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Behaviour model for diabetic ulcer prevention

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Abstract

Purpose Diabetic ulcers are one of the complications that often occur in patients with DM. The aim is to develop a behaviour model for diabetic ulcer prevention by integrating Lawrance Green Theory and the Theory of Planned Behaviour.

Methods An explanative observational design was used with a cross-sectional approach. The population consisted of DM patients who had underwent treatment at the internal medicine clinic of Sidoarjo District Hospital. The sample size of 133 respondents was obtained through purposive sampling. The data analysis used Partial Least Square.

Results Predisposing factors (knowledge), supporting factors (availability of health facilities and accessibility of health resources) and driving factors (the role of health workers and family support) significantly influence the main factors (attitudes toward behaviour, subjective norms and perceptions of self-control) with a statistical T value > 1.96. The main factor influences intention (T = 48.650) and intention influences behaviour (T = 4.891).

Conclusion Intention is influenced by the attitudes toward behaviour, subjective norms and self-control perceptions. Good intentions can increase the preventive behaviour related to diabetic ulcers. Increasing the diabetic ulcer prevention behaviour can be done by providing regular education to both the patients and their families about diabetic ulcers and their prevention through the appropriate management of DM, lifestyle modification and regular foot care that requires active involvement from the family and health care workers.

Keywords Behaviour · Diabetic ulcer · Diabetes mellitus · Prevention

Introduction

Diabetic ulcers are one of the complications of Diabetes Mellitus (DM) that often occurs and it is a significant cause of hospitalisation in patients with DM [1]. Diabetic ulcers are associated with amputation and increasing morbidity, mortality, health financing, dependence on care, a sense of discomfort and physical limitations [2]. Secondary precautions can be

taken to prevent complications such as diabetic ulcers in people with DM [3].

In 2017, the prevalence of diabetes in Southeast Asia reached 10.1%, and Indonesia ranked 6th as the country with the most considerable DM incidence rate of 10.3 million cases [4]. In Indonesia, the prevalence of DM has increased from 6.9% to 8.5% [5]. The incidence of diabetic ulcers in patients with DM has reached 25% over their lifetime. Diabetic ulcers occur in 15–25% of patients with DM and more than 2% per year between 5 to 7.5% of patients with neuropathy [6].

The role of nurses is significant in the prevention of diabetic ulcers through education on how to do foot examinations and foot protection activities, providing health services and screening patients with a high risk [7]. Preventive measures for diabetic ulcers can be given to DM patients through counselling going forward from the initial management of DM. Research conducted by Hadi Sulisty, Sae Sia, & Maneewat [8] showed that education could improve the knowledge and behaviour of foot care in patients with DM. Various factors influence the formation of behaviour. D'Souza et al., and Li et al., [9, 10] showed that the behaviour of foot care as an effort to prevent diabetic ulcers is influenced by the

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factors of education level, the knowledge of complications and foot care, the duration of diabetes and self-awareness in self-care.

This research integrated the Theory of Planned Behaviour [11] and Lawrance Green Theory [12]. The integration of two theories is expected to improve the behaviour of diabetic ulcer prevention in patients with DM. From the explanation above, this study aims to develop a behaviour model for diabetic ulcer prevention by integrating Lawrance Green Theory and the Theory of Planned Behaviour.

Method

Study design

An explanative observational study design with a cross-sectional approach was used to observe the variables simultaneously.

Participant sampling

The population was all of the DM Patients who had underwent treatment at the Internal Medicine Clinic of Sidoarjo District Hospital, East Java, Indonesia. The determination of the sample size in this study was done using the rule of thumb that was 5–10 times the number of independent variables. The number of samples in this study was $10 \times 12 = 120$. To anticipate drop-outs (10%), the number of respondents was 133 respondents. The sampling technique used was purposive sampling. The inclusion criteria were: (a) DM patients aged between 18 and 65 years old, (b) can write, read and understand Bahasa (National Indonesian Language) and (c) they had suffered from DM ≥ 1 year. The exclusion criteria were: patients with musculoskeletal disorders, hearing loss, psychiatric disorders and patients with diabetic ulcers.

The independent variables (X1, X2, X3, X3, X4, X5) were the predisposing factors (age, sex, education and knowledge), supporting factors (use of health services and *accessibility of health resources*) and driving factors (the role of health workers and family support), in addition to the main factors (attitudes, subjective norms, perception of self-control) and intention. The dependent variable (Y1) in this study was the behaviour of diabetic ulcer prevention (Table 1).

Setting and location

The study was conducted between May and July 2019 in the *Internal Medicine Clinic of Sidoarjo District Hospital, East Java, Indonesia*. The researchers introduced themselves and explained the benefits, goals and approval procedures by referring to the informed consent form. Furthermore, they gave the questionnaires to the respondents regarding any

Table 1 Research variable behaviour model for diabetic ulcer prevention in DM patients

Variables	Information	Indicators
X1	Predisposing factors	X1.1 = age X1.2 = sex X1.3 = education X1.4 = knowledge
X2	Supporting factors	X2.1 = use of health services X2.2 = accessibility of health resources
X3	Driving factors	X3.1 = the role of health workers X3.2 = family support
X4	Main factors	X4.1 = attitude X4.2 = subjective norms X4.3 = perception of self-control
X5	Intention	
Y1	The behaviour of diabetic ulcer prevention	

predisposing factors (age, sex, education and knowledge), supporting factors (availability of health facilities and accessibility of health sources), driving factors (the role of health workers and family support), main factors (attitudes, subjective norms and self-control perception), intention and the behaviour to prevent diabetic ulcers. The data collection was carried out in the Internal Medicine Clinic of Sidoarjo District Hospital where the patients were in control.

Measurement

The questionnaire was tested for validity and reliability using 30 patients with DM in the Internal Medicine Clinic of Dr. Soedomo District Hospital of Trenggalek, East Java, Indonesia in April 2019. The calculation of the validity of the question items was done using the Pearson product-moment correlation.

