



LEMINWA Transformation: Lemon-Honey Infused Water as a Healthy Approach to Reducing the Risk of Hyperglycemia

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ABSTRACT

Infused lemon honey water is one of the alternative healthy drinks that are easy to make and have the potential to help people reduce the risk of hyperglycemia. This community service activity aims to increase the knowledge and skills of participants regarding the benefits of lemon honey infused water as an effort to prevent increased blood sugar levels. The implementation method includes health education through counseling, demonstrations of making infused water, and interactive discussions related to the implementation of a healthy lifestyle. Participants were given material on the nutritional content of lemon and honey, the mechanism of action of bioactive compounds in reducing the risk of hyperglycemia, and safe consumption. The results of the activity showed an increase in participants' understanding of the concept of hyperglycemia, risk factors, and the benefits of infused water as a support for blood sugar regulation. Participants are able to practice directly making infused water and understand the right proportions of ingredients so that the benefits are optimal without increasing excess blood sugar levels. The discussion showed that the majority of participants were willing to implement the consumption of lemon honey infused water as part of a healthy lifestyle. This activity has a positive impact on increasing awareness and changing health behavior. In conclusion, infused lemon honey water can be a simple, economical, and practical solution in helping to reduce the risk of hyperglycemia. Education and direct practice have proven to be effective in increasing people's knowledge and motivation to implement a healthy lifestyle.

Keywords: *Transformation, solution, healthy, risk, hyperglycemia.*

Introduction

Hyperglycemia, a condition characterized by blood glucose levels above the normal range, represents an important public health concern because it is a major risk factor for the development of diabetes mellitus and other metabolic complications. Chronic hyperglycemia may increase the risk of both microvascular and macrovascular complications and contribute to reduced quality of life through conditions such as neuropathy, nephropathy, and cardiovascular disorders. Globally, the prevalence of impaired glucose tolerance and diabetes continues to increase, particularly in association with increasingly sedentary lifestyles and



dietary patterns characterized by high sugar intake and low nutritional quality. Therefore, primary prevention through healthy lifestyle modification and appropriate dietary practices is essential to reduce the risk of hyperglycemia in the community (Rosares & Boy, 2022).

One important aspect of maintaining metabolic health is adequate fluid intake. Water is an essential requirement for human survival and plays a fundamental role in maintaining normal physiological functions. Inadequate fluid intake can lead to dehydration, which may adversely affect health and cause symptoms such as headache, visual disturbances, fatigue, and, in severe cases, fainting and other serious complications. Fluid requirements may increase during hot weather and periods of intense physical activity; therefore, appropriate preventive measures are necessary to maintain adequate hydration and fluid balance (Ritonga et al., 2025).

One simple approach to increasing daily fluid consumption is through the use of infused water. Infused water is prepared by adding pieces of fruits, vegetables, or herbs to drinking water and allowing them to infuse for a certain period so that their flavors and some soluble compounds are released into the water. This type of beverage provides a refreshing taste and is relatively easy to prepare, making it a potentially attractive option for individuals who have difficulty consuming plain water. However, infused water should be regarded as a complementary hydration option and does not replace the nutritional benefits obtained from consuming whole fruits and vegetables.

In response to these conditions, community education is needed to improve public knowledge and awareness regarding the importance of adequate fluid intake and healthy beverage choices. Therefore, this community service activity was designed as a practical training program on the preparation of lemon-honey infused water. The activity was intended to introduce a simple and accessible beverage alternative that may encourage adequate hydration, reduce reliance on sugar-sweetened beverages, and support healthier daily consumption patterns.

Honey is one of the ingredients used in the preparation of lemon-honey infused water. Honey contains antioxidant compounds, including flavonoids and phenolic compounds, which may contribute to protection against oxidative stress. The addition of honey can provide a naturally sweet taste and improve the palatability of the beverage. However, because honey still contains sugars and carbohydrates, its consumption should remain moderate, particularly among individuals who are at risk of or are managing hyperglycemia. Thus, honey should not automatically be considered a risk-free substitute for refined sugar.

