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The Use of Date Juice and Sugarcane Juice for Hypoglycemia Therapy in Young Adult

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ABSTRACT

Introduction: Hypoglycemia is a medical emergency requiring immediate intervention as it can lead to fatalities. One of the initial treatments for hypoglycemia out of hospital settings is the administration of sweet food and drinks. This research aims to analyze the difference in blood glucose level increase between respondents given date juice and those given sugarcane juice.

Methods: A quasi-experimental two-group pretest-posttest design was conducted in March 2024, involving 92 students divided into 2 groups (Intervention Group: 46; Control Group: 46) recruited through purposive sampling. Both groups were asked to fast for 14 hours, followed by blood glucose measurement (pretest), and then given date juice (intervention group) and sugarcane juice (control group). Blood glucose post-test was conducted at 15 and 30 minutes after intervention with a glucometer, and data were analyzed using ANOVA ($\alpha \leq 0.05$).

Results: The study indicated an increase in blood glucose levels after date juice intake at 15 minutes with a mean of 129.83 mg/dl (p=0.000), followed by a decrease in mean blood glucose from 15 to 30 minutes by 21.7. There was an increase in blood glucose levels after sugarcane juice intake at 15 minutes with a mean of 131.17 mg/dl, followed by a decrease in mean blood glucose from 15 to 30 minutes by 19.8. Statistically, there was no difference in blood glucose increase between the two groups at both 15 minutes (p=0.633) and 30 minutes (p=0.347).

Conclusion: Date juice and sugarcane juice similarly increase blood glucose levels and can be used as out-of-hospital therapies for conscious hypoglycemic patients.

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1. INTRODUCTION

Stroke is one of the most common neurological disorders and is the second leading cause of death worldwide (Tsao, 2023). Stroke is characterized as a central neurological shortfall of sudden onset, with side effects enduring more than 24 hours (or coming about in passing some time recently 24 hours) (Murphy & Werring, 2020). Based on the Indonesian Health Profile in 2020, the number of stroke cases in Indonesia is quite high, with 1,789,261 Indonesian residents experiencing or suffering from stroke (Kemenkes, 2020). The prevalence of stroke sufferers in East Java reached 21,120 or 12.4%, ranking 8th in Indonesia in 2018 (Kemenkes, 2018). Based on Medical Record data from Bangil Regional Hospital, stroke is among the top 10 most common diseases in the inpatient ward, where the latest record in 2023 shows that the number of stroke patients reached 644 out of 9,643 patients in 2023. The most common type of stroke is non-hemorrhagic stroke, with 443 cases (68.79%), followed by hemorrhagic stroke with 201 cases (31.21%) (Medical record RSUD Bangil, 2024). Based on the above issues, the urgency of health literacy needs to be addressed with a family approach. This study aims to explore the relationship

between health literacy and family involvement in the care of stroke patients at Bangil Regional Hospital.

According to (Kurniawati et al., 2020), there needs to be very precise support as the main source of support, which is the family. The family plays a role as a facilitator in preventing the risk of stroke among family members, ensuring that antihypertensive medication is taken regularly, and providing emotional support (Kurniawati et al., 2020). Families need to be empowered as optimally as possible to prevent and guide family members in adapting to their health conditions, so that an optimal quality of life can be achieved. In order to empower families, their knowledge about stroke and skills in helping patients adapt must be improved. For stroke patients, family involvement is critical in assisting with daily care, such as mobility, nutrition, and rehabilitation exercises. Health literacy serves as the foundation for effective, family-centered care. Improving literacy levels among patients and caregivers leads to better health outcomes, fewer complications, and improved quality of life, especially for stroke patients.

Long-term complications of stroke include seizures, musculoskeletal disorders, urinary incontinence, psychosocial issues, and cognitive impairments (Chohan et al., 2019). Complications from a stroke can be prevented with patient self-care. Complications can occur and are influenced by several factors such as age, education level, language, cultural background, education, and health literacy (Cook & Pompon, 2023). Health literacy is an individual's capacity to get to, perused, prepare, and get it wellbeing data and administrations, and to utilize wellbeing data and administrations successfully to create fitting wellbeing choices (Karasneh et al., 2020). Furthermore, the first literature on the definition and systematic model of health literacy was compiled by Sorensen et al. in 2012 (Okan et al., 2019). Health literacy can also be translated as Individuals require skills and competencies in accessing, comprehending, analyzing, and applying health information in diverse health domains like health promotion, healthcare settings, and preventive health (Tutu et al., 2024). Health literacy requires information, motivation, and community competence to get to, get it, assess, and apply data to form assessments and choices in standard of living related to healthcare, infection avoidance, and wellbeing advancement to preserve and move forward their quality of life (Yu et al., 2023). Somebody who has satisfactory health literacy will lock in decision-making, keep up their health, and get superior treatment, in this manner contributing to the advancement of their health (Asharani et al., 2021). Thus, someone with good health literacy will not only improve their own health but also that of their family members who are receiving care.

