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Meta-Analysis

The Relationship between Alcohol Consumption and Cardiovascular Disease in Adults: Meta-Analysis

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ABSTRACT

Background: Alcoholic drink is a type of drink that contains ingredients similar to alcohol, usually ethyl alcohol or ethanol. Cardiovascular disease or also known as heart disease, generally refers to conditions that involve narrowing or blocking of blood vessels. The cardiovascular effects of alcohol consumption seen in observational studies continue to be hotly debated in the thematic literature and popular media. The purpose of this study was to analyze the relationship between alcohol consumption and cardiovascular disease in adults
Subjects and Method: This is a meta-analysis study using PRISMA flowchart guidelines and the articles were published in English from 2013 to 2022. The article search was conducted using the PICO model, Population: Adults, Intervention: Alcohol consumption. Comparison: No Consumption of alcoholic beverages. Articles obtained from the PubMed, Google Scholar and ScienceDirect databases. Based on the database, there were 9 articles that met the inclusion criteria. The analysis was carried out using Revman 5.3. software.
Results: There were 9 articles from Asia, North America, and Europe, 2 articles from South Korea, 2 articles from China, 1 article from Japan, 1 article from the United States (USA), 1 article from England, 1 article from Spain and 1 article from Eastern Europe. Based on the results of the forest plot using a cohort study, it showed that someone who consumes alcohol has a high risk of cardiovascular disease by 2.83 times compared to someone who does not consume alcohol which is associated with cardiovascular disease (aHR= 2.83; CI 95%= 2.67 to 3.00; p <0.001).
Conclusion: Adults who consume alcohol are at risk for cardiovascular disease.

Keywords: cardiovascular, alcoholic drink, heart disease

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BACKGROUND

Alcoholic beverages are a type of drink that is often consumed by humans. Pure alcohol is not consumed by humans, humans consume beverages that contain ingredients similar to alcohol, usually ethyl alcohol or ethanol. Alcohol is a type of drink that contains the chemical element ethyl alcohol or ethanol, ethanol is a clear, colorless liquid and has a bitter taste. Alcohol is obtained from fermentation by microorganisms from sugar, fruit juices, seeds, honey, tubers and certain cactus sap (Newcomb et al., 2013).

Cardiovascular disease or commonly known as heart disease generally refers to conditions that involve narrowing, blocking of blood vessels that can lead to a heart

attack, chest pain (angina) or stroke. Other heart conditions that affect the heart muscle, valves or rhythm, are also considered forms of heart disease. According to the American Heart Association in (2017) in Oliver (2013), cardiovascular disease is the cause of death for 17.3 million people in the world, about 3 million of these deaths occur before the age of 60 years old. According to world statistics, there are 9.4 million deaths every year due to cardiovascular disease and 45% of these deaths are caused by coronary heart disease.

Cardiovascular disease is a term for a range of disorders that attack the heart and blood vessels, including coronary heart disease, cerebrovascular disease, hypertension (high blood pressure), and peripheral vascular disease (PVD). The definition of cardiovascular also includes other diseases such as rheumatic heart disease (heart damage due to rheumatism) and congenital heart disease (damage to the structure of the heart from birth) (Guilherme and Kalil, 2016)

The possible cardiovascular effects of alcohol consumption seen in observational studies continue to be highly debated in the thematic literature and popular media. In the absence of clinical trials, clinicians must interpret these data when answering a patient's question about alcohol drinking to reduce the risk of cardiovascular disease. Systematic reviews and meta-analyses have addressed the association of alcohol consumption with cardiovascular disease outcomes but have not uniformly addressed the association between alcohol use and mortality from cardiovascular disease.

In this article, the researchers synthesize results from a cohort study comparing alcoholics to nondrinkers for overall mortality from cardiovascular disease, incidence of cardiovascular disease and death from cardiovascular disease.

SUBJECTS AND METHOD

1. Study Design

This study used a meta-analysis study design. This study was conducted by searching for articles obtained from the PubMed, Google Scholar and ScienceDirect databases. The selection of articles was carried out using the PRISMA flow. An article search strategy with keywords and Boolean operators, namely Alcohol OR Alcoholic Beverage Consumption OR Consumption of Alcoholic Drinks AND Cardiovascular OR Cardiovascular Disease OR Cardiovascular Mortality.

