Original Research

The Effect of Traditional Jamu with Polyphenol-Rich Mixture Content on Cholesterol Levels in the Elderly with Coronary Heart Disease

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Article Info

Abstract

Introduction: The aging process can impact the cardiovascular system in both structural and physiological ways, which can lead to atherosclerosis and an increased risk of coronary heart disease (CHD). While pharmacological interventions for CHD exist, they may come with unwanted side effects. As an alternative, many individuals turn to complementary medicine, including traditional herbal remedies. Among these remedies is a polyphenol-rich mixture (PRM) that has been shown to lower cholesterol levels and inhibit cholesterol absorption. Consequently, this study seeks to explore the efficacy of traditional jamu (herbal medicine) containing PRM in reducing cholesterol levels in elderly with CHD.

Methods: Design research uses quasi-experiment with two groups pre-test and post-test, the number of samples is 55 elderly with CHD, divided into 28 elderly consuming traditional herbal medicine and 27 elderly without any intervention. The researcher used an Accu-check to check the cholesterol level and analysed using a t-test.

Results: The results showed that the decrease in mean cholesterol levels before and after the intervention period in the herbal medicine group (d = 50.50) was significantly greater than the mean score in the control group (d = -1.44) with p <.001.

Conclusion: Elderly with coronary heart disease could benefit from traditional jamu containing polyphenol-rich mixture by reducing cholesterol levels. This could be used as complementary medicine in nursing.

Keywords: cholesterol, traditional herbal medicine, elderly, coronary heart disease

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INTRODUCTION

As we grow older, our cardiovascular system undergoes both structural and physiological changes. These changes include a decrease in heart rate, thickening of the left ventricular wall, an increase in collagen coupled with a decrease in elastin in the heart muscle and blood vessel walls, and an increase in left atrial size. Furthermore, aortic distensibility and vascular tone decrease, leading to a decrease in myocardial muscle contraction and subsequent cardiac output. We also experience a decrease in diastolic pressure, diastolic filling, and beta-adrenergic stimulation. Conversely, our arterial pressure, systolic pressure, wave velocity, and left ventricular end-diastolic pressure increase. Additionally, muscle contraction, muscle relaxation, and the ventricular relaxation phase all lengthen [1].

Coronary heart disease, also known as ischemic heart disease, is a collection of medical conditions that block blood flow to the heart muscle either partially or completely. When the coronary artery is obstructed, it can lead to myocardial ischemia, which is an imbalance between the heart’s oxygen supply and demand. If the oxygen supply is unable to meet the heart’s needs, it can result in myocardial infarction or death of the heart muscle. Atherosclerosis is a common cause of coronary heart disease, and it can lead to angina, myocardial infarction, and sudden death [1] [2]. Millions of people are affected by coronary artery disease (CAD), also known as ischemic heart disease or heart disease (CHD) each year in many countries [3].

Coronary heart disease, also known as ischemic heart disease, is the most commonly diagnosed heart condition around the world. Coronary heart disease is the leading cause of death worldwide. As of 2019, it was responsible for the highest number of deaths globally, followed by stroke, for both men and women. According to the latest data published by WHO in 2020, 259,297 deaths in Indonesia were attributed to coronary heart disease, accounting for 15.33% of total deaths. The age-adjusted death rate stands at 125.99 per 100,000 population, placing Indonesia at the 70th position in the world [4]. According to the doctor's diagnosis, the prevalence of coronary heart disease in East Java was 0.5% in 2017, which means there were approximately 144,279 patients. However, in 2019, the number of patients increased to 1.3% based on either doctor's diagnosis or symptoms, which resulted in around 375,127 cases. This is the highest number of patients recorded with coronary heart disease in East Java [5].

