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Health Benefits of Yerba Mate Consumption on Cardiovascular Health

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ABSTRACT

Background: Yerba mate is a Paraguayan kind of herbal tea prepared from the dried and roasted leaves of trees called *Ilex paraguariensis* St. Hill. It is known for high content of polyphenols, methylxanthines and saponins. According to the studies products rich in those nutrients may have a positive influence on the humans cardiovascular health.

Materials and methods: We reviewed publications obtained from PubMed and Google Scholar. Articles were selected based on keywords such "yerba mate'', "*Ilex paraguariensis*'', "cardiovascular diseases''. For the final analysis, qualified articles were published from 2005 to 2024.

Results: Confirming positive impact on serum lipid levels individuals using mate tea. Long – term positive influence on blood pressure. Moreover subjects with obesity took advantages of Yerba beverage by decreasing waist-to-hip ratio. Patients with diabetes were observed to have a significant reduction in fasting plasma glucose level and HbA1c concentration.

Conclusions: Most of the cited researches support the hypothesis of benefits coming from drinking mate infusions for patients with elevated lipid serum levels, obesity, high blood pressure and type 2 diabetes mellitus. All of mentioned health issues can lead to the cardiovascular problems therefore using mate infusions can prevent CVDs. Taking everything into consideration, medical professionals might recommend Yerba mate tea for their patients especially as a replacement of a coffee.

Keywords: Yerba mate, *Ilex paraguariensis*, cardiovascular diseases, polyphenols

Introduction

Yerba mate is a Paraguayan kind of herbal tea prepared from the dried and roasted leaves of trees called *Ilex paraguariensis* St. Hill. The genus Ilex encompasses approximately 450 species found in the tropical regions of South America, primarily in northern Argentina, southern Brazil, Uruguay, and Paraguay. [1,2] Morphologically, trees have sturdy perennial leaves measuring 8 cm in length, which are olive green in hue, with a darker shade on the upper surface. They are egg shaped with a wedge-shaped base, a crenate edge, and a blunt tip.

Yerba mate had been consumed by indigenous people from South America, especially in the current areas of Brazil, Paraguay, Argentina and Uruguay, since the early centuries.

Although Yerba is widely known around the world and its yearly consumption is increasing outside South American countries, most of its production is consumed in Latin America [3].

Picture 1. Leaves and fruits of *Ilex paraguariensis* (Peggychoucair, 2024) [4].

Picture 2. Dried, shredded leaves and branches of yerba mate ready to drink (laridra, 2024) [5].

Yerba mate is a source of basic nutrients such as carbohydrates, proteins and fats. Extensive analysis has revealed the presence of various secondary metabolites, such as methylxanthines, especially caffeine, theobromine and theophylline [6]. Moreover, the plant is rich in polyphenolic compounds, mainly phenolic acids, with a predominance of chlorogenic acid and the addition of the flavonoids caffeic acid, 5-caffeoylquinic acid and rutin [7]. The leaves are also high in vitamins A, C, B1 and B2 and are rich in macronutrients such as magnesium, calcium, iron, sodium, and potassium [6]. The bitter, water-soluble triterpene saponins found in mate leaves are classified as derivatives of ursolic acid, which are collectively known as mate saponins 1 through 5 [3]. In the process of preparing mate leaves from the fresh plant to the dry product, a maturing process needs to be overcome. During this maturation process, there is a notable increase in the concentration of certain components, such as methylxanthines and polyphenols, as well as the antioxidant activity of Yerba mate [1]. Table 1. contains a short summary of the substances found in Yerba mate.

Table 1. Overview of the bioactive compounds present in Yerba mate

Compound	Type	Amount of compound	References
Caffeine	Methylxanthines	25 to 175 mg/g of dry mass	Gawron-Gzella et al. [1]
Theobromine	Methylxanthines	6 to 28 mg/g of dry mass	Gawron-Gzella et al. [1]
Chlorogenic acid	Phenolic acids	2,8% of dry weight	Lutomski et al. [8]
Caffeic acid	Flavonoids	0,023% of dry weight	Lutomski et al. [8]
Ursolic acid and other saponins	Saponins	5-10% of dry weight	Lutomski et al. [8]

