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Effectiveness of Giving Muntingia Calabura Leaves and Muntingia Calabura Fruit (Muntingia Calabura L) on Blood Sugar Levels In Type 2 Diabetes Mellitus Patients: Literature Review

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ABSTRACT

Introduction : Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia caused by abnormalities in insulin secretion, thus impacting on blood glucose levels. Calabura muntingia leaves are traditionally used as an alternative medicine because they contain flavonoid compounds which have anti-diabetic properties. In general, it is known that how to make traditional medicine is by boiling it, where the solvent only uses water so that the polar compounds will be attracted. The purpose of this study is to explain effectiveness the effect of administration between calabura muntingia leaves and calabura muntingia fruit through a review of studies related to blood sugar levelsin the last ten years.

Method : Search for journals or articles using Scopus, Proquest, and Scholar indexed databases using appropriate keywords. The Center for Review and Dissemination and The Joanna Briggs Institute was used to assess the quality of the study. The framework used for the review is PICOS and the inclusion criteria used are English and Indonesian journals published in 2010 to 2020. Data analysis and tabulation are carried out in articles or journals. Title, abstract, full text and methodology are assessed to determine the eligibility of the article or journal.

Results : Six hundred and forty-one articles were identified, there were eleven articles that fit the research criteria. The leaves of muntingia calabura and fruit of muntingia calabura contain flavonoids and saponins which can reduce blood sugar levels. A flavonoid compound that is thought to have activity in reducing blood glucose levels is quercetin.

Conclusion : The form of extract, infusion, juice and stew did not change the content of the calabura muntingia plant.

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1. INTRODUCTION

Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia due to abnormalities in insulin secretion, insulin action, or both, T2DM is a growing epidemic, resulting in individual suffering and extraordinary economic losses. (Decroli, 2019). Diabetes Mellitus is among the most common in the world and the prevalence of diabetes is projected to increase from 2014 to 2035 (Guariguata et al., 2014). The increasing prevalence of T2DM in developing countries must be anticipated by policy makers in an effort to determine long-term health service policy plans. In this case, preventive and promotive action is needed that can help the community, one of which is by consuming herbal plants, one of the antidiabetic medicinal plants that can be used by the community is Muntingia calabura leaves (Muntingia calabura L). In previous studies, it

was stated that the positive secondary metabolites contained in the ethyl acetate fraction of muntingia calabura leaves were flavonoids, saponins, and tannins.(Utami & Sari, 2015). Research conducted by(Zahroh & Musriana, 2016)stated that the calabura muntingia leaf decoction had an average pre and post value of 305 mg / dL to 178 mg / dL. Meanwhile, the research conducted(Pramono & Santosa, 2015)stated that the calabura muntingia fruit had an average pre and post intervention value of 513 mg / dL to 109 mg / dL. From these two studies, the researcher wanted to analyze the effectiveness of the calabura muntingia leaves and calabura muntingia fruit.(muntingia calabura l) can affect blood sugar levels.

2. METHOD

The search for journals in English and in Indonesian was carried out on three search sources for indexed journals, namely Scopus, ProQuest, Scient Direct and Scholar published in the last ten years (2010-2020). Keywords used in journal searches are "(muntingia [All Fields] AND calabura [All Fields]) AND (" hypoglycemic agents "[All Fields] OR" hypoglycemic agents "[MeSH Terms] OR (" hypoglycemic "[All Fields] AND" agents "[All Fields]) OR" hypoglycemic agents "[All Fields] OR" antidiabetic "[All Fields])". The findings that emerged were specified in the publication of the last ten years (2010-2020).

A number of journals that match the keywords are specified in the publication of the last ten years (2010-2020), open access and in English. It found 155 journals from Scopus, 23 journals from ProQuest, 141 journals from Scient Direct and 322 journals from Scholar. The research journals were then screened, as many as 20 journals were excluded because they were published in 2010 and under and used languages other than English and Indonesian. The feasibility assessment of 610 journals, duplicate journals and journals that did not comply with the inclusion criteria was excluded, so that 11 journals were reviewed.

