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MANAGEMENT OF TYPE II DIABETES MELLITUS WOUND AT HOME UTILIZING PURE ODENG HONEY ON GRANULATION TISSUE IN STAGE TWO GANGRENOUS WOUND

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ABSTRACT

Honey odeng pure as a topical therapy for wound care contains 40% glucose, 40% fructose, 20% water, and amino acids, biotin, niacin, folic acid, pentenoic acid, proksidin, thiamine, calcium, iron, magnesium, phosphorus, and potassium, antioxidants, and H2O2 as a free radical neutralizer. Pure odeng honey can be used as a primary component in the treatment of grade 2 gangrene wounds. The prevalence of foot ulcers in Diabetes Mellitus (DM) patients ranges from 2% to 10%, with amputation rates of 7% to 20%. One of the non- pharmacological treatments for diabetic gangrene wounds is the use of pure odeng honey. Clinically, honey application can reduce edema, form exudates, minimize scar tissue formation, and reduce pain sensation in burns and other types of wounds. Objective: This research aims to determine the effectiveness of using pure odeng honey in the treatment of stage 2 diabetic ulcer wounds. Method: The research utilizes a Quasi-Experimental design, specifically the Pretest Posttest Nonequivalent Control Group Design, with the treatment involving the use of pure odeng honey. Ten participants with stage 2 diabetic foot ulcers are included. The instruments used are the Standard Operating Procedure (SOP) for wound care and wound observation. Results: Clients suffering from diabetic foot ulcers experience improvement in skin tissue integrity related to peripheral neuropathy. The action taken to accelerate the healing of type II diabetes wounds is wound care using pure odeng honey. Wound care using honey is proven effective in expediting the healing of type II diabetes wounds. It is recommended for individuals with a family history of Type II DM that pure odeng honey can be an alternative non-pharmacological option for treating type II gangrene wounds at home.

Keywords: Type II diabetes mellitus, honey, wound care

INTRODUCTION

Honey as a remedy has been known for tens of thousands of years. Honey can also be used as a topical therapy for burns, infections, and ulcer wounds. To date, numerous research findings have reported the effectiveness of honey in wound care, both clinically and in laboratory settings. Several studies have indicated that honey is effective as a topical wound therapy by enhancing granulation tissue, collagen, and significantly accelerating the epithelialization period (Suguna et al., 1992; 1993; Aljady et al., 2000). According to Lusby PE (2006), honey proves to be effective as a topical therapy due to its rich nutritional content, a widely acknowledged fact.

Bergman et al. (1983) generally stated that honey contains 40% glucose, 40% fructose, 20% water, and amino acids, as well as biotin, nicotinic acid, folic acid, pentenoic acid, proksidin, thiamine, calcium, iron, magnesium, phosphorus, and potassium. Honey also contains antioxidants and H2O2 (Hydrogen Peroxide) as a free radical neutralizer. The composition and properties of honey may vary depending on its source (Gheldof et al., 2002; Gheldof and Engeseth, 2002). Honey is more effectively used as a topical therapy due to its nutritional content and properties. Honey is a supersaturated solution with high sugar

content and has a strong interaction with water molecules, inhibiting the growth of microorganisms and reducing odor in wounds. This is especially evident in infection wounds caused by Staphylococcus aureus bacteria. As reported by Cooper et al. (1999), laboratory studies indicate that honey has antibacterial effects on various types of infection wounds, such as those caused by Staphylococcus aureus bacteria. Other research findings suggest that natural honey can kill Pseudomonas aeruginosa and Clostritidium bacteria (Efem & Iwara, 1992). Wounds can become sterile to germs when honey is used as a dressing for topical therapy.

Additionally, the low pH (3.6-3.7) of honey can prevent germ penetration and colonization (Efem, 1998). In the event of contact with wound fluids, especially chronic wounds, the high sugar content in honey will dissolve the wound fluids, keeping the wound moist, which is considered beneficial for the wound healing process.

When honey is diluted with the fluid (exudate) on a wound, hydrogen peroxide is produced. This occurs due to the enzymatic reaction of glucose oxidase present in honey, which possesses antibacterial properties. This process does not cause damage to the wound tissue and helps reduce unpleasant odors. Hydrogen peroxide is generated in low concentrations and does not generate heat, thus not posing a threat to the wound condition (Molan,1992). Additionally, the production of hydrogen peroxide depends on the type and source of the honey used.