It is common for the elderly with CHD in Indonesia to arrive at the hospital in an unstable condition with serious illness. Unfortunately, there is often a significant delay between the onset of the disease and hospital admission, resulting in patients rarely receiving the treatment recommended by guidelines. As a consequence, advanced stages of CHD may require expensive high-tech interventions, such as coronary artery bypass grafting (CABG), making the costs even higher, especially for patients without health insurance. Health service coverage for CHD patients is still incomplete in Indonesia, leading those with better financial support to
seek treatment abroad in high-income countries like Singapore and Malaysia, due to excessively long waiting lists and a lack of specialized cardiovascular facilities. Patients assume that the drugs, high-tech interventions, and services available abroad are superior to those within the country. Unfortunately, primary care capacity is lacking, and therapeutic outcomes are not optimal. Therefore, it is necessary to increase the development of natural resources and internal health technology for chronic diseases, instead of always relying on foreign technology and science, especially for CHD therapy and care [6].

The treatment of coronary heart disease aims to restore the balance between the demand for oxygen by the heart muscle and the supply of oxygen to it. For the elderly with CHD, a combination of pharmacological and complementary medicine can be used. There are several drugs available for the pharmacological treatment of CHD, including fibrinolytic or anticoagulants that help prevent, reduce, and dissolve blood clots around the atherosclerotic plaques by altering the mechanism of blood clotting. Beta-blocker drugs are prescribed to reduce heart rate. Treatment with these drugs can cause a range of side effects, including bradycardia, hypotension, dyspnea, dizziness, syncope, difficulty walking, sexual dysfunction, congestive heart failure, heart block, bronchoconstriction, and depression [1][7]. Complementary medicines can be done using herbs and foods that support the treatment of the elderly with CHD [8]. Herbal or traditional Indonesian medicine is also often used by the community in curing various diseases.

Indonesia has a fast-growing traditional herbal medicine industry. In every region, traditional medicines using natural ingredients are available and believed to be effective in treating various diseases. Compared to conventional medicines, herbal medicines are believed to have fewer side effects. The World Health Organization (WHO) also recommends using traditional and herbal medicines for maintaining good health and preventing and treating diseases, ranging from minor ailments to chronic conditions [9]. Traditional herbal medicine is a popular choice among the elderly because of its mild and effective nature, with fewer side effects. It can treat the root cause of illnesses, is cost-effective, and does not require invasive examinations. However, there have been no studies conducted on the use of traditional Indonesian herbal medicine for the elderly with CHD in Indonesia. The traditional herbal medicine used in this study is produced by a home industry in Batu, East Java. This herbal medicine has gained the trust of the communities, especially in Malang Raya and surrounding areas. People have been subscribing to this medicine for many years, from 2005 until now. The ingredients of this traditional herbal medicine include ginger, garlic, lemon, apple cider vinegar, and real honey. These ingredients are refined without using water, ensuring that the herbal medicine is pure. The benefits of this traditional herbal medicine, which contains ginger, garlic, lemon, apple cider vinegar, and honey, come from a polyphenol-rich mixture (PRM). This mixture has hypolipidemic
activity in humans, which means it can lower cholesterol levels. As a complementary therapy, PRM can inhibit cholesterol absorption and increase cholesterol transport and excretion in multiple organs [10]. The main benefits are lowering LDL (Low-Density Lipoprotein), lowering TG (Triglycerides), increasing HDL (High-Density Lipoprotein), and lowering total cholesterol (TC) [11], [12]. It also functions as cardioprotective and anti-atherogenic, preventing atherosclerosis, because each ingredient contains hypolipidemic, anti-oxidant, anti-diabetic, and hepato-protective functions [13].