Findings from cohort studies suggest that increased consumption of polyphenols might lower the risk of cardiovascular diseases (CVDs) and type 2 diabetes [9]. Cardiovascular diseases (CVDs) encompass a range of disorders affecting the heart and blood vessels, including conditions such as peripheral arterial disease, stroke, atherosclerosis, hypertension, coronary heart disease (CHD), cerebrovascular disease, and rheumatic cardiac disease. Polyphenols are suggested to have a pleotropic effect on the cardiovascular system, counteracting oxidative stress, which plays a significant role in the progression of CVDs [10]. As mentioned previously, yerba mate is a product rich in polyhenols; thus, research on the positive impact of drinking yerba infusions is gaining popularity. This positive effect is reinforced by findings from various studies carried out in animal models using physiologically relevant doses of isolated polyphenols, as well as in humans who consume foods rich in flavonoids [11,12,13,14]. The majority of research has focused on commonly consumed products rich in polyphenols, such as tea, coffee, cocoa, and soy. A wide range of studies provides an opportunity to delve into the positive effects of drinking mate infusions on human health. The benefits of drinking yerba could be used by medical professionals in their daily practice by encouraging patients to introduce this beverage into their daily diet. The

following sections of this research review seek to offer a thorough overview of previous studies on the benefits of drinking Yerba mate for the cardiovascular system in humans.

Methods

The search engine PubMed and the Google Scholar browser were searched by each author separately. The following keyword combinations were used: "yerba mate'', ''polyphenols'', "cardiovascular health", "lowering of lipids", "antioxidant effect'', *"Ilex paraguariensis*'', "cholesterol", "cardiovascular diseases''. The authors also checked the bibliography of the analyzed articles in terms of related research. When duplicate reports were observed during the search, only the most complete report was included in the aggregate meta-analysis. Eligible studies met the following inclusion criteria: 1) were published since 2005; 2) were published in English, Polish or Spanish; 3) were published in periodical publication; 4) focused on the influence of the intake of yerba mate on cardiovascular health; 5) provided a clear presentation of the applied methodology; and 6) applied proper methodology. Parameters such as the selection of research groups, group comparability, and determination of the exposure or outcome of interest in case–control studies or cohort studies, as appropriate, were assessed.

Results

In the following sections, we present selected articles with their results and their impacts on the daily practices of medical professionals.

Effects on lipid metabolism

De Morais et al. conducted a study involving one hundred and two participants [15]. The aim of this study was to examine the impact of consuming yerba mate (Ilex paraguariensis) on lipid and lipoprotein levels in humans. The studied group included 15 normolipidemic patients, 57 dyslipidemic patients and 30 hypercholesterolemic patients receiving long-term statin therapy. All of the subjects were asked to ingest 330 mL, 3 times/day, of green or roasted yerba mate infusions for 40 days. After that period, scientists compared the serum levels of lipid parameters such as LDL-C, HDL-C, apo B-100, triglyceride and total cholesterol before and after the consumption of yerba mate. In the normolipidemic population, the results revealed a 7.3% reduction in LDL-C. In the dislipidemic group, the effect was even more pronounced: the LDL-C reduction reached 8.6%, the total level of cholesterol was reduced by 4.6%, and other parameters, such as apo B-100, were also decreased. The last studied group involving hypercholesterolemic subjects on statin therapy presented a reduction in the serum LDL-C level of 13.1% after 40 days of drinking mate infusions as an addition to statin therapy. Moreover, in this group, the level of HDL-C increased. Another interesting aspect of the study was the examination of the effect of drinking yerba mate on blood pressure, which is an important factor in maintaining proper cardiovascular health. Researchers have assessed the impact of consuming 1 liter of mate tea daily over 40 days in adult subjects and reported a 2.3% reduction in systolic blood pressure in the experimental group [15]. This study has several limitations because of the small study group involved. Nevertheless, the effect observed in the research is noteworthy. This study revealed that encouraging patients to drink Yerba mate can strengthen the results of statin therapy and prevent the development of dyslipidemia in healthy individuals.