The research findings indicate that the activities of B lymphocytes and T lymphocytes can be stimulated by honey with a concentration of 0.1% (Abuharfeil et al., 1999). The presence of lymphocyte and phagocyte activities demonstrates the body's immune response to infection, particularly in wounds. Due to its acidic nature, honey creates an acidic environment in the wound, preventing bacteria from penetrating and colonizing. Additionally, the water content in honey provides moisture to the wound, aligning with the modern wound care principle of 'Moisture Balance.' Gethin GT et al.'s (2008) research results report that honey can significantly reduce the pH and size of chronic wounds (venous/arterial ulcers and pressure ulcers) within two weeks. This facilitates the granulation and epithelialization processes of the wound.

Honey harvested from the nectar produced by wild Manuka tree bees, which grow in New Zealand and certain regions of Australia. This honey is often utilized as a key ingredient in wound care products in several countries. According to research reports, honey is believed to inhibit over 80 types of bacteria. However, the antimicrobial properties of honey have not been fully leveraged by modern medicine.

The wound infected with S. pyogenes bacteria often proves challenging to heal due to the formation of biofilm, hindering the antibiotic's effectiveness in penetration. This issue also serves as a trigger for antibiotic resistance. Research conducted by experts at Cardiff Metropolitan University Wales reveals that honey in low concentrations can prevent the early formation of biofilm. This honey is capable of killing up to 85% of bacteria within two hours. Researchers have disclosed that honey can disrupt the interaction between S. pyogenes bacteria and fibronectin protein in humans. They found that honey can reduce the expression of surface proteins in bacteria, bind fibronectin to inhibit wounds, thus preventing the potential formation of bacteria. This is a mechanism achievable only by honey, minimizing the initiation of acute wound infections and reducing the formation of chronic infections.

Based on these findings, researchers are inclined to further explore the application of pure honey in the treatment of stage two gangrene wounds.

METHOD

The Quasi-Experimental Design employed in this research is the Pretest Posttest Nonequivalent Control Group Design. This design involves conducting a pretest before applying the treatment and a posttest after administering the treatment to each group.

The sampling technique utilized is Non-Probability Sampling with a Purposive Sampling approach. In this study, the sample was selected by observing diabetic wounds before and after honey therapy.

The study involved a sample of 10 patients with Diabetes Mellitus, specifically those with stage 2 wounds requiring special care for gangrenous wounds at home.

RESULT

Table 1. Characteristics of respondents based on gender

Gender	Frequency	%
Man	6	60
Woman	4	40
Total	10	100

Based on the table above, the majority of respondents are male, totaling 6 people (60%).

Table 2. Characteristics of respondents based on age.

Age	Frequency	%
55-60 thn	7	70
61-65	2	20
66-70	1	10
>70	0	0
Total	10	100

Based on the table above, the majority of respondents are aged 55-60, namely 7 individuals (70%).

Table 3. Characteristics of respondents based on the duration of suffering from stage 2 pressure ulcers.

Long Suffering	%	Frequency
1-5 yo	6	60
6-10 yo	4	40
>10 yo	0	0
Total	10	100

Based on the table above, the majority of respondents have been experiencing injuries for a period ranging from 1 to 5 years, totaling 6 individuals (60%).

Table 4. Measurement results of the degree of wounds in respondents before undergoing pure Odeng honey therapy.

No	Degree of Wound	Total	Percentage
1	Mild	4	40 %
2	Moderate	1	10 %
3	Severe	5	50 %
Total		10	100

Based on the table above, the majority of 5 respondents (50%) fall into the category of severe injury degree in terms of wound severity

Table 5. Results of wound severity measurement after pure Odeng honey therapy.

No	Degree of Wound	Total	Percentage
1	Mild	5	50 %
2	Moderate	3	30 %
3	Severe	2	20 %
Total		10	100

Based on the table above, the majority of wound severity after the therapy, as reported by 6 respondents (60%), falls under the category of mild wounds

Table 6. Cross-tabulation of wound severity levels before and after pure odeng honey therapy.

Honey Therapy	Post	%	Pre	%
Degree of Wound	4	40%	5	50%
Mild	1	10%	3	30%
Moderate	5	50 %	2	20%
Total	10	100	10	100%

The results of the Paired t-test statistic show that $p = 0.023 < 0.05$. Based on the table above, there is an observable change in the degree of wounds before and after honey therapy. The number of respondents with mild wound categories increased from 4 (40%) to 5 respondents (50%). The moderate wound category also changed from 1 to 3 respondents (30%), and for severe wounds, there was a decrease from 5 individuals (50%) to 2 individuals (20%). The statistical analysis using the Paired t-test yielded a p-value of 0.023, indicating that there is an influence of honey therapy on diabetic wounds.

