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Differences Between Wound Care with Modern Technique and Wound Care with Conventional Technique in Healing Diabetes Mellitus Wound

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ABSTRACT

Diabetes mellitus is a disease caused by glucose metabolism disorder because there is glucose transportation disorder in cells as the result of the decrease in the work of insulin. Its great impact will influence patients' life quality, especially patients with complication in diabetic foot wound. The objective of the research was to find out the differences between wound care with modern technique and wound care with conventional technique in healing diabetes mellitus wound. The research used quasi experimental method with pretest-posttest group design. The population was diabetic wound patients treated in the Praktek Mandiri Perawat (Nurse Independent Practice) Asri Woundcare, Medan, for diabetic wound care with modern and conventional technique at Mitra Sejati Hospital, Medan, and 34 of them were used as the samples. The result of the research showed that most of the respondents were > 49 years old, males, and had foot wound. Diabetes mellitus wound care with modern technique decreased in wound regeneration score of 49.5% while with conventional technique it decreased to 42.5%. There were significant differences between diabetes mellitus wound care with modern technique and that with conventional technique; diabetes mellitus wound care with modern technique was faster than that with conventional technique. It is recommended that SOP in wound care be reviewed in every hospital in order to improve nursing care system, especially in applying modern technique in wound care so that diabetes mellitus patients can feel its benefit.

Keywords: Modern wound care, Conventional wound care, Diabetes mellitus

INTRODUCTION

Background

Diabetes Mellitus (here in after called DM) is a disease caused by glucose metabolism disorder because there is glucose transportation disorder in cells as the result of the decrease in the work of insulin. Its great impact will influence patients' life quality, especially patients with complication in diabetic foot wound[(1)].

DM ranks the 5th in causing death throughout the world[(2)]. There were 82.7 million people in Asia who suffered from DM in 2000, and it is estimated that there would have 190.5 million in 2030. The result of epidemiological research revealed that from 1984 until 2000 there was significant increase in its prevalence. The data from the Health Department of the Republic of Indonesia (2013) showed that the prevalence of DM nationally was 5.7%. In Indonesia, there were 8.4 million DM patients in 2000, and it is predicted by the World Health Organization (WHO) that there would have reached 21.3 million in 2030[(3)].

The data from the Central Bureau of Statistics (2003) revealed that it was estimated that people of 20 years of age with DM will have been undergone swift and vigorous growth of 14.7% (12 million people) in urban area and 7.2% (8.1 million people) in rural area, based on the pattern of the increase in population. The data from WHO shows that most of DM patients in the developing countries are 45-64 years old[(3)].

The causes of the increase in DM patients, among others, are the increase in population growth in large scale, lack of sport, obesity, aging process, and unhealthy eating pattern[(3)]. Aging process is related to the decrease in nitrate acid content. The decrease in the sensitivity of beta adrenergic receptor will have the impact on the change in glucose metabolism[(4)].

Diabetic ulcer and gangrene is one of the disorders in lower extremity which can end in computation. Based on the result of the research of NLLIC (2008), it was found that 67% of all amputation actions are caused by DM, while according to Perkeni (2009), 30%-50% of post-amputation patients will undergo another amputation on the other legs in the period of 1-3 years. Mortality rate caused by ulcer and gangrene reaches 17-23% and can increase in the neighborhood of 17-23% and 15-30% is caused by amputation. Mortality rate in one

year of post- amputation is around 14.8% and will increase in three years of post-amputation of 37% with the average age of patients is only 23.8 months in post-amputation[3].

In order to decrease the impact of diabetic ulcer and gangrene, it is necessary to organize accurate strategy in handling diabetic ulcer and gangrene, starting from early detection in diabetic foot disorder, vascular control, wound control, infection control, and education control[3]. One of the forms of wound control which can be done by nurses is how to provide diabetic ulcer and gangrene care in order to be able to pass the stages of the process of healing wound optimally, based on wound condition and characteristics. According to Genna (2003) in Milne et al. (2003), systemic factors which had the influence on the healing process of DM wound, among others, were inadequate profusion, infection, edema, and inadequate nutrition. Meanwhile, cellular factors are caused by lack of the number of fibroblasts, inhibition of keratinocyte migration, lack of the factor of growth, fluid in wound, and lack of collagen, glycosaminoglycan, and fibroblast[5].

