Original Research

THE BEHAVIOR OF FOOT CARE IN PATIENTS WITH TYPE 2 DIABETES MELLITUS: APPLYING THE THEORY OF PLANNED BEHAVIOUR

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ABSTRACT

Background: Diabetes mellitus (DM) is a chronic non-infectious disease with complications such as diabetic foot, which has the potential for amputation if left untreated. Theory of Planned Behavior (TPB) is a behavior-based theory that can be applied to DM patients including foot care to minimize risk. Some studies related to TPB particularly about physical activity and diet have been explored, however, studies on foot care are still lacking.
Objective: This study aims to apply the Theory of Planned Behavior (Intentions, Attitudes, Subjective Norms and Behavioral Control) on the patient's foot care.
Methods: This was a cross sectional descriptive study. There were 93 patients diagnosed with type 2 DM recruited at 9 public health centers (Puskesmas) using accidental sampling on April 2018. TPB-based foot care questionnaire from the IWGDF (International Working Group on Diabetic Foot) Diabetic Foot guidelines was used. Data were analyzed in the form of frequency distribution.
Results: Of the total number of respondents, 25 males and 68 females with average age of 53.05 ± 8.04 years, approximately 87.1% of them have the intention to wear footwear according to size. The majority of patients think that washing feet every day is a form of good and positive practice. They also agreed that the family expects the patient to examine the presence of bone / joint protrusions independently and believes that monitoring the foot deformities performed by other DM patients is very important as well as having control that the patient can check for signs of boils in the legs and there is a high likelihood of blisters / sores if the socks used are not suitable.
Conclusion: The majority of respondents have good intentions, positive attitudes, social support and behavioral controls for foot care.

Keywords: diabetes mellitus, diabetic foot care, theory of planned behaviour

BACKGROUND

Diabetes mellitus (DM) is a progressive chronic disease that is caused by a lack of production of insulin derived or acquired by the pancreas. In other words, the insulin produced is not effective, which affects the body's metabolism of carbohydrates, fats and proteins which can cause blood glucose levels to rise (Black & Hawks, 2014). While Type 2 or NIDDM (Non-Insuline-Dependent Diabetes Mellitus) Diabetes Mellitus is a condition where the body becomes resistant to the normal effects of insulin caused by genetic and environmental factors (Thomassian, 2017). Some of the results of research into gene

factors and the environment are very instrumental in the development of type 2 DM disease (Brunetti, Chiefari, & Foti, 2014; Ekpenyong, Akpan, Ibu, & Nyebuk, 2012).

Globally, in 2014, people suffering from DM was around 422 million and in 2015 around 1.6 million died (Organization, 2016). Based on data from the International Diabetes Federation in 2015, diabetes mellitus patients in Indonesia as many as 10 million people are currently the third leading cause of death (6.7%) after stroke and heart disease (Kementerian Kesehatan, 2014). In Southeast Sulawesi, diabetics diagnosed by doctors and other health workers, including based on symptoms, are recorded at around 3% (780 people) (Indonesia, 2013).

Diabetes is classified as a lifelong disease with complications in the form of diabetic foot symptoms characterized by neuropathy, ischemia and infection (Pendsey, 2010) Complications such as neuropathy, Indonesia occupy the highest position (54%) (Aumiller & Dollahite, 2015), an estimated 15% of DM patients have diabetic foot complications. Diabetic foot is a form of macrovascular complications that is very dangerous if left untreated maybe because of the potential for loss of limbs or amputation (Shearman, 2015) that diabetics cause 1.5 million who die with complications of lower limb amputation in 2012. The possibility for amputation complications can occur which begins with the emergence of diabetic foot injuries with infection (Wukich, Sadoskas, Vaudreuil, & Fourman, 2017). A study of 249 people with type 2 diabetes mellitus with a risk factor for wounds was around 55.4% and for diabetic foot injuries around 12%, of which the predictors were daily foot examinations, including age, insulin, shoes and belief (Yusuf et al., 2016). Therefore, routine foot care through foot examination is one of the main early interventions for health care services that can be performed on diabetes patients to minimize the risk of diabetic foot injury (Al-Rubeaan et al., 2015; Goie & Naidoo, 2016; Tiwari et al., 2012).

The results of interviews with diabetic foot care from several patients diagnosed with type 2 DM in several health centers in Kendari City revealed that most of the DM patients have not been fully exposed to diabetic foot care, so they always ignore and they assume that foot care is only done when there is an injury . So the fact is that all this time they always ignore the importance of diabetic foot care. This is due to the lack of knowledge / information about diabetic foot care. All this time what they always do to minimize the risk of complications is just diet, exercise every week done in each public health center (Puskesmas) through prolanis government program and monitoring of blood sugar levels every month by the health team from Prodia laboratory.