All journals that have been screened are assessed for their eligibility using The Joanna Briggs Institute (JBI) Critical Appraisal. The total journals found were 11 journals divided by 3 Scopus journals, 1 ProQuest journal and 7 Scholar journals. Journal characteristics average published in 2018.

3. RESULT

Based on the table of literature search results, the results of the study are divided into two major themes, namely the effect of giving cherry leaves and the effect of giving cherry fruit on blood sugar levels. The research design that is widely used to discuss cherry leaves is experimental study, while the research design used to discuss cherry leaves is an experimental study.

The results of many studies have decreased glucose. The most effective concentration in reducing blood glucose by 25%, the greater the concentration of the decoction of muntingia calabura leaves, the more chemical components are in it so that it is effective in lowering blood glucose levels.(Titihalawa et al., 2018). According to the content of the calabura muntingia fruit, there are ingredients that can lower blood sugar levels, the mechanism of which inhibits the absorption of blood sugar from the intestine and accelerates the digestive process that occurs in the digestive system so that the carbohydrates in the digestible food ingredients will not be absorbed by the intestines(Jumain et al., 2019).

Calabura muntingia leaves contain various kinds of vitamins and active substances such as quartz, flavonoids, the ability of flavonoids, especially quarantine to inhibit GLUT 2 in the intestinal mucosa so that it can reduce glucose absorption. This results in a reduction in the absorption of glucose and fructose from the intestine so that glucose levels fall. GLUT 2 is thought to be the major glucose transporter in the intestine under normal conditions(INDRIANA, 2018). Insulin promotes glucose uptake by most cells through GLUT 4 as a recruitment transporter (Lemaire et al., 2011).

