

# The effect of a foot care camp on diabetic foot care knowledge and the behaviours of individuals with diabetes mellitus

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## Abstract

**Aim:** The aim of this study was to examine the effectiveness of a foot care (FC) camp to enhance diabetic foot care knowledge (DFCK) and diabetic foot care behaviours (DFCB) among diabetic participants in Indonesia.

**Methods:** A two-group pre- and post-test quasi-experimental design was used in this study. A total of 72 participants completed a 5-week programme. The participants' DFCK and DFCB were examined in the fifth week using the Modified Diabetic Foot Care Knowledge (MDFCK) and the Modified Diabetic Foot Care Behaviours (MDFCB) questionnaires. Data were analysed by descriptive and independent t-tests.

**Results:** The mean score of DFCK (DFCK and DFCB in this study represent the score of knowledge and behaviors which gathered from MDFCK and MDFCB's questionnaires) in the experimental group after completing the FC camp was significantly better than that in the control group ( $p < .001$ ). Similarly, the mean score of DFCB in the experimental group after completing the FC camp was significantly better than that in the control group ( $p < .001$ ).

**Conclusions:** The FC camp was found to enhance DFCK and DFCB among diabetic patients. Therefore, this programme can be utilised for nursing practice in order to prevent diabetic foot ulcers and foot amputation.

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**Keywords**

diabetic foot care behaviour, diabetic foot care knowledge, diabetic foot ulcer prevention, foot care camp

**Introduction**

Approximately 422 million people worldwide are diagnosed with diabetes mellitus (DM; World Health Organization, 2017). DM is one of the top 10 diseases that cause death in Indonesia and a recent study reported 9 million cases in 2014 (Centers for Disease Control and Prevention, 2015). The diabetic foot ulcer (DFU) is the most common DM complication, which is costly and has devastating adverse effects (Yazdanpanah et al., 2015). In 2011, the mortality rate of Indonesian patients with DFU was accelerated by between 17% and 23% and the amputation rate was between 15% and 30% (Indonesian Hospital Association, 2011). Likewise, a lack of adequate knowledge and behaviours to prevent DFU was reported to be the most common problem in DFU prevention (Beattie et al., 2014).

Enhancing foot care knowledge and foot ulcer behaviours are essential to prevent or delay the complications in patients with DM who are prone to develop DFU (Yazdanpanah et al., 2015). According to one systematic review, knowledge improvement is one of the main desired outcomes that determine the prevention of DFU development (Sharoni et al., 2016). Therefore, a programme to enhance knowledge and behaviours seems to be pivotal to the prevention of DFU.

Various strategies for an educational programme proved to effectively improve foot self-care practice among DM patients. A face-to-face or individual education programme is one of the approaches that is effective for transferring knowledge to enhance foot care behaviours (Fan et al., 2013; Kurniawan et al., 2011). However, a face-to-face educational procedure needs certain resources that are not always available in every healthcare system, particularly in Indonesia. Although educational programmes have proved to be effective in enhancing foot care behaviours, the most efficient and effective strategies still need continuous evaluation.

Most studies in the literature provide both face-to-face and group-based lectures in their educational programme (Fan et al., 2013; Monami et al., 2015; Pérez-Borges et al., 2015). It is attested that studies enhancing foot care knowledge and behaviours are usually conducted in the form of teacher-centred sessions in a didactic manner (Monami et al., 2015; Pérez-Borges et al., 2015). In contrast, health education with traditional lectures using a didactic manner is more likely to be boring for some audiences (Baid and Lambert, 2010). The combination of health education with fun activity, recreational activity, or involving multimedia technology (picture and video) are believed to capture more attention from audiences and provide a less stressful education environment (Baid and Lambert, 2010).

In order to enhance knowledge and foot care behaviours, a camp is another well-known strategy that provides an educational programme in a nonclinical atmosphere. Various studies have proved that camps improve knowledge (Chaichanwattanakull et al., 2012; Karagüzel et al., 2005; Mercuri et al., 2009) and behaviours (Chaichanwattanakull et al., 2012; Suphornin et al., 2009). A camp is defined as a supervised programme for people with the same problem or experience in a medically safe environment (American Diabetes Association, 2012). It allows patients to participate in educational sessions through recreational and relaxing activities to improve the patients' self-management (McAuliffe-Fogarty et al., 2007). Camping programmes are commonly used to provide recreational education for children and for the youth population with DM (American Diabetes

Association, 2012; Békési et al., 2011; Chaichanwattanakull et al., 2012; Mercuri et al., 2009). Yet the application of a camp environment to specifically prevent the occurrence of DFU in the adult population has not been reported. Therefore, the availability of a diabetic foot care (FC) camp, especially for the adult population, is expected to increase knowledge and improve behaviours regarding foot care.