The characteristic of diabetic ulcer and gangrene can be seen from the changing in the process of wound healing and the increase in the level of tissue damage[6].Genna (2003) in Milne et al. (2003) points out that one of the inhibiting factors of the healing of diabetes wound is the lack of the factor of growth. TGF-β1 plays an important role in the process of establishing new capillaries as the channel for supplying oxygen and food needed by wound during the process of tissue regeneration which is called angiogenesis[5].

Various techniques of DM wound care treatment today rapidly develop. They include conventional technique and modern technique. Gauze, antibiotic, and antiseptic are used in conventional technique, while synthetic bandage, alginate bandage, foam bandage, hydro-polymer bandage, hydro-fiber bandage, hydrocolloid bandage, hydro-gel bandage, transparent film bandage, and absorbent bandage. The process of care in the two methods has differences which are based on DM wound clinical condition such as exudates production and wound basic condition. The development of the various wound care techniques will have the impacts on the process of tissue regeneration as the result of opening bandages, cleaning up wound, debridement action, and the types of bandage. The result of observation in the clinic showed that wound care treatment was done according to wound macroscopic condition without paying attention to the microscopic changes[5].

Kolcaba views comfort from four contexts – physical comfort, psycho-spiritual comfort, environmental comfort, and socio-cultural comfort. Wound care treatment with modern and conventional technique is one of the aspects in an attempt to provide physical comfort so that the process of healing DM wound can occur. Its impact is physical comfort which can influence the condition of psycho-spiritual, environmental, and socio-spiritual comforts which will eventually influence the life quality of DM ulcer patients. This condition will motivate nurses to change the bandages during wound care treatment, especially during the phase of the growth of new tissues so that the process of wound healing will be more optimal. This condition will also have the impact on the effectiveness of treatment cost, the effectiveness of healing, and patients' comfort. Based on these phenomena, the writer was interested in doing the research on the differences between wound care with modern technique and wound care with conventional technique in healing diabetes mellitus wound.

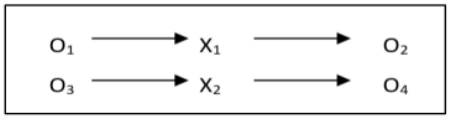
Accurate wound care treatment can influence the process of healing wound. Heretofore, there have not been many researches done on wound care treatment using modern and conventional techniques in healing diabetes wound. Choosing wound care technique will provide accurate intervention so that the process of wound healing can occur optimally. Based on this phenomenon, the writer was interested in proposing the formula of the problem as follows: "How were the differences between wound care with modern technique and wound care with conventional technique in healing diabetes mellitus wound?"

The social objective of the research was to identify the characteristics of respondents with diabetes mellitus wound, to identify diabetes mellitus wound care in pre and post observation on modern technique, and to identify DM wound care which was getting better in the post-observation using modern and conventional techniques.

The significance of this research was to find an accurate method for diabetic wound care, especially in determining the plan for diabetic wound care treatment which could accelerate the process of healing DM wound, to increase nurses' and people's knowledge of the development of DM wound care method, to be used as the basis for developing researches on DM wound care, especially in developing DM wound care treatment with patients' comfort, and facility for developing health education in DM patients, especially in supporting the process of regeneration of new tissues so that wound would be healed fast.

METHODS

The research used quasi experimental design with observation on pretest-posttest group design[7]. The research design could be seen in the scheme (Figure 1). The population was diabetic wound patients treated in the Praktek Mandiri Perawat (Nurse Independent Practice) Asri Woundcare, Medan, for diabetic wound care with modern and conventional technique at Mitra Sejati Hospital, Medan, and 34 of them were used as the samples. The research was conducted from March until August, 2017. The data were analyzed by using univariate analysis for describing the characteristic of each datum. Paired t-test and independent t-test were used to find out the mean difference between the two groups of dependent data.



Note:
O_1 : Measurement of diabetic wound tissues in Group I (pretest).
X_1 : Modern bandage used in wound care (Group 1)
O_2 : Measurement of diabetic wound tissues in Group I (posttest).
O_3 : Measurement of diabetic wound tissues in Group II (pretest).
X_2 : Conventional bandage used in wound care (Group 2)
O_4 : Measurement of diabetic wound tissues in Group II (posttest).