Lemon is another important ingredient because it provides a refreshing flavor and contains



various nutrients and bioactive compounds. Lemon has traditionally been associated with several potential health benefits, including supporting digestive comfort. It also contains minerals such as phosphorus, potassium, and calcium, as well as antioxidant compounds that may contribute to overall health (Herlina & Mulyani, 2022). The inclusion of lemon in infused water may therefore improve the taste of drinking water and encourage greater fluid consumption.

Mint leaves can also be incorporated into the beverage to provide a refreshing aroma and flavor. Mint contains menthol and various secondary metabolites, including tannins and flavonoids. These compounds have been associated with potential effects on digestive function. Winarno and Sundari (1996) reported that tannins may influence intestinal mucosal function, while flavonoids have been associated with effects on intestinal motility and fluid secretion. The addition of mint may therefore enhance the sensory characteristics of the beverage while contributing additional plant-derived bioactive compounds.

Plain water remains the primary component of infused water and serves an essential role in maintaining hydration. Adequate daily water consumption helps prevent dehydration and supports various physiological processes, including digestion, metabolism, nutrient transport, and maintenance of fluid balance. Previous literature has suggested that adults generally require approximately 1–2.5 liters of water per day, although individual requirements vary according to age, body size, activity level, environmental conditions, dietary intake, and health status (Karmitasari Yanra & Siti Santi, 2018). Accordingly, adequate water intake should remain the primary objective of any infused water intervention.

Cucumber is another ingredient that can be added to infused water because of its high water content and contribution of electrolytes and nutrients. Its high water content may support hydration, while nutrients such as potassium play an important physiological role in maintaining fluid balance and cardiovascular function. The incorporation of cucumber can therefore enhance the sensory appeal and nutritional characteristics of the beverage while supporting adequate fluid consumption (Yuliza & Solehudin, 2024).

Previous studies have explored the potential effects of lemon and honey on metabolic health. Experimental studies involving lemon extracts have reported potential effects on blood glucose regulation and pancreatic beta-cell function in animal models of hyperglycemia. Similarly, studies involving honey have reported potential effects on glucose metabolism and insulin responses in experimental models. Nevertheless, findings from human studies have been



variable, and the effects of lemon-honey beverages on blood glucose levels cannot be assumed to be equivalent to established medical interventions. Therefore, the use of lemon-honey infused water in this community service program is positioned primarily as a healthy beverage and hydration education strategy, rather than as a treatment for hyperglycemia (Nuryanti & Nurung, 2023).

Based on these conditions, there is a need for community-based interventions that combine health education with practical skills. The present community service activity was therefore designed to provide education and hands-on training regarding the preparation and potential benefits of lemon-honey infused water as an accessible healthy beverage. The activity aimed to increase community knowledge regarding hyperglycemia and its risk factors, introduce healthier daily beverage choices, and provide participants with practical skills for preparing infused water safely and appropriately.

Ultimately, the program is expected to contribute to increased health awareness and encourage positive changes in beverage consumption behavior. By introducing a simple beverage preparation method using readily available ingredients such as lemon, honey, mint, cucumber, and water, the activity seeks to promote adequate hydration and healthier lifestyle practices. More broadly, the program is expected to support community-based preventive efforts aimed at reducing modifiable risk factors associated with metabolic disorders, while emphasizing that dietary and beverage interventions should complement, rather than replace, appropriate medical care and professional health advice.