## **Study aim**

The aim of this study was to compare diabetic foot care knowledge (DFCK) and diabetic foot care behaviours (DFCB) among diabetic participants between the experimental and control groups.

## **Methodology**

### *Design*

A two-group pre- and post-test quasi-experimental design was used in this study. This study was conducted to examine the effects of an FC camp on DFCK and DFCB of individuals with DM in Indonesia.

### *Setting and participants*

This study was conducted in public health centres located in Bojonegoro district, East Java, Indonesia, from December 2016 to February 2017. Two public health centres with the largest DM populations were selected in this study.

The sample for this study consisted of participants who met the inclusion criteria set by the researcher. The inclusion criteria included the following: (1) being between 18–65 years old to minimise the common problem of the ageing process that may impact the participants' ability to perform independent daily activity; (2) having a diagnosis of DM by a physician; (3) having the ability to write, read and understand the Indonesian language; (4) having the ability to do daily activities independently; (5) having no existing visual problems; (6) having no existing hearing problems; and (7) being contactable by telephone.

The effect size of this current study was calculated based on knowledge variables of a previous study (Beiranvand et al., 2015). According to Cohen (1988), the minimum sample size for significant level of alpha at .05, power of .80 and effect size of .60 was 35 participants per group or 70 participants in total. To offset diminution of participants due to attrition, the researcher added 20% to the total sample (Polit and Beck, 2012). Therefore, the sample size of each group was 42 with 84 in total. Participants were randomly assigned to either the experimental or control group by tossing a coin. The total number participants who completed a 5-week programme was 72, comprising 35 in the control group and 37 in the experimental group. The dropout of participants in both groups was due to not participating in the whole scheduled programme.

### *Procedures*

The FC camp in this study integrates the concept of a camp that was proposed by Beljic (2007) and the prevention of DFU based on the Indian Health diabetes best practice foot care guidelines (Indian Health Service, 2011). The FC camp consists of three major

concepts: motivating, learning and socialising (Beljic, 2007). The FC camp procedure consisted of two components: 2-day camp activities and follow-up sessions by telephone call. First, the 2-day camp activities consisted of a half-day of educational session for 2 days. In the first half-day activities, the researcher conducted several activities including (1) performing pre-test on DFCK and DFCB, (2) a 1-hour group-based educational session by lecture format and having the participants watch a diabetic foot care video (provided by the World Diabetic Foundation), and (3) a discussion session according to questions arising within the group. After finishing the first of the 2-day activities, participants went home and the researcher made an appointment with the participants for the next day activities. In the second half-day programme, the researcher provided several activities including (1) a 1-hour practice session regarding desired DFCB, (2) a discussion session according to DM experiences and potential barriers in implementing foot care, and (3) managing fun and recreational activities.

Second, the follow-up sessions were held during the second, third and fourth weeks of this programme. Brief counselling via telephone was conducted once a week to assess participants' foot care concerns and foot care on a daily basis, and to give reinforcement based on achievement. In the final telephone call session, the researcher reminded the participants about foot self-care strategies and the next follow-up call.

### *Data collection*

The data were collected from December 2016 to February 2017. The pre-test data were collected in both the experimental and the control group, including demographic data, DFCK and DFCB. The post-test data of DFCK and DFCB were collected after 5 weeks of the FC camp.

### *Measurements*

DFCK in this study was measured using the Modified Diabetic Foot Care Knowledge (MDFCK) questionnaire in the Indonesian language. This questionnaire consisted of 15 items, comprising general DM management (5 items), preventing foot injuries (2 items), checking foot condition (2 items), foot hygiene (3 items), appropriate footwear (2 items) and toenail care (1 item).

DFCB in this study was measured using the Modified Diabetic Foot Care Behaviours (MDFCB) questionnaire, which was modified from the tool that had been developed by Kurniawan et al. (2011). The questionnaire consists of 34 items, comprising general DM management (4 items), checking foot condition (4 items), foot hygiene (4 items), appropriate footwear (11 items), foot moisturiser (2), toenail care (5), foot injury prevention (1 item) and foot injuries treatment (3 items).

The MDFCK and MDFCB were validated by three experts. All of the experts gave suggestions regarding the instruments and the programme. Following the suggestions, the researcher revised the questionnaires based on experts' suggestions. Altogether, 20 individuals, who had similar characteristics to the study sample, were tested in reliability checks of the questionnaires. The internal consistency and reliability of the MDFCK questionnaire was analysed by the Kuder Richardson test (KR-20), and the internal consistency and reliability of MDFCB was analysed by Cronbach's alpha coefficient. The MDFCK questionnaire yielded a KR-20 coefficient of .75 and the MDFCB yielded a Cronbach's alpha coefficient of .81.

