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Original Research

Guazuma Ulmifolia Lamk Leaf Tea to Decrease Blood Lipid Profiles in Depo-Medroxyprogesterone Acetate (DMPA) Acceptors

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ABSTRACT

Background: *Depo Medroxyprogesterone Acetate (DMPA) is an injectable contraceptive method that is widely used in Indonesia and has the side effect of increasing the blood lipid profile. Guazuma ulmifolia Lamk. Leaf has been proven to have benefits in controlling blood lipid levels. However, in previous research, giving Guazuma ulmifolia Lamk. Leaves were mostly done only on experimental animals. It is important to measure changes in blood lipid levels of cholesterol, LDL, HDL and triglycerides after consuming guazuma ulmifolia lamk leaf in DMPA acceptor.*

Methods: *Quasi-experiment with one group pretest-posttest design, with 48 respondents using purposive sampling. The intervention was carried out for 10 days routinely, twice a day, by giving 2 grams of Guazuma ulmifolia Lamk leaf tea. Analyse data of cholesterol levels and HDL levels using the T-test, while LDL and triglyceride levels using the Wilcoxon signed ranks test.*

Results: *There was a decrease in cholesterol levels (p-value = <0.001) and a decrease in LDL levels (p-value = <0.001), but it was not proven to increase HDL levels (p-value = 0.185) and decrease triglyceride levels (p-value = 0.353).*

Conclusion: *Giving guazuma ulmifolia lamk leaf tea was effective in decreasing cholesterol levels and decreasing LDL levels of DMPA acceptors. It is hoped that health workers can provide guazuma ulmifolia lamk leaf tea as an alternative or additional medicine to reduce cholesterol levels due to the side effects of DMPA injections.*

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INTRODUCTION

Family planning programs are intensively carried out to reduce population density using contraceptive methods. The majority of childbearing age women (63%) in the world have used contraceptive methods (United Nation, 2017), 58% with modern contraceptive methods such as contraceptive pills, injections, implants, intrauterine devices (IUD), women's surgical methods, male surgical methods, and emergency prevention (Prawerti et al., 2020). The results of family data collection in 2022 show that the prevalence rate

of family planning participants in Indonesia is 59.5%, with the majority of acceptors choosing to use injection contraceptive at 61.9% (Kemenkes RI, 2022).

One broad injection method is the Depo Medroxyprogerteron Acetate (DMPA). DMPA contraceptive acceptors may experience weight gain (Lucin & Herlinadiyaningsih, 2023). Most DMPA users will experience a 5% weight gain in the first 6 months (Handayani & Yulaikah, 2017). New DMPA users experience weight gain around 1.2-2.6 kg in a year and around 6.1 kg in 2.5 years (Dianat et al., 2019). Another research using female Wistar rats also showed that DMPA injectable contraception affects weight gain (Prihati, 2018).

Weight gain is caused by the progesterone hormone in DMPA making it easier for glucose and carbohydrates to change into fat which accumulates under the skin (Sari & Sholehah, 2022). DMPA also causes an imbalance of hormone estrogen, leading to HDL (high density lipoprotein) reduction and increase LDL (low density lipoprotein), which will lead to an increase in the total number of cholesterol (Prawerti et al., 2020). High cholesterol and LDL levels in the blood can lead to atherosclerosis, pancreatic and kidney disease, while high triglycerides can cause liver, pancreatic and renal dysfunction (Fauzi et al., 2022), while decreased HDL levels can cause coronary heart disease (Pratiwi et al., 2021).