Early intervention through the participation of diabetic patients in health care services including behavioral changes related to foot care is very useful to minimize the risk of diabetic foot injury that points to amputation if not treated as early as possible (Glanz, Rimer, & Viswanath, 2008). That behavior change begins with a person's intention to change. Intention to change is predicted by several variables: attitude, subjective norms and behavioral control. The basis of the theory of change is the concept of the Theory of Planned Behavior (TPB) which is one of the behavioral-based nursing theories. This theory states that achieving changes in one's behavior depends on intention and ability (LaMorte, 2016). The studies in DM patients with the application of TPB include physical activity and diet that has been widely used (Boudreau & Godin, 2014; Rahmati-Najarkolaei et al., 2017), however, the study of foot treatments in DM patients from TPB is still lacking, therefore this study aims to apply TPB-based foot care in type 2 DM patients.

METHODS

Study design
This research is a descriptive study with a cross sectional approach. This approach is carried out by collecting data directly at one time in order to provide an overview of the

characteristics of a population sample (Grove, Burns, & Gray, 2014; Neuman, 2013).

Setting & Sample
This study was conducted from April to May 2018 on 93 patients diagnosed with type 2 DM who were recruited at 9 public health centers (Puskesmas) throughout Kendari city, namely Puskesmas Nambo, Abeli, Poasia, Mokoau, Jati Raya, Lepo-Lepo, Wua-Wua, Mekar and Puskesmas Puuwatu. The recruitment of samples was conducted during prolanis activities at each puskesmas through non-random sampling method with accidental sampling, which the researchers took samples at the time of the study. Some of the inclusion criteria of this sample were patients aged ≥20 years, diagnosed with type 2 diabetes mellitus with FPG 6126 mg / dL or 2-h PG ≥200 mg / dL (based on medical records of puskesmas), no injuries on the feet, willing to participate in research and be able to read and write.

Instrument
The research instrument used was a questionnaire about TPB-based foot care that was prepared based on the guidelines for making TPB-based instruments and foot care, which refers to the IWGDF (International Working Group on Diabetic Foot) Diabetic Foot guidelines which can support the prevention of foot problems (Bakker, Apelqvist, Schaper, & Board, 2012; Francis et al., 2004; Schaper et al., 2016). The instruments that the researchers have compiled based on these guidelines were then validated by 4 experts in the field of diabetic foot injuries with criteria for ETN (Enterostoma Therapy Nurse) and experienced in the clinic with I-CVI (Item Content Validity Index) results of each item is 0.75 and 1.0. However, prior to CVI, a pilot study was first conducted to ascertain whether there were sentences in the instrument that were not understood by participants, including the time needed to fill the questionnaire. The validated research instrument consists of 40 statement items measured using a likert scale with answer choices from the range 1 s.d 7 and (-3) s.d (+3). The answers with the highest scores are values 6 and 7 or positive values of +2 and +3,

showing answers that are sufficiently varied from the opinions agree-strongly agree, useful-very useful, desirable-very desirable, maybe-very possible, should-very ought to be, important - very important, easy - easier or harder - more difficult, permissible - very permissible to do, fun - very pleasant, things that are really right to do, good practice - very good practice. Of the 40 statement items consisting of 6 statements representing Intent and 34 statement variables representing predictor variables (4 statements representing Direct Attitude, 8 statements representing Indirect Attitudes, 3 statements representing variables of Direct Subjective Norms, 8 statements representing variable Indirect Subjective Norms, 3 statements representing the Direct Behavior Control variable, 8 statements representing Indirect Behavior Control variables.

Data collection and analysis methods
The researcher collected data directly from each respondent through introduction stages with the explaination of the objectives, the signing of the informed consent, and the fulfillment of the questionnaire. The data that has been collected both the characteristics of the respondents and the description of the research variables, including variables from the Theory of Planned Behavior consisting of intention and predictor variables attitudes, subjective norms and behavioral controls, were then analyzed and described in the form of frequency distribution.

Ethical consideration
This study has received approval from the Health Research Ethics Committee of Faculty of Medicine, Hasanuddin University with No. 184 / H4.8.4.5.31 / PP36-KOMETIK / 2018. Signs of verbal consent were also obtained from respondents who participated in the study.