## Data analysis

Data gathered from the study results were analysed using the IBM SPSS statistics package, version 19. Descriptive statistics were used to describe the demographic data. In order to compare the equivalence of the proportion of demographic data between control group and experimental group, a chi-square and independent *t*-test were used. Independent *t*-test and dependent *t*-test were used to test the between-group differences and within-group differences. The assumptions of normality and homogeneity of variance of DFCK and DFCB variables were met (the *p* levels were set on 5%).

## Results

### Demographic characteristics and general clinical information

A total of 72 diabetic participants at two public health centres in Bojonegoro were included in this study. In the control group ( $n=35$ ) and experimental group ( $n=37$ ) the mean ages were 57.97 years old ( $SD=6.01$ ) and 53.3 years old ( $SD=7.75$ ), respectively. The majorities in both groups consisted of female participants: 26 (74.3%) in the control group and 27 (73%) in the experimental group. The differences of demographic data between the control and experimental groups were not statistically significantly different except in the context of age ( $p=.03$ ; Table 1).

### DFCK and DFCB between groups

The researcher compared DFCK and DFCB between the experimental and control groups to determine the effects of FC camp on DFCK and DFCB. Table 2 shows that the difference of DFCK between the experimental and control groups in the pre-test was not statistically

**Table 1.** Demographic characteristics of the participants in the control and experimental groups ( $N=72$ ).

Characteristics	Control group ( $n=35$ )		Experimental group ( $n=37$ )		Test statistics	<i>p</i> value
	<i>n</i>	%	<i>n</i>	%		
Age (min–max = 36–65)	$M=57.97$	$SD=6.01$	$M=53.3$	$SD=7.75$	$3.02^a$	.03
Gender					$0.16^b$	.88
Male	9	(25.7)	10	(27)		
Female	26	(74.3)	27	(73)		
Religion						
Islam	35	(100)	37	(100)	$1.0^b$	1.0
Education status					$4.56^c$	.33
Elementary school	12	(34.3)	16	(43.2)		
Junior high school	12	(34.3)	8	(21.6)		
Senior high school	7	(20)	5	(13.5)		
Bachelor degree	3	(8.6)	3	(8.1)		
No education	1	(2.9)	5	(13.5)		

<sup>a</sup>Independent *t*-test.

<sup>b</sup>Chi-square test.

<sup>c</sup>Likelihood.

*M* = mean, *SD* = standard deviation.

**Table 2.** Comparisons of the mean diabetic foot care knowledge (DFCK) and diabetic foot care behaviour (DFCB) scores between the two groups ( $N = 72$ ).

Variables	Control group ( $n = 35$ )		Experimental group ( $n = 37$ )		$t$	$p$ value
	$M$	$SD$	$M$	$SD$		
DFCK pre-test	8.94	2.12	8.46	2.21	.94	.34
DFCK post-test	9.34	2.22	11.59	2.02	-4.49	<.001
DFCB pre-test	47.83	9.29	48.76	12.96	-.34	.72
DFCB post-test	51.23	9.91	73.51	13.16	-8.14	<.001

$M$  = mean,  $SD$  = standard deviation. Modified Diabetic Foot Care Knowledge (MDFCK) and Modified Diabetic Foot Care Behaviors(MDFCB) are the name of the tools or questionnaires to take Diabetic Foot Care Knowledge (DFCK) and Diabetic Foot Care Behaviors's (DFCB) Scores.

**Table 3.** Comparisons of the mean of diabetic foot care knowledge (DFCK) and diabetic foot care behaviour (DFCB) scores of each group ( $N = 72$ ).

Variables	Pre-test		Post-test		$t$	$p$ value
	$M$	$SD$	$M$	$SD$		
Control group ( $n = 35$ )						
DFCK	8.94	2.12	9.34	2.22	-1.83	.07
DFCB	47.83	9.29	51.23	9.91	-2.47	.01
Experimental group ( $n = 37$ )						
DFCK	8.46	2.21	11.59	2.02	-7.14	<.001
DFCB	48.76	12.96	73.51	13.16	-11.26	<.001

$M$  = mean,  $SD$  = standard deviation. Modified Diabetic Foot Care Knowledge (MDFCK) and Modified Diabetic Foot Care Behaviors(MDFCB) are the name of the tools or questionnaires to take Diabetic Foot Care Knowledge (DFCK) and Diabetic Foot Care Behaviors's (DFCB) Scores.

significantly different ( $t = .94$ ,  $p = .34$ ). By comparison, after completing the 5-week programme the participants in the experimental group had better DFCK than those who received standard care (control group) ( $t = -4.49$ ,  $p < .001$ ). After completing the FC camp, the mean score of DFCB in the experimental group ( $M = 73.51$ ,  $SD = 13.16$ ) was significantly better than that in the control group ( $M = 51.23$ ,  $SD = 9.91$ ;  $p < .001$ ).