DISSCUSSION

Based on Table 1, it is known that the majority of respondents are male, totaling 6 individuals (60%). According to Morison (2009), it is stated that males tend to experience more problems with diabetes mellitus related to activities proportional to pressure. The higher an individual's activity level, the higher the pressure obtained. As a result, males have a higher risk of experiencing diabetic wounds compared to females.

Pressure and friction can disrupt tissue circulation, leading to blockages in blood vessels and causing hypoxia, as well as enlarging metabolic waste disposal, which can result in necrosis. This was evidenced when the researchers questioned the respondents; some respondents stated that during work or daily activities, they rarely use footwear because they find it uncomfortable. When their feet are injured, they do not immediately treat them.

Based on Table 2, it can be observed that 7 individuals (70%) of the respondents are aged between 55-60 years. According to Riyadi and Sukarmin (2010), it is stated that with increasing age, an individual will undergo rapid physiological decline. Additionally, there is a decrease in the sensation of the feet and other parts of the body, leading to a risk of decreased pancreatic function in producing insulin. Based on the research data associated with the theory where many respondents are aged 55-60 years, as the age of the respondents increases, the risk of injury becomes increasingly significant with their current age. This can also be seen in the declining mobility of respondents and the weakening of physical strength, which can worsen and slow down the healing process.

Based on Table 3, it can be observed that the most common type of injury suffered by the respondents is within the range of 1-5 years, totaling 6 individuals. Suyono (2004) states that individuals with diabetes mellitus who have been experiencing diabetic wounds for 1-5 years or more, if their blood glucose levels are not well controlled, may develop complications related to vascular issues. This can lead to respondents experiencing macroangiopathy and microangiopathy, resulting in decreased blood circulation due to the blockage of peripheral blood vessels. This obstruction hinders the supply of oxygen to nerve fibers and causes damage to the endothelium of blood vessels. This condition may trigger the proliferation of bacteria, especially anaerobic bacteria, leading to the onset of diabetic wounds on the feet.

Based on theories and research findings, respondents experiencing diabetic wounds vary in severity, ranging from degree 1 (mild), degree 2 (moderate), to degree 3 (severe). This variation can also be linked to the age of the respondents and other unidentified factors.

Characteristics of diabetic wounds before honey therapy, based on Table 4, indicate that the distribution of wound severity levels among respondents was as follows: 5 respondents (50%) experienced severe wounds, 4 respondents (40%) had mild wounds, and 1 respondent (10%) had moderate wounds. From these results, it can be concluded that the majority of respondents had diabetic wounds classified as severe. According to Prabowo (2007, as cited in Situmorang, 2009), diabetic wounds occur due to abnormalities in nerves, blood vessels, and subsequent infections. Several factors suspected to be related to the development of diabetic wounds include a history of ulcers, unhealthy lifestyle, infections, and high blood sugar levels. The occurrence of risk factors is not limited to a single factor; instead, various factors mutually support each other. For instance, an unhealthy lifestyle supports an increase in blood sugar levels, posing a risk of diabetic wounds.

Based on the researcher's observations before honey therapy was administered, many respondents experienced severe diabetic wounds. This can be attributed to a lack of information about alternative methods for healing diabetic wounds, apart from the medical approach recommended by doctors. Consequently, respondents have focused solely on medical treatment until now. It is well-known that the healing process for diabetic wounds requires a considerable amount of time and involves substantial costs.

This is what causes respondents to tend to be reluctant to seek medical treatment and rarely utilize available health facilities. When researchers inquired about the actions respondents took to help heal their diabetic wounds, most respondents mentioned trying various alternative methods based on information shared by people around them who had experienced similar situations. However, according to the respondents, there was no improvement whatsoever in the wounds they experienced. As a result, respondents became frustrated and unwilling to try other alternatives. It is known that if diabetic wounds are not properly treated, it can lead to serious implications, even requiring drastic measures such as amputation. Therefore, alternative treatments for diabetic wounds not only involve medical interventions but also include other cost-effective and easily implemented alternatives that respondents can carry out at home. This is what categorizes the diabetic wounds experienced by respondents as severe.