Knowledge of diabetic ulcer prevention

The level of knowledge regarding diabetic ulcer prevention was measured using The Modified Diabetic Foot Care Knowledge Questionnaire from Hadi Sulisty, Sae Sia, & Maneewat [8], modified by the researchers. The components of the question include the management of DM, foot care, and foot exercises. The instrument consists of 17 questions with true or false type answers. The consistency and reliability of the questionnaire was analyzed using the Kuder Richardson test (KR-20) and the result was 0.75. The questionnaire used an ordinal scale with the following scoring: 3 = Good (76%–100%), 2 = Moderate (56%–75%) and 1 = Less (<56%).

Availability of health services

The instruments on the availability of health facilities were made by the researchers based on the indicators of facility completeness and costs or insurance concerning the availability of the health facilities. The questionnaire contained four questions with true or false answers. The consistency and reliability was KR-20 = #0.380–0.746. The questionnaire used an ordinal scale with the following scoring: 3 = Good (76%–100%), 2 = Moderate (56%–75%), 1 = Less (<56%).

Accessibility of health resources

The instruments on the availability of health facilities was made by the researchers based on the indicators of the distance to the health services, the transportation used, the health service costs and time required. The questionnaire contained four questions that were true or false type questions. The consistency and reliability was KR-20 = 0.131–0.821. The questionnaire used an ordinal scale with the following scoring: 3 = Good (76%–100%), 2 = Moderate (56%–75%), 1 = Less (<56%).

The role of health workers

This questionnaire is a modified questionnaire from Mandasari [13] adjusted to the theme and research needs. Three questions cover the frequency and implementation of education on the prevention of diabetic ulcers where the answer choices are always, often, sometimes, and never. The consistency and reliability were KR-20 = 0.874–0.949. The questionnaire used an ordinal scale with the following scoring: 3 = Good (76%–100%), 2 = Moderate (56%–75%) and 1 = Less (<56%).

Family support

The family support questionnaire was arranged based on the theme and research needs. This questionnaire consists of five statements that include information support, instrumental, emotional, and appreciation. The answer choices are always, often, sometimes, and never. The consistency and reliability were KR-20 = 0.534–0.840. The questionnaire used an ordinal scale with the following scoring: 3 = Good (76%–100%), 2 = Moderate (56%–75%), 1 = Less (<56%).

Attitude

The questionnaire used to measure the attitudes towards behaviour was a questionnaire prepared based on the theory of planned behaviour questionnaire [14] adjusted with the indicators on the prevention of diabetic ulcers. This questionnaire consists of 24 questions. This instrument consists of two parts in pairs. The first part is a strong belief and the second part is an outcome evaluation. Each section consists of 12

statements, namely statements number 1–12, which constitutes belief and numbers 13–24, which constitute an outcome evaluation. The consistency and reliability was KR-20 = 0.240–0.799. The questionnaire used a nominal scale with a Likert scale 1–4. The scoring was as follows: positive attitude > mean t score, negative attitude < mean t score. Favourable questions (+): 4 = strongly agree; 3 = agree; 2 = disagree and 1 = strongly disagree. Unfavourable questions (-): 1 = strongly agree; 2 = agree; 3 = disagree and 4 = strongly disagree.

Subjective norms

The questionnaire was compiled based on the theory of planned behaviour questionnaire [14] adjusted with the indicators on the prevention of diabetic ulcers. This questionnaire consists of 14 statements. This instrument consists of 7 pairs where the first part is normative belief and the second part is the motivation to complain. Each section consists of 14 statements in which statements number 1–7 being normative beliefs and numbers 8–14 being the motivation to complain. The consistency and reliability was KR-20 = 0.175–0.794. The questionnaire used an ordinal scale with a Likert scale of 1–4. The questionnaire scoring was as follows: good: score \geq mean, less: score < mean. Favourable questions (+): 4 = strongly agree; 3 = agree; 2 = disagree and 1 = strongly disagree. Unfavourable questions (-): 1 = strongly agree; 2 = agree; 3 = disagree and 4 = strongly disagree.

Perception of self-control

This questionnaire was compiled based on the theory of planned behaviour questionnaire [14] which was adjusted according to the indicators of the prevention of diabetic ulcers. This questionnaire consists of 12 questions. This instrument consists of two parts in pairs. The first part is control belief and the second part is power belief. Each section consists of 6 statements where statements number 1–6 are control beliefs and numbers 7–12 are power beliefs. The consistency and reliability are KR-20 = 0.284–0.619. The questionnaire used an ordinal scale with a Likert scale 1–4. The questionnaire scoring was as follows: good: score \geq mean and less: score < mean. Favourable questions (+): 4 = strongly agree; 3 = agree; 2 = disagree and 1 = strongly disagree. Unfavourable questions (-): 1 = strongly agree; 2 = agree; 3 = disagree and 4 = strongly disagree.

Intention

This instrument was arranged based on the theory of planned behaviour questionnaire [14]. The instrument consists of 13 statements. The consistency and reliability were KR-20 = 0.193–0.815. The questionnaire used an ordinal scale with a Likert scale of 1–4. The questionnaire scoring was as follows:

good: score \geq mean, less: score $<$ mean. Favourable questions (+): 4 = strongly agree; 3 = agree; 2 = disagree and 1 = strongly disagree. Unfavourable questions (-): 1 = strongly agree; 2 = agree; 3 = disagree and 4 = strongly disagree.

Behaviour of diabetic ulcer prevention

This instrument uses the Modified Diabetic Foot Care Behaviour Questionnaire from Hadi Sulistyono, Sa'e Sia, & Maneewat [8] which has been modified by the researchers in accordance with the research theme which consists of 16 statements. The indicator questions include DM management and lifestyle modification, foot care and foot exercises. The consistency and reliability was KR-20 = 0.068–0.805. The questionnaire used an ordinal scale with a Likert scale of 1–5. Favourable questions (+): 5 = always; 4 = often; 3 = sometimes; 2 = Rarely and 1 = never. Unfavourable questions (-): 1 = always; 2 = often; 3 = sometimes; 4 = rarely and 5 = never.