Research Method

The community service activity was conducted at the Institute of Technology and Health Muhammadiyah West Kalimantan (ITEKES MUH KALBAR) and specifically involved first-semester students of the Bachelor of Nursing Program, Class A. The educational intervention primarily targeted undergraduate nursing students, with lecturers at ITEKES MUH KALBAR also participating in the activity. The selection of nursing students as the main target group was based on their strategic role as prospective healthcare professionals who are expected to possess adequate knowledge of health promotion, disease prevention, and healthy lifestyle practices. The educational approach emphasized the nutrition infusion method, particularly the utilization of fruits, vegetables, and other natural ingredients to prepare nutritious and palatable infused beverages. Participants were introduced to the concept of combining readily available natural ingredients to produce beverages that are refreshing, appealing, and potentially beneficial as



part of a healthy lifestyle. The activity also emphasized the importance of selecting appropriate ingredients, maintaining hygienic preparation practices, and understanding the nutritional characteristics of each ingredient used.

Through this educational activity, students were encouraged not only to understand the theoretical concept of nutrition infusion but also to recognize its practical application in health promotion. The activity provided participants with an opportunity to explore how simple food-based innovations can be incorporated into daily dietary practices and used as an educational medium for promoting healthier beverage choices. As prospective nurses, the participants were also expected to acquire knowledge that could subsequently be disseminated to patients, families, and communities as part of their future health promotion and preventive care activities.

Results and Discussion (12 pt)

Implementation of the LEMINWA Infused Water Education

The community service activity was delivered through a socialization session introducing LEMINWA, a lemon-honey infused water beverage, to the participants. The session began with an explanation of infused water, including the ingredients and equipment required for its preparation, as well as its potential benefits as part of a healthy lifestyle. The participants showed considerable interest in the product and actively engaged with the information presented during the session.

The educational session emphasized the application of the nutrition infusion method, in which fruits, vegetables, and other natural ingredients are combined with water to produce a beverage that is flavorful, refreshing, and potentially beneficial to health. Participants were introduced to the potential of readily available ingredients as alternatives for developing healthier beverage choices. The activity also highlighted the importance of consuming infused water appropriately. Although infused water can be incorporated into a healthy dietary pattern, its consumption should remain moderate and should not be regarded as a substitute for a balanced diet or medical treatment. Individuals with sensitive stomachs or gastric disorders may also need to exercise caution when consuming acidic beverages such as lemon-infused water, particularly on an empty stomach (Sari & Hartanti, 2022).

The socialization was followed by a hands-on demonstration and practice session on preparing LEMINWA. The ingredients used included approximately five liters of mineral water, three lemons, one cucumber, an appropriate amount of fresh mint leaves, and approximately 250 mL



of honey. The equipment consisted of a knife, cutting board, spoon, and empty 350-mL bottles for serving and storage.

The preparation process began by washing and preparing all ingredients. The lemons and cucumber were then thinly sliced to facilitate the release of their flavor and soluble components into the water. The prepared mineral water was placed in a suitable container, followed by the addition of honey. The mixture was stirred thoroughly to ensure that the honey was evenly distributed. The sliced lemon and cucumber were then added to the mixture, followed by the mint leaves. The mint leaves were gently crushed before being added to help release their characteristic aroma and flavor.

After all ingredients had been combined, the mixture was stirred again and refrigerated for approximately 30 minutes to allow the flavors to infuse into the water. Following the infusion period, the beverage was ready to be consumed or portioned into 350-mL bottles. Through this practical activity, participants were able to observe and practice each stage of the preparation process directly, thereby strengthening their understanding of the nutrition infusion method and its practical application in preparing a healthy and appealing beverage.

The combination of health education, demonstration, and direct practice enabled participants to gain both theoretical knowledge and practical skills. The activity also encouraged participants to recognize that healthy beverage preparation can be simple and accessible when appropriate ingredients and preparation methods are used.



Figure 1. Ingredients for Preparing Infused Water



After the practical session was completed, samples of the prepared infused water were distributed to participants for tasting. This tasting session was conducted to obtain direct feedback regarding the sensory characteristics and acceptability of the beverage. The participants provided a variety of responses. Several participants described the beverage as refreshing, while others noted a slightly bitter taste, which was attributed to the lemon peel that had intentionally been left intact during preparation. Some participants also described the flavor as initially sour, followed by a sweet taste.

