

Conference Paper

Effectiveness Diabetes Self-Management Education (DSME) to Foot Care Behaviour and Foot Condition in Diabetes Mellitus Patient

Sanny Frisca

Lecturer Nursing Diploma, Faculty of Health Science, Musi Charitas Catholic University Palembang

ORCID:Sanny Frisca: <https://orcid.org/0000-0002-9502-371X>**Abstract**

Diabetes mellitus (DM) is disease with hyperglycaemic condition. Hyperglycaemic can induce vascular problem (microvascular and macro vascular), neuropathy, and nephropathy. Microvascular and neuropathy can induce foot problem in patient, which can make amputation, increase medical cost, and care cost. Diabetes Self-Management and Education (DSME) can influence patient foot care behaviour and also patient foot condition. This research aim is to find effectiveness of DSME to patient foot care behaviour and patient foot condition. This research involve 112 respondents (intervention group= 56 respondents, control group= 56 respondents) with *quasi experiment non-equivalent control group pre-test – post-test* method. Intervention DSME was given for eight week with 15 minutes education every week for each patient, data collected by foot behaviour questionnaire and checking patient's foot condition. In first week researcher collected pre-test data and in eight week researcher collect post-test data. Data analysed by ordinal regression at 5% for significant value.

Result: DSME significantly increase foot care behaviour ($p = 0.000$) and influence foot behaviour 12.2%, DSME also significantly increase patient foot condition ($p = 0.000$) and influence foot condition 7.4%. DSME which applied with continuity can enhance foot care behaviour and awareness to checking foot condition then patient can avoid foot problem related to DM. Future research can use monofilament and Ankle Brachial Index for examination foot condition.

Keywords: DSME, foot care behaviour, foot condition

Corresponding Author:

Sanny Frisca

sanny@ukmc.ac.id

Published: 15 March 2021

Publishing services provided by
Knowledge E

© Sanny Frisca. This article is distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use and redistribution provided that the original author and source are credited.

Selection and Peer-review under the responsibility of the IVCN Conference Committee.

1. Introduction

Diabetes mellitus (DM) is a chronic disease caused by abnormal insulin production or insulin resistance (impaired utilization) which characterized by hyperglycemia condition (Lewis, Bucher, Heitkemper, & Harding, 2017). Diabetic care can increase economic burden for 8%, 727million in 2015 and 850million in 2017 (International Diabetes Federation, 2017). Hiperglycemia can lead to complication for patient, nephropaty, neuropathy, diabetic retinopathy, angiopathy and foot problem are chronic complication that can

 OPEN ACCESS

occurred in DM patient (Lewis, Bucher, Heitkemper, & Harding, 2017). Foot problem such ulceration and amputation are high risk in diabetic patient (Lewis, Bucher, Heitkemper, & Harding, 2017). Foot ulcer can occurred to 10 – 15% diabetic patient and influenced by poor metabolic control, age, vasculopathy perifer, poor knowledge, foot deformity, and duration with disease (Seid & Tsige, 2015). Foot ulcer can lead amputation for patient, patient with diabetes 25 times more risk for amputation (International Diabetes Federation, 2015). Amputation can occurred 73,067 of 20,7 diabetic patient and increase their economic burden (Gregg, et al., 2014; Li, et al., 2013)

Good management such education can reduce complication for diabetic patient (Darmawati, 2018). Patient with good knowledge from education about diabetic complication can know how foot ulcer can occure can reduce foot ulcer and amputation 25% (American Diabetes Association, 2019; International Diabetes Federation, 2017). Diabetes Self-Management Education (DSME) is program that recommended by American Diabetes Association to facilitate knowledge, practice, and self-care include foot care (American Diabetes Association, 2019; Powers, et al., 2015; Haas, et al., 2014). The program can prevent and manage complication in patient, optimalize quality of life, and reduce economic burden (American Diabetes Association, 2019). Good knowledge also can improve foot care behaviour which can reduce foot ulcer (Sae-Sia, Maneewat, & Kurniawan, 2013; Beiranvand, Fayazi, & Asadizaker, 2015), can improve patient behaviour for use good foot wear (Fan, Sidani, Cooper-Brathwaite, & Metcalfe, 2014).