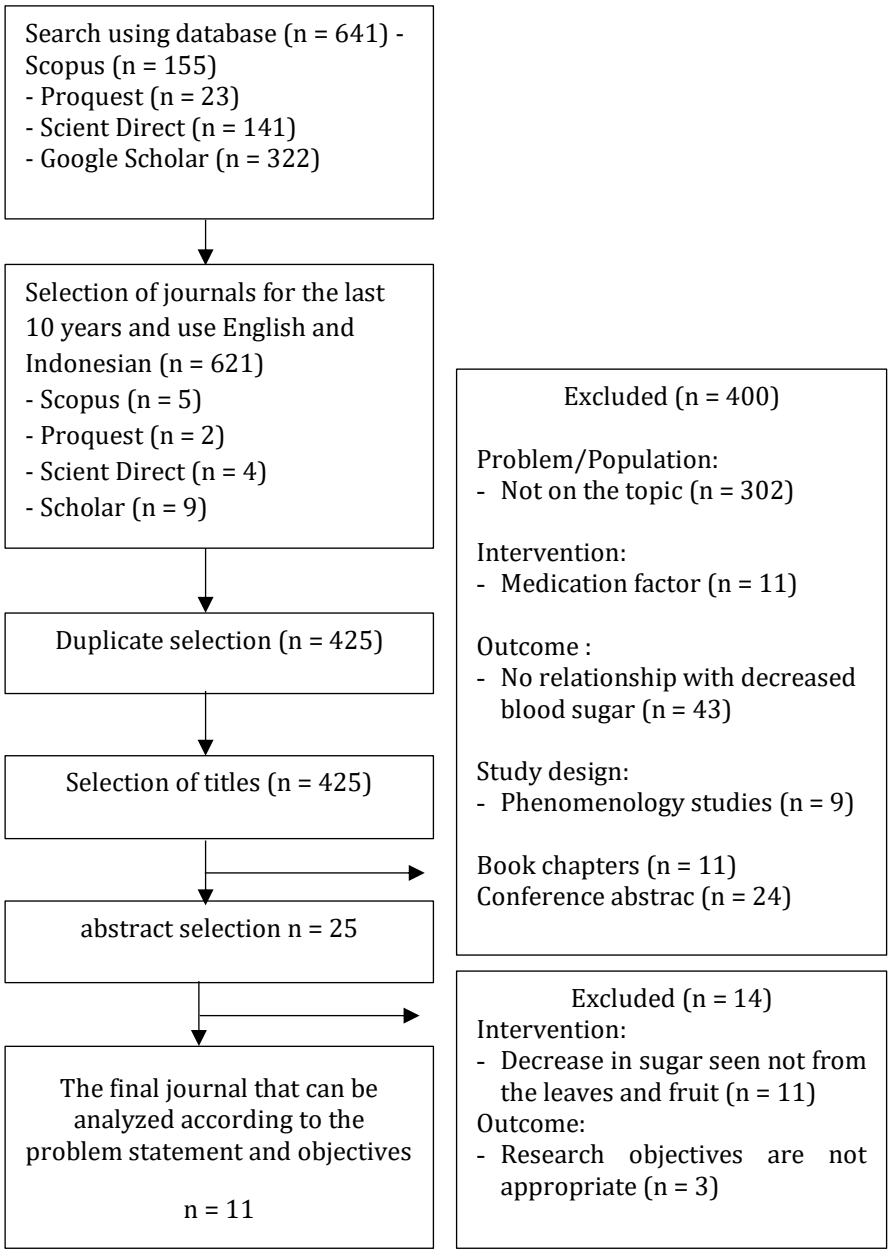

Figure 1. PRISMA Flow Diagram

According to (Fiana & Oktaria, 2016) muntingia calabura leaves contain saponins and flavonoids which function as an antihyperglycemic because they are enzyme inhibitors. α-glucosidase which plays a role in converting carbohydrates into glucose (sugar), so that blood glucose levels in the body will decrease.

The content of flavonoids can reduce blood glucose levels. Flavonoids are able to regenerate pancreatic beta cells and are able to stimulate insulin secretion. Another mechanism of flavonoids that shows the effect of hypoglycemia is reducing glucose uptake and regulating the secretion activity of enzymes involved in carbohydrate metabolism (Brachmachri, 2011). The effect of hypoglycemia, the mechanism of action is similar to the sulfonylurea group, which increases insulin secretion, increases insulin receptors so that glucose absorption in peripheral tissues increases, increases insulin in muscle, fat and liver tissue and inhibits the breakdown of polysaccharides into monosaccharides (Febrina & Sari, 2019).

Based on the results of journal analysis, muntingia calabura leaf preparations used are in the form of extract, infusion, and decoction. Whereas in the calabura muntingia fruit, namely in fruit juice and fruit extract preparations. Of the various

preparations used showed a decrease in glucose in blood sugar levels.

4. DISCUSSION

The Content of Cherry Leaves And Fruit

Kersen (Muntingia calabura L) contains alkaloids, tannins, saponins, flavonoids, polyphenols, flavonols (kaemferol and quercetin) as well as proanthocyanidin and cyanidin, some myoinositol, and every 100 grams of this plant contains: 76.3 g water, 2.1 g protein, 2.3 g fat, 17.9 g carbohydrates, 4.6 g fiber, 1.4 g ash, 125 mg calcium, 94 mg phosphorus, 0.015 mg vitamin A, 90 mg vitamin C. Energy value 380 kJ / 100 g (Perry 1980). Kersen is a type of the Muntingia clan that grows evergreen throughout the year (Chin, 1990). According to an article written by (Andalia et al., 2017) Kersen plants contain several chemical compounds, such as the Kersen leaves contain tripenoids, carbohydrates, proteins, polyphenols, flavonoids, ascorbic acid, α - tocopherol, and chlorophyll. Kersen leaves contain a group of compounds that exhibit antioxidative activity. These antioxidants are thought to be able to protect liver cells from damage caused by free radicals. Qualitatively, it is known that the dominant compounds in Kersen leaves are flavonoids. Other articles according to(Febrina & Sari, 2019) also states that the content of cherry leaves contains many groups of compounds or lignans, including flavonoids, tannins, triterpene, saponins and polyphenols.