Figure 1. Research Design

RESULTS

Respondents' Characteristics

Based on the result of the research on 34 respondents being treated in the Praktek Mandiri Perawat Asri Woundcare, Medan, for diabetic wound using modern technique and conventional technique in Mitra Sejati Hospital, Medan, it was found that [7]

Table 1. Respondents' characteristics with diabetic wound in the Praktek Mandiri Perawat "Asri Woundcare", Medan

No	Characteristics	Modern Technique		Conventional Technique	
		f	%	f	%
	Age (Years)				
1	<44.9	6	35.3	7	41.2
2	>44.9	11	64.7	10	58.8
	Total	17	100.0	17	100.0
	Gender				
1	Male	10	58.8	12	70.6
2	Female	7	41.2	5	29.4
	Total	17	100.0	17	100.0
	Wound Location				
1	Foot	13	76.5	14	82.4
2	Hand	4	23.5	3	17.6
	Total	17	100.0	17	100.0

From the Table above, it could be found that concerning patients with diabetic wound in the Praktek Mandiri Perawat Asri Woundcare, Medan, based on modern technique, 11 respondents (64.7%) were > 44.9 years old, 10 respondents (58.8%) were males, and 13 respondents (76.5%) had diabetic wound on their feet. Based on conventional technique, it was found that 10 respondents (58.8%) were > 44.9 years old, 12 respondents (70.6%) were males, and 14 respondents (82.4%) had diabetic wound on their feet.

Wound Care with Modern and Conventional Techniques in the Process of Diabetic Wound Healing

The first measurement showed that the result of homogeneity test (Levene's test) was F-value = 0.036 < 0.05 so that equal variances not assumed was used. The result of t-count test was 1.205 < 1.695 (t-table) at df = 31, while the significance value was 0.237 > 0.05 which indicated that there was no difference in the two studied groups in the initial measurement.

The second measurement showed that F-value = 0.743 > 0.05 so that equal variances assumed was used. The result of t-count test was 6.097 > 1.693 (t-table) at df = 32, while the significance value was 0.000 < 0.05 which indicated that there was significant difference in wound regeneration in modern wound care compared with conventional wound care of the second measurement in the Praktik Mandiri Perawat Asri Woundcare, Medan, in 2017. The sign of negative (-) in t-count indicated that the first group (modern wound care) had Mean value lower than that in the second group (conventional wound care).

The third measurement showed that F-value =3.0[4] > 0.05. The result of t-count test was 6.790 > 1.693 (t-table) at df = 32, while the significance value was 0.000 < 0.05 which indicated that there was significant difference in wound regeneration in modern wound care compared with that in conventional wound care of the third measurement in the Praktek Mandiri Perawat Asri Woundcare, Medan, in 2017. The sign of negative (-) in t-count indicated that the first group (modern wound care) had Mean value lower than that in the second group (conventional wound care).

The fourth measurement showed that F-value =4.074 > 0.05.The result of t-count was 5.236 > 1.693 (t-table) at df = 32, while the significance value was 0.000 < 0.05 which indicated that there was significant difference in wound regeneration in modern wound care compared with that in conventional wound care of the third measurement in the Praktek Mandiri Perawat Asri Woundcare, Medan, in 2017. The sign of negative (-) in t-count indicated that the first group (modern wound care) had Mean value lower than that in the second group (conventional wound care).

DISCUSSION

Respondents' Characteristics

Based on the result of the research on 34 respondents being treated in the Praktek Mandiri Perawat Asri Woundcare, Medan, for diabetic wound care with modern technique and conventional technique in Mitra Sejati Hospital, Medan, it was found that, based on modern technique, 11 respondents (64.7%) were > 44.9 years old, 6 respondents (35.3% were < 44.9 years old 10 respondents (58.8%) were males and 7 respondents (41.2%) were females. 13 respondents (76.5%) had diabetic wound on their feet and 4 respondents (23.5%) had diabetic wound on their hands. In the patients treated with conventional technique, it was found that 10 respondents (58.8%) were > 44.9 years old and 7 respondents (41.2%) were < 44.9 years old. 12 respondents (70.6%) were males and 5 respondents (29.4%) were females. 14 respondents (82.4%) had diabetic wound on their feet and 3 respondents (17.6%) had diabetic wound on their hands.