2. Methods

This study design is quasi experiment nonequivalent control group pre-test post-test to 112 subjects. DSME given to diabetic patient to improve knowledge, behaviour, and foot condition. The subjects were 112 patients with type 2 Diabetes Mellitus, 56 subjects in intervention group and 56 subjects in control group, this characteristics shown in table 1. Criteria inclusion in this study are diabetic patient, without foot problem, can read and write properly, and agreed to follow 8 week program for DSME. Demographic data collected by questionnaire consist of initial, age, level of education, and sex. Informed consent signed for ethical consideration. Foot care behaviour data collected by The Summary of Diabetes Self-Care Activities (SDSCA) scale (Toobert, Hampson, & Glasgow, 2000). This questionnaire consist of diet, exercise, self-monitoring blood glucose, oral medicine management, foot care, and smoking. There are 5 items about foot care behaviour that used and was evaluated on a 7-point scale from 0 to 7, the score indicate

the number of day foot care performance by patient. Result of foot care behaviour categorized for good behaviour (if patient do each foot care performance ≥ 5 times in week) and poor behaviour (if patient do each foot care performance < 5 times in week). Foot status was evaluated before and after DSME given in patient. There are 12 items that evaluated (dry, pale, cracking heels, dry foot, long nail, sharp nail, closed foot ware, tight foot ware, cold or hot feeling in toes, edema*, wound*, redness*) (Kemenkes, 2015; Boulton, et al., 2008). Each items given "0" score if there is no present condition, "1" if there is present condition in items without "*" sign, "2" if there is present condition in items with "*" items. Data collected by examine both foot and added up the score. Foot status classify in three categorized "score 0 – 1= good condition", "score 2=less good", ">2=bad condition".

Pre-test given to subjects in first week (both group). Pre-test consist of demographic data questionnaire After pre-test the intervention group given DSME about foot care in 8 weeks, 1 time each week. Post-test given in 8th week for both group. Control group given intervention after post-test. Data analysed using PC with Statistical Package for Social Sciences (SPSS version 20) in univariate and bivariate analyse. Univariate used to analysed statistic descriptive of characteristics of subjects, foot care behaviour, and foot condition. The simple ordinal regression choose to analysed effectiveness of DSME to foot care behaviour and foot condition. This study used level of significant with CI 95% (p value= < 0.05).

3. Results

Table 1 shown that the highest percent 74.1% of subjects female, majority subjects 58.03% aged in middle adult, and 45.53% of them level of education is senior high school. There is no different characteristic between intervention and control group. Homogeneity test in each characteristic subject is more than 0.05, its mean the characteristic of the group equal.

Table 2 clarifies that subjects have change foot care behaviour after given intervention. In this table we shown good foot care behaviour changing in subject. There are all item that change after given intervention: checking feet, inspect inside of shoes, wash feet, soak feet, and dry between toes after washing. All of change is enhancement of subject's foot care behaviour. Foot care behaviour has increase in both group but in intervention group increase more than control group. There are three item that increase in foot care behaviour in intervention group more than 30% are item checking feet (35.7%), wash feet (30.4), and dry between toes after washing (30.3). Meanwhile, control

TABLE 1: Characteristic of Subjects

Characteristics of Subjects	Intervention Group		Control Group		Total		Homogeneity test p value
	N	%	N	%	N	%	
Sex							
Male	13	23.21	16	28.57	29	25.9	0.518
Female	43	76.79	40	71.43	83	74.1	
Age							
Middle Adult	19	33.92	12	21.42	31	27.67	0.146
Older Adult	32	57.14	33	58.92	65	58.03	
Elderly	5	8.92	11	10.64	16	14.28	
Level of Education							
Elementary school	6	10.71	15	26.78	21	18.75	0.114
Junior high school	16	28.57	14	25.00	30	26.78	
Senior High School	29	51.78	22	39.28	51	45.53	
College	5	8.92	5	8.92	10	8.92	

group have highest percentage that increase is item checking feet (7.1%). That's shown that intervention can increase patient behaviour for checking feet 4 to 5 times more compared to patient without intervention.

