DESCRIPTION OF TRIGLYCERIDE LEVELS IN ALCOHOL CONSUMERS IN TIBAWA DISTRICT GORONTALO REGENCY

Ilham Rizki Bolota[1)], Erfan AR. Lainjong[2)], Rachma[3)]
[1,2,3)]Universitas Bina Mandiri Gorontalo
E-mail: ilhaamrizkibolota@gmail.com, erfan.laindjong@ubmg.ac.id, rahmaanalis.ra@gmail.com

ABSTRACT

Alcohol consumption is known to influence lipid metabolism and may contribute to elevated triglyceride levels, which are associated with an increased risk of cardiovascular disease, pancreatitis, and other metabolic disorders. This study aimed to describe triglyceride levels among alcohol consumers in Tibawa District, Gorontalo Regency. A quantitative descriptive study with a cross-sectional approach was conducted from July to August 2025. The study involved 30 alcohol consumers selected using purposive sampling. Venous blood samples were collected and analyzed using an enzymatic colorimetric method with a spectrophotometer to determine serum triglyceride levels. Data were analyzed descriptively using frequencies, percentages, means, minimum values, and maximum values. The results showed that most respondents were male (66.7%) and aged 10–18 years (63.3%). Triglyceride examination revealed that 29 respondents (96.7%) had normal triglyceride levels, while only 1 respondent (3.3%) had abnormal triglyceride levels. The mean triglyceride level was 141.70 ± 28.99 mg/dL, with a minimum value of 105 mg/dL and a maximum value of 215 mg/dL. These findings indicate that the majority of alcohol consumers in Tibawa District had triglyceride levels within the normal range, although abnormal triglyceride levels were identified in a small proportion of respondents. Continuous health education and monitoring are recommended to prevent future lipid metabolism disorders associated with alcohol consumption.

Keywords: *Alcohol Consumption, Triglyceride Levels, Lipid Metabolism, Hypertriglyceridemia, Community Health.*

INTRODUCTION

Alcohol consumption remains a significant public health concern worldwide due to its association with various metabolic and cardiovascular disorders. Beyond its well-known effects on the liver and nervous system, alcohol consumption has increasingly been recognized as an important factor influencing lipid metabolism, particularly triglyceride levels. Elevated triglyceride concentrations are associated with an increased risk of cardiovascular disease, metabolic syndrome, pancreatitis, and other chronic health conditions [1]. Hypertriglyceridemia has therefore become an important biomarker for assessing metabolic health and identifying individuals at risk of future cardiovascular complications.

The relationship between alcohol consumption and triglyceride metabolism has been extensively documented in previous studies. Acute alcohol intake has been shown to increase fasting and postprandial triglyceride levels through enhanced hepatic synthesis of very-low-density lipoprotein (VLDL) and reduced clearance of circulating triglycerides [2]. Alcohol consumption may also suppress lipoprotein lipase activity, an enzyme responsible for triglyceride hydrolysis, resulting in the accumulation of triglycerides in the bloodstream [3].

Submit: Dec 11th, 2025 Accepted: June 08th, 2026 Published: June 30th, 2026

Furthermore, chronic alcohol exposure stimulates adipose tissue lipolysis, leading to increased release of free fatty acids into circulation and subsequent hepatic triglyceride synthesis [4]. These physiological mechanisms contribute to the development of hypertriglyceridemia among individuals who consume alcohol regularly.

Several studies have demonstrated that the magnitude of alcohol-induced lipid alterations varies according to the amount, frequency, duration, and type of alcoholic beverages consumed. Heavy and chronic alcohol consumption has consistently been associated with higher triglyceride concentrations compared with moderate or occasional drinking [5]. Likewise, Martínez et al. [6], reported that alcohol consumption patterns significantly influence lipid profiles, including triglyceride concentrations, among adult populations. In addition, individual characteristics such as nutritional status, age, genetic predisposition, and lifestyle factors may influence the metabolic response to alcohol consumption [7]. Consequently, the impact of alcohol on triglyceride levels may differ across populations and geographical settings.