DM Wound Care in Pre and Post Observation in Modern Technique

Based on the result of the first measurement of modern wound care, it was found that the mean value was 40.35 with standard deviation of 1.320, and in the final observation it was found that the mean value was 20.35 with standard deviation of 1.766. It indicated that DM wound care by using modern technique decreased the score of wound regeneration of 49.5%.

The decrease in the regeneration score within 4 days of observation indicated that modern bandage had provided the impact on patients' comfort. The feeling of comfort in patients with DM wound would influence their psychological response so that they would be more cooperative with the treatment. The increase in comfort was caused by modern bandage and the mechanism during the process of wound healing. Modern bandage is moister so that it can minimize repeated trauma in the wound basis as the result of friction between wound base and bandage. This is supported by the capacity to absorb exudates.

Modern wound care more emphasizes on the process wound healing. The obstacle in wound care is that there is an assumption that the material for modern wound care is not appropriate for Indonesian people. Therefore, it is important for observers of [5]ound care to understand wound care with conventional method and to know the advantage or the disadvantage of wound care by using modern dressing method. Wound care with modern method is a method of wound healing by paying attention moist wound healing by using occlusive and closed technique[8]. In wound care with modern technique, there is the process of the attachment of bandage on wound base, but it is moist so that it is moist so that it is easy to be released from wound base, and in some types of bandage the fibers will change to gel when it is exposed to wound fluid so that it always maintain wound moisture and is able to bind bacteria and prevent from the incidence of excessive bleeding. When wound washing is done in modern bandage, the fibers will fall off wound base by carrying debris and dead tissues[9].

Modern bandage has the work principle of maintaining moisture and warming in wound area. The types of bandage used in this research were Alginates, Hydro-fiber, Hydro-gel. Alginate was used in wound with moderate until high exudation and wet wound with deep cavity (Kaltostat®)., while Hydro-gel was used in wet wound and wound which tended to dry (Duoderm gel®). Gel which was formed in wound was easy to be cleaned up and could provide moisture in wound. This condition could increase the process of angiogenesis, cell proliferation, granulation, and epithelization[10].

Based on the result of macroscopic observation on the treatment in 0 day compared with the fourth day in the modern group, it was found that the wound was odorless and exudates were minimal. Minimal and odorless exudates production is one of the contextual applicati[14] of the comfort in its vicinity. The process of the growth of new tissues in modern bandage occurred fast. The result of this research was in accordance with the r[6]earch done by Heri Kristianto (2010) which stated that wound care with modern technique was able to increase TGF β1

expression and to decrease response to pain compared with that of conventional technique which has the impact on patients' physical comfort[9].

DM Wound Care in Pre and Post Observation in Conventional Technique

Based on the result of the first measurement of conventional wound care, it was found that the mean value was 40.94 with standard deviation of 1.519, and in the final observation it was found that the mean value was 23.53 with standard deviation of 1.382. It indicated that DM wound care by using conventional technique decreased the score of wound regeneration of 42.5%.

Conventional/traditional wound care is a method of wound care done by using wound bandage which has lack of absorption and has the same antiseptic liquid in all types of wound. Conventional wound care uses iodine, H_2O_2, metronidazole, and gauze bandage compress with NaC1 of 0.9% in the process of wound healing. Based on the observation during the research, it was found that conventional bandage was glutinous with wound base, absorbed exudates minimally, frequent change of bandage, and slow change of color of wound base to be red.

The glutinous process of gauze with wound base can cause the incidence of repeated injury on capillary coils which will and has been established so that the process of angiogenesis will be longer and cause the risk for infection as the result of the stickiness of gauze fibers on the wound base as the medium of the growth of micro-bacteria. When it takes a long period of time, it can prolong the phase of inflammation so that the wound will become chronic and difficult to be proliferated[1].

Conventional bandage is wound bandage which uses gauze as the main bandage. This bandage is included in passive material which main function is to protect, to keep warm, and to cover inconvenient appearance. Besides that, it is also used for protecting wound against trauma, maintaining wound area, pressing wound and its area, and preventing from bacterium contamination. In this research, it was found that the development score was 0 in the respondents' control group 7 and 8 which indicated that it was because of the change of gauze was made only once a day for wound which exudates were minimal or moderate. This was because the wound tended to be dry so that the process of wound healing was hampered[10].