TABLE 2: Description of foot care behaviour changing in subjects

NO	Items	Intervention		Control	
		Before	After	Before	After
		Good	Good	Good	Good
1	Checking feet	1.8	37.5	3.6	10.7
2	Inspect inside of shoes	3.6	17.9	8.9	10.7
3	Wash feet	33.9	64.3	41.1	41.1
4	Soak feet	0.0	10.7	5.4	7.1
5	Dry between toes after washing	16.1	46.4	21.4	23.2

Table 3 illustrate improvement of foot condition in subjects. In this table we shown present of 12 foot condition in right and left foot. In both foot, there are four condition that absent in subjects: cold/hot feelings in toes, edema, wound, and redness. After given intervention there are absent dry foot, long nail, and using tight foot ware in subject's right foot. But cracking heels, pale, not using closed foot ware still present in same score. Dirt foot have decrease 19.65%, but still present in subjects. Dry foot, long nail, sharp nail, and using tight foot ware are absent in left foot. But cracking heels and using closed foot ware still present in same score. Dirt and pale condition has decrease score but still present in subjects.

TABLE 3: Improvement of foot condition in Subjects

NO	Foot condition	Intervention Group		Control Group	
		Before	After	Before	After
		Present (%)	Present (%)	Present (%)	Present (%)
1	Dirt	21.43	1.78	21.43	8.9
2	Pale	1.78	1.78	3.6	0
3	Dry foot	46.4	0	12.5	12.5
4	Cracking heels	17.86	17.86	21.43	19.6
5	Long nail	16.1	1.78	21.43	16.1
6	Sharp nail	10.7	0	0	1.78
7	Closed foot ware	1.78	1.78	1.78	1.78
8	Tight foot ware	1.78	0	5.3	0
9	Cold/hot feelings in toes	0	0	0	0
10	Edema*	0	0	0	0
11	Wound*	0	0	0	0
12	Redness*	0	0	0	0

Table 4 describe change of foot care behaviour and foot condition. After intervention good foot care behaviour enhance 35.71%, but without intervention enhance just 7.14%, enhancement in intervention group 5 times more than control group. Foot condition also have enhance, before intervention bad foot condition is the highest level of foot condition (20/35.7%), but after intervention there is no one subject in level of foot condition. Compare to control group bad behaviour still have 4 subjects in level of foot condition. The highest change in foot condition is good foot condition which enhance 44.7% after intervention. Both variable have p-value less than 0.05 (foot care behaviour=0.000, foot condition=0.000) its mean intervention (DSME) effective to change foot care behaviour and foot condition. Intervention can make subjects have enhance foot care behaviour and foot condition. The effectiveness of intervention to change foot care behaviour is 12.2 and foot condition 7.4. Its mean with intervention, subjects 12.2 time have increase in foot care behaviour, and 7.4 time have increase in foot condition.

4. Discussion

One of chronic complication of DM is foot ulcer, is considered can increase morbidity, economic burden, and mortality among patients (Lewis, Bucher, Heitkemper, & Harding, 2017; A.Bus, et al., 2019). By knowing foot care people with DM can have good foot care behaviour which can lead to prevented foot ulcer (Beiranvand, Fayazi, & Asadizaker,

TABLE 4: Change foot care behaviour and foot condition category in subjects

Variable	Intervention		Control		p-value	R ²
	Before	After	Before	After		
Foot care behaviour						
Good behaviour ≥5	0 (0%)	20 (35.71%)	0 (0%)	4 (7.14%)	0.000	12.2
Poor behaviour <5	56 (100%)	36 (64.29%)	56 (100%)	52 (92.86%)		
Foot Condition						
Good 0-1	18 (32.1%)	43 (76.8%)	26 (46.4%)	30 (53.6%)	0.000	7.4
Less good 2	18 (32.1%)	13 (23.19%)	18 (32.3%)	18 (32.1%)		
Bad >2	20 (35.7%)	0 (0%)	12 (21.4%)	8 (14.3%)		

2015; American Diabetes Association, 2019; A.Bus, et al., 2019; Bonner, Foster, & Spears-Lanoix, 2016). Identifying how education can improve foot care behaviour and condition are this study aim.

People with diabetes sometime neglect the possibility foot ulcer in their feet. That's happen because there is no sign and symptom their feel, thus make difficultness to understand they illness (Lavdaniti & Dimitriadou, 2017; Pretty, Gonzalez, & Hernandez-Diaz, 2018). It condition also make them have difficulty to adopt new behaviour and consistent in new behaviour. That the reason researcher give education in eight weeks, so subjects can improve and maintenance appropriate behaviour.