Methods for decreasing cholesterol levels have been carried out in several studies, such as giving combination of camellia sinensis tea extract, chickpeas and cinnamon (Fauzi et al., 2022), giving brewed robusta coffee (Fatimatuzzahro & Prasetya, 2018), giving bay leaf extract (Nasution et al., 2023), giving boiled corn water (Sumarni et al., 2022), and giving Guazuma Ulmifolia Lamk leaf. In previous research, the intervention of giving Guazuma Ulmifolia Lamk leaf was still widely carried out on experimental animals, such as research which measured the reduction in blood triglyceride levels in male white rats (Lubis et al., 2021), and research which tested the activity of Guazuma Ulmifolia Lamk leaf extract on cholesterol, HDL and LDL in hypercholesterolemic rats (Naim et al., 2017). Guazuma Ulmifolia Lamk has presence of quercetin and sterols which have the property of decreasing cholesterol levels (Batubara et al., 2017; Supriani et al., 2019).

The novelty of this study lies in translating findings from animal studies into a human population, particularly among DMPA users who are at risk of lipid profile alterations. It also contributes to the limited evidence on plant-based, non-pharmacological interventions in reproductive health settings. This study aims to evaluate the effects of Guazuma ulmifolia Lamk leaf on cholesterol, HDL, LDL, and triglyceride levels among DMPA acceptors. This study offers a potential alternative strategy to prevent metabolic complications associated with hormonal contraceptive use.

MATERIALS AND METHOD

This research used a quasi-experimental with one group pretest-posttest design model, without a comparison group or control group. This design was chosen to assess changes in lipid profiles before and after intervention in the same group. In addition, ethical and practical limitations in providing a control group for DMPA acceptors made this design the most feasible for directly evaluating the effectiveness of the intervention. Study was carried out in the working area of Patebon 02 Kendal Community Health Center. The population was 399 DMPA injection contraceptive acceptors. The sampling technique used was purposive sampling. The sample decision was 15% of the population, totaling 60 samples.

The sample requirements for respondent characteristics (inclusion criteria) are DMPA acceptors who reside in the Patebon 02 Kendal Community Health Center area, have been DMPA acceptors for more than 2 years, minimum age 20 and maximum 35 years, and were willing to be involved in research activities. Meanwhile, the exclusion criteria were respondents with comorbidities (diabetes, heart disease, and kidney disease), do not routinely carry out interventions and incomplete pre-test or post-test examinations. During the reasearch, there were 48 respondents who met the whole research criteria.

The independent variable in this study was the administration of Guazuma ulmifolia Lamk leaf tea to Depo-Medroxyprogesterone Acetate (DMPA) acceptors. The dependent variables included changes in blood lipid profiles consisting of total cholesterol, LDL, HDL, and triglyceride levels after intervention. This study focuses on the relationship between the administration of Guazuma ulmifolia Lamk leaf tea and the reduction of lipid profiles in DMPA acceptors.

Samples of DMPA acceptors were pre-tested (initial measurement of cholesterol, HDL, LDL and triglyceride levels before the intervention was carried out), then intervention was given by giving 2 grams Guazuma Ulmifolia Lamk leaf tea for 10 days routinely twice a day in the morning and afternoon. Then a post-test was carried out on the 11th day to determine the effect of giving Guazuma Ulmifolia Lamk leaf on cholesterol, HDL, LDL and triglyceride levels in DMPA acceptors. The instruments were stepping scales to measure body weight that has been calibrated, a lipid level test tool (analyzer) that has been calibrated which used by taking blood serum to measure a complete lipid profile such as fixed cholesterol, LDL, HDL and triglycerides and an observation sheet to record the results of weight scales and examination result of cholesterol, LDL, HDL and triglyceride levels before and after intervention.

Total cholesterol and HDL levels were analysed using a paired t-test after performing a normality test to ensure normal data distribution. Conversely, LDL and triglyceride levels were analysed using the Wilcoxon signed-ranks test because the data were not normally distributed. These statistical tests were used to determine the significance of changes in lipid levels before and after the intervention.

This research has undergone an ethical eligibility test at the Faculty of Medicine, Sultan Agung Islamic University (UNISSULA) Semarang on October 30th 2021, No. 348/X/2021/Komisi Bioetik. All participants provided written consent after receiving a full explanation of the objectives, procedures, benefits, and potential risks of the study. The confidentiality of respondents' identities and data was fully maintained and used solely for research purposes.