METHODS

Design, Population, and Sample

The research design used in this study was a quick experiment with a two-group pre-test and post-test approach. This study measured cholesterol levels before and after consumption of traditional herbal medicine in the elderly with CHD. The population is 74 elderlies in Malang Raya, East Java which consists of Batu City, Malang City, and Malang Regency from June 12th to July 22nd 2023. The number of samples is 56 elderlies with CHD, calculated by using power analysis with the G*Power 3.1.9.2 program, divided into 28 elderlies consuming traditional herbal medicine as the intervention group and 28 elderlies assigned as the control group who were chosen via simple random sampling. The number of samples in Malang Raya consisted of 18 elderlies in Batu City, 32 elderlies in Malang City, and 6 elderlies in Malang Regency. To determine the number of samples in each location, kindly follow the steps: Issue codes to the possible participants in each area. For example, use codes B-1, B-2, B-3, etc. for Batu city; M-1, M-2, etc. for Malang city; and KM 1, KM 2, etc. for Malang regency. Select a location at random and engage with respondents using the corresponding code until we obtained 56 respondents who provided their informed consent.

The inclusion criteria in this study are: people with age > 60 years, medically diagnosed with coronary heart disease, consuming medicine from a doctor and getting assistance from a doctor, consuming traditional herbal medicine for > 6 months (regular customer), able to communicate well, and willing to be a respondent. The exclusion criteria are elderlies aged ≤ 60 years old, unable to communicate well, and or refusing to join the study. The dropout criteria are if the respondent moves or travels to another city before the interventions are completed.

Procedures

The data collection process in the intervention group: Step 1: Contact the elderly via WhatsApp for an appointment and visit their house. If the sample is willing, proceed with the assignment of informed consent, followed by a pre-test for cholesterol levels in the elderly with CHD. Step 2: Give traditional herbal medicine to the elderly to be consumed for 4 weeks. The herbal ingredients consist of garlic (Allium sativum), ginger (zingiber officinale), lemon (citrus limon), apple vinegar (malus domestica), and honey, which contains a polyphenol-rich mixture (PRM). Step 3: Provide health
education using a home care guidebook for elderly people with CHD. Step 4: Make a time contract with the elderly to do a post-test cholesterol check in the 4th week. Step 5: Contact the sample for an appointment and visit his house. If the sample is willing, a post-test cholesterol level is carried out in elderly people with CHD.

The data collection process in the control group: Step 1: Contact the sample via WhatsApp for an appointment and visit their house. If the sample is willing, proceed with the assignment of informed consent, followed by a pre-test for cholesterol levels conducted on older adults with CHD. Step 2: Giving a home care guidebook for older adults with CHD. Step 3: Make a time contract with the elderly to do a post-test for cholesterol check in the 4th week. Step 4: Contact the sample for an appointment and visit his house. If the sample is willing, a post-test cholesterol level is carried out on older adults with CHD. The researcher used Accu-check equipment to check cholesterol. The equipment has been calibrated before being used.

Data Analysis

Before analysing, the data was tested for normality data. According to the Kolmogorov-Smirnov normality test for the cholesterol data, during the pre-test and post-test in both groups, all showed a p-value >0.05, so it can be said that all data had a normal distribution, then the data analysed using an independent t-test to compare cholesterol level between two groups and paired t-test to compare the cholesterol level before and after the intervention.

Ethical Clearance

This study has been approved by the Research Ethics Committee of Health STIKes Hafshawaty Pesantren Zainul Hasan Probolinggo, East Java Province, on June 10th, 2023 with approval number KEPK/153/STKes-HPZH/VI/2023.

RESULTS

The total research respondents are 55 elderly people who enrolled in the study (intervention group = 28; control group =27). One respondent from the control group was unable to complete the post-test due to travel to another city.

From the data presented in Table 1, it is evident that almost all respondents in both groups were aged between 60-69 years old, (70.4% in the control group and 85.7% in "jamu" group), and out of these participants, 70.4% in the control group and 64.3% in the "jamu" group were female. The percentage of married individuals was 88.9% in the control group and 82.1% in the "jamu" group. The percentage of individuals who were self-employed was 48.1% in the control group and 53.6% in the "jamu" group. The control group had a percentage of 51.9% of participants with senior high school backgrounds while the "jamu" group had a percentage of 50.0%. The duration of medicine consumption in the control group and in the "jamu" (herbal medicine) group was mostly less than a year (92.6% and 60.7%, respectively). The control group did not follow a low-cholesterol diet (74.1%), while the intervention group did (82.1%). The duration of doing exercises in each group gave different results, in the
control group, most did not exercise (81.5%), contrary to the traditional herbal medicine group, mostly did exercises for at least 30 minutes (82.1%).