RESULTS

In **Table 1** the average demographic of respondents based on age was 53.05 ± 8.047 years, sex was dominated by women (68

people, 73.1%), more education at the university level (PT) (34 people, 36.6 %), work as a housewife is more (39 people, 41.9%), marital status is dominated by respondents with marital status (80 people, 86.0%), long time to suffer from DM who is <5 years more (59 people , 63.4%), average blood glucose level (273.96 ± 99.127 mg / dL).

Table 1 Distribution of frequency based on the characteristics of respondents (n=93)

Variable	Total f (%)	Mean ± SD
Age (year)		
Early & late adults (26-45)	14 (15.1)	53.05 ± 8.047
Early age (46-55)	41 (44.1)	
Late age (>56)	38 (40.9)	
Gender		
Man	25 (26.9)	
Women	68 (73.1)	
Education		
Primary school	15 (16.1)	
Junior high school	14 (15.1)	
Senior high school	30 (32.3)	
College	34 (36.6)	
Employees		
Government	37 (39.8)	
Military	1 (1.1)	
Parmer	2 (2.2)	
Enterpreneur	14 (15.1)	
Housewife	39 (41.9)	
Status of marriage		
Married	80 (86.0)	
Not merried	1 (1.1)	
Widower	1 (1.1)	
Widow	11 (11.8)	
Long suffering of Diabetes Mellitus (years)		
< 5	59 (63.4)	
≥ 5	34 (36.6)	
Blood of sugar levels (mg/dL)		
FPG (*Fasting Plasma Glucose*)	21 (22.6)	273.96 ± 99.12
2-h PG (*2-Hour Plasma Glucose*)	72 (77.4)	

Table 2 Percentage of participants who have a high intention for foot care (n=93)

Item	Statement	Answers (%)
1	I hope to wash my feet daily with warm water	75.3
2	At this time I intend to examine my feet every day for blisters or boils	73.1
3	I really want to wear footwear (shoes / sandals) at any time both inside and outside the house	76.4
4	I hope to wear shoes / sandals that fit / match the size of my feet	87.1
5	At this time I intend to cut my toenails straight	76.3
6	I would love to check for nail deformities on my toes	76.3

Table 2 describes the frequency distribution of respondents' answers to intentions in performing foot care. Patients hope to wear shoes that are suitable for size with total answers of 6 and 7 showing a higher percentage (87.1%) including the desire of patients to wear footwear both inside and outside the house 76.4%.

Table 3 Percentage of participants who have a positive attitude and support for foot care (n=93)

Item	Statement	Answers (%)
1	In my opinion, washing my feet every day with warm water is ... (very useless, very useful)	92.5
2	In my opinion, washing my feet every day with warm water is ... (very exciting s.d very unpleasant)	88.2
3	In my opinion, washing my feet every day with warm water is ... (the very wrong thing done is that things really are done)	94.6
4	In my opinion, washing my feet every day with warm water is ... (very good practice, very bad practice)	96.7
5	If I wash my feet every day with warm water, I will feel that I am doing something positive for myself	86.1
6	I feel worried if I experience tingling / pain in my legs	80.7
7	If I check my foot skin (color, edema, capallan, temperature), I can detect problems at an early stage	73.1
8	If there is a history of previous injuries, I have to see them often	78.5
9	Check my feet more often for abrasions, scratches or boils	68.9
10	I feel worried if there is a boil on my leg	59.1
11	Thinning the calluses on my feet by the nurse specialist wounded for me is ...	62.3
12	Detecting nail deformities on my toes in the early stages is ...	61.3

Note: Items number of 1 to 4 include direct attitude while 5 to 12 includes indirect attitude, Number of 9 to 12 answer options -3 s.d +3

For **Table 3** which describes the attitude in doing foot care shows that the highest frequency distribution of respondents is in the subvariable direct attitude that according to patients washing their feet every day with warm water is a form of good practice showing a total total score of 96.7% . As for the most indirect attitude in patients who think that washing feet with warm water means that they have done something positive about themselves with the highest percentage of total answers, namely 86.1%.

Table 4 Percentage of participants on subjective norms who have high social pressure on foot care (n=93)

Item	Statement	Answers (%)
1	My family and friends think that I don't need to wash my feet every day with warm water	82.8
2	People around me, always thinking of taking care of my toenails that grow into / thicken by a wound nurse specialist	84.9
3	Family and friends expect me to carry out self-examination of the joints on my legs regularly	87.1
4	Other diabetics expect me to ... ... use the right foot for the size of my foot	62.4
5	Other diabetics will .... if they check the shoes before wearing them	78.5
6	Other diabetics say I ... thin the calluses on my feet by wound nurse specialists	69.9
7	People around me ... ... if moisturizing cream is not given between my toes	43.3
8	Monitoring feet every year on foot deformities / history of injuries done by other diabetics is ... for me	83.3
9	Cutting nails straight which according to the diabetics I have to do is .... for me	80.7
10	Approval of the people around me about the use of footwear (shoes / sandals) at any time both inside and outside the house ... ... for me	81.7
11	The opinion of other diabetes mellitus patients who agree that nail care is growing into / thickened by a specialist nurse wound ... for me	81.7