RESULTS

Table 1. Respondent Characteristics (n =48)

Characteristics		n	%	*Mean*	*Min*	*Max*	*SD*
Age	unhealthy reproductive age (< 20 dan > 35 years old)	26	54.2	35.63	18	53	8.89
	healthy reproductive age (20-35 years old)	22	45.8				
Weight	Pre	-	-	58.60	39.2	92	11.97
	Post	-	-	58.82	40.5	92	11.89

n = number of observations; SD = Standard Deviation

Based on Table 1, it was shown that the majority of unhealthy reproductive-age respondents were 26 people (54.2%), while respondents of healthy reproductive age were 22 people (45.8%). The average body weight of respondents before and after giving Guazuma Ulmifolia Lamk leaf was almost the same, 59 kg. Based on the average values before and after consuming Guazuma Ulmifolia Lamk leaf tea, it can be seen that there was no drastic weight gain or that it was almost the same.

Table 2. Cholesterol, LDL, HDL and Triglyceride Levels After Giving Guazuma Umlifolia Lamk Leaf (n = 48)

Lipid Profile	Increase	Stable	Decrease
Cholesterol	4	-	44
LDL	1	1	46
HDL	19	3	26
Triglyceride	22	-	26

Based on Table 2, it was shown that of the 48 respondents who had been given guazuma umlifolia Lamk. leaf tea for 10 days, 44 experienced a decrease in cholesterol, while 4 experienced an increase. There was a decrease in LDL levels for 46 respondents, 1 respondent had no decrease, and 1 respondent experienced an increase. There was a decrease in HDL levels for 26 respondents, 3 respondents had no decrease, and 19 people experienced an increase. Meanwhile, triglyceride levels decreased for 26 respondents, and 22 respondents experienced an increase.

Table 3. Distribution of Mean, Minimum, Maximum and Standard Deviation of Cholesterol, LDL, HDL and Triglyceride Levels (n = 48)

Variable	Pre				Post				p-Value
	Mean	Max	Min	SD	Mean	Max	Min	SD	
Cholesterol	190	253	124	32.38	173	240	111	30.21	<0.001[a]
LDL	133	252	66	11.08	104	221	64	30.13	<0.001[b]
HDL	52	83	32	11.08	50	63	31	8.98	0.185 [a]
Triglyceride	133	252	66	36.94	121	244	39	58.92	0.353 [b]

SD = Standar Deviation

[a] T-test *level of significance sig <0.05

[b] Wilcoxon Signed Ranks Test *level of significance sig <0.05

Based on Table 3, it was shown that there was an average decrease in cholesterol, LDL, HDL, and triglyceride levels before and after respondents consumed Guazuma Ulmifolia Lamk leaf tea. Cholesterol levels averagely decrease from 190 mg/dL to 173 mg/dL, LDL levels decrease from 133 mg/dL to 104 mg/dL, HDL levels decrease from 52 mg/dL to 50 mg/dL, and triglyceride levels decrease from 133 mg/dL to 121 mg/dL.

DISCUSSION

Based on research results, consuming Guazuma Umlifolia Lamk leaf tea for 10 days has been proven to reduce cholesterol levels of DMPA acceptors. From 48 respondents, 44 respondents experienced a decrease in cholesterol levels. The average reduction in cholesterol levels before and after treatment was 253 mg/dL to 240 mg/dL.

These results are in accordance with research that giving a mixture of Guazuma Ulnifolia Lamk leaveses has an effect on cholesterol levels in menopausal women. The

research results showed that cholesterol levels (81.3%) were quite high before giving the mixture of Guazuma Ulnifolia Lamk leaf, and almost half (81.3%) had normal cholesterol levels after giving the mixture of Guazuma Ulnifolia Lamk leaf (Saputri et al., 2022). The research results were also strengthened by the research that giving Guazuma Umlifolia Lamk at a dosese of 50 mg/kg BW wasable to reduce the level of cholesterol significantly in High-Fat Diet (HFD)-fed rats (Mahfudh et al., 2024).