Hypertriglyceridemia represents a growing public health problem because it contributes to the increasing burden of non-communicable diseases, particularly cardiovascular diseases. Persistent elevation of triglyceride levels has been associated with atherosclerosis, coronary heart disease, and acute pancreatitis [1]. In communities where alcohol consumption is prevalent, these health risks may be amplified, especially among individuals with other metabolic risk factors such as obesity, diabetes mellitus, and sedentary lifestyles. Therefore, understanding triglyceride profiles among alcohol consumers is essential for identifying at-risk populations and developing effective preventive strategies.

In Indonesia, alcohol consumption remains a public health issue despite cultural and regulatory differences across regions. In several communities, alcoholic beverages continue to be consumed as part of social interactions, traditional practices, and recreational activities. Although the health consequences of alcohol consumption have been widely recognized, studies examining its effects on lipid metabolism in Indonesian populations remain limited. Most available evidence originates from studies conducted in Europe, North America, and East Asia, creating a gap in understanding the metabolic consequences of alcohol consumption within the Indonesian sociocultural context.

Tibawa District, located in Gorontalo Regency, is one of the communities where alcohol consumption continues to be observed among certain population groups. However, information regarding triglyceride levels among alcohol consumers in this area remains scarce. To date, no published study has specifically described the triglyceride profile of alcohol consumers in Tibawa District. This lack of localized evidence limits the ability of health authorities and policymakers to develop targeted interventions aimed at preventing alcohol-related metabolic disorders within the community.

Although previous studies have consistently reported associations between alcohol consumption and elevated triglyceride levels, evidence from local Indonesian populations remains insufficient. Furthermore, community-based studies focusing on alcohol-induced hypertriglyceridemia in rural and semi-rural settings are still limited. Differences in drinking patterns, socioeconomic conditions, nutritional status, and cultural practices may influence lipid metabolism and contribute to variations in triglyceride levels across populations. Therefore, localized studies are necessary to provide

context-specific evidence regarding the metabolic effects of alcohol consumption.

Based on these considerations, this study was conducted to describe triglyceride levels among alcohol consumers in Tibawa District, Gorontalo Regency. The findings are expected to provide baseline epidemiological information regarding the lipid profiles of alcohol consumers in the local community, contribute to the understanding of alcohol-related metabolic health risks, and support the development of preventive health programs aimed at reducing the burden of dyslipidemia and cardiovascular disease in the region.

RESEARCH METHODS

Study Design and Setting

This study employed a quantitative descriptive research design using a cross-sectional approach. A cross-sectional design is commonly used to describe the distribution of health-related variables within a population at a specific point in time [8]. The study was conducted from July to August 2025 in Tibawa District, Gorontalo Regency, Indonesia. The research aimed to describe triglyceride levels among alcohol consumers residing in the study area.

Population and Sample

The target population consisted of individuals who consumed alcoholic beverages and resided in Tibawa District, Gorontalo Regency. A total of 30 respondents were included in the study using a purposive sampling technique. Purposive sampling allows researchers to select participants who meet specific criteria relevant to the research objectives [9].

Inclusion Criteria

1. Individuals aged 10–59 years.
2. Residents of Tibawa District, Gorontalo Regency.
3. Individuals who reported consuming alcoholic beverages.
4. Willing to participate in the study and provide informed consent. For respondents aged under 18 years, informed consent was obtained from their parents or legal guardians.

Exclusion Criteria

1. Individuals with incomplete laboratory examination results.
2. Individuals who declined blood sample collection.
3. Individuals diagnosed with severe metabolic disorders affecting lipid metabolism.

Research Instruments and Materials

The instruments used in this study included a tourniquet, disposable syringe, plain vacuum tube, centrifuge, micropipette, spectrophotometer, alcohol swabs (70% ethanol), dry cotton, gloves, and adhesive plaster. The biological material analyzed in this study was venous blood serum.