Data analysis

Statistical analyses were performed using SEM PLS. Descriptive statistics such as numbers, percentages, mean and standard deviation were used to present the descriptive characteristics of the respondents. This study used a structural equation modelling model based on variance or component-based called PLS (Partial Least Square). The model evaluation consisted of two parts, namely the evaluation of the outer model with the relative indicators evaluated based on the results of the validity and reliability indicators. Convergent validity is the correlation between the reflective indicator scores and the latent variable scores. A factor loading value of 0.5 to 0.6 states that the indicator is valid. Discriminant validity is the value of the cross-loading correlation with the latent variable which must be higher than the correlation with other potential variables. The average variance extracted (AVE) value must be above 0.5 and the composite reliability value is good if it has a value of ≥ 0.7 .

The evaluation of the inner model was done in order to determine the magnitude of the influence or causal relationship between the variables in the study, namely by getting the value of R square (coefficient of determination) and the value of Q^2 (relevance of prediction). R square is a value that explains the amount of influence of the independent variables on the dependent variable. If the Q^2 value is more than two and close to 1, then the model is proven to have predictive relevance. If the Q^2 value is below zero, then the model has no predictive relevance.

Ethical considerations

The Ethical Commission approved this study in *Sidoarjo District Hospital, East Java, Surabaya, Indonesia* with No.

893.3/1875/438.6.7/2019 on February 8th, 2019. Written consent was obtained from all centres. The aim of the study was explained to the participants, and informed consent forms were collected.

Results

The majority of respondents aged 56–65 years old were female, had a high school level of education and the respondents' knowledge was enough. Most respondents stated that the availability of health facilities and accessibility of health resources was enough. The role of health workers in efforts to prevent diabetic ulcers and family support were found to be good. Attitudes towards behaviour indicates that the majority of respondents were negative and had less subjective norms and self-control perceptions. The intention distribution data shows that most respondents were less aware of the prevention of diabetic ulcers. The behaviour of respondents in the prevention of diabetic ulcers includes the management of DM, foot care and foot exercises, which were less (Table 2).

Figure 1 explains the results of the analysis of diabetic ulcer prevention behaviour models in patients with DM in Sidoarjo District Hospital. The analysis shows the relationship between the variables with a level of significance that can be seen in (Table 3).

Based on (Table 3), eight hypotheses were obtained as follows: (1) there was a significant influence from the predisposing factors on the main factors, (2) there was a significant influence from the predisposing factors on the prevention behaviour of diabetic ulcers, (3) there was a significant influence from the supporting factors on the main factors, (4) there was no significant influence from the supporting factors on the prevention behaviour of diabetic ulcers, (5) there was a significant influence from the driving factors on the main factors, (6) there was a significant influence from the driving factors on the prevention behaviour of diabetic ulcers, (7) there was a significant influence from the main factors on intention and (8) there was a significant effect on intention on the prevention behaviour of diabetic ulcers.

Discussion

Predisposing factors (knowledge) affect the main factors (attitudes toward behaviour, subjective norms and self-control perceptions). This is in-line with the research by Lestarina [15] where there was an influence from knowledge predisposing factors on attitude towards behaviour, subjective norms and self-control perceptions in patients with type 2 DM in self-care management. Research by Ghannadi et al. [16] showed the relationship between knowledge and attitude where good knowledge will form a positive attitude in the

Table 2 Distribution of the predisposing factors, supporting factors, driving factors, main factors, intention, and behaviour of diabetic ulcer prevention (N= 133)

Variables	n	%
Predisposing Factors		
Age		
36–45 years	4	3
46–55 years	44	33.1
56–65 years	85	63.9
Gender		
Male	30	22.6
Female	103	77.4
Education		
No school	1	0.8
Elementary School	34	25.6
Junior High School	24	18
Senior High School	54	40.6
Universities	20	15
Knowledge		
Good	37	27.8
Enough	52	39.1
Less	44	33.1
Supporting Factors		
Availability of health service		
Good	44	33.1
Enough	84	63.2
Less	5	3.8
Accessibility of health resources		
Good	53	39.8
Enough	73	54.9
Less	7	5.3
Driving Factors		
The role of health workers		
Good	19	14.3
Enough	64	48.1
Less	50	37.6
Family supports		
Good	58	43.6
Enough	53	39.8
Less	22	16.5
Main Factors		
Attitude		
Positive	52	39.1
Negative	81	60.9
Subjective norms		
Good	64	48.1
Less	69	51.9
Perception of self-control		
Good	62	46.6
Less	71	53.4
Intension		

Table 2 (continued)

Variables	n	%
Good	60	45.1
Less	73	54.9
Behaviour		
Good	29	21.8
Enough	50	37.6
Less	54	40.6

self-care management of patients with DM. Someone who has good knowledge about diabetic ulcers and their prevention efforts can have a positive attitude towards the effort to prevent diabetic ulcers. When someone knows the efforts and benefits of diabetic ulcer prevention, they will have positive confidence in doing so. The more knowledge that a person has about the prevention of diabetic ulcers, the more that that person will have a positive attitude. Good knowledge can be the basis of a patient's beliefs about the benefits of performing certain behaviours, the expectations of those closest to him and the belief in his ability to do certain behaviours.

Research by Ahmet et al., Chin et al. and Indrayana et al. [17–19] showed that self-care behaviour in patients with diabetic ulcers was influenced by patient knowledge. Al Odhayani et al. [20] found that DM patients who have less knowledge about foot care cannot perform optimal foot care. Sayampanathan et al. [21] showed that one of the obstacles experienced by patients when performing foot care is information about foot care itself. DM patient self-care behaviour is influenced by patient knowledge, where DM patients with a good level of knowledge have good self-care behaviour as well [22]. The information obtained increases the patient's knowledge of the foot care that must be performed by the DM patients in an effort to prevent diabetic ulcers. Patients who have good knowledge about DM self-care management, lifestyle modification and foot care will easily do so. Good patient knowledge in efforts to prevent diabetic ulcers can increase their confidence in the benefits of the prevention efforts so then this will be reflected in their behaviour.