The separation results on Guazuma Uliginosa Lamk leaf showed the presence of quercetin. Quercetin is found in Guazuma Umlifolia Lamk leaves at a relatively high level and has properties related to reducing cholesterol levels. Therefore, quercetin can be a characteristic compound in Guazuma Umlifolia Lamk leaf (Batubara et al., 2017). Apartfrom that, changes in cholesterol levels because of sterols which aree also found in Guazuma Umlifolia Lamk leaves.

Sterolss bind cholesterol in the food consumed, so that if Guazuma Umlifolia Lamk leaveses are consumed after eating, the sterolss in Guazuma Umlifolia Lamk leaveses will bind cholesterol so that the cholesterol that has been bound will be carried away by food waste and cause the changes of cholesterol in the body (Supriani et al., 2019). Cholesterol is the most important sterol that most human cells synthesise primarily in the liver. It is a necessary part of the cell membrane and functions as a precursor to the synthesis of steroid hormones, vitamin D and bile acids (Narwal et al., 2019).

Consuming Guazuma ulmifolia Lamk leaf tea is is also proven to reduce LDL levels. From 48 respondents, 46 respondents experienced a decrease in cholesterol levels. The average decrease in cholesterol levels before and after treatment was 252 mg/dL to 221 mg/dL. A similar study conducted on white ratss showed a decreasein LDL levels (Hidajat et al., 2019). Likewise, oral administration of Guazuma Ulmifolia Lamk ethanol extract to mice with hypercholesterolaemiaa for 14 days showed that this extract was effective in reducing LDL levels.

About 70% ethanol extract of Guazuma Ulmifolia Lamk leaves at a dose of 75 mg/kgBW/day has been proven to have the most significant effect on reducing LDL levels. The mechanism of lowering LDL cholesterol levels by Guazuma Ulmifolia Lamk leaf extract is played by steroid compounds found in plants called phytosterols. Phytosterols have a mechanism in lowering LDL cholesterol levels, namely as ligands for LXR-RXR nuclear receptors. In addition, there are tannin compounds that play a role in lowering LDL levels by inhibiting the work of the HMG-CoA reductase enzyme.

Other compounds in Guazuma Ulmifolia Lamk leaves that play a role in lowering LDL levels are saponins. Saponin compounds have a high affinity for binding and forming mixed food micelles (DMM) rather than cholesterol. As a result, this component replaces cholesterol from DMM ithout affecting the concentration of bile salts entered in DMM. Cholesterol will precipitate into a form in large aggregates that cannot be absorbed by the intestinal wall (Naim et al., 2017).

Low LDL-C is defined as the the <5th percentile for age and sex, the latter derived from National Health and Nutrition Examination Survey data. It should be noted that published definitions are not based on clinical endpoints, and LDL-C values > 50 mg/dL are found in some individuals with genetic mutations as well. Low levels of LDL-C can be caused by common acquired conditions such as malignancies, anaemiaa, sepsis, chronic infections, medication effectss and malabsorption syndromes. In DMPA KB acceptors, the hormone content can increase appetite and cause malabsorption in the form of fluid accumulation in the body (Hartz et al., 2019).

This study showed that there were no increasing HDL levels of DMPA acceptors. Only 19 of 48 respondents experienced an increasee in HDL levels. The average HDL level before and after treatment decreased from 52 mg/dL to 50 mg/dL. The research results are are in line with another studyat Guazuma ulmifolia Lamk leaf doeses not have a significant effect on increasing HDL levels (Naim et al., 2017). However, this is different from the otherne, that Guazuma Umlifolia Lamk leaf extract in male Wistar rats with dyslipidaemiaa showed an increase in HDL levels (Hidajatet al., 2019).