Education can change foot care behaviour and foot condition. Nurses have role as part of education team in hospital, nurse can teach patient how to examine feet in simple ways so patient feel easy to implement what they know before. Study from (Formosa, Gatt, & Chockalingam, 2012) shown that 54% patient not received foot care education and 56% have unsuitable footwear. Nurse need to facilitate patients needed for knowledge with continue education because patients need to adapt with new health information they have (Formosa, Gatt, & Chockalingam, 2012).

Other study says that good knowledge about foot care behaviour can lead to good practice foot care behaviour and good foot care confidence (Mohamed, El-Moneam, & El-Sahky, 2018). According to the study, education is very important given to patient because education program can reduce risk for amputation 8.1% in King Abdulaziz Medical City in Riyadh, Saudi Arabia (Al-Wahbi, 2010). Another study shown that there are increase foot care score after given education although statistic test not shown significantly improvement in subjects. Education can increase foot care knowledge, study from Sae-Sia, et.al shown that mean of foot care knowledge increase 16.34 after given intervention (Sae-Sia, Maneewat, & Kurniawan, 2013).

Average value for patient behaviour increase after given intervention, there are checking feet regularly, inspecting inside of shoes, and drying between toes, all of that practice increase significantly with $p=0.000$ (Neta, da Silva, & da Silva, 2015). According to this study there are increase for all three practice in subjects. That shown that giving education can significantly change foot care practice in patients. Good foot care behaviour can lead to good foot condition even in Ozawa study foot care score not increase significantly but the score still increase and higher compare to another group (Ozawa, et al., 2014). In this study foot condition increase in several condition although cracking heels still have the same status.

Patients with good knowledge expected have good behaviour so they can do foot care practice properly and aware about foot condition. If patient do all the practice regularly, they can recognize normally foot condition. That importance so they can find change of the foot early and discuss their condition with nurse or other health team. Earlier they found foot change, earlier they can find solution and care for foot. All practice that they do expected can prevented diabetic foot and amputation.

5. Conclusion

Education can increase patient foot care behaviour and patient condition. With eight week education, patient's foot behaviour ($p=0.000$, $R=12.2$) and foot condition ($p=0.000$, $R=7.4$) significantly increased. Education about foot care recommended given by nurse to diabetic patient which can increase patient awareness and practice to foot care. This study recommended to use foot examination such monofilament 10 G and ankle brachial index for further study to examine foot neurophaty and foot peripheral arterial disease. Also diabetic patient need support to remind them how to do foot care and do it continue, family and health provider can use social media.

References

- [1] A.Bus, S., Lavery, L., Monteiro-Soares, M., Rasmusen, A., Raspovic, A., Sacco, I., et al. (2019). IWGDF Guideline on the prevention of foot ulcers in persons with diabetes. *Part of the 2019 IWGDF Guidelines on the Prevention and Management of Diabetic Foot Disease*, pp. 1-35.
- [2] Al-Wahbi, A. M. (2010). Impact of a Diabetic Foot Care Education Program on Lower Limb Amputation Rate. *Vascular Health and Risk Management*, 6, 923-934.