The supporting factors in this study are the availability of health facilities and the accessibility of health resources. Jannuzzi et al., [23] stated that the availability of health facilities and the affordability of access to health resources affects the control belief or confidence of DM patients in terms of medication adherence. Gabert et al. [24] stated that the unavailability of optimal health facilities could be a barrier in the care of DM patients. The availability of the early detection of risk factors for diabetic ulcers is one of the supporting elements in the effort to prevent diabetic ulcers [25]. Some of the barriers related to patient affordability concerning the health sources covers transportation, financial and geography. McKee at al. [26] stated that financial factors and limited access to health

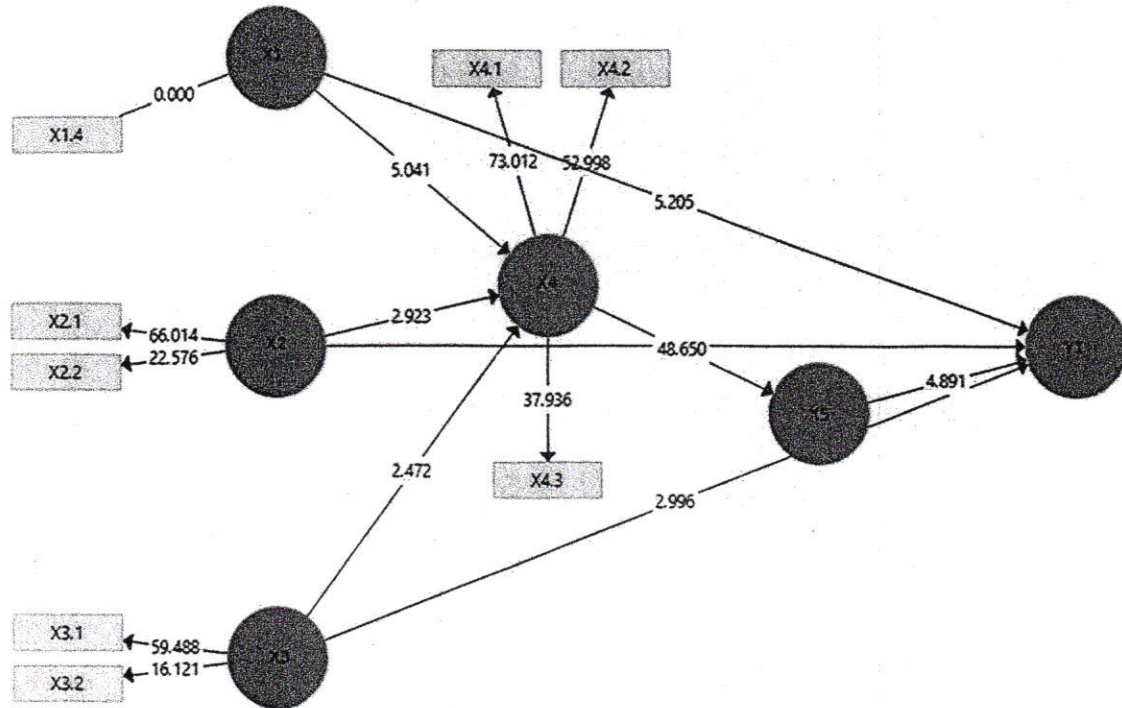


Fig. 1 Structure Model. X1: Predisposing factors; X1.4: knowledge; X2: Supporting factors; X2.1: use of health services; X2.2: accessibility of health resources; X3: Driving factors; X3.1: the role of health workers;

X3.2: family support; X4: Main factors; X4.1: attitude; X4.2: subjective norms; X4.3: perception of self-control; X5: Intention; Y1: Behavior of diabetic ulcer prevention

services affect the DM patients when it comes to managing self-care. Limited access to health services and the ownership of health insurance can affect the care of DM patients [27].

The availability of facilities is a factor that supports and strengthens the formation of health behaviours [28]. The availability of health facilities in the care of DM patients can include the availability of treatment and facilities as well as health financing [29]. The accessibility of health resources is the ability of individuals to search for the needed health services [30]. Research by Dasgupta et al. [31] shows the influence of the

availability of facilities on patient self-care behaviour. The results of the study are not in line with the research by Susila [32] which states that there is no relationship between the availability of facilities and maternal behaviour.

The driving factor in this research is the role of the health workers and family support. The formation of the subjective norms of DM patients is influenced by the role of the health workers [33]. In an effort to prevent diabetic ulcers, health workers can provide education and check the risk factors for diabetic ulcers [7]. The quality of service provided by the health workers influences the attitude of the DM patients in their self-care management [34]. Information regarding the prevention of diabetic ulcers obtained by patients can increase patient confidence that it is necessary to prevent diabetic ulcers. Optimal family support can improve the subjective norm of DM patients in relation to diet management [35].

Health workers play an important role in the efforts to prevent diabetic ulcers in DM patients, especially when educating patients about the prevention of diabetic ulcers [36]. The role of the health workers in foot care can improve foot care behaviour [37, 38]. The role of health workers in efforts to prevent diabetic ulcers come in the form of education and consultation which relates to the management of therapeutic measures to control glycemic levels and foot care. They also conduct the early detection of the risk factors for diabetic ulcers [39].

Attitudes toward behaviour will affect one's intentions towards a behaviour in turn. Research has showed that there is a

Table 3 Results of the Statistical Hypothesis Testing Behaviour Model for Diabetic Ulcer Prevention in DM Patients

Influence	T	p
X1 → X4	5.041	0.000
X1 → Y1	5.205	0.000
X2 → X4	2.923	0.004
X2 → Y1	1.481	0.139
X3 → X4	2.472	0.014
X3 → Y1	2.996	0.003
X4 → X5	48.650	0.000
X5 → Y1	4.891	0.000

X1: Predisposing factors; X2: Supporting factors; X3: Driving factors; X4: Main factors; X5: Intention; Y1: Behaviour of diabetic ulcer prevention; $p \leq 0.05$ (significant); $T \geq 1.96$ (significant)

relationship between attitude towards behaviour with the intention to take medication in DM patients [40]. A positive attitude increases the intention towards a behaviour. This is in line with the research conducted by Guénette et al. [41] where a positive attitude affects the intention of the DM patients in their treatment. The patient's attitude is influenced by the patient's knowledge of the benefits of managing DM and regular foot care. When the patient believes in the benefits of preventing diabetic ulcers, there is an intention to prevent the diabetic ulcers themselves. A study conducted by Basu et al. [42] showed that patients who use insulin about reported higher care but show less optimal glycemic control when compared to patients who only use oral hypoglycemic agents. However, dual treatment can cure and prevent diabetes effectively.