According to the data presented in Table 2, the average Cholesterol level in the group that consumed the herbal medicine was 220.82 units before intervention and 170.32 units after intervention. The paired t-test revealed that p-value of 0.000 (p<0.05), indicating a significant difference in Cholesterol levels before and after the intervention, in contrast to the control group with a p-value of 0.737 which indicates that there is no difference in cholesterol levels before and after the test. The average Cholesterol level during the pre-test was higher than during the post-test, implying that the group consuming herbal medicine experienced a noteworthy reduction in Cholesterol levels after consuming the herbal medicine. The group that received herbal medicine saw a noteworthy reduction in their average cholesterol levels from before to after the intervention period, with a difference of 50.50. This difference was considerably larger than the average score observed in the control group, which only had a difference of -1.44. Moreover, the independent t-test result shows that p < 0.001 (p<0.05) indicates the statistical difference in the cholesterol level between the two groups.
### Table 1
Demographic Data (n=57)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Control Group (n=27)</th>
<th>Intervention Group (n=28)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-69 years</td>
<td>19</td>
<td>70.4%</td>
</tr>
<tr>
<td>&gt;= 70 years</td>
<td>8</td>
<td>29.6%</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>8</td>
<td>29.6%</td>
</tr>
<tr>
<td>Female</td>
<td>19</td>
<td>70.4%</td>
</tr>
<tr>
<td><strong>Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>24</td>
<td>88.9%</td>
</tr>
<tr>
<td>Widow</td>
<td>2</td>
<td>7.4%</td>
</tr>
<tr>
<td>Widower</td>
<td>1</td>
<td>3.7%</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>not work/jobless</td>
<td>2</td>
<td>7.4%</td>
</tr>
<tr>
<td>Housewife</td>
<td>12</td>
<td>44.4%</td>
</tr>
<tr>
<td>Self-employed</td>
<td>13</td>
<td>48.1%</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary school</td>
<td>7</td>
<td>25.9%</td>
</tr>
<tr>
<td>Junior high school</td>
<td>3</td>
<td>11.1%</td>
</tr>
<tr>
<td>Senior high school</td>
<td>14</td>
<td>51.9%</td>
</tr>
<tr>
<td>Diploma</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Bachelor (S1 / S2)</td>
<td>3</td>
<td>11.1%</td>
</tr>
<tr>
<td><strong>Duration of</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 years</td>
<td>25</td>
<td>92.6%</td>
</tr>
<tr>
<td>1-5 years</td>
<td>2</td>
<td>7.4%</td>
</tr>
<tr>
<td>6-10 years</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Diet</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Cholesterol</td>
<td>7</td>
<td>25.9%</td>
</tr>
<tr>
<td>No diet</td>
<td>20</td>
<td>74.1%</td>
</tr>
<tr>
<td><strong>Duration of Exercise</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;= 30 minutes</td>
<td>5</td>
<td>18.5%</td>
</tr>
<tr>
<td>No exercise</td>
<td>22</td>
<td>81.5%</td>
</tr>
</tbody>
</table>

### Table 2
Comparison of the difference of cholesterol levels before and after intervention

<table>
<thead>
<tr>
<th>Cholesterol level</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Mean different</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>Min-max</td>
<td>Mean ± SD</td>
<td>Min-max</td>
</tr>
<tr>
<td>Intervention group</td>
<td>220.82 ± 48.14</td>
<td>133-302</td>
<td>170.32 ± 27.79</td>
<td>116-224</td>
</tr>
<tr>
<td>Control group</td>
<td>198.40 ± 52.06</td>
<td>131-313</td>
<td>199.85 ± 46.62</td>
<td>118-303</td>
</tr>
</tbody>
</table>