Blood Collection Procedure

Venous blood samples were collected by trained laboratory personnel following standard venipuncture procedures recommended by the World Health Organization [10]. The procedure consisted of the following steps:

1. The examiner washed hands and wore disposable gloves.
2. All equipment and materials were prepared before sample collection.
3. A tourniquet was applied to the participant’s upper arm to facilitate vein identification.
4. The selected venipuncture site was identified through palpation.
5. The puncture site was disinfected using a 70% alcohol swab and allowed to air dry.
6. Venous blood was collected using a sterile disposable syringe.

7. The collected blood sample was transferred into a plain tube without anticoagulant.
8. After venipuncture, the puncture site was compressed with dry cotton and covered with adhesive plaster.
9. Blood samples were allowed to clot and subsequently centrifuged at 3000 rpm for 10 minutes to obtain serum.
10. The serum was separated and prepared for triglyceride analysis.

Laboratory Examination of Triglyceride Levels

Serum triglyceride levels were measured using an enzymatic colorimetric method with a spectrophotometer according to the manufacturer's standard operating procedures. The enzymatic colorimetric method is widely used in clinical laboratories because of its accuracy and reliability in determining serum triglyceride concentrations [11].

Triglyceride levels were reported in milligrams per deciliter (mg/dL) and classified according to the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) guidelines (National Cholesterol Education Program, 2002):

1. Normal: <150 mg/dL
2. Borderline high: 150–199 mg/dL
3. High: 200–499 mg/dL
4. Very high: ≥500 mg/dL

Data Analysis

Data were analyzed using descriptive statistical methods. Respondent characteristics and triglyceride levels were summarized using frequencies, percentages, means, standard deviations, minimum values, and maximum values. The findings were presented in tables and narrative form to describe the distribution of triglyceride levels among alcohol consumers in Tibawa District, Gorontalo Regency [12].

Ethical Considerations

Prior to data collection, participants were informed about the objectives and procedures of the study. Participation was voluntary, and informed consent was obtained from all respondents. Confidentiality and anonymity were maintained throughout the study in accordance with ethical principles for human research [13].

RESEARCH RESULT

Univariate Analysis

Respondent Characteristics Based on Age

The distribution of respondents based on age and triglyceride examination results is presented in Table 1.

Table 1. Distribution of Respondents Based on Age and Triglyceride Levels (n = 30)

Age Range (Years)	Number of Respondents n (%)	Abnormal n (%)	Normal n (%)
10–18 (Adolescent)	19 (63.3)	0 (0.0)	19 (65.5)
19–59 (Adult)	11 (36.7)	1 (100.0)	10 (34.5)
Total	30 (100.0)	1 (100.0)	29 (100.0)

Source: Primary Data, 2025.

Based on Table 1, most respondents were adolescents aged 10–18 years, accounting for 19 individuals (63.3%), while adults aged 19–59 years accounted for 11 individuals (36.7%). The only respondent with abnormal triglyceride levels was found in the adult age group. Overall, 29 respondents had normal triglyceride levels and only 1 respondent had abnormal triglyceride levels.

Respondent Characteristics Based on Gender

The distribution of respondents according to gender is presented in Table 2.

Table 2. Distribution of Respondents Based on Gender (n = 30)

Gender	Frequency (n)	Percentage (%)
Male	20	66.7
Female	10	33.3
Total	30	100.0

Source: Primary Data, 2025.

Based on Table 2, the majority of respondents were male, totaling 20 individuals (66.7%), whereas female respondents accounted for 10 individuals (33.3%). These findings indicate that alcohol consumers included in this study were predominantly male.

Laboratory Examination Results of Triglyceride Levels

The distribution of triglyceride level categories is presented in Table 3.

Table 3. Distribution of Triglyceride Level Categories (n = 30)

Triglyceride Category	Frequency (n)	Percentage (%)
Normal	29	96.7
Abnormal	1	3.3
Total	30	100.0

Source: Primary Data, 2025.

Based on Table 3, the majority of respondents had normal triglyceride levels, accounting for 29 individuals (96.7%). Only one respondent (3.3%) was classified as having abnormal triglyceride levels. These findings suggest that most alcohol consumers in Tibawa District had triglyceride levels within the normal reference range.

Descriptive Statistics of Triglyceride Levels

The descriptive statistics of triglyceride levels are presented in Table 4.