- [3] American Diabetes Association. (2019). Standards of Medical Care in Diabetes-2019. *Diabetes Care: The Journal of Clinical and Applied Research and Education*, 1-193.
- [4] Beiranvand, S., Fayazi, S., & Asadizaker, M. (2015). Effect of educational programs on the knowledge, attitude, and practice of foot care in patients with diabetes. *Jundishapur Journal of Chronic Disease Care*, 1-7.
- [5] Bonner, T., Foster, M., & Spears-Lanoix, E. (2016). Type 2 Diabetes Related Foot Care knowledge and Foot Self-Care Practice Interventions in the United States: A Systematic Review of the Literature. *Diabetic Foot & Ankle*, 7(1), 1-7.
- [6] Boulton, A. J., Armstrong, D. G., Albert, S. F., Frykberg, R. G., Hellman, R., Kirkman, M., et al. (2008). Comprehensive foot examination and risk assessment. *Diabetes Care*, 1679-1685.
- [7] Darmawati, I. (2018). A Descriptive Study Of Woman Motivation For Partisipation In Exercise. In *International Conference on Heath Care and Management 2018* (Vol. 1, No. 1).
- [8] Fan, L., Sidani, S., Cooper-Brathwaite, A., & Metcalfe, K. (2014). Effects of a foot selfcare educational intervention on improving footwear choices in those with type 2 diabetes at low risk of foot ulceration. *Diabetic Foot Canada*, 2(2), 4-12.
- [9] Formosa, C., Gatt, A., & Chockalingam, N. (2012). The importance of diabetes foot care education in a primary care setting. *Journal of Diabetes Nursing*, 16(10), 410-414.
- [10] Gregg, E. W., Li, Y., Wang, J., Burrows, N. R., Ali, M. K., Rolka, D., et al. (2014). Changes in diabetes-related complications in the united states, 1990-201. *The New England Journal of Medicine*, 1514-1523.
- [11] Haas, L., Maryniuk, M., Beck, J., Cox, C. E., Duker, P., Edwards, L., et al. (2014). National standards for diabetes self-management education and support. *Diabetes Care*, 144-153.
- [12] International Diabetes Federation. (2015). *IDF Diabetes Atlas Seventh Edition 2015*. New York: International Diabetes Federation.
- [13] International Diabetes Federation. (2017). *IDF Diabetes Atlas*. Brussels, Belgium: International Diabetes Federation.
- [14] Kemenkes. (2015). *Petunjuk teknis pengelolaan kaki diabetes berbasis masyarakat*. Jakarta: Direktorat Jenderal Pengendalian Penyakit dan Penyehatan Lingkungan Kementerian Kesehatan RI.
- [15] Lavdaniti, M., & Dimitriadou, A. (2017). Foot Care Education for Diabetes Mellitus Patients. *Journal of Nursing Science*, 3(1), 1-4.

- [16] Lewis, S., Bucher, L., Heitkemper, M. M., & Harding, M. (2017). *Medical-Surgical Nursing: Assessment and Management of Clinical Problems* (10 ed., Vol. 2). St.Louis, Missouri: Elsevier.
- [17] Li, R., Bilik, D., Brown, M. B., Zhang, P., Ettner, S. L., Ackermann, R. T., et al. (2013). Medical costs associated with type 2 diabetes complications and comorbidities. *The American Journal of Managed Care*, 19(5), 421-430.
- [18] Mohamed, A. A.-R., El-Moneam, A. A.-G., & El-Sahky, N. M. (2018, Mar-Apr). Barrier of Foot Care Practice among Older Adults with Diabetes in Alexandria, Egypt. *IOSR Journal of Nursing and Health Science (IOSSR-JNHS)*, 10-23.
- [19] Neta, D. S., da Silva, A. V., & da Silva, G. R. (2015). Adherence to foot self-care in diabetes mellitus patients. *Revista Brasileira de Enfermagem (REBEn)*, 68(1), 103-108.
- [20] Ozawa, K., Tomisawa, T., Sakuraba, S., Urushizaka, M., Kitajima, M., Itaki, C., et al. (2014). Factors related to changes in foot status and foot care in patients with diabetes mellitus participating in an exercise health education program. *Journal of Diabetes Mellitus*, 4(1), 67-71.
- [21] Powers, M. A., Bardsley, J., Cypress, M., Duker, P., Funnel, M. M., Fischl, A. H., et al. (2015). Diabetes self-management education and support in type 2 diabetes: A joint position statement of the american diabetes association, the american association of diabetes educators, and the academy of nutrition and dietetics. *The Diabetes Educator*, 1-14.
- [22] Pretty, M. I., Gonzalez, M. C., & Hernandez-Diaz, A. (2018). Foot ulcers: perception of patients with Type 2 diabetes. *Rev. Fac. Med*, 66(2), 187-94.
- [23] Sae-Sia, W., Maneewat, K., & Kurniawan, T. (2013, 05 04). Effect of a self-management support program on diabetic foot care behaviors. *International Journal of Research in Nursing*, 4(1), 14-21.
- [24] Seid, A., & Tsige, Y. (2015). Knowledge, practice, and barriers of foot care among diabetic patients attending Fellege Hiwot Referral Hospital, Bahir Dar, Northwest Ethiopia. *Advance in nursing*, 1-9.
- [25] Toobert, D. J., Hampson, S. E., & Glasgow, R. E. (2000). The summary of diabetes selfcare activities measure. *Diabetes Care*, 943-950.