immunity. Reduced Paneth cell secretion of antibacterial substances can promote the overgrowth of more intestinal bacteria and allow endotoxins, which are produced by these bacteria, to get past the intestinal barrier. Proinflammatory cytokines are released by the immune system of the intestine as a result of the bacteria's endotoxins, which set off an inflammatory reaction. The endotoxins and cytokines can then interact with the liver immune cells and hepatocytes directly, releasing local cytokines that promote fibrosis and further inflammation (Faraz, 2008). An acute-phase protein

known as C-reactive protein (CRP) is used as an early indicator of infection or inflammation. The protein is produced in the liver and is typically present in the blood in quantities of less than 10 mg/L (World Health Organization, 2014). In response to most types of tissue injury, infection, and inflammation, the liver produces C-reactive protein, an acute-phase reactant that is exceedingly sensitive, nonspecific, and controlled by cytokines including interleukin-6, interleukin-1, and tumor necrosis factor (Mohamed, 2020). The control of pro-inflammatory cytokines and acute-phase proteins is probably influenced by elements including aging, infections, chronic illnesses, body composition, and lifestyle choices like drinking beer. Among men and women who appear to be in good health, C-reactive protein (CRP), a measure for systemic inflammation, predicts cardiovascular events. Concurrently, IL-5 was recognized as the major maturation and differentiation factor for eosinophils in mice and humans. Over-expression of IL-5 significantly increases eosinophil numbers and antibody levels in vivo IL-5 primarily affects eosinophils and their progenitors in humans, but it may also be essential for the generation of IgA in human mucosal tissues. Understanding the function of IL-5 and its receptor system in the immune response, inflammation, and disease regulation is possible thanks to structural, functional, and clinical research Monoclonal antibodies that selectively target mediators and surface receptors involved in eosinophil proliferation and activation have been developed as a result of a better knowledge of the role of eosinophils in several chronic inflammatory disorders, most notably allergic asthma. A crucial mediator that affects eosinophil biology on several levels is interleukin-5 (IL-5). Because only eosinophils, basophils and a minority of mast cells are known to express the IL-5R (CD125) chain in humans, this cytokine has a relatively limited range of cellular targets The biological effects of IL-5 in humans are best understood about eosinophils. Therapeutic possibilities have improved as a result of recent advancements in our understanding of eosinophil formation and activation as well as the etiology of eosinophil-dependent inflammatory disorders (Mohamed, 2020). Therefore, the levels of C-reactive protein and interleukin-5 in beer users were assessed.

MATERIALS AND METHODS

The reagents and kits for the biochemical analysis were commercially obtained and the manufacturer's standard operating procedures were strictly observed. This cross sectional study was conducted in Nnewi North, Anambra state, south East of Nigeria.

Study participants

Sample size: Sample size was calculated using G*Power software version 3.0.10 (Universität Düsseldorf, Germany). Power analysis for difference between two independent means (two groups) was conducted in G*Power to determine a sufficient sample size using an alpha of 0.05, a power of 0.80 and a large effect size of 0.8, based on these, the calculated total sample size of 82 has 90% power to detect a difference of 0.25 at a significance level of 0.05. A total sample size of 82 was used for this study to take care of possible attrition. Eighty two (82) male participants in Nnewi (Okofia Otolo) were recruited by random sampling for this cross sectional study, aged between18-55years comprising of 41 beer drinkers and 41 non beer drinkers of corresponding age. Questionnaires were used to obtain their socio demographic information. The study protocol was explained to subjects who consented to the study.

Inclusion criteria: Male beer drinkers between the age of 18 and 55 years in Nnewi and subjects who do not drink beer as control.

Exclusion criteria: Subjects who do not drink beer and are not within the age range of 18 to 55 years, subjects outside Nnewi, Anambra State, and unwilling beer drinkers and non beer drinkers were excluded in the research.

Ethical approval: The study was approved by the Ethics Committee of the Faculty of Health Sciences and Technology, Nnamdi Azikiwe University, Nnewi, Anambra State, Nigeria NAU/FHST/ 2021/MLS27.

Anthropometrics measurements: Weight and height were measured in clothing without shoes and body mass index (BMI) calculated as the ratio of weight (kg) to the square of height (m^2). Height was obtained using a stadiometer while weight was measured by using a manual weighing scale. Overweight and generalized obesity was defined as body mass index (BMI) ≥ 25 and 30 kg/m^2, respectively [17](Ihim et al, 2018)

Blood pressure reading: Systemic blood pressure was obtained using an OMRON automatic digital blood pressure monitor on the left arm after 10-minute rest using a cuff of appropriate size with the subject in the sitting position. Blood pressure was expressed as Systolic and Diastolic rate. Hypertension was defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90mmHg.