Intention is a direct factor in behaviour where individual behaviour will be consistent concerning the intentions towards the behaviour. Where an individual has the intention to carry out certain behaviours, they will do so. The results of this study are in line with the research conducted by Sainsbury, Mullan, & Sharpe [43] who found that intention had a significant effect on behaviour change. Akbar, Anderson & Gallegos [44] states that intention is a predictor of the formation of DM patient behaviour and self-care management. Gattoc, et al., Ferreira & Pereira [45, 46] stated that intention in foot care affects foot care behaviour in DM patients.

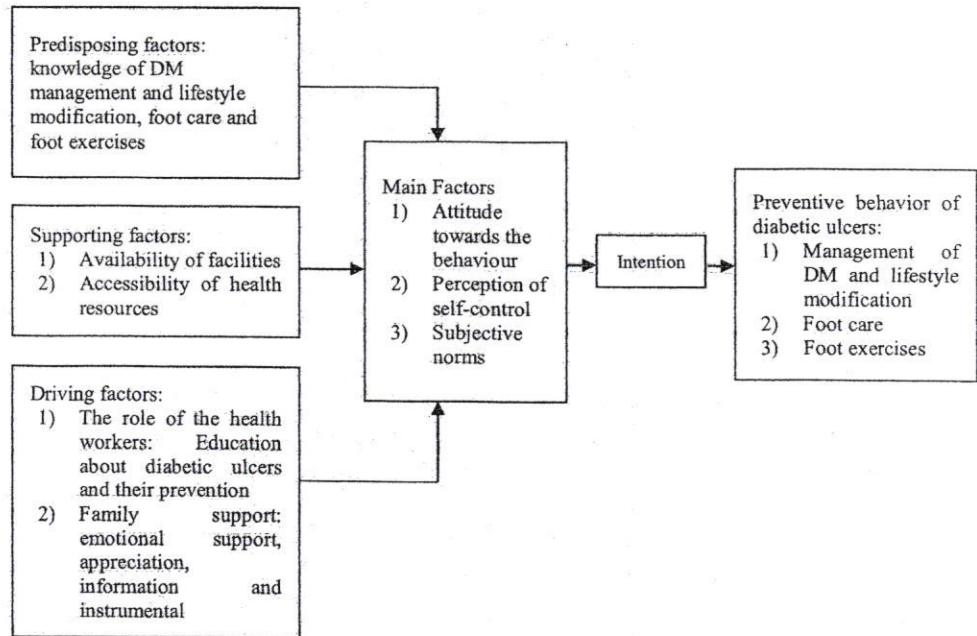
Structure of the behaviour model for diabetic ulcer prevention

Predisposing factors, namely knowledge about the prevention of diabetic ulcers including DM management and lifestyle

modification, foot care and foot exercises, affect the main factors. In addition to the predisposing factors, supporting factors which include the availability of health facilities and the accessibility of health resources also influence the main factors where the availability of health facilities and the accessibility of good health resources can improve the attitude, subjective norms and perception of self-control in the patients in the prevention of diabetic ulcers. Limited health facilities and access to the health services can be a hindering factor for the patients in preventing diabetic ulcers. The role of the health workers and family support, which is a driving factor, also influences the main factors. The role of the health workers, especially when providing information about diabetic ulcers and prevention efforts as well as the family involvement in providing emotional support, appreciation, information and instrumental involvement, can improve the attitudes towards the behaviour, subjective norms and perceptions of the self-control of the patients.

The main factors include attitudes toward behaviour, subjective norms and self-control perceptions. These affect the intention of the patients in the context of the effort undertaken to prevent diabetic ulcers. Confidence in the benefits of the efforts to prevent diabetic ulcers, the motivation to behave according to the expectations of the people around them such as the health workers and their family and confidence in the ability of the self can increase the intention or desire of individuals to do the prevention of diabetic ulcers behaviour. The preventive behaviour of diabetic ulcers which includes adherence to self-care management and lifestyle modification, optimal foot care and foot exercises are influenced by the patient's good intentions towards diabetic ulcer prevention (Fig. 2).

Fig. 2 Findings of the Behaviour Model of Diabetic Ulcer Prevention in the DM Patients in Sidoarjo District Hospital



Limitation

The instrument in this study used a subjective questionnaire without observing any respondent behaviour.

Conclusion

Predisposing factors which include knowledge affect the main factors which include attitudes toward behaviour, subjective norms and the self-control perceptions of the DM patients in terms of diabetic ulcer prevention. Predisposing factors which include knowledge affect the behaviour of DM patients related to preventing diabetic ulcers. Supporting factors which include the availability of health facilities and the accessibility of the health resources affect the main factors which include attitudes towards behaviour, subjective norms and the self-control perceptions of DM patients when seeking to prevent diabetic ulcers. Supporting factors which include the availability of the local health facilities and the accessibility of the health resources do not influence the behaviour of diabetic ulcer prevention in DM patients.

Encouraging factors which include the role of the health workers and family support influence the main factors which include the attitudes towards behaviour, subjective norms and self-control perceptions in DM patients in the context of preventing diabetic ulcers. Encouraging factors which include the role of the health workers and family support influence the behaviour of DM patients in terms of preventing diabetic ulcers. The main factors which include attitudes toward behaviour, subjective norms and the perceptions of self-control affect the intention of the DM patients to prevent diabetic ulcers. Intention influences the behaviour of diabetic ulcer prevention in DM patients.