Independent t-test (p=0.000)
DISCUSSION

According to a recent study, the use of traditional herbal medicine that includes a high concentration of polyphenols (PRM) may have a significant impact on lowering cholesterol levels in the elderly with CHD. This marks the first time such a benefit has been observed in this particular demographic, as compared to the control group that was monitored for a duration of 4 weeks. The research indicates that individuals who ingested a 15ml dose of traditional herbal medicine on a daily basis experienced a notable reduction in their cholesterol levels after the 4-week period. The decrease in the average score of cholesterol levels before and after the intervention period in the herbal medicine consumption group was significantly greater than the average score in the control group (d = -1.44). Based on the demographic data, it appears that “jamu” group has a higher percentage of respondents who consumed traditional herbal medicine and followed a low-cholesterol diet (85.7%) compared to the control group (74.1%). Similarly, the percentage of traditional herbal medicine group respondents who exercised for at least 30 minutes was greater (82.1%) compared to the control group (81.5%). These findings suggest that diet and exercise are important factors to consider when managing high cholesterol levels. To lower total and LDL cholesterol, it is recommended to limit your intake of trans fats, saturated fats, sugar, and cholesterol. Additionally, increasing physical activity may help to decrease LDL cholesterol and increase HDL cholesterol (considered "good" cholesterol) levels [14]. Consuming traditional herbal medicine, maintaining a low-cholesterol diet, and exercising for more than 30 minutes daily can lower cholesterol levels in the elderly.

Traditional herbal medicine containing PRM reduces cholesterol levels in the elderly with CHD, this can be explained based on the results of previous research [10] [11]. The elderly with CHD have experienced decreasing cholesterol levels based on reduced signs and symptoms of the disease such as chest pain, heavy chest, arrhythmias, increased blood pressure, easy to feel sick, easily tired, and migraines after consuming traditional herbal medicine containing PRM, [11] and there are elderly with CHD who can give up doctor’s medicine and simply consume traditional herbal medicine while maintaining a healthy diet and regular exercise. The emotional perception of the elderly with CHD is feel healthier, fitter, and satisfied with traditional herbal medicine products. Traditional herbal medicine supports the work of doctors’ medicines, there are no side effects from traditional herbal medicine, and they want to tell family members or relatives who suffer from the same disease to consume this herbal medicine [9] [11]. The elderly with CHD consume traditional herbal medicine in the morning and are given a break before the elderly take the doctor’s medicine for 4-5 hours.

Reducing cholesterol, experiencing decreased signs and symptoms of CHD, and good emotional perception indicate the benefits of traditional herbal medicine containing PRM. This is due to the content of the herbal medicine. The herbal ingredients consist of garlic (Allium sativum), ginger
(zingiber officinale), lemon (citrus limon), apple vinegar (malus domestica), and honey. Garlic has been known as an herbal ingredient for the prevention and treatment of cardiovascular disease [15]. Has benefits as an antioxidant, antiatherosclerosis, antidiabetic, anticarcinogenic, and immunomodulator in mice. Garlic contains the sulfur-containing enzyme allinase which has cardioprotective and antihypertensive effects [12], [13]. Previous research shows garlic is effective in lowering lipids, cholesterol levels, and triglycerides [15].

Ginger (zingiber officinale). Ginger is recommended as a traditional herbal medicine to cure CHD, hypertension, and palpitations [16]. Ginger as an anti-hypercholesterolemia and antioxidant, can protect blood vessels and relax the ring of blood vessels in porcine coronary arteries. Ginger research results that have been tested on humans with a low dose of 5 grams show significant activation of anti-thrombocytes. [17].