Necrotic tissues in conventional technique are wider, harder, and smellier, especially slough which is caused by the slow mechanism of autolitic debridement since the wound lacks of moisture and dryness. This condition can cause microorganism to grow and develop in the dead tissue, for it lacks of oxygen (anaerobic). The capacity of gauze to absorb exudates is very limited so that it can cause the bandage is frequently taken off to minimize bad smell and to increase patients' comfort. This condition will have the impact on the increase in the risk for repeated injury on wound base as the result of manipulation of wound base during the change of bandage[9].

Differences between Modern Wound Care and Conventional Wound Care

Based on the result of statistical test, it was found that from the result of measurement 1, there was no difference between group 1 (modern wound care) and group 2 (conventional wound care) at p-value = 0.237 > 0.05 and t-count < t-table.

Based on the result of measurement 2 until measurement 4, it was found that p-value < 0.05 and t-count value > t-table which indicated that there was significant difference between wound care with modern technique and wound care with conventional technique. It could be concluded that modern wound care was better than conventional wound care. Diabetes wound is a chronic wound which can be caused by local condition like infection and by systemic condition like the increase in glucose content in blood which can cause the decrease in cell sensitivity toward insulin. The main factor which can hamper the process of wound development is the decrease in the factors of growth and imbalance between proteolytic enzymes and their inhibitor[11].

Moist condition on wound surface can increase the process of improved development of wound and prevent from tissue dehydration and from the death of cells. It can also increase the interaction between cells and the factor of growth. Therefore, a bandage should be able to keep moisture and to maintain warmth in wound[12].

The result of the research showed that the decrease in wound regeneration score using modern technique was 49.5%, while using conventional technique it was 42.5% which indicated that DM wound care with modern technique could be healed faster than that with conventional technique at the difference in percentage of wound regeneration score with modern technique from that with conventional technique of 7%.

According to Seaman (2002) the word, moist is defined as a bandage has the capability of controlling the production of exudates, maintaining the wound condition to be moist, preventing it from attaching to wound base, preventing bacteria from entering the wound, having the capacity to hold liquid, having the capacity to absorb water and gas, and preventing from changing bandages very often. The mechanism of moist can help the process of wound healing through the channels of fibrinolysis and angiogenesis factors, the establishment of growth factor, and the stimulation of active cells. The process of fibrin crushing will be influenced by the production of platelet, endotel cells, and fibroblasts in which the mechanism is highly influenced by moisture[13].

Wound condition should be monitored in each dressing change and studied regularly in order to determine whether the types dressing should be changed or not. Wound care with conventional technique still uses NaC1 gauze bandage, while wound care with modern technique mostly uses Hydrocolloid which is proved to be more effective than gauze in decreasing the wound area and accelerating the rate of healing compared with NaC1 gauze[14].

Principally, a modern bandage is the same as a conventional one in keeping moisture and warmth and preventing from trauma. However, traditional bandage cannot keep moisture because NaC1 will evaporate so that gauze will dry. The condition of dryness can cause gauze to be attached to wound so that repeated trauma will easily occur. The lack of gauze in keeping moisture in wound area will extend the duration of wound care. A modern bandage is a good choice to increase the process of wound development, but modern wound care using modern technique is more expensive than that with conventional technique. However, it does not mean that a modern bandage is not effective in financing because financing effectiveness itself is used to evaluate the result ad the cost expended in san intervention designed to increase health status. Expensive treatment cost does not mean that it is not effective; this condition can be analogized by wound which is treated by using conventional method will take longer time in its treatment which will most possibly cause bleeding and repeated trauma which will eventually bring about long duration of treatment. Therefore, the effectiveness in financing is highly influenced by health status as the main purpose of treatment[10].

CONCLUSION

1. Respondents' characteristics in modern wound care and conventional wound care were similar; most of the respondents were > 44.9 years old, males, and had wound on their feet;
2. DM wound care by using modern technique decreased wound regeneration score of 49.5%;
3. DM wound care by using conventional technique decreased wound regeneration score of 42.5%;
4. There was significant difference between DM wound care with modern technique and DM wound care with conventional technique. Wound care with modern technique could heal DM wound care faster than that with conventional technique.

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