Family individuals are an important asset for the conveyance of modern healthcare, particularly within the intensive care unit. Families can engage in communication and decision-making with the healthcare group, give enthusiastic or physical back to their adored ones, and effectively contribute to the delivery of care (Goldfarb et al., 2022). Based on that perspective, nursing care not only focuses on the individual client but also simultaneously on the family (Hagedoorn et al., 2021). However, the involvement of clients and families is still not optimal due to several significant barriers, including a lack of awareness or opportunities, as well as accessibility challenges (Hirschkorn et al., 2022). Thus, there is a need for health literacy for the families of patients undergoing treatment. Given the importance of family involvement in care, the author wants to understand the relationship between health literacy and family involvement in caring for stroke patients at Bangil Regional Hospital. The aim of this research is to determine how health literacy affects family involvement in the care of stroke patients.

2. METHODS

Study Design

The research design employed a quasi-experimental two-group pre-posttest approach with a control group. The dependent variable was blood glucose levels, while the independent variables were date juice and sugarcane juice. The intervention group (A) received date juice, whereas the control group (B) received sugarcane juice.

Population, Samples, and Sampling

This study was conducted during Ramadan, from March 15 to March 29, 2024, among undergraduate nursing students of the Faculty of Health Sciences, Muhammadiyah University of Lamongan. The researchers chose healthy respondents aged 18-19 years as subjects due to the lower risk of complications from the intervention compared to conducting the study on diabetes patients who are more sensitive to blood glucose fluctuations. The study population consisted of 152 students from three classes (Semester 1A, 1B, 1C). The sample comprised 92 students divided into two groups: the intervention group consisting of 46 students selected from classes A (15), B (16), and C (15), and the control group also consisting of 46 students selected from classes A (15), B (16), and C (15). The determination of the sample size was conducted using the cluster sampling formula (Budiawati, 2023).

The inclusion criteria for the study encompass healthy male and female nursing students who are physically fit, devoid of diabetes, willing to fast for 14 hours, and agreeable to undergoing blood glucose testing thrice. Exclusion criteria pertain to physically ailing students, those experiencing menstruation, and individuals afflicted with endocrine disorders such as diabetes, hyperthyroidism, among others. Sample selection employed purposive sampling through open recruitment via the dissemination of flyers detailing the respondent criteria.

Instruments

Intervention group A received 100ml of date juice (administered once) consisting of 30 grams of seedless date fruit pureed with 100ml of water.

Table 1. Respondents Characteristics (N=90)

Variable	Category	Date Juice		Sugarcane Juice	
		N	%	N	%
Age	20	3	6.5	4	8.7
	21	7	15.2	9	19.6
	22	26	56.5	19	41.3
	23	10	21.7	14	30.4
	Total	**46**	**100**	**44**	**100**
Gender	Male	13	28.3	13	28.3
	Female	33	71.7	33	71.7
	Total	**46**	**100**	**44**	**100**

Table 2. Statistical Analysis of Respondents' Blood Glucose Level Values

Group		Intervention	Control
Blood Glucose Level (mg/dl) Minute-	KGD-Pre	95.30±10.768	93.41±9.722
	KGD-15	129.83±14.773	131.17±12.074
	KGD-30	108.13±16.400	111.37±18.233