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Development of Asthma Management Based on Health Belief Model in Parents

Tintin Sukartini, Sandi Alfa Wiga Arsa, Sri Utami, Nursalam Nursalam

Abstract— Asthma is chronic diseases which often happened in childhood, while parents are the key to control asthma by provide adequate education. This study aimed to increase belief in parents about asthma in their children who consists of four components that build beliefs. A quasi-experiment design with 33 samples parents of Children aged 6 - 11 with asthma. Measurement of belief in parents using the development of the Health Belief Model (HBM). The educational intervention given used an asthma-based childhood management module in the prevention of asthma relapse. MANOVA was used to determine the effect of management of asthma on belief-based children given to parents. Chi-square test showed no difference of respondent characteristic on education, occupation, age, asthma information and sex ($p > 0.05$). F group prices for Pillai Trace, Wilk Lambda, Hotelling's Trace, and Roy's Largest Root have significance values < 0.001 ($p < 0.05$). It showed a significant influence in every variables of the group on the component of the belief. Strength of the relationship also showed between the management of asthma in belief components, which were indicated by partial Eta Squared value, perceived susceptibility/seriousness (0.486), perceived benefit (0.547), perceived barrier (0.539), and self- 0.150) of parents. The education intervention for management asthma integration with HBM theory can be used as an alternative education all parents. Healthy behaviors that individuals do because of the belief about the benefits of a new activity, usually prevent the arrival of the disease.

Keywords— Asthma management, Health Belief Model, Children, Parents.

I. INTRODUCTION

Asthma was chronic disease which often happened in childhood, it causes deaths occur in country with average low and middle income [1],[2]. Asthma is a chronic inflammatory respiratory disorder involving various inflammatory cells. The basis of this disease is bronchial hyperactivity at various levels, airway obstruction, and respiratory symptoms [3]. This disease is still a public health problem in various countries in the world, suffered by children to adults with degrees of disease from mild to severe, even in some cases causing death [4],[5].

Asthma become crussial in childhood health because it can recurrence and occur last long, school aged childrens have experince exacerbation of asthma is 3.4 million and it makes increasing 18.9 times patient become emergency condition [6]. Although the level of morbidity or mortality in children is not caused by asthma, but health service must concern about this problem. It can be important because high recurrence rates in children can reduce children's quality of life, disrupt growth, restrict activities in habitual, sleep, decrease school attendance rates, and led to declining the children's achievement [1],[7]. Parents are important and the key to controlling asthma in children, so adequate education is needed [8].

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Parents lack an understanding of the role of various asthma management medications and therapies including preventive strategies and management at home in the face of recurrence. Management of asthma is generally influenced by family characteristics [9] add asthma education to affect a child's asthma management skills [10],[11] found that modified education in asthma give result for parent to manage asthma in their child. Based on previous reseach that had conducted, children still dependent on their parents and can not to make decision for their self, so it makes problem difficult to solve. [10]. The goals of asthma management are achieved through partnerships between parents/nurses and teams of health professionals, with cycles: assessing (diagnosis, symptom control, risk factors, inhaler techniques, adherence, parental preferences), adjusting medications (drugs, pharmacological, and treatment of modifiable risk factors), reviewing responses including treatment effectiveness and side effects [12]. Parental management of children with asthma contribute as important role to achieve goals in controlling asthma. Based on Health Belief Model (HBM) approach, management in asthma can help parents to manage and to control asthma. This theory is a theory of behavioral changes in health and psychological models that can be used to predict health behavior by focusing on individual perceptions and beliefs on disease [13],[14].

The Health Belief Model (HBM) has been widely used to measure health beliefs and behaviors [14]. HBM is a cognitive model that tries to identify healthy behavior patterns. The susceptibility, seriousness, benefits, and perceived barriers are the four main components of HBM. The behavior is explained by HBM as follows from a combination of attitudes related to the four concepts [13]. Researchers compiled an education module for parents with children with asthma based on the basic concepts of HBM which were then applied for the purpose of this study which is to increase parents' trust in asthma in their children which consists of 4 components that build confidence are: perceived susceptibility / seriousness, perceived benefits, perceived barriers, and self-efficacy. This study aimed to increase belief in parents about asthma in their children who consists of 4 components that build beliefs.

II. LITERATURE REVIEW

The literature review showed that researchers have been analyzing the commonly management of asthma in the world, because researcher tried to study about the other alternative about astma using conceptual theory. Asthma was a world problem in childhood and it needs role from interdiciplinary sector to manage it, eventhough government and community [4],[5]. The previous research that conducted in management of asthma had been done by some country and scientist, they conducted in medical sector, nursing sector and other diciplinary. One of the study about asthma stated that health service must concern about this problem. It can be important because high recurrence rates in children can reduce children's quality of life, disrupt growth, restrict activities in habitual, sleep, decrease school attendance rates, and led to declining the children's achievement [1],[7]. This statement is supported by the other research that parents was the key role in management of asthma patient, parents can give treatment to their children and controlling habituality of children, so asthma can to control and children may not get asthma attacked and exacerbation period [8].

The parents of the children should understand about caring in their child that have asthma, but in our environment there still many parents did not understand what they should do, it make the condition of their children getting worse. Previous study conducted that parents lack an understanding of the role of various asthma management medications and therapies including preventive strategies and management at home in the face of recurrence. Management of asthma is generally influenced by family characteristics [9] add asthma education to affect a child's asthma management skills [10],[11] found that modified education in asthma give result for parent to manage asthma in their child. Based on previous research that had conducted, children still dependent on their parents and can not to make decision for their self, so it makes problem difficult to solve [10].

Based on some previous research, we interested to conduct study about management asthma with novelty was parents contributing in managed their children. We modified the theory from Health Belief Model in integrating with parents behavior. The Health Belief Model (HBM) has been widely used to measure health beliefs and behaviors [14]. HBM is a cognitive model that tries to identify healthy behavior patterns. The susceptibility, seriousness, benefits, and perceived barriers are the four main components of HBM. The behavior is explained by HBM as follows from a combination of attitudes related to the four concepts that build confidence [13].