Based on Table 5, the distribution of injury degrees among respondents after honey therapy indicates that out of 10 respondents, 5 individuals (50%) experienced mild injuries, 3 individuals (30%) had moderate injuries, and 2 individuals (20%) had severe injuries. From these results, it can be stated that the majority of respondents undergoing gangrene wound treatment at the community level experienced a change in the degree of injury after pure Odeng honey therapy. According to Molan (1992, as cited in Jeffrey and Echazaretta, 1997) and Basal et al (2009), honey contains 18.25% water content, moisture/water activity (AW) of 0.58%, hydrogen peroxide of 0.038 mmol/L, acidity (pH) of 3.95, protein content of 0.29%, fructose of 38.87%, glucose of 29.98%, and minerals of 0.20%. The average water content in

honey is around 17%, with an AW of 0.56-0.62, which does not support the growth of most bacteria requiring an AW of 0.94-0.99. Bacterial growth is inhibited by hydrogen peroxide, and pathogenic bacteria can only thrive at pH levels between 4.0-4.5. Pure Odeng honey also stimulates the growth of new tissue, thus not only accelerating healing but also reducing the formation of scars or marks on the skin. Treating diabetic wounds with pure Odeng honey aims to kill bacteria (antibacterial), reduce inflammation (anti-inflammatory), and stimulate and expedite wound healing, as evidenced by differences in wound status assessments across all evaluation parameters.

Based on the research findings and correlated with the theory, it is found that this aligns with the statements made by the respondents who stated that the wound is somewhat drying and has significantly improved from its previous condition after undergoing treatment using pure Odeng honey for 2 weeks, resulting in a notable reduction in necrotic tissue. Additionally, when observing diabetic wounds after wound therapy, they appear to be drying, showing new tissue formation, and the wounds are already covered by a layer of fine, white fibrin threads. The pus generated by the previous wound is also visibly reduced or even disappeared. This is attributed to respondents undergoing honey therapy, where many experienced positive changes in diabetic wounds, moving them into a better category.

This positive outcome is also due to the respondents following the applied procedures. The treatment was administered for 2 weeks, with honey applied to the wound every day, approximately twice a day. Subsequently, the wound was covered with dry gauze, and respondents were advised to keep the wound dry. On the other hand, the support and trust from the family regarding the elderly's healing process are significant. The cooperative attitude of the family towards the researcher's actions is noteworthy.

The pure Odeng honey therapy for diabetic wounds, based on Table 6, shows the distribution of data for wound degree measurements after the application of pure Odeng honey therapy. It is observed that a significant number of respondents undergoing stage 2 gangrene wound care at community homes experienced a change in the wound degree following the pure Odeng honey therapy. Respondents in the mild category, totaling 4 individuals (40%), exhibited a change in the wound condition, becoming drier with an increased level of granulation.

Additionally, one respondent (10%) who initially had a moderate wound degree shifted to the mild category, resulting in a total of 5 respondents (50%) in the mild category. Respondents with severe wound degrees decreased from 5 (50%) to 2 individuals (20%), while 3 respondents (30%) moved up to the moderate category.

Based on the results of the Paired t-test statistical analysis, the obtained p- value is 0.023, indicating that $p < 0.05$. Therefore, it can be interpreted that the null hypothesis (Ho) is rejected, suggesting a significant change in gangrenous wounds through the application of pure Odeng honey in diabetic wound healing. According to Hastuti (2008), pure Odeng honey is one of the oldest remedies for wound healing, focusing on addressing or expediting the healing process.

The wound categories of the respondents, initially classified as severe, could transform into moderate or mild. This transformation is attributed to the willingness and compliance of the respondents in treating their diabetic wounds diligently. They consistently applied honey to the affected areas every day, coupled with maintaining a healthy diet and ensuring cleanliness in the wound area. Additionally, family support played a crucial role in the patient's healing process, as such support can boost the patient's confidence and serve as motivation for recovery.

CONCLUSION AND SUGGESTION

The degree of diabetic wounds in respondents before the administration of pure odeng honey therapy was categorized as severe. Meanwhile, the degree of diabetic wounds in respondents after the administration of pure odeng honey therapy was categorized as moderate and mild. From these results, it is found that there is an improvement in granulation tissue at the second-stage degree with the administration of pure odeng honey therapy for the degree of wounds in home care within the general community.

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