2. Inclusion Criteria

The inclusion criteria used in this study were full-text articles with a cohort design. The article was published in English from 2013 to 2022. An analysis of the perceived benefits to the final study results was reported using the adjusted Hazard Ratio (aHR).

3. Exclusion Criteria

In this study, the exclusion criteria were articles that had been meta-analyzed, duplicate articles, published articles only in the abstract, and the number of research samples was less than 100.

4. Operational Definition of Variable

The search for articles was carried out by considering the eligibility criteria determined using the PICO model. Population: Adults, Intervention: Consumption of alcoholic beverages. Comparison: No Consumption of alcoholic beverages. Outcome: Cardiovascular Disease

Cardiovascular Disease: Cardiovascular disease or commonly known as heart disease generally refers to conditions that involve narrowing or blocking of blood vessels that can lead to a heart attack, chest pain (angina) or stroke. The definition of CVD also includes other diseases such as rheumatic heart disease (heart damage due to rheumatism) and congenital heart

disease (damage to the structure of the heart from birth).

5. Study Instrument

This study was guided by the PRISMA flow diagram and the assessment of the quality of research articles using the Critical Appraisal Checklist for Cohort Study. There were 12 questions used in this study).

6. Data Analysis

The data in this study were analyzed using the Review Manager application (RevMan 5.3). Forest plots and funnel plots were used to determine the size of the relationship and the heterogeneity of the data. The fixed effect model was used when the data was homogeneous, while the random effect model was used when the data was heterogeneous.

RESULTS

This study used an article search process obtained from various databases such as PubMed, Google Scholar and ScienceDirect. The review process of the article was shown in the PRISMA flow diagram which can be seen in Figure 1.

It can be seen in Figure 2 which described the study sites, namely 9 studies in total from Asia, North America, and Europe, 2 articles from South Korea, 2 articles from China, 1 article from Japan, 1 article from the United States (USA), 1 article from England, 1 article from Spain, and 1 article from Eastern Europe. A total of 9 articles were designed with a cohort study analyzing the association of alcohol consumption with cardiovascular disease in adults. In Table 1, the researchers conducted an assessment of the quality of the study. Table 2 presents a summary of 9 articles from a cohort study with a total sample of 2,612,032 participants regarding alcohol consumption and cardiovascular disease.

Based on the results of the forest plot using a cohort study showed that a person who consumed alcohol has a high risk of cardiovascular disease by 2.47 times compared to someone who did not consume alcohol (aHR= 2.47; 95% CI = 1.94 to 3.15) and the results were statistically significant. ($p< 0.001$). The heterogeneity in this study showed $I^2= 90\%$ so that the distribution of the data was said to be heterogeneous and the forest plot data analysis used a random effect model.

Based on the results of the funnel plot in Figure 4, it can be concluded that there was a publication bias which was characterrized by an asymmetrical plot with a distribution between right and left. There were five plots on the right, three plots on the left, and one plot touching the vertical line. The plot on the right side of the graph has a standard error (SE) between 0 and 0.5. The plot on the left side of the graph has a standard error (SE) between 0 and 0.3.