### DFCK and behaviours within groups

Table 3 shows the mean of DFCK and DFCB within the groups. In the experimental group, the DFCK and DFCB scores were significantly better than before participating in the FC camp ( $p < .001$ ). In addition, the DFCB score of the control group in the fifth week after receiving standard care showed significantly better behaviour than in the first week ( $p = .01$ ). However, there were no significant differences in the DFCK scores within the control group in the pre-test or post-test scores (Table 3).

## Discussion

The mean scores of DFCK and DFCB in the experimental group were better than in the control group. In addition, the DFCK and DFCB after completing the FC camp in the experimental group showed better scores than before participating in the FC camp. The significant results are explained in the following.

### *DFCK between groups*

Three main factors that possibly influenced the significant difference of DFCK in the experimental group as compared to that in the control group might be due to the strategies used in the FC camp.

Concepts of the camp are believed to be the main factors in the development of DFCK in the experimental group. The FC camp combined the concepts of motivating, learning and socialising in order to enhance the effectiveness of the educational strategy. The concept of learning that occurred during the camp activities was useful as it allowed the participants and the researcher to share knowledge regarding foot ulcer prevention, particularly in the unthreatening and open environment in the recreation centre. The combination of the learning and socialising concepts in the FC camp allowed the participants to receive interactive learning regarding foot ulcer prevention with interactive strategies, especially demonstration and self-reflection with peers, dietitian and researcher. Moreover, the motivating activities used during the FC camp encouraged the participants to pay attention to the education programme that was provided. Based on reviews of other studies, three concepts effectively enhanced the knowledge in adult populations, namely motivation (Brewer-Lowry et al., 2010; Choi et al., 2014), learning (Choi et al., 2014) and socialisation (Akca and Cinar, 2008; Hunt et al., 2012).

Based on the results of this study, the mean age of the participants in the experimental group was significantly lower than the mean age of the participants in the control group ( $p < .05$ ). This result possibly influenced the dropout rate of the participants during the study. According to the study by Desalu et al. (2011), older diabetic participants were less knowledgeable about foot care; however, further analysis in this current study found that the characteristic of age did not definitely influence the outcome of DFCK. A comparison between the levels of age showed no statistically significant difference between the participants aged  $< 50$  years and 50–65 years of age in the outcome of DFCK ( $p = .26$ ). Therefore, the age variable would not be a factor related to the different outcomes of DFCK between the groups.

### *DFCB between groups*

Besides the observation of the effectiveness of the FC camp in enhancing DFCK, another aim of this study was to prove the effectiveness of the FC camp in enhancing DFCB among individuals with DM in Indonesia. Knowledge and appropriate behaviours of the participants are needed to prevent foot ulcers. It was shown that the mean score of DFCB in the experimental group was better than in the control group. Several factors possibly influenced this result, including DFCK and the strategies used in the camp.

Basic knowledge of the participants regarding DFU prevention became the factor that could influence the outcome of DFCB. Participants with better knowledge of foot

care tended to have better results in DFCB. However, the biggest challenge of this study was converting foot care knowledge into proper foot care behaviours. Poor habits regarding foot care, such as an improper diabetic diet, walking barefoot and inappropriate toenail care were common in the study settings. However, since the educational programme provided in FC camp using motivation and interactive learning strategies effectively enhanced DFCK, the results should have determined the outcome of DFCB. A study by Li et al. (2014) mentioned that participants with good DFCK showed better DFCB and vice versa. In addition, the results within the experimental group revealed that the DFCB of participants after completing the FC camp was better than before the FC camp. This result supported the effectiveness of the FC camp in enhancing DFCB among the participants in this study.

## Conclusion

The FC camp is another approach that combines an educational programme with interactive learning in a nonclinical atmosphere. The concepts of motivating, learning and socialising that occur during the FC camp are pivotal to enhancing diabetic foot care knowledge and behaviours. Based on the result of the study, it is revealed that an FC camp could improve the development of diabetic foot care knowledge and behaviours among participants with DM in Indonesia.

### Key points for policy, practice and/or research

- The findings of this study can be used as information for future studies associated with FC camps and diabetic foot care knowledge and behaviours.
- The concept of motivating, learning and socialising in FC camps can be used as a concept to enhance knowledge and behaviours in other chronic diseases.
- The FC camp should be incorporated into the standard care of public health centres in community settings.
- It is feasible to include a FC camp as standard care in public health centres because it saves time and money and reduces the workload of healthcare providers.
- The findings of this study can be used as evidence-based nursing regarding diabetic foot care.

## Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Ethical considerations

The ethical consideration was approved by ethical committee review from Prince of Songkla University Thailand (approval no. MOE 0521.1.05/3014). Permission to conduct the study in the public health centres was granted (approval no. 440/6361/412.43/2016).



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