Sample collection and storage: Venous blood samples (5ml) was collected asceptically by venipuncture from each subject in the antecubital vein using a plastic syringe .It was dispensed in a plain tube, allowed to clot and centrifugation was performed at 4000 rpm for 5 minutes using table top centrifuge. The serum obtained for the evaluation of interleukin-5 and C reactive protein levels was stored in aliquots of three at -4˚C until biochemical analysis.

Laboratory methods: Serum interleukin -5 levels were determined by Enzyme-Linked Immunosorbent Assay (ELISA) as described by (Di, 2019) while C-Reactive Protein levels were determined by Enzyme-Linked Immunosorbent Assay (ELISA) as described by (Carl, 2012).

Statistical analysis

The Statistical Package for the Social Sciences (SPSS) version 23.0 was used for the analysis of the results. Data was presented as mean ± standard deviation (SD) and analyzed statistically using independent paired student t-test and Pearson correlation. The level of significance was set at $p<0.05$. Values were deemed significant when $p< 0.05$.

RESULTS

Table 1 the mean values of the Age, blood pressure, and Body Mass Index of the beer consumers and non-beer consumers (Mean ± SD).

The mean values of the BMI (Kg/m^2) (23.83±3.17) and SBP(mmHg) (128.10±16.44) of the beer consumers were significantly higher compared with the non beer drinkers (21.58±4.07) (116.25±8.64) ($p<0.05$). Whereas there is no significant difference in the mean value of DBP (mmHg) (76.08±13.46) of the beer consumers compared with the non beer consumers (72.55±8.12) ($p > 0.05$).

Table 1. The mean values of the Age, blood pressure, and body mass index of the beer consumers and non-beer consumers (Mean ± SD).

Variables	beer consumers Mean ± S D	Non Beer Consumers	t-test	p- value
Age	31.60 ±1.26	31.82 ±0.47	3.72	0.107
BMI (Kg/M^2)	23.83 ±3.17	21.58 ±4.07	2.92	0.006
SBP	128.10 ±16.44	116.25 ±8.64	3.63	0.001
DBP	76.08 ±13.46	72.55 ±8.12	1.70	0.980

*Statistically significant at $p< 0.05$ SBP=systolic blood pressure, DBP=diastolic blood pressure.

Table 2 The mean levels of interleukin-5 and C-reactive protein of beer consumers and non-beer consumers (Mean ± SD). A significant higher difference was observed in the mean values of interleukin-5 of beer consumers (117.25 ±1.50) compared with non beer consumers

(46.85±58.85) ($p < 0.05$). However, no significant difference was observed in the mean value of the C-reactive protein of beer consumers (0.79±2.65) compared with non beer consumers (0.24±0.14) ($p > 0.05$).

Table 2. The mean levels of Interleukin-5 and C-reactive protein of beer consumers and non-beer consumers (Mean ± SD)

Variables	Beer consumers	Non beer consumers	t-test	p- value
Interleukin-5	117.25 ±1.50	46.85 ±58.85	2.77	0.009
C-reactive protein	0.79 ±2.65	0.24 ±0.14	1.84	0.073

*Statistically significant at $p< 0.05$

Table 3 the association between Interleukin-5 and C Reactive protein with the Frequency/Intensity of beer consumption. There was a weak positive correlation between the mean level of interleukin-5, and the frequency of beer drinking (r= 0.279, p=0.011), while there is no correlation between the mean levels of C-reactive proteins and the frequency of beer drinking (r=-0.197 p=0.077).

Table 3. The association of Interleukin-5 and C-reactive protein levels with the frequency/intensity of beer consumption

Variables		Interleukin-5	C- reactive protein
Frequency beer of drinking	R-VALUE	0.279	0.197
	P-VALUE	0.011	0.077