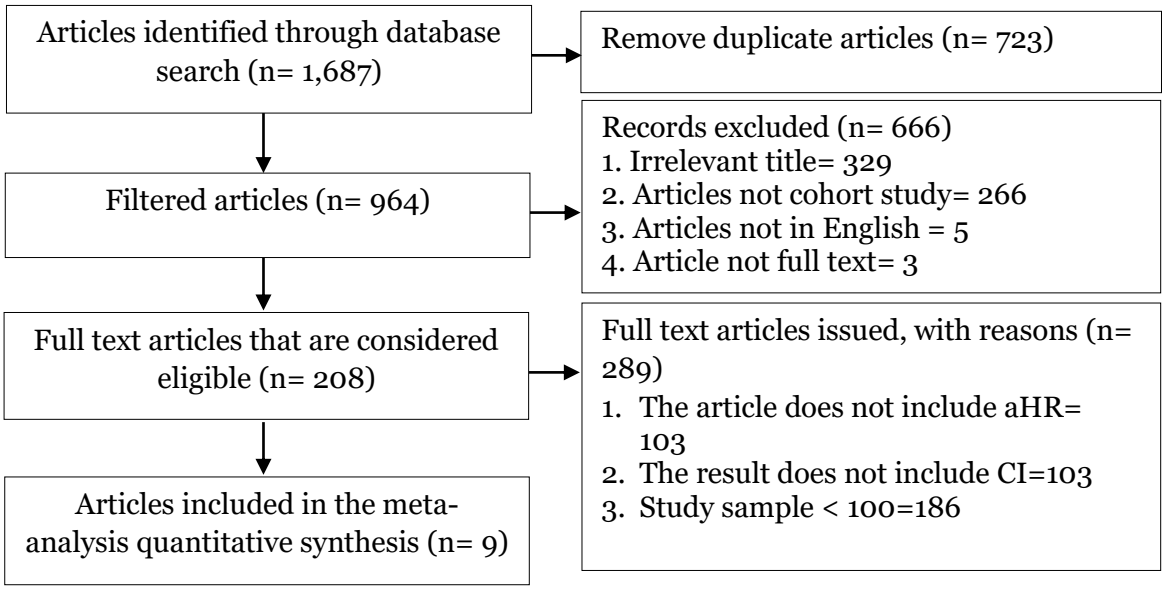

Figure 1. PRISMA flow Chart

Figure 2. Map of study area of the relationship between alcohol consumption and cardiovascular disease in adults

Table 1. Assessment of study quality published by the Critical Appraisal Skills Program (CASP)

No	Indicator	Publication (Author and Year)								
		Xi et al. (2017)	Bell et al. (2017)	Bobak et al. (2016)	Newcomb et al. (2013)	Higashiyama et al. (2013)	Lee et al. (2021)	Ye et al. (2021)	Zhang et al. (2021)	Chang and Park (2020)
1.	Does this research address a clearly focused problem?	2	2	2	2	2	2	2	2	2
2.	Is the group recruited in the right way?	2	2	2	2	2	2	2	2	2
3.	Is exposure to cardiovascular disease accurately to minimize bias? Is the outcome (status of death) measured	2	2	2	2	2	2	2	2	2
4.	Are outcomes measured accurately (correctly) to prevent/minimize bias?	2	2	2	2	2	2	2	2	2
5.	Does the researcher identify all the important confounding factors? Did the researcher control for important confounding factors in the design or data analysis phase?	2	2	2	2	2	2	2	2	2
6.	Do the research subject complete the research time in full? Were the research subjects followed (follow-up) for a long time?	2	2	2	2	2	2	2	2	2
7.	What are the results of this study?	2	2	2	2	2	2	2	2	2
8.	How precise are the results?	2	2	2	2	2	2	2	2	2
9.	Are the results reliable?	2	2	2	2	2	2	2	2	2
10.	Are the results applicable to the local (local) population?	2	2	2	2	2	2	2	2	2
11.	Are the results of this study compatible with other available evidence?	2	2	2	2	2	2	2	2	2
12.	What are the implications of this research for practice?	2	2	2	2	2	2	2	2	2
	Total	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**

Note:

2: Yes; 1: Can't Tell; 0: No

Table 2. Summary of primary research related to alcohol consumption and cardiovascular disease