Intervention : Date Juice
Control : Sugarcane juice

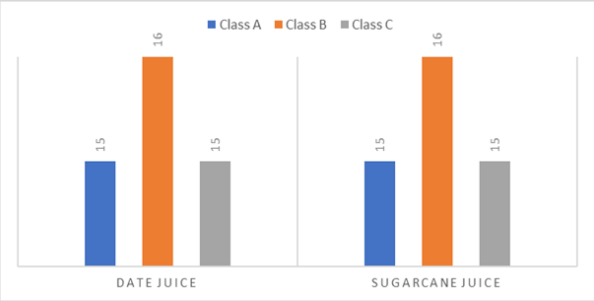

Figure 1. Sample Selection and Distribution

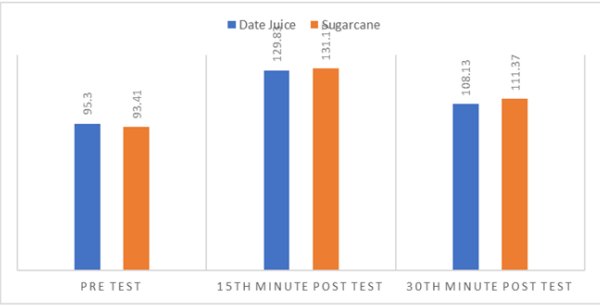

Figure 2. Graph of Respondents' Mean Blood Glucose Levels

Meanwhile, intervention group B was given 100ml of pure sugarcane juice without any water added. The preparation of sugarcane juice begins by selecting sugarcane stalks, peeling off the skin, and thoroughly washing them. The sugarcane is then processed by activating a pressing machine and crushing the stalks to extract the juice, which is collected in a pitcher. Next, the sugarcane juice is measured to 100 ml using a measuring cup while being strained to remove fibers and residue. The juice is transferred to a glass and served immediately . The sugarcane juice is prepared 1-2 hours before the activity to ensure it remains fresh.

Another group was given date juice, prepared using Sukari dates with the seeds removed. The dates are weighed to 30 grams, and 100 ml of mineral water is measured using a measuring cup. The dates and water are then blended together until smooth. The blended mixture is poured directly into a glass without straining, and the date juice is ready to be served.

Procedure

The study commenced with the distribution of flyers to recruit prospective respondents. Those who registered by filling out a registration link were directed to join a WhatsApp group. A total of 92 students registered and were then randomly divided into 2 groups using an odd-even method based on their registration sequence numbers. Intervention was administered to 46 students from the intervention group on Friday, while 46 students from the control group received intervention on Monday

Subsequently, researchers organized a timing contract for intervention delivery via the WhatsApp group and explained the study preparations, including fasting for approximately 14 hours (Ramadan fasting), and the requirement to have a pre-dawn meal at 03:30. Each participant received only one intervention. One hour before implementation, participants who were fasting were gathered and briefed on the study's objectives, benefits, and procedures. If they agreed, participants were asked to sign an informed consent form.

On Monday 18 march, data collection was conducted with the intervention group (date juice). Fifteen minutes prior to intervention, a random blood glucose measurement (pre-test) was taken from the respondents. At the call to Maghrib prayer (sunset prayer), respondents were instructed to consume the date juice provided by the researcher. Fifteen minutes after consumption, their blood glucose levels were measured again, followed by another measurement at the 30-minute mark. The date juice was administered simultaneously to all participants, consumed in one sitting, with a composition of 30 grams of Sukari date fruit and 100ml of mineral water without added sugar or ice.

On Friday 22 march, data collection was carried out with the control group (pure sugarcane juice). Fifteen minutes before the intervention, a pre-test blood glucose measurement was taken from the respondents. At the call to Maghrib prayer, respondents were asked to drink the pure sugarcane juice provided by the researcher. Fifteen minutes after consumption, their blood glucose levels were measured again, followed by another measurement at the 30-minute mark. The pure sugarcane juice was administered simultaneously to all participants, consumed in one sitting, with a composition of 100ml of pure sugarcane juice without added sugar, water, or ice.

Table 3. Difference in Blood Glucose Levels of Respondents

Intervention Group			
Category	Pretest - posttest minute 15	Pretest - posttest minute 30	Posttest minute 15 – posttest minute 30
***p* value**	0	0	0
Difference	34.53	12.83	21.7
Control Group			
Category	Pretest - posttest minute 15	Pretest - posttest minute 30	Posttest minute 15 – posttest minute 30
***p* value**	0	0	0
Difference	37.76	17.96	19.8

Table 4. Comparison of p Value between Intervention & Comparison Groups

Group	p value
Minute 15	0.633
Minute 30	0.374

Prospective respondents who registered were first provided with an explanation of the procedure. If they agreed to participate, they were given a consent form to sign. Respondents' identities were kept confidential by not disclosing their names. This research was approved ethically by the Ethics Committee of Muhammadiyah University of Lamongan on March 7, 2024, under approval number 033/EC/KEPK-S1/03/2024 prior to commencement of the study.

Data Analysis

Before conducting statistical tests, a test of data distribution was performed using the Kolmogorov-Smirnov test. The results indicated that the pre-test data for the intervention group, pre-test data for the control group, and the post-test at 15 minutes for the control group followed a normal distribution. Conversely, the post-test data at 15 minutes for the intervention group, post-test data at 30 minutes for the intervention group, and post-test data at 30 minutes for the control group did not follow a normal distribution.