Note. Item Number of 1 to 3 includes direct subjective norms while 4 to 11 includes indirect subjective norms, Number of 4 to 7 answer options -3 s.d +3

Subjective norm variables described in **Table 4** illustrate that the percentage of respondents' total answers is more in the sub-variable direct subjective norm with a higher percentage of total scores in patients who think strongly agree that family and friends of patients expect patients to examine the presence of bone / joint protrusions routine is as much as 87.1%. While indirect subjective norms, the percentage of respondents' answer scores is higher for respondents who argue that doing foot examinations on deformities performed by other DM sufferers is very important for patients, namely 83.3%.

Table 5 The percentage of participants on behavioral control who have a high level of control of foot care (n=93)

Item	Statement	Answer (%)
1	I am sure that I can check for signs of boils on my legs if I want	94.6
2	Check my shoes and footwear regularly, depending on my own will	93.6
3	For me to check my own feet every day for blisters, scratches or boils ...	78.5
4	The footwear (shoes / sandals) that I use do not match the size of my feet	74.2
5	When I wash my feet every day with warm water I feel rushed	69.9
6	The foot cos I use doesn't fit my feet	74.2
7	When I check my feet every day for cuts / abrasions I feel rushed	72.1
8	If the footwear (shoes / sandals) that I use do not match the size of my feet, I ... for abrasions on the feet	67.8
9	If I am in a hurry when washing my feet with warm water, then I clean it up to between my toes	63.4
10	If the leg cost I use is not right, then ... ... to have a blister on my leg	79.6
11	If I check my feet in a hurry, then I ... to detect any blisters on my feet	69.9

Note. Item number of 1 to 3 including direct behavior control 4 to 11 including indirect behavior control, Number of 8 to 11 choices of answer -3 to +3

In **Table 5** which describes the control of the behavior of patients on foot care shows that the total percentage of respondents' answers scores more on the subvariables of direct behavioral control which argues that the patient is sure to check for signs of boils on his legs if he wants 94.6%. While indirect behavioral control that it is likely to cause cuts / abrasions at the foot if the socks used are not right shows the percentage of respondents' answers that are more 79.6%.

DISCUSIONS

Theory of Planned Behavior (TPB) is a theory of individual health promotion behavior models in nursing where attitudes and knowledge as a determinant of behavior (Pender, Murdaugh, Parsons, & Ann, 2006). This study describes the behavior of TPB-based foot care, which means that a person is able to promote the behavior of virgin feet based on knowledge and attitude.

The main factor of TPB is the individual's intention to conduct behavior. According to this theory, there are 3 variables that will predict intentions, namely attitudes, subjective norms and behavioral controls. Attitude which means psychological tendencies expressed by evaluating both preferred and non-behavioral behaviors, subjective norms (subjective norms) are individual perceptions of certain behaviors that are influenced by other people's research (family, parents, friends), behavior control (perceived behavior control is the ease or difficulty of a person to conduct behavior, while intention (intention) is the readiness of a person to perform certain behaviors. The three predictor variables can be expressed either directly which means overall of a person's attitude while indirectly means a person's beliefs and evaluation of specific results (Ajzen, 1991).

The result of the study on the demographics of respondents that based on the age of more DM patients in the category of early elderly (46-55 years) is 44.1%, with an average age of 53.05 ± 8.047 years. Increasing age is related to the aging factor will lead to a process of accumulation of visceral fat in the body thus causing a decrease in glucose tolerance which will lead to the development of diabetes (Ozougwu, Obimba, Belonwu, & Unakalamba, 2013). A finding of DM patients with an average age of 46-60 has a higher percentage, so age is significantly associated with T2DM (Ekpenyong et al., 2012). Riskesdas study data in Indonesia shows that people suffering from diabetes increases at the age of > 45 and increases over > 55 years (Indonesia, 2013).

People with higher education level are more likely to suffer from DM, which is 36.6%. These results indicate that some respondents

have a higher level of education, in other words that having higher education is expected to increase one's knowledge, especially diabetes care. Data from riskesdes, in Indonesia, indeed someone with a higher level of education is suffering from diabetes (Indonesia, 2013). Percentage of female sex with diabetes is more than males, namely 73.1%. The risk of type 2 DM is closely related to gender (Black & Hawks, 2014). This data contrasts with the study of the prevalence of type 2 DM more commonly found in male gender (Ekpenyong et al., 2012). But in Indonesia according to Riskesdas data shows more women suffer from DM compared to men (Indonesia, 2013).