III. DATA COLLECTION

This study conducted with quasi-experiment quantitative design. The study sample was parents of Children (6 – 11 years old) that diagnosed asthma who came for treatment between the month of January until April 2018 at Pediatric Department in Mardi Waluyo Hospital Blitar, Indonesia. G Power software used to determine sample size, using 5% rate of error and the power was 95% [15]. Mean group I had assumptions 59.50 and SD 17.23 while mean group II has assumptions of 44.9 and SD of 12.19. So using the software generates a sample size of 33 samples per group. 33 respondents in the treatment group and 33 control group respondents, and sample was taken by simple random sampling.

A questionnaire modified from Becker et al., (1978) and Bursch, Schwankovsky, Gilbert, & Zeiger (1999) [16] based on the Health Belief Model (HBM) used to Measure belief in parents. The questionnaire of parent's belief totaled 48 questions consisting of perceptions of susceptibility/seriousness, perceived benefits, perceived barriers, and self-efficacy. The belief questionnaire has an interval scale, with a score of 1-5 answer choices each question. Before use, the first step was measured validity of the instrument. The level of validity was tested with Pearson's product moment correlation obtained the range value for r count 0.99 - 0.605, while the reliability was tested with Cronbach alpha with a value of 0.89, the results showed a valid and reliable belief questionnaire.

The intervention tool of education used an asthma-based childhood management module in to prevent asthma relapse. The module was developed before the study began, where the module preparation process had consulted with the figure that have experts. Intervention was developed and focused on 4 Health Belief Model (HBM) constructions: perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers, and self-efficacy, 3 times in 3 meetings conducted based on the distribution of educational materials given: 1) Assessment/rate 2) adjust the treatment 3) review. While the time taken was 21 days based on, that habits can be established by giving the child's asthma diary to be filled with

parents. The protocol of this study was approved by Commission of Ethical Faculty of Nursing, Airlangga University, and number of certificate was 642-KEPK. The effect of asthma management on belief-based children given to parents on the belief component of the parents, namely perceived susceptibility/seriousness, perceived benefit, perceived barrier, and self-efficacy test used MANOVA

IV. DATA ANALYSIS

Table 1 showed the competencies developed in the management of asthma in belief-based children. The component of parents competencies to developed were 1) assessing children asthma by Improving perceptions of seriousness/susceptibility in performing assessment, Improve the perception of benefits in conducting assessment, Reduce the perception of obstacles in managing asthma in children and Increase parental-beliefs in assessing child's asthma; 2) Adjust the management of childhood asthma by Increase perceptions of seriousness/susceptibility, the perception of benefits, Reduce the perception of obstacles and Increase the belief of parents to manage asthma in their children; and 3) Review response of asthma management by Increase the perception of seriousness/susceptibility in reviewing the management response to asthma in children and improve the perception, Increase the perception of parents about the obstacles in reviewing the response of management of asthma in children and Increase parents' belief in reviewing the response of asthma management in children.

Table 1 Competencies developed in the management of asthma in belief-based children

No	Asthma Management	Basic Activities of Belief	Materials
1	Assessment child's asthma	Improving perceptions seriousness/susceptibility in performing assessment	Explain the concept of asthma 1. Understanding Asthma 2. Signs and symptoms 3. Classification of asthma 4. Risk factors 5. Childhood Asthma Disorders
		Improve the perception of benefits in conducting assessment	Describes the benefits of assessing childhood asthma
		Reduce the perception of obstacles in managing asthma in children	Explain the asverse effects of not performing asthma management
		Increase parental beliefs in assessing child's asthma	Teach you how to assess asthma in children: 1. The degree of asthma control 2. Peak flow meter 3. Daily notes of asthma 4. Rainbow of asthma
2	Adjust the management of childhood asthma	Increase perceptions of seriousness/susceptibility in the management of asthma in children	Describes the purpose of asthma management in children.
		Increase the perception of benefits in doing the management	Explain the benefits gained in the management of asthma
		Reduce the perception of obstacles in managing asthma in children	Explain the adverse effects of not performing asthma management.
		Increase the belief of parents in the management of asthma in children	Explain about the management performed on children with asthma Medicaments: 1. Asthma medicines 2. Use of inhaled drugs 3. Management of asthma attacks at home. Non-medical: 1. Identification and controlling control of the originator

3	Review the response to asthma management	Increase the perception of seriousness/susceptibility in reviewing the management response to asthma in children	Explain the importance of evaluating the management that has been undertaken
		Improve the perception of benefits in reviewing the management response to asthma in children.	Explain the benefits of doing a review of the management that has been undertaken.

	Increase the perception of parents about the obstacles in reviewing the response of management of asthma in children.	Explain the adverse effect of not evaluating the management.
	Increase parents' belief in reviewing the response of asthma management in children.	Explains how to monitor child's asthma

Table 2 shows that the majority of respondents graduate secondary education (Intervention group Vs Control group, 48.5% Vs 57.6%). The majority of respondents' occupations from the two groups were housewives by 66.7% in the group of intervention and 63.6% in the control group. Respondent's age range in intervention group was 31-35 years and in the control group in the 26-30-year age range with the same percentage of 39.4%. Based on information about childhood asthma that a parent has found, the majority did not receive previous asthma information (Intervention group Vs Control group, 48.4% Vs 36.4%).