Author (Year)	Location	Study Design	Sample	Population	Intervention	Comparison	Outcome	aHR (95%CI)
Bell et al. (2017)	England	Cohort	1,937,360	Adults aged ≥ 30 years old	Consuming alcohol	Not consuming alcohol	Cardiovascular disease, coronary heart disease	3.42 (1.28 to 9.14)
Newcomb et al. (2013)	United States	Cohort	22,890	Adults aged 20-79 years old	Consuming alcohol	Not consuming alcohol	Breast cancer, cardiovascular disease	2.53 (2.32 to 2.77)
Lee et al. (2021)	South Korea	Cohort	20,653	Adults aged 55-72 years old	Consuming alcohol	Not consuming alcohol	Colorectal cancer, cardiovascular disease	1.51 (1,15 to 1.98)
Ye et al. (2021)	China	Cohort	1,702	Adults aged 60-69 years old	Consuming alcohol	Not consuming alcohol	Cardiovascular disease, cardiovascular mortality	3.78 (3.32 to 4.31)
Higashiyama et al. (2013)	Japan	Cohort	6,485	Adults aged 46-54 years old	Consuming alcohol	Not consuming alcohol	Cardiovascular disease, hypertension.	0.80 (0.50 to 1. 28)
Zhang et al. (2021)	China	Cohort	83,732	Adults aged 46-53 years old	Consuming alcohol	Not consuming alcohol	Cancer, cardiovascular disease	3.16 (2.83 to 3.53)
Chang and Sang (2020)	South Korea	Cohort	490,255	Adults aged ≤60 years old	Consuming alcohol	Not consuming alcohol	Cardiovascular disease	2.06 (1.09 to 3.89)
Hernandez-Hernandez et al. (2015)	Spain	Cohort	14,651	Adults aged 39.7-46.5 years old	Consuming alcohol	Not consuming alcohol	Cardiovascular disease, cardiovascular mortality	4.71 (1.79 to 12.43)
Bobak et al. (2016)	Eastern Europe	Cohort	34,304	Adults aged 45-69 years old	Consuming alcohol	Not consuming alcohol	Cardiovascular disease, coronary heart disease	3.74 (2.33 to 6.02)

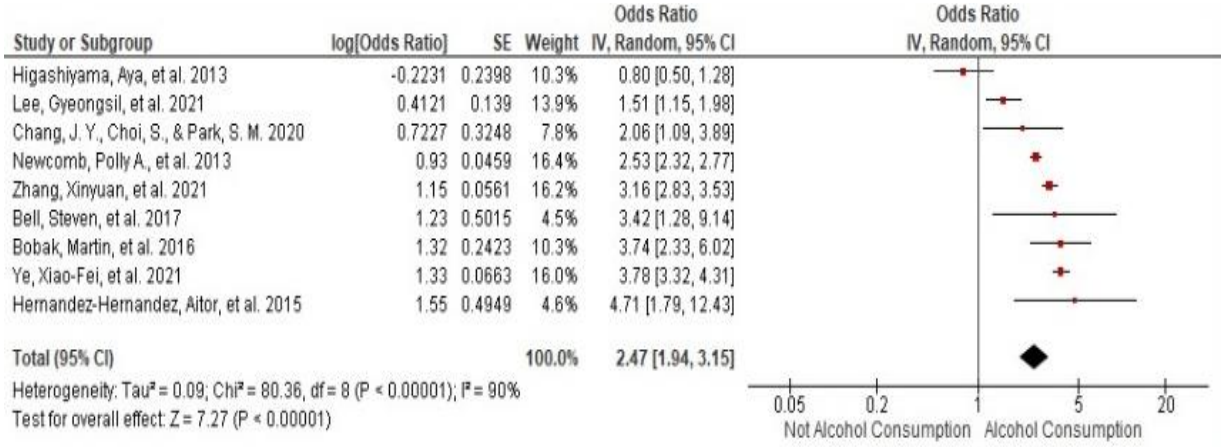

Figure 3. Forest Plot of the relationship of alcohol consumption with cardiovascular disease in adults