Table 4. Descriptive Statistics **of Triglyceride Levels (n = 30)**

Variable	N	Minimum (mg/dL)	Maximum (mg/dL)	Mean (mg/dL)
Triglyceride Level	30	105	215	141.70
Valid N (listwise)	30	-	-	-

Source: Primary Data, 2025.

Based on Table 4, triglyceride levels among respondents ranged from 105 mg/dL to 215 mg/dL. The mean triglyceride level was 141.70 ± 28.99 mg/dL. Although one respondent exhibited triglyceride levels above the normal threshold, the overall mean triglyceride level remained within the normal range (<150 mg/dL). These results indicate that, on average, triglyceride levels among alcohol consumers in Tibawa District were still within acceptable clinical limits.

DISCUSSION

Triglyceride Levels Among Alcohol Consumers in Tibawa District, Gorontalo Regency

This study aimed to describe triglyceride levels among alcohol consumers in Tibawa District, Gorontalo Regency. The findings showed that most respondents had triglyceride levels within the normal range (96.7%), while only 3.3% exhibited abnormal triglyceride levels. The mean triglyceride level among respondents was 141.70 ± 28.99 mg/dL, with values ranging from 105 mg/dL to 215 mg/dL. These findings indicate that, despite consuming alcoholic beverages, the majority of respondents did not exhibit clinically elevated triglyceride levels.

The predominance of normal triglyceride levels observed in this study may be explained by several factors, including the amount, frequency, and pattern of alcohol consumption. Previous studies have demonstrated that the relationship between alcohol consumption and triglyceride levels is dose-dependent and follows a J-shaped pattern. Light-to-moderate alcohol consumption is often associated with lower triglyceride concentrations, whereas excessive or heavy alcohol intake contributes to elevated triglyceride levels and increased

cardiovascular risk [1][14]. Therefore, the relatively normal triglyceride levels observed among respondents may suggest that most participants consumed alcohol at levels that had not yet caused significant disturbances in lipid metabolism.

The present findings are consistent with studies reporting that moderate alcohol consumption may not necessarily lead to hypertriglyceridemia. Wakabayashi [15], found an inverse association between alcohol consumption and the triglyceride-to-HDL cholesterol ratio among middle-aged men, suggesting that moderate alcohol intake may be associated with a more favorable lipid profile. Similarly, Wakabayashi [16], reported that individuals consuming alcohol in moderate amounts tended to exhibit lower triglyceride-to-HDL cholesterol ratios compared with non-drinkers. These findings indicate that the effects of alcohol on lipid metabolism are complex and may vary depending on drinking patterns and individual metabolic characteristics.

Although most respondents had normal triglyceride levels, one respondent exhibited abnormal triglyceride concentrations. This finding is important because alcohol-induced hypertriglyceridemia remains a recognized metabolic consequence of excessive alcohol consumption. Klop et al. [1], explained that alcohol can increase triglyceride concentrations through enhanced hepatic synthesis and secretion of very-low-density lipoprotein (VLDL), reduced fatty acid oxidation, and impaired triglyceride clearance. Chronic alcohol consumption also increases the release of free fatty acids from adipose tissue to the liver, contributing to triglyceride accumulation and elevated plasma triglyceride levels.

The occurrence of abnormal triglyceride levels in one respondent may also be associated with differences in drinking intensity or binge-drinking behavior. Previous research has shown that heavy alcohol consumption is strongly associated with dyslipidemia and hypertriglyceridemia. Bessembinders et al. [17], reported that excessive alcohol intake is a major contributor to severe hypertriglyceridemia and may increase the risk of acute pancreatitis. Likewise, Wakabayashi [16], found that heavy drinkers exhibited less favorable lipid profiles compared with moderate drinkers, including significantly higher triglyceride concentrations. Therefore, although the prevalence of abnormal triglyceride levels was low in the present study, individuals who consume alcohol excessively may remain at risk for lipid abnormalities and related health complications.