In terms of employment, there were 41.9% of participants are housewives. This was due to the fact that the DM patients in this study were the majority of women. In fact women are more concerned with work at home and tend to stress and they may not have time to exercise. Lack of physical activity (exercise: aerobics) and stress are the precipitating environmental factors for the occurrence of DM (Black & Hawks, 2014). In theory, DM type 2 occurs due to the disturbing effect of glucose uptake, excess fat accumulation due to physical inactivity (Lin & Sun, 2010). Average blood sugar levels of all respondents both fasting and post-meal blood sugar were 273.96, ± 99.12 mg / dL. This value indicates that someone has been diagnosed with diabetes. The diagnostic criteria for diabetes mellitus is if fasting blood glucose level is ≥ 126 mg / dL or blood glucose 2 hours after meals is ≥ 200 (American Diabetes Association, 2016).

The results of the analysis of the TPB variable illustrate that, intention to wear shoes / sandals, according to size both inside and outside the home, shows a higher percentage. This means that more patients diagnosed with DM have readiness (there is a plan) to perform foot care related to the use of footwear according to size (Yusuf et al., 2016), that the use of shoes is the main predictor of patients with DM who are at risk for injury. The use of sandals both inside and outside the home will

minimize the risk for injuries, and shoes that are not suitable or too narrow are the main causes of foot ulceration (Schaper et al., 2016). Intention is the main precursor or determinant of behavior change. The stronger the intention to conduct behavior, the greater the performance (Ajzen, 1991). In other words, the more someone's intention to use footwear according to size both inside and outside the house, then it is possible to have a stronger change. Actions of behavior changes to foot care in DM patients on a regular basis will be less risk for injury (Tiwari et al., 2012).

The majority of respondents showed their attitude that washing their feet every day with warm water was a very good form of practice and positive things that needed to be done. In other words, the treatment of washing feet that they will do is a form of good skill and can provide benefits. Related to the subjective norm, the majority of respondents have the perception that the answers strongly agree with the support of family / friends to conduct an examination of the presence of bones / joints that protrude in the legs independently and it is important for patients to examine foot deformities like what other DM patients have done. This means that patients assume there is support from the closest people to what they will do and anything that other DM sufferers do according to the patient is very important. Whereas, in terms of behavioral control, most respondents thought that they could check for signs of ulcers when they wanted and they were sure there would be a wound if the socks were not suitable. This means that there is control in patients about the risks of what they do regarding foot care. Care for the feet by washing feet every day with warm water, regular checks on the presence of bone / joint protrusions in the area of the feet, confirmation of the feet against deformities / history of wounds, examination of signs of boils in the legs, proper use of socks is management of foot care for Diabetic sufferers to minimize risk (Bakker et al., 2012).

Overall these results illustrate that the majority of respondents with diabetes mellitus in the City of Kendari have an attitude that what they

do is a form of good practice / skill, positive for themselves, quite useful, and good perception / confidence in what is done by the people around them are very important, there is support from the family, and they have the confidence to control that what they do if it is not appropriate will cause losses related to foot care, so there will be intention (readiness) in themselves to perform foot care regularly with hope there are no complications such as the presence of diabetic foot injuries especially if amputation occurs. In a combination of attitudes toward behavior, subjective norms and perceptions of behavioral control lead to the formation of behavioral intentions. The better subjective attitudes and norms and the greater the perceived control, the stronger the intention or desire of someone to do the related behavior (Ajzen, 2002; Noar & Zimmerman, 2005).

Intention to do various types of behavior can be predicted with high accuracy from attitudes toward behavior, subjective norms, and perception of behavioral control (Ajzen, 1991). In fact this finding reveals that the majority of respondents have a positive attitude, there is pressure / support for the people around them (family and friends) and there are behavioral controls related to foot care, as well as stating the intention to perform regular foot care. Therefore, patients diagnosed with diabetes through an inner intention to perform routine foot care which is predicted by attitudes, subjective norms and behavioral control are expected to reduce or minimize the risk of complications such as the occurrence of diabetic foot injuries.

CONCLUSION

Most of the respondents in this study show that there was an intention, positive attitude, social pressure from close people and behavioral controls related to diabetic foot care. Patients with diabetes mellitus are expected to carry out regular foot care to minimize the complications of diabetic foot injuries.

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