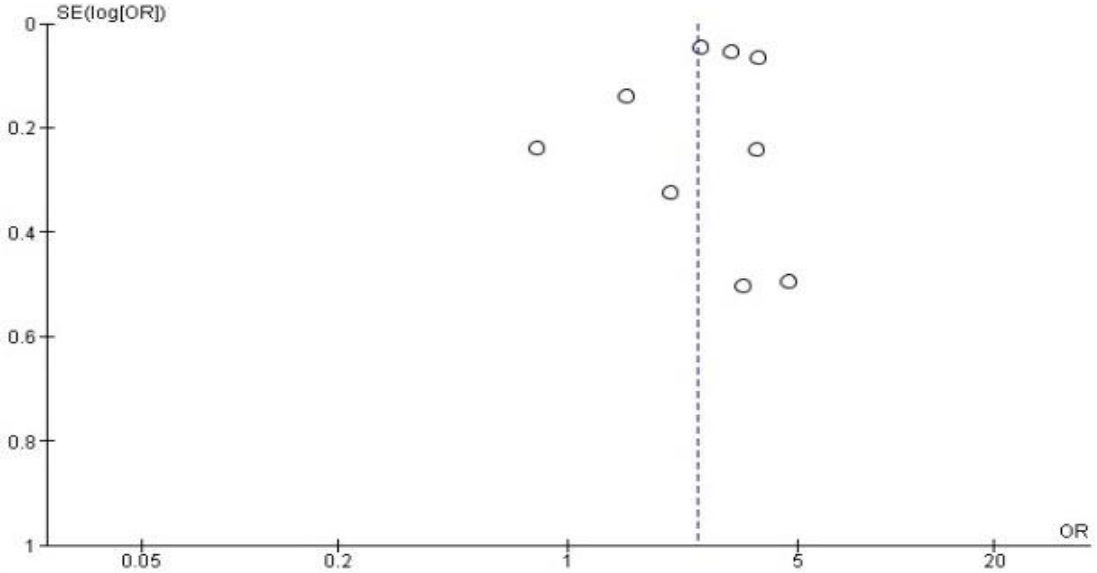

Figure 4. Funnel Plot of the relationship of alcohol consumption with cardiovascular disease in adults

DISCUSSION

The independent variable of this study is Alcohol Consumptions while the dependent variable of this study is cardiovascular disease. This study discusses one of the life-styles of a person, especially adults who consume alcohol that can be at risk of cardiovascular disease. According to Kamida et al (2008), alcohol consumption is linearly associated with an increased risk of CVD. The results of this study indicated that a person who consumed alcohol has a high risk of cardiovascular disease by 2.47 times compared to someone who did not consume alcohol for cardiovascular disease (aHR= 2.47; 95% CI= 1.94 to 3.15; p< 0.001). This is in line with a study by Rosoff et al (2020) which stated that genetically predicted alcohol consumption was associated with an increased risk of CHD (OR= 1.24; 95% CI= 1.03 to 1.50). Individuals who do not consume alcohol have a better quality of life than individuals who consume alcohol (Daeppen et al., 2014).

Jensen et al. (2019) argues that drinking allows adolescents to form and

strengthen new friendships, strengthens existing social bonds, and engages in stories about drinking allows them to position themselves in society. According to study by Ramadhan and Mahdalena (2017), stress is positively correlated with alcohol intake. This relationship occurs because by consuming alcohol, adolescents can relieve stress temporarily. As a result, teenagers who experience severe stress will also become heavy drinkers.

The limitations of this study are that there is a language bias because it only uses English articles, a publication bias shown in the funnel plot results, and a search bias because it only uses three databases.

AUTHOR CONTRIBUTION

Moh Maulana and Shofia Andriyani as the main researchers, designed the study, collected articles from electronic journal databases and analyzed the data.

FUNDING AND SPONSORSHIP

This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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REFERENCES

Bell S, Daskalopoulou M, Rapsomaniki E, George J, Britton A, Bobak M, Casas JP, et al. (2017). Association between clinically recorded alcohol consumption and initial presentation of 12 cardiovascular diseases: Population based cohort study using linked health records. BMJ. 356(2): 1–7. doi: 10.1136/bmj.j909.

Bobak M, Malyutina S, Horvat P, Pajak A, Tamosiunas A, Kubinova R, Simonova G, et al. (2016). Alcohol, drinking pattern and all-cause, cardiovascular and alcohol-related mortality in Eastern Europe. Eur J Epidemiol. 31(1): 21–30. doi: 10.100-7/s10-654-015-0092-8.