Lemon (Citrus limon). Lemon as an antioxidant lowers total cholesterol (TC), reduces LDL (Low-Density Lipoprotein), and increases HDL (High-Density Lipoprotein) in rats [12]. Lemon flavonoids capture free radicals (radical oxygen species) and increase endothelial dysfunction, thus preventing vasoconstriction, thrombosis, inflammation, and atherosclerosis[18]. Other studies have shown that consuming lemons reduces triglycerides in CHD patients [19].

Apple cider vinegar (malus domestica). The results showed that apple cider vinegar is hypolipidemic, lowers triglycerides (TG), reduces cholesterol by inhibiting cholesterol absorption, reduces hyperlipidemia, and is anti-inflammatory in rats [12]. Clinical trials of apple cider vinegar can reduce cholesterol levels in hyperlipidemia patients [20].

Honey. Honey is one of the most valuable medicines used since ancient times. Honey can function as a cardioprotective agent in CHD [21]. Various studies on honey, both in vitro studies, in vivo, and clinical trials have revealed that honey has a positive influence on risk factors for heart problems by improving plasma lipid profiles mean oxidase, attenuates the increase in markers of heart damage (CK-MB, AST, ALT), increases the activity of antioxidant enzymes, and increases LDL resistance to oxidation induced by oxidative stress in heart disease [22]–[26].

A traditional herbal medicine containing PRM has four important effects, namely hypolipidemic, antioxidant, anti-diabetic, and hepato-protective [12]. The benefits of traditional herbal medicine containing ginger, garlic, lemon, apple cider vinegar, and honey are as a polyphenol-rich mixture (PRM), which contains hypolipidemic activity in humans which can reduce cholesterol levels and function to inhibit cholesterol absorption and increase cholesterol transport and excretion in multiple organs [10]. There were 60.7% of respondents who had a duration of Jamu consumption of <1 year, 28.6% of respondents who had a duration of Jamu consumption of 1-5 years, and 10.7% of respondents who had a duration of Jamu consumption of 6-10 years in the intervention group. This corresponds to the duration of consumption PRM in rats for 24 days which could give cardioprotective effects and anti-atherogenic functions to prevent
atherosclerosis, can also lower LDL (Low-Density Lipoprotein), lower TG (Triglycerides), increase HDL (High-Density Lipoprotein), and decrease total cholesterol (TC) levels [12]. The results of this study looked at the effect of reducing cholesterol after 4 weeks of consuming traditional herbal medicine containing PRM in elderly with CHD, where this study strengthened the findings of research data.

**NURSING IMPLICATION**

It is hoped that this research will become an evidence-based practice in utilizing traditional herbal medicine containing polyphenol-rich mixture (PRM) in the elderly, especially elderly with CHD to lower cholesterol levels to be able to control risk factors that are the main cause of heart attack. Nurses are the front line in caring for society, where the largest population is the elderly. Most of the Indonesian elderly are at home or in the community, so the presence of community nurses and gerontic nurses is needed. The main challenge in caring for the elderly today is finding new ideas that are in line with local wisdom, especially those with chronic diseases that many elderly suffer, one of which is CHD, and pharmaceutical knowledge is needed to support the care of elderly CHD sufferers with complementary therapy, namely traditional herbal medicine.

**LIMITATION**

The decrease in cholesterol levels cannot be solely attributed to the consumption of traditional jamu due to uncontrolled variables such as medication and lifestyle.

**CONCLUSION**

The present study highlights a new finding regarding the implication of a combination of traditional jamu, medication, low-cholesterol diet, and exercise lasting more than 30 minutes in mutually supporting the reduction of cholesterol levels. The data suggests that the interplay among these four factors plays a crucial role in supporting each other towards reducing cholesterol levels, which could benefit individuals at risk for cardiovascular diseases. Therefore, the findings of this study could have significant implications for individuals with high cholesterol levels and those who wish to adopt a healthy lifestyle to reduce the risk of developing cardiovascular diseases. The next research topic could continue to know the effect of herbal medicine on LDL and HDL of CHD patients.

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