HDL particles are polymeric complexes synthesised by the liver and intestine nd are formed from surface components released in plasma during lipolysis of triglyceride-based lipoproteins. HDL particles are made up of amphiphilic lipid monobacterial species made of phospholipids and cholesterol nd surround the liver nucleus of embedded amphiphilic proteins, mainly cholesterol esters and triglycerides. This special class of lipoprotein polymers is characterised as "high density" due to the relatively high proportion of protein to lipids (particularly the density area of HDL is 1.06-1.21 g/ml) (Karathanasis et al., 2017).

Reduction in HDL has a significant effect on the increase in total cholesterol levels. Hormonal contraceptive receptors indicate that contraceptive injection receptors for a period of 6-2 months determined that dyslipidaemiaa was diagnosed in 33% of receptors (Surati & Priyatno, 2021). This study also showed there was no decreasing triglyceride levels of DMPA acceptors. A total of 26 out of 48 respondents experienced a decrease in triglyceride levels.

However, thesee study results are not in line with research on white rats which showed a significant reduction in triglycerides (Hidajat et al., 2019). Likewise, research on male white rats using a combination tea of kombucha and Guazuma Umlifolia Lamk leaf showed that there was a reduction in blood triglyceride levels. The most effective reduction was at a dose of 200 ml/g bw with a percentage reduction in triglyceride levels of 37.68% (Lubis et al., 2021).

Guazuma ulmifolia Lamk. leavesves can break down fat and reduce triglyceride levels because of their active chemical content, namely flavonoids, alkaloids, carotenoids, tannins, saponins, phenolic acids, mucus, and resin. The alkaloid content of Guazuma Umlifolia Lamk leaf has a chemical structure similar to orlistat, a synthetic drug that can eliminate appetite by inhibiting the activity of the lipase enzyme, thus reducing the absorption of fat in the body (Hidajat et al., 2019). Triglycerides are one of the important connections between blood flow and fat cells.

Blood triglycerides are primarily used for somatic cell metabolism and energy production, while a smaller percentage is used for blood cholesterol production. Foods can play an important role in maintaining triglyceride levels and promoting general health. Triglycerides are a type of fat that plays an important role in nutrition and general health (Majedi & Ahamad, 2024).

This research uses an intervention providing Guazuma Ulmifolia Lamk leaf in a teaea product. The selection of the tea product was was because there was a positive response from respondents regarding the intervention of Guazuma Ulmifolia Lamk leaf tea because it tastes the same as regular tea (Supriani et al., 2019), so we believe that providing this intervention can be easily carried out and accepted by our respondents. The giving of of Guazuma Ulmifolia Lamk leaf tea in this study was carried out for 10 days, faster than previous studies with a period of 14 days. The recommended duration for consumption of traditional types of medicine or plants ranges from 1 to 2 weeks; if it exceeds this time, then strict supervision is required (Zulkarnain et al., 2021).

We took the intervention delivery time faster than the results of other studies, but still according to recommendations, so that respondents do not feel bored with the intervention given and as a time comparison with previous studies. Future research will be able to control the nutritional intake of the respondents, which has not been carried out in this research, and use more accurate tools like the enzymatic colorimetric method or CHOD-PAP (Cholesterol Oxidase Deaminase Peroxidase Aminoantipyrine), which method is required based on WHO guidelines. In the future, it is hoped that health workers can provide Guazuma Ulmifolia Lamk leaf tea as an alternative or additional medicine to reduce cholesterol levels due to the side effects of DMPA injections.

CONCLUSION

Giving 2 grams of guazuma (Umlifolia Lamk) leaf tea for 10 days was effective in decreasing cholesterol levels and LDL levels in DMPA acceptors. This study demonstrates the potential of Guazuma ulmifolia Lamk leaves as an herbal ingredient. These leaves have the potential to be developed for use in health interventions, particularly in lipid profile management. Therefore, Guazuma ulmifolia Lamk has promising value for wider application in the health sector.

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