Another explanation for the predominance of normal triglyceride levels may be related to the relatively young age of most respondents. In this study, 63.3% of participants were adolescents aged 10–18 years. Younger individuals generally possess more efficient metabolic regulation and may have lower cumulative exposure to alcohol compared with older adults. Consequently, lipid metabolism may not yet have been substantially affected by alcohol consumption. However, continued alcohol use over time may contribute to metabolic disturbances later in life, particularly when combined with unhealthy dietary habits, obesity, physical inactivity, or genetic predisposition.

The findings of this study also support the notion that alcohol does not affect all individuals equally. Genetic and environmental factors may influence the metabolic response to alcohol consumption. Tan et al. [18], demonstrated that genetic polymorphisms related to alcohol metabolism can modify the association between alcohol intake and

serum triglyceride levels. Consequently, individuals consuming similar amounts of alcohol may experience different lipid responses depending on their genetic background and metabolic characteristics.

From a public health perspective, these findings provide important baseline information regarding lipid health among alcohol consumers in Tibawa District. Although the majority of respondents had normal triglyceride levels, alcohol consumption remains a potential risk factor for future dyslipidemia, cardiovascular disease, and metabolic disorders. Studies conducted in various populations have shown that heavy alcohol consumption is associated with increased triglyceride levels and adverse cardiovascular outcomes [19][20]. Therefore, continuous health promotion efforts are needed to educate communities about the potential long-term consequences of excessive alcohol consumption.

This study has several limitations. First, the descriptive cross-sectional design does not allow determination of causal relationships between alcohol consumption and triglyceride levels. Second, information regarding the quantity, frequency, duration, and type of alcohol consumed was not collected, limiting a more detailed analysis of alcohol-related effects on lipid metabolism. Third, other factors influencing triglyceride levels, such as dietary intake, body mass index, smoking habits, physical activity, and genetic predisposition, were not assessed. Future studies should incorporate these variables and employ analytical designs to better understand the relationship between alcohol consumption and triglyceride levels in the local population.

Overall, the findings indicate that most alcohol consumers in Tibawa District had triglyceride levels within normal limits. Nevertheless, given the established relationship between excessive alcohol consumption and hypertriglyceridemia reported in previous studies, continued monitoring and preventive interventions remain important to reduce the risk of future metabolic and cardiovascular complications.

CONCLUSION

This study found that the majority of alcohol consumers in Tibawa District, Gorontalo Regency, had triglyceride levels within the normal range. Most respondents were male and belonged to the adolescent age group. Laboratory examination showed that only a small proportion of respondents had abnormal triglyceride levels, while the overall mean triglyceride concentration remained within the normal clinical reference range. Although the findings suggest that triglyceride levels among alcohol consumers in the study area were generally normal, alcohol consumption remains a potential risk factor for lipid metabolism disorders, particularly when consumed excessively and over a prolonged period. Therefore, routine health promotion, early screening, and monitoring of lipid profiles are recommended to prevent the development of hypertriglyceridemia and other alcohol-related metabolic complications in the community.

REFERENCES

[1] B. Klop, A. T. D. Rego, and M. C. Cabezas, “Alcohol and plasma triglycerides,” *Curr. Opin. Lipidol.*, vol. 24, no. 4, pp. 321–326, 2013, doi: 10.1097/MOL.0b013e3283606845.

[2] A. Van De Wiel, “The effect of alcohol on postprandial and fasting triglycerides,” *Int. J. Vasc. Med.*, vol. 2012, 2012, doi:

10.1155/2012/862504.

[3] K. Zemánková, E. Makoveichuk, Z. Vlasáková, G. Olivecrona, and J. Kovář, "Acute alcohol consumption downregulates lipoprotein lipase activity in vivo," *Metabolism.*, vol. 64, no. 11, pp. 1592–1596, 2015, doi: 10.1016/j.metabol.2015.08.016.

[4] W. Zhong *et al.*, "Chronic alcohol exposure stimulates adipose tissue lipolysis in mice: Role of reverse triglyceride transport in the pathogenesis of alcoholic steatosis," *Am. J. Pathol.*, vol. 180, no. 3, pp. 998–1007, 2012, doi: 10.1016/j.ajpath.2011.11.017.