At the end of the educational session, an interactive question-and-answer session was conducted to assess participants' understanding of the material presented. Participants who were able to answer the questions correctly and promptly were given samples of the infused water as an appreciation for their active participation. One of the questions discussed was why lemon-mint infused water produces a refreshing sensation. This interactive approach encouraged participants to reflect on the material and connect the theoretical explanation with the characteristics of the beverage they had prepared and tasted.

The combination of tasting, discussion, and question-and-answer activities provided participants with a more engaging learning experience. It also enabled the facilitators to assess participants' comprehension while reinforcing key concepts regarding the preparation, ingredients, sensory characteristics, and potential health benefits of infused water. Through this approach, participants were expected to gain a clearer understanding of the material and acquire knowledge that could be applied independently in preparing infused water as part of healthier daily beverage choices.



Figure 2. Community Service Activity



Conclusion

The community service activity through LEMINWA (Lemon-Honey Infused Water) preparation training contributed to improving participants' knowledge and awareness of the importance of adequate fluid intake for preventing dehydration and maintaining overall health. The educational materials introduced the potential benefits of the main ingredients used in LEMINWA. Honey was introduced as a source of antioxidant compounds, lemon as a fruit containing antioxidant compounds and potentially supporting digestive health, mint leaves for their refreshing properties and potential contribution to digestive comfort, cucumber as an ingredient with high water content that can support hydration, and plain water as an essential component for maintaining fluid balance and supporting various metabolic processes.

The combination of explanation, demonstration, hands-on practice, product tasting, and interactive question-and-answer sessions made the educational process more engaging and accessible to participants. The practical approach enabled participants to directly observe the preparation process and subsequently practice it themselves. This approach also provided an opportunity for participants to connect the theoretical information with the sensory characteristics of the beverage and its potential application as part of their daily healthy lifestyle.

The activity involved 20 participants, who generally responded positively to the LEMINWA product. During the tasting session, participants provided various comments regarding its sensory characteristics. Several participants described the beverage as refreshing, while some noticed a slightly bitter taste, which was associated with the use of lemon with its peel intact. Other participants described the taste as sour at the beginning and sweet toward the end. These responses provided useful feedback regarding the acceptability and sensory characteristics of the beverage and demonstrated the participants' active engagement throughout the activity.

The interactive question-and-answer session further strengthened participants' understanding of the material. Questions concerning the ingredients, preparation process, and reasons for the refreshing sensation of lemon-mint infused water encouraged participants to recall and apply the information presented during the training. This interaction also enabled the facilitators to identify participants' level of comprehension and clarify concepts that required further explanation. Thus, the activity did not merely provide information but also encouraged participants to actively process and apply the knowledge acquired during the training.

Nevertheless, the activity also emphasized that although infused water can be incorporated into



a healthy lifestyle, its consumption should be appropriate and should not be considered a substitute for balanced nutrition or medical treatment. Participants were informed that individuals with gastric sensitivity or certain gastric disorders should exercise caution when consuming acidic beverages containing lemon, particularly on an empty stomach (Sari & Hartanti, 2022). This consideration is important to ensure that the promotion of healthy beverages is accompanied by appropriate awareness of individual health conditions.

Overall, the implementation of LEMINWA training demonstrated that a simple, practical, and participatory educational approach can facilitate the dissemination of health-related information and encourage participants to adopt healthier beverage practices. The activity is particularly relevant in conditions characterized by hot weather and intensive daily activities, where adequate fluid intake is essential. By utilizing readily available natural ingredients, LEMINWA also provides an accessible alternative for increasing the appeal of water consumption while encouraging greater awareness of healthy dietary and hydration practices. The positive response from participants indicates that similar educational activities may be further developed as part of broader health promotion initiatives among students and the wider community.

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177.