Chang JY, Choi S, Park SM (2020). Association of change in alcohol consumption with cardiovascular disease and mortality among initial non-drinkers. Sci Rep. 10(1): 1–9. doi: 10.-1038%2Fs41598-020-70304-7.

Daeppen JB, Faouzi M, Sanchez N, Rahhali N, Bineau S, Bertholet N (2014). Quality of life depends on the drinking pattern in alcohol-dependent patients. Alcohol Alcohol. 49(4): 457–465. doi: 10.1093/alcalc/agu027.

Guilherme L, Kalil J, Cunningham M (2006). Molecular mimicry in the autoimmune pathogenesis of rheumatic heart disease. Autoimmunity. 39 (1): 31-9. doi: 10.1080/08916930-500484674.

Higashiyama A, Okamura T, Watanabe M, Kokubo Y, Wakabayashi I, Okayama A, Miyamoto Y (2013). Alcohol consumption and cardiovascular disease incidence in men with and without hypertension: The Suita study. Hypertens Res. 36(1): 58–64. doi: 10.-1038/hr.2012.133

Huang J, Choi P, Pang TWY, Chen X, Wang J, Ding H, Jin Y, et al. (2021). Factors associated with participation in colorectal cancer screening: A population-based study of 7200 individuals. Eur J Cancer Care (Engl). 30(2). doi: 10.1111/ecc.13369.

Jensen MB, Hunt G (2019). Young women's narratives on sex in the context of heavy alcohol use: Friendships, gender norms and the sociality

of consent. Int J Drug Policy. 5(1): 1–24. doi: 10.1016/j.drugpo.2019.07.-021.

Lee G, Jeong S, Choi S, Kim KH, Chang J, Kim SR, Kim K, et al. (2021). Associations between alcohol consumption and cardiovascular disease among long-term survivors of colorectal cancer: a population-based, retrospective cohort study. BMC Cancer, 21(1): 1–8. doi: 10.1186/s12885-021-08436-w.

Newcomb PA, Kampman E, Trentham-Dietz A, Egan KM, Titus LJ, Baron JA, Hampton JM, et al. (2013). Alcohol consumption before and after breast cancer diagnosis: Associations with survival from breast cancer, cardiovascular disease, and other causes. J Clin Oncol. 31(16): 1939–1946. doi: 10.1200/jco.2012.46.5765.

Jenie Oliver. (2013). Climate Change 2013 – The Physical Science Basis Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. J Chemical Information and Modeling, 53(9): 1689–1699.

Ramadhan MH, Syarniah, Mahdalena (2017). Hubungan tingkat stres dengan konsumsi minuman beralkohol pada remaja di Kelurahan Landasan Ulin Timur (The relationship between stress levels and consumption of alcoholic beverages in adolescents in the East Landasan Ulin Village). Jurnal Citra Keperawatan, 5(1): 26–33. http://ejurnal-citrakeperawatan.-com/index.php/JCK/article/view/66.

Rosoff DB, Smith GD, Mehta N, Clarke TK, Lohoff FW (2020). Evaluating the relationship between alcohol consumption, tobacco use, and cardiovascular disease: a multivariable Mendelian randomization study. PLoS Med. 17(12): e1003410. doi: 10.1371/journal.pmed.1003410.

Xi B, Veeranki SP, Zhao M, Ma C, Yan Y, Mi J (2017). Relationship of alcohol consumption to all-cause, cardiovascular, and cancer-related mortality in U.S. Adults. J Am Coll Cardiol. 70(8): 913–922. doi: 10.1016/j.jacc.2017.06-.054.

Ye XF, Miao CY, Zhang W, Sheng CS, Huang QF, Wang JG (2021). Alcohol consumption in relation to cardiovascular and non-cardiovascular mortality in an elderly male Chinese population. BMC Public Health, 21(1): 1–8. doi: 10.1186/s12889-021-12140-6.

Zhang X, Liu Y, Li S, Lichtenstein AH, Chen S, Na M, Veldhee S, et al. (2021). Alcohol consumption and risk of cardiovascular disease, cancer and mortality: a prospective cohort study. Nutr J. 20(1): 1–10. doi: 10.1186/s12-937-021-00671-y.