Table 2. Distribution of respondent characteristics

	Intervention		Control		p value
	n	%	n	%	
Education					
Basic	10	30,3	9	27,3	0,857
Medium	16	48,5	19	57,5	
High	7	21,2	5	15,2	
Jobs					
Housewife	22	66,7	21	63,6	0,484
Entrepre	6	18,1	6	18,2	
Officer	5	15,2	3	9,1	
Freelance			3	9,1	
Age					
21-25	4	12,1	9	27,3	0,107
26-30	12	36,4	13	39,4	
31-35	13	39,4	8	24,2	
36-40	4	12,1	3	9,1	
Asthma Information					
No	16	48,4	12	36,4	0,274
TV	3	9,1	3	9,1	
Media	5	15,2	8	24,2	
Nurse	5	15,2	2	6,1	
friend	1	3,0	2	6,1	
Internet	3	9,1	6	18,1	
Gender					
Male	33	100	33	100	1.000
Female	0	0	0	0	

All respondents are 100% female. The chi-square test shows that there is no difference of respondent characteristic on education, occupation, age, asthma information, sex, with $p > 0.05$ which means that both groups are equal or equal. The data distribution normality of each variable (Kolmogorov-Smirnov test), with significant value ($p > 0.05$) which means normal data distribution. The distribution of pre and post data on each variable is normally distributed with $p > 0,05$. The Lavene test also shows the results of homogeneity of the variable values in this study with sig value $> 0,05$.

Table 3. Multivariate test

Effect	Value	Sig.
Pillai's Trace	.588	<0.001
Wilks' Lambda	.412	<0.001
Group		
Hotelling's Trace	1.429	<0.001
Roy's Largest Root	1.429	<0.001

Table 4. Test of Between-Subject Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
	Suscability	89.833	1	89.833	60.423	<0.001	0.486
	Benefit	101.879	1	101.879	77.176	<0.001	0.547
Group							
	Barrier	94.561	1	94.561	74.743	<0.001	0.539
	Self-Efficacy	14.561	1	14.561	11.306	0.001	0.150

Table 3 shows Multivariate significance test results. The results of the analysis show that F group prices for Pillai Trace, Wilk Lambda, Hotelling's Trace, and Roy's Largest Root have significance values <0.001 ($p < 0.05$). This shows that the value of F for Pillai Trace, Wilk Lambda, Hotelling's Trace, and Roy's Largest Root were significant. It can be concluded that there is a significant influence between variables both two groups on the component of the belief that is perceived susceptibility/seriousness, perceived benefit, perceived barrier, and self-efficacy of parents. Data has same variance because the value of sig > 0,05, so the second condition for MANOVA test fulfilled.

Table 4 shows the results of differences in perceived susceptibility/seriousness, perceived benefit, perceived barrier, and self-efficacy between two groups. This study is showed there was a relationship between the management of asthma in belief with perceived susceptibility/seriousness (<0.001), perceived benefit (<0.001), perceived barrier (<0.001), and self-efficacy (0.001) for intervention group and control group. There was also a strength of the relationship between management of asthma with belief components, which were indicated by partial Eta Squared value, perceived susceptibility/seriousness (0.486), perceived benefit (0.547), perceived barrier (0,539), and self-0.150) of parents.

VI. STUDY RESULTS, SUMMARY AND CONTRIBUTION

Research showed belief-based asthma management education had effect on belief, where parents' beliefs about the condition of asthma suffered by children in an effort to prevent recurrence have increased. 4 belief components are perceived barriers, perceived susceptibility/seriousness, perceived benefits, and self-efficacy. Belief improvements are obtained through asthma management education which includes assessment, treatment adjustment and review of treatment with belief-based for 21 days divided into 3 meetings.

This is in line with research conducted by Walker et al (2009) showing there is a relationship of family belief in asthma management with clinical outcomes of inflammatory asthma in children, family changes in the cognitive domain will affect on other domains [17]. Research conducted by Searle, Jago, Henderson, & Turner, (2017) demonstrates the role of family function through education with a belief approach to increase parental confidence in the management of asthma in children. Studies measured on parents that have children with asthma in pre-school level, the results showed that higher self-efficacy in parents make their confidence to perform asthma management, such as administration of drug, judgment and make a decision [18]. Parental beliefs that managed asthma in children

can increase parent and subcontinent compliance (treatment behavior, environmental behavior, self-management, and behavior to consultate with health) [19].

This belief-based education strategy enhances parents' perceptions of the seriousness and susceptibility of asthma suffered by children when parents understand the basic concepts of asthma and the problems facing children. Belief in this study shows the perception of parents to the problems encountered. The perceived benefit is the assumption of parents in following the advice of health workers to manage asthma in children who have been given, does it provide benefits in recurrence of asthma relapse, so that parents feel the value of benefits obtained [20]. Perceived barrier is a thought of the parents' fidelity regarding the value paid to carry out the suggested advice as a barrier factor. Perceptions of profit will be greater and the perceived obstacles can be reduced with the education that has been given. Parents' beliefs that their ability for assess asthma in certain situations are particularly important in relation to overcome recurrences [21]. Parents who have high self-efficacy in terms of doing asthma assessment, then believe in his ability to behave in assessing. When parents aware of asthma's worsening asthma symptoms and identified of triggers become strategy management between parents and children, so it can reduce the symptom of asthma [18].

Increased parental beliefs about preventing childhood asthma relapse have a positive effect on the asthma's management in children. Better beliefs about asthma allow for the reduction of exacerbations, urgent care, decided to bring to the hospital, increased school attendance, undisturbed child social activity and improved quality of life [22]. Avoiding asthma triggers can improve quality of life and reduce asthma's exacerbations [23]. Increased confidence adds to the knowledge and understanding of the concept of asthma, theoretically also can be attributed to educational factors, based on the characteristics of parents based on the education of the majority of secondary education level. Education here is associated with a person's learning process, where a person with higher education will tend to more easily absorb a lot of information. This is in line with research by Macy & Stanley (2010), which divides the research group into lowliteracy groups and high-literacy groups, a higher frequency distribution of education in high-literacy groups. after being given educational management of asthma given to both groups, high health literacy group has value [24] Beliefs of parents and guardians increased health conditions in children is very important by health professionals to improve understanding in managed children with asthma, the understanding become a parent consideration to avoidance of factors triggering for asthma's recurrence [25]. This belief-based asthma management education emphasizes parents belief to act of preventing childhood asthma relapse, the parent's belief about education indicates a change in action. The statement was suitable with meta-analysis study that carried out by Carpenter (2010) that describes confidence that targeted in a communication campaign leading a positive health behaviors. Confidence directing of the components in the HBM can construct a positive direction, and behavioral adoption of positive health behavior can be formed [26].

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