DISCUSSION

The potential negative consequences of moderate alcohol intake, notably beer, on health, are gaining more and more attention. The link between low-to-moderate alcohol consumption and health benefits is still debatable because the findings of the available studies are inconsistent, making it difficult to draw definitive conclusions. This is true even though the detrimental effects of excessive alcohol consumption, such as cardiovascular diseases, general or abdominal obesity, and diabetes, are well established (Marcos, 2021). In this study, levels of Interleukin-5, which may have cardioprotective effects in humans, and C-reactive protein, a marker of inflammation in cardiovascular diseases, were measured in beer drinkers and non-drinkers to learn more about the health effects of beer. Adult beer drinkers had significantly higher mean systolic blood pressure and BMI than non-drinkers (control group) (p 0.05) (Table 1). This result is consistent with that of (Santana, 2018), which found that drinking alcoholic beverages makes hypertension worse. Beer consumption has no impact on blood pressure, either systolic or diastolic, however (Roerecke, 2012) asserted that the connection between excessive alcohol consumption and hypertension, as well as blood pressure improvement after alcohol reduction, are well established. Hypertension has been dubbed a "Silent Killer" by some researchers because it is a condition that can cause cardiovascular disorders, cerebral infarction, and renal failure. Alcohol drinking is an important risk factor for hypertension especially with the increase in drinking frequency. It is difficult and debatable what effect moderate alcohol consumption has (Roerecke, 2012). Additionally, in agreement with this study (Uraiporn, 2019), discovered that both men and women's average BMI increased with greater alcohol use. One of alcohol's initial effects is to boost appetite, which causes those with poor appetites to consume more food and store more energy in their bodies (Engel, 2014). It makes sense that habitual beer drinkers will become centrally obese. According to (Gregory Traversy and Jean-Philippe Chaput, 2015) alcohol prevents the oxidation of fat, which may result in fat-sparing and greater body fat levels over time. Because of the quantity and kind of alcohol that men tend to consume, the relationship between alcohol consumption and body weight is typically higher in males than it is in women. Beer drinkers had a statistically significant higher difference in interleukin-5 mean values than non-drinkers (p 0.05) (Table 2). Since high levels of Interleukin-5 bind to oxLDL and lower the risk of atherosclerosis, some studies have long hypothesized that they may have cardio-protective effects (Sampi, 2008; Di, 2019 and Knutsson, 2019). A cardio-protective effect has also been linked to low to moderate beer consumption (De Gaetano, 2016). High-density lipoprotein cholesterol (HDL-C) is one of the most well-known and logical ways that alcohol increases cardio-protective effects (Kerr, 2005; De Gaetano, 2016; 2016; Gemes, 2016; Zatu, 2015; Capurso, 2016; Gemes, 2016; Giovanni de G, Simona, 2017; Huang, 2017; Ronksley, 2011). In comparison to the group of deceased donors, IL-5 levels in the coronary plaque of patients with suspected coronary artery disease (CAD) were significantly lower in a study (Di, 2019) on patients with chest pain. Plasma IL-5 levels in the CAD groups were significantly lower than those in the non-CAD group. Research using binary linear regression demonstrated an independent relationship between the prevalence of CAD and IL-5. Therefore, it is safe to presume that test individuals who drink beer have greater levels of IL-5 than the control group, who do not drink beer and have lower levels of IL-5, as a result of their moderate beer consumption and the associated cardio-protective impact. Beer drinkers' mean serum levels of C-reactive protein did not differ significantly from non-drinkers' levels ($p> 0.05$) (Table 2). Without a shadow of a doubt, C-reactive protein is a reliable indicator of cardiovascular risk and inflammation As one of the primary pro-inflammatory cytokines generated, it is also high in the majority of cardiovascular disorders, and clinical trials have shown that lowering plasma CRP levels may lessen the incidence of CVD (Juan, 2014). In comparison to other inflammatory biomarkers, CRP has the largest body of evidence pointing to its potential as a standalone risk factor for the emergence of CVD Since it directly affects procedures including complement system activation, apoptosis, vascular cell activation, monocyte recruitment, lipid buildup, and thrombosis, it actively contributes to atherogenesis (Juan, 2014). Low-density lipoprotein cholesterol has traditionally been regarded as the primary indicator of cardiovascular disease (CVD), but clinical investigations have shown that CRP can also serve as a predictor of CVD. However, its precise role in the onset and progression of CVD is still unclear [36]. Interleukin-5 levels and beer consumption frequency exhibited a weakly positive association (r= 0.279, p=0.011), although the mean level of C-reactive proteins showed no correlation (r=-0.197, p=0.077) with beer consumption frequency among beer users. This may be because the bulk of the individuals, who are categorized as moderate beer users, said they consumed 1 to 5 bottles of beer per week. Moderate alcohol consumption confers cardiometabolic protective effects, according to a study (Bell) involving 8209 British Whitehall II study participants who drank alcohol for about up to 10 years.

CONCLUSION

Beer drinkers had significantly higher mean values for systolic blood pressure, BMI, and serum interleukin-5 compared to non-drinkers, while there was no significant difference in mean values for C-reactive protein compared to controls. There was also a weakly positive correlation between interleukin-5 levels and the frequency of beer consumption. These results indicate that moderate beer consumption, as observed in this study, does not cause an inflammatory response or increase the risk of cardiovascular diseases, and because IL-5 levels were higher, this study is consistent with other studies that have suggested that IL-5 may have atheroprotective effects in humans that lower the risk of cardiovascular disease.

Recommendation

All beer drinkers are advised to drink in moderation because it reduces the chance of developing cardiovascular problems. This makes sure that all inflammatory processes are suppressed and that oxidized low-density lipoprotein is inhibited by lowering C-reactive protein levels and raising IL-5 levels. To validate these results, more study with a larger sample size of low, moderate, and high-frequency beer drinkers is advised.

Conflict of Interest: The authors declare that they have no conflicts of interest.

Contributors: ACI, JUU, and CEO conceived and designed the research proposal. AFE, CEO, PCO, and ACI performed sample collection, experiments and data analysis. JUU, ACI, EIN, and PCO contributed to the final version of the manuscript. All authors have read and approved the final manuscript.

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