Kersen leaves contain various kinds of vitamins and active substance quartzetin such as flavonoids, the ability of flavonoids especially kuarcetin to inhibit GLUT 2 in the intestinal mucosa so that it can reduce glucose absorption.(INDRIANA, 2018)

According to(Fiana & Oktaria, 2016) Kersen leaves contain saponins and flavonoids which function as an antihyperglycemic because they are enzyme inhibitors. α rahma-glucosidase which plays a role in converting carbohydrates into glucose (sugar), so that blood glucose levels in the body will decrease.

The Role of Flavonoids and Saponins in Reducing Blood Sugar

Various types of compounds, content and antioxidative activity of flavonoids as a group of natural antioxidants found in cereals, vegetables and fruit, have been widely published. Flavonoids act as antioxidants by donating their hydrogen atoms or through their ability to chelate metals, in the form of glucosides (containing glucose side chains) or in free form called aglycones (Redha, 2013). Flavonoids can reduce blood glucose levels with their ability as antioxidants. Flavonoids are protective against beta cell damage as insulin-producing and can increase insulin sensitivity. Antioxidants can suppress beta cell apoptosis without altering the proliferation of pancreatic beta cells. Antioxidants can bind to free radicals which have been proven in the research of Ruhe et al., Thus reducing insulin resistance. Antioxidants can decrease the Razctive Ocygen Species (ROS). In the formation of ROS, oxygen will bind to the free electrons that come out due to the leak of the electron chain. The reaction between oxygen and free electrons is what produces ROS in the mitochondria. 12 The antioxidants in flavonoids can donate their hydrogen atoms.

Another mechanism is the ability of flavonoids, especially quercetin, to inhibit the intestinal mucosa GLUT 2 so that it can reduce glucose absorption. This results in a reduction in the absorption of glucose and fructose from the intestine so that blood glucose levels fall. GLUT 2 is thought to be the major transporter of glucose in the intestine under normal conditions. In the research conducted by Song, it was found that flavonoids can inhibit glucose absorption. When quercetin is ingested with glucose, hyperglycemia is significantly decreased. This suggests that quercetin can inhibit glucose absorption through GLUT 2. Flavonoids can also inhibit phosphodiesterase thereby increasing cAMP in

pancras beta cells. The increase in cAMP will stimulate the production of protein kinase A (PKA) which attacks insulin secretion to increase(Ajie, 2015)

In addition to flavonoids, the content of cherry leaves also contains saponins. This saponin functions as an antidiabetic because it is an inhibitor of the α-glucosidase enzyme. This enzyme can be found in the small intestine and has the function of converting carbohydrates into glucose. Thus, the apavila α-glucosidase enzyme is inhibited, the blood glucose levels in the body will decrease, causing a hypoglycemic effect (Fiana & Oktaria, 2016).

5. LIMITATION

Research cannot be carried out directly due to the COVID-19 pandemic, so researchers cannot provide objective results.

Few studies have been found regarding the effectiveness of the effect of calabura muntingia leaves and calabura muntingia fruit in a database indexed by Scopus, ProQuest and Scholar, so there is no strong reason for the effectiveness of calabura muntingia leaves and calabura muntingia fruit.

The drawback of various articles that have been reviewed is that in article 2, article 3 and article 4, only discussing the therapeutic properties of this plant has not been fully researched. In article 6, article 7 and article 8 only discuss the pharmacological potential of the isolated bioactive compounds and their contribution to use. Whereas in article 1, article 5, article 9, article 10, article 11 have discussed the content and role of plants, of all the articles some do not discuss the content and role as a whole and the claimed drugs have not been fully studied.

6. CONCLUSION

From the results of the literature review that has been obtained, the same opinion was not found in each of the studies related to the content and role of the calabura muntingia plant. A stronger and more recent study has found that muntingia calabura leaves and muntingia calabura fruit contain flavonoids and saponins which can reduce blood sugar levels, a flavonoid compound that is thought to have activity in reducing blood glucose levels is quercetin. The form of extract, infusion, juice and stew does not change the content of the calabura muntingia plant. The therapeutic properties of this plant have not been thoroughly studied. Other than that, future studies are advised to compare the reduction in blood glucose levels with different preparations.

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