To assess the impact of the intervention on pre-test to post-test data, paired t-tests were employed. An ANOVA test was used to compare blood glucose levels between the intervention and control groups using Statistical Package for the Social Sciences (SPSS).

3. RESULTS

Table 1 A total of 92 students completed the entire research process. The study findings revealed that a majority of the respondents, 56.5% in the intervention group (date juice) and 41.3% in the control group, were 22 years old. The majority of respondent were female, comprising 71.7% of the total participants.

Table 2 displays the mean values for the intervention group as follows: pre-test (95.30), post-test at 15 minutes (129.83), and post-test at 30 minutes (108.13). For the control group, the values are: pre-test (93.41), post-test at 15 minutes (131.17), and post-test at 30 minutes (111.37).

Table 3. From the statistical test results, the intervention group experienced an increase in blood glucose levels, with a mean difference between pre-test and post-test at 15 minutes of 34.53 units. Subsequently, at 30 minutes, there was a decrease with a mean difference of 21.7 units. In contrast, the control group showed an increase in blood glucose levels, with a mean difference between pre-test and post-test at 15 minutes of 37.76 units. At 30 minutes, there was a decrease with a mean difference of 19.8 units.

Table 4. The results of the ANOVA test for both groups showed a p-value of 0.633 at 15 minutes, indicating that there was no significant difference between the intervention and control groups. Similarly, at 30 minutes, the comparison between the two groups yielded a p-value of 0.374, suggesting no significant difference as well. This means that both the intervention and control groups similarly influenced the increase in blood glucose levels.

4. DISCUSSION

Several factors can affect blood glucose levels, including exercise, dietary patterns, stress, age, medication intake, comorbidities, smoking, alcohol consumption, and dietary (Paramitasari, 2017; Ciarambino et al., 2022). In this study, the influential factor on blood glucose levels was food intake. Hypoglycemic therapies, as per (Kementrian Kesehatan, 2021), include sugar, honey, and candies.

Blood glucose levels can be measured in laboratories or using a glucometer. Glucose testing with a glucometer strip is rapid and straightforward, providing immediate results for healthcare professionals and clients, thus facilitating treatment evaluation. The research findings indicate that blood glucose levels among Muhammadiyah University Lamongan students increased 15 minutes after consuming date juice. However, a decrease in blood glucose levels was observed at 30 minutes because the glucose has been absorbed in the body. The results align with , which demonstrated an increase in blood glucose levels among students after consuming Ajwa dates during iftar (breaking the fast).

The research by Anggraini & Murbawani (2013) reported a non-significant decrease in blood glucose levels after consuming honey before a simulated match. Significant findings were observed in athletes

who consumed sugar water, where glucose levels increased after 60 minutes. While another study showed a significant improvement in blood glucose levels in the three groups given 75 g honey (175.9±277.8), 30 g honey (191.7±246), and 75 g glucose (187.4±290) after an hour of fasting in patients with type 2 diabetes at Jinnah Medical College Hospital, Karachi (Nazir et al., 2014).

This study aligns with Rajabul Haery et al. (2022), who found an increase in blood glucose levels among students 15 minutes after consuming 3 Ajwa dates. Similarly, Mirghani (2021) research that involving 390 adult respondents with diabetes mellitus who consumed Ajwa dates over 12 weeks showed a decrease in blood glucose levels. The increase in blood glucose levels was higher with Sukari date juice compared to Ajwa dates.

Setianingsih (2018) conducted a study on mouse embryos, there was a non-significant difference in blood glucose levels at the 15-minute mark between those administered with date flesh extract and those without Ajwa date flesh extract. The mean difference in the study using mouse samples was 10.5. In contrast, the current study with student respondents showed a mean difference of 34.53 at the 15-minute mark. This comparison suggests that the use of Sukari date juice in the present study resulted in a higher increase in blood glucose levels compared to using Ajwa dates or Ajwa date flesh extract in mouse studies. Butler et al. (2022) study did not show a decrease in blood glucose levels in both the treatment and control groups after consuming 50 grams of Lulu dates daily for 14 days. Both groups continued to take anti-diabetes medication, but only the treatment group consumed Lulu dates.

Jati et al. (2024) study in Yogyakarta showed that family-supported nutrition education improved dietary adherence, though it had mixed effects on actual blood glucose levels. According to Rahmi et al. (2024) a study from Aceh, Indonesia found significant associations between physical activity, diet, and fasting blood glucose levels in patients with Type 2 Diabetes. Astuti et al. (2023) research indicated that foot exercises significantly improve foot sensitivity in diabetic patients at the Selemadeg II Timur Community Health Center in Denpasar, Bali.