[5] K. Paul, N. K. Bairwa, H. L. Kazal, and A. Batta, "To study the effects of alcohol on lipid profile on basis of amount, type and duration of alcohol consumption," *Indian J. Public Heal. Res. Dev.*, vol. 6, no. 3, pp. 302–307, 2015, doi: 10.5958/0976-5506.2015.00186.2.

[6] O. G. E. Martínez, V. C. Luft, C. P. de Faria, and M. C. B. Molina, "Alcohol consumption and lipid profile in participants of the longitudinal study of adult health (Elsa-Brasil)," *Nutr. Hosp.*, vol. 36, no. 3, pp. 665–673, 2019, doi: 10.20960/nh.2260.

[7] Z. Luo, J. Cheng, and Y. Wang, "Effects of the genetic variants of alcohol-metabolizing enzymes on lipid levels in Asian populations: a systematic review and meta-analysis," *Nutr. Rev.*, vol. 81, no. 8, pp. 921–938, 2023, doi: 10.1093/nutrit/nuac100.

[8] M. S. Setia, "Methodology Series Module 3: Cross-sectional Studies," *Indian J. Dermatol.*, vol. 61, no. 3, pp. 261–264, 2016.

[9] S. Campbell *et al.*, "Purposive sampling: complex or simple? Research case examples," *J. Res. Nurs.*, vol. 25, no. 8, pp. 652–661, 2020, doi: 10.1177/1744987120927206.

[10] W. H. Organization, *WHO guidelines on drawing blood: Best practices in phlebotomy*. WHO Press, 2010.

[11] C. A. Burtis and D. E. Bruns, *Tietz fundamentals of clinical chemistry and molecular diagnostics*, 9th ed. Elsevier, 2023.

[12] J. W. Creswell and J. D. Creswell, "Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (th ed.)," in *SAGE Publications*, 2018.

[13] W. M. Association, "World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects," *JAMA*, vol. 310, no. 20, pp. 2191–2194, 2013.

[14] J. Kovář and K. Zemánková, "Moderate alcohol consumption and triglyceridemia," *Physiol. Res.*, vol. 64, pp. S371–S375, 2015, [Online]. Available: https://www.scopus.com/inward/record.uri?eid=2-s2.0-84983146541&partnerID=40&md5=a47c9950700abb8a84a5a6383a2c49c2

[15] I. Wakabayashi, "Inverse association between triglycerides-to-HDL-cholesterol ratio and alcohol drinking in middle-aged Japanese men," *J. Stud. Alcohol Drugs*, vol. 73, no. 6, pp. 998–1004, 2012, doi: 10.15288/jsad.2012.73.998.

[16] I. Wakabayashi, "Alcohol intake and triglycerides/high-density lipoprotein cholesterol ratio in men with hypertension," *Am. J. Hypertens.*, vol. 26, no. 7, pp. 888–895, 2013, doi: 10.1093/ajh/hpt033.

[17] K. Bessembinders, J. Wielders, and A. van de Wiel, "Severe hypertriglyceridemia influenced by alcohol (SHIBA)," *Alcohol Alcohol.*, vol. 46, no. 2, pp. 113–116, 2011, doi: 10.1093/alcalc/agq088.

[18] A. Tan *et al.*, "A genome-wide association and gene-environment interaction study for serum triglycerides levels in a healthy Chinese male population," *Hum. Mol. Genet.*, vol. 21, no. 7, pp. 1658–1664, 2012, doi: 10.1093/hmg/ddr587.

[19] H. Park and K. Kim, "Association of alcohol consumption with lipid profile in hypertensive men," *Alcohol Alcohol.*, vol. 47, no. 3, pp. 282–287, 2012, doi: 10.1093/alcalc/ags019.

[20] X.-F. Ye, C.-Y. Miao, W. Zhang, L.-N. Ji, and J.-G. Wang, "Alcohol intake and dyslipidemia in male patients with hypertension and diabetes enrolled in a China multicenter registry," *J. Clin. Hypertens.*, vol. 25, no. 2, pp. 183–190, 2023, doi: 10.1111/jch.14638.