Research by D.T.A. da Veiga et al. revealed a positive effect on cardiovascular health in a group of postmenopausal women [16]. The analysis included ninety-five postmenopausal women, forty-six with major bone fractures in their medical history and forty-nine controls. All of the studied women were over 55 years old. The participants completed two

questionnaires, one including risk factors for CVD and the second evaluating yerba mate consumption. All of the studied women had their serum albumin, CT, LDL-cholesterol (LDL-C), HDL-cholesterol (HDL-C), TG, glucose, and creatinine measured. According to this study, women who drank a minimum of 1 liter of mate daily had significantly lower rates of diagnoses for dyslipidemia, hypertension, and coronary disease. Moreover, research has shown that greater consumption of mate infusions is correlated with lower fasting serum levels of glucose. On the other hand, no significant differences were detected in the levels of albumin, serum lipids, markers of oxidative stress, or creatinine between women who consumed 1 liter or more of mate per day and those who did not consume mate. The results of this study suggest a complex and multistage mechanism affecting lipid metabolism following the consumption of yerba mate beverages [16]. As mentioned in the previous study, this one also has a small study group, which should be considered a limitation of the research. Moreover, the patients completed the questionnaires by themselves, which can also be seen as a limitation. Nevertheless, considering the large population of postmenopausal women in the GP offices, the positive effect of yerba intake could be used as an additional factor in maintaining good health in this group.

A double-blind placebo-controlled trial lasting 6 weeks was performed by Shaohong Yu et al. [17]. The study involved 142 subjects with elevated blood viscosity. Patients were divided into two groups: one received Yerba mate tea, and the other received a placebo at a dosage of 5 g/day. After the treatment period, the hemorheological indices, nailfold microcirculation, 6-keto-PGF1α and TXB2 levels, and lipid profiles of the subjects in the Yerba mate tea group were compared with those in the placebo group. High blood viscosity is a known risk factor for atherosclerosis and thrombosis, which can lead to other cardiovascular events. Thus, elevated levels of this parameter should be lowered to prevent cardiovascular diseases as an additional factor to low serum lipid levels. After the experiment was completed, high-density lipoprotein (HDL) cholesterol levels increased in the Mate tea group, whereas low-density lipoprotein (LDL) and triglyceride levels, as well as total cholesterol levels, decreased in this group. Moreover, no such changes were observed in the control group. The results of the present study revealed a positive effect on blood viscosity in the group of subjects who consumed mate tea compared with the control group. The measured parameters, such as whole blood viscosity, plasma viscosity and the equation K value of the erythrocyte sedimentation rate (ESRK), decreased significantly in the Yerba mate group. Furthermore, in the serum samples of the Yerba mate group, the vasodilator 6-keto PGF1α increased, whereas the thromboxane TXB2 decreased. The daily intake of yerba mate restores healthy blood flow in vessels [17]. These findings highlight the potential of yerba mate as a therapeutic substance for lowering the risk of cardiovascular diseases. Notably, the described effect was observed in a population with only subclinical risk parameters for CVDs. Therefore, it is not known whether the same outcome can be reproduced with clinically diagnosed patients.

A study performed by Álvarez et al. investigated the hypolipemic effect of daily yerba mate infusion intake on serum lipid levels and body composition in overweight women [18]. The scientists recruited 119 overweight women aged 25-50 years and put them into three groups: Mate and Diet, Mate without Diet and Water and Diet. The study lasted for 12 weeks when the teams with diets followed a low-calorie food plan and the mate groups consumed mate infusions. Before the trial started and after 12 weeks, blood samples were taken from the participants to compare the levels of parameters such as total cholesterol, LDL-cholesterol, HDL-cholesterol and triglycerides. The analysis revealed that total cholesterol decreased in all the groups, with no significant differences between the groups. According to the data presented in the paper, LDL cholesterol decreased in both mate groups, with no significant differences between them. Moreover, HDL cholesterol increased in the mate group, and

triglycerides decreased in the mate and diet groups [18]. Therefore, we conclude that yerba mate can be used as a supplement to a diet to achieve hypolipemic effects in patients with obesity.

Health effects of mates on obesity

Obesity has long been a known risk factor for the development of cardiovascular diseases. Overweight can lead to dyslipidemia, type 2 diabetes and hypertension. Obesity is also believed to be an independent cardiovascular risk factor [19].