The total sugar content in Sukari dates is 78.5 ± 0.1 g/100g dry weight. In 100 g of dry weight Sukari date flesh, it contains glucose 52.3 g, fructose 48.2 g, and sucrose 3.2 g. Compared to other varieties such as Labanah, Burni, Safawy, and Mabroom, Sukari dates have higher sugar content (Fadilla et al., 2022). Date juice is a readily usable substrate derived from finely ground dates. This juice is liquid in form with a thick consistency, brownish in color, very sweet in taste, and contains a complete nutritional profile akin to whole dates. Compared to consuming whole dates, date juice is absorbed more quickly by the body, potentially leading to faster increases in blood glucose levels (Rizkika et al., 2023).

Based on the research findings, the mean blood glucose levels before and after consuming date juice increased. Subsequently, at 30 minutes, there was a decrease of 19.8 (from 131.17 to 111.37). Anggraini & Murbawani (2013) study indicated a non-significant decrease in blood glucose levels when honey was administered before a simulated match. Conversely, Al-Ghifari (2020) research showed significant results in basketball athletes before training after consuming gula aren.

This study is consistent with Nisrina & Deny (2014) research, which compared blood glucose levels before and 15 minutes after consuming sugarcane juice and a commercially produced carbohydrate drink. The mean difference between sugarcane juice and the commercial drink was 15.1. In contrast, the study using only sugarcane juice showed a mean value of 37.76. This comparison from previous studies suggests that sugarcane juice leads to a higher increase in blood glucose levels compared to both commercially produced carbohydrate drinks and date juice. The components found in sugarcane stalks include glucose at 73 g, calories at 180, calcium at 1.87 g, and phosphorus at 0.56 g (Hermawati, 2018). The composition of sugarcane juice predominantly consists of 70-75% water, 10-15% fiber, and approximately 13-15% natural sugars (Aprilia, 2020).

Statistical tests indicated no significant difference between the post-test values after consumption of date juice and sugarcane juice. However, the research demonstrated a higher increase in blood glucose levels among participants who consumed sugarcane juice compared to those who consumed date juice. The mean values at 15 minutes for participants given date juice were 129.83, whereas for those given sugarcane juice, they were 131.17. The difference in mean values between the two groups was 1.34. Thus, at the 15-minute mark, participants given sugarcane juice exhibited higher blood glucose levels than those given date juice. At 30 minutes, participants given date juice experienced a mean decrease of 21.7 (from 129.83 to 108.13), whereas those given sugarcane juice experienced a decrease of 19.8 (from 131.17 to 111.37). It can be concluded that at the 30-minute mark, the decrease in blood glucose levels was greater in the date juice group, amounting to 21.7. Sugarcane juice contains a higher glucose content of 73 g/100 ml compared to date juice, which contains 52.3 g/100 ml of glucose. Both interventions can increase blood glucose levels and serve as alternatives for hypoglycemic therapy outside of hospital settings for conscious patients.

The study conducted by Setianingsih (2018) on mice showed no significant difference in blood glucose levels at 15 minutes between the group given Ajwa date fruit extract and the group that was not. This finding contrasts with the results of the present study, which demonstrated a difference in blood glucose levels among students before and after consuming Sukari date juice. The total sugar content in Sukari dates is 78.5 ± 0.1 g/100g of dry weight (Fadilla et al., 2022), while Ajwa dates from Madinah contain 51.3 ± 0.3 g/100g (Ahyar & Syamsu, 2024).

Sugarcane stalks contain 73 g of glucose per 100 grams (Aprilia 2020). While pure honey contains 41.2 ± 0.9 g/100 grams, and palm sugar contains 35 g of glucose per 100 grams Al-Ghifari (2020).

Nisrina & Deny (2014) Nisrina & Deny (2014) research revealed a comparison of blood glucose levels before consuming sugarcane juice and commercially produced carbohydrate beverages. However, blood glucose levels increased more significantly with the administration of sugarcane juice and Sukari date juice

5. CONCLUSION

The administration of both sugarcane juice and date juice has been shown to increase blood glucose levels in respondents, with a higher increase observed in those given sugarcane juice compared to those given date juice. This study indicates that both sugarcane juice and date juice can increase blood glucose levels within 15 minutes, making them viable options for first aid in hypoglycemia for conscious patients outside the hospital setting. The findings can serve as a reference for the initial management of hypoglycemic incidents outside the hospital. Future research is encouraged to standardize the calorie content in both interventions. Additionally, further studies could be conducted on different populations, such as diabetes patients, the elderly, and others, to assess the impact on blood glucose levels across various age groups and/or individuals with underlying health conditions.

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