Kim SY. et al. conducted a randomized, double-blind, placebo-controlled trial on patients with obesity (BMI ranging between 25 and 35 kg/m^2), resulting in interesting conclusions [20]. Twenty-five subjects were divided into two groups: one group received yerba mate (3 g/d), and the other group was given placebos for 12 weeks. After finishing the trial, researchers compared body fat mass and percent body fat in the yerba mate group and placebo group. Both of these parameters decreased significantly in the yerba mate group. No significant differences were observed between the groups in total abdominal fat, abdominal visceral fat or abdominal subcutaneous fat. Additionally, no significant changes were reported in the serum levels of total cholesterol, triglycerides, LDL cholesterol, or HDL cholesterol in the studied populations after 12 weeks. Notably, HR (waist-to-hip radio) significantly decreased among the team receiving yerba mate compared with the placebo group [20]. Although the study involved a small population, the weight-reducing potential of *Ilex paraguariensis* is promising.

These findings contrast with those of a study performed by Chaves et al. [21]. The research was a large cross-sectional study including 18,287 subjects aged ≥18 years, with a prevalence of women. Most of the individuals in the studied population were obese or overweight. Among 18,287 subjects, 16,676 (91.2%) consumed Yerba mate infusions, and daily consumption was more common than sporadic consumption, with the majority of daily intake being more than 1 L per day. The following groups were identified on the basis of the amount of yerba mate consumed: “none”, “low”, “moderate” (<1 L per day), and “high” (>1 L per day). The analysis revealed that heavy drinkers were more obese than moderate drinkers were. However, in the group of subjects with high mate intake, the amount of sugar and refined carbohydrates consumed in the daily diet was significantly greater than that in the second group. It is possible that mate infusions can provoke episodes of hypoglycemia and compensate for the increased intake of sugars. On the other hand, the study did not influence the diet of the studied population; therefore, healthier ways of eating may have affected the results [21]. This may explain why this cross-sectional study stands in opposition to the other studies.

Discussion

The majority of the presented studies support the positive effects of drinking Yerba mate infusions on the cardiovascular system. Research by Chaves et al. suggested the occurrence of episodes of hypoglycemia after Yerba mate consumption more than 1 L per day [21]. However, other studies, such as the one conducted by Klein et al., benefit from the use of *Ilex paraguariensis* St. Hill. Diabetic patients take advantage of this lowering effect on sugar levels [22]. In this study, subjects with diabetes mellitus type 2 who consumed mate tea (approximately 1 L per day) for 60 days had a significant reduction in fasting plasma glucose (25.0 mg/dL or 17%) compared with the levels before starting consumption, and their concentration of HbA1c decreased by 0.85%. It is known that a reduction in HbA1c is a protective factor against CVS diseases in the diabetic population [23]. Furthermore,

individuals who drank Yerba mate had lower fasting plasma glucose levels than patients who followed only dietary plans for diabetic patients. All of the subjects also used oral hypoglycemic drugs [22]. In conclusion, the use of mate tea as a support for conventional treatments can improve human health.

Studies on *Ilex paraguariensis* St. Hill, which contradict enthusiastic studies, emphasize that caffeine may increase blood pressure, heart rate, anxiety and insomnia [1]. However, those effects seem to be short term and are present mostly when the daily intake of mate tea is excessive. According to the studies mentioned above, the daily intake of Yerba mate should be approximately 1 L per day. Moreover, physicians, while introducing *Ilex par aguariensis* beverages to their patients, should advise them to replace coffee with mate tea.

Conclusions

The exact mechanism by which Yerba mate tea affects lipid and sugar levels is still unclear and needs further research. Nevertheless, current studies support the view of the benefits of drinking *Ilex paraguariensis* St. Hill infusions for patients with elevated lipid serum levels, high blood pressure and type 2 diabetes mellitus. All of these health problems can result in the development of cardiovascular diseases. Therefore, the use of mate tea as a support for pharmacological treatment is likely to lower the risk of serious cardiovascular events. In addition, Yerba beverages also have positive effects on liver cells and anti-inflammatory properties [8]. Taking everything into consideration, medical professionals might recommend Yerba mate tea for their patients.

Author's contribution

Conceptualization, D.S., and K.S.; methodology, A.S. and K.Ś.; software, N.L.; check, J.S. and J.S.; formal analysis, M.B.; investigation, M.M.; resources, W.W.; data curation, D.S., writing - rough preparation, K.S.; writing - review and editing, A.S.; visualization, WW; supervision, KŚ; project administration, N.L.; receiving funding – no funding was recived.
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