Development of A Community-Based Care Program to Prevent Type 2 Diabetes Mellitus in Rural Areas of Indonesia

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Abstract— *Diabets mellitus is one of helath problem in the wolrd and Indonesia and its prevealence incresed each year. It is important to prevent type 2 diabetes mellitus because the occurrence of the desease can be prevented or delayed. This study aimed to develop a community-based care program to prevent type 2 diabetes mellitus in rural areas of Indonesia. This study used action research design consisted of phase of look, think, and act. Data collection carried out by questionnaire, focus group discussion, in-depth interview, and observation. This study revealed that the problem of people at risk for type 2 diabates mellitus was lack of knowledge about disease and its prevention. To address the problem, a diabetes prevention education program was developed through the phase of action research. After one and a half months of implementation phase, evaluation was conducted and revelaed that risk people of type 2 diabetes mellitus perceived incraesed knowledge on diabates and its prevention as well as gradually followed lifestyle to prevent diabetes mellitus in their daily activities. This action research was conducted in the first cycle. Therefore, second cycle is recommended to gain deeper understanding of the effectiveness of the program.*

Keywords—*Type 2 diabetes mellitus prevention, community-based care, action research, Indonesia.*

I. INTRODUCTION

Diabetes mellitus is characterized by impaired metabolism carbohydrates, lipids, and protein leading to hyperglycemia. In general, diabetes can be divided into two primary form of insulin deficiency, called type 1 diabetes, and the occurrence of resistance of body cells to insulin, called type 2 diabetes. Type 2 diabetes is the most common form, which account for 90% to 95% of all diabetic patients (Wu, Ding, Tanaka, & Zhang, 2014). Diabetes mellitus become major public health problem in the world because its prevalence increased each year and its effect on health. The disease affected an estimated an estimated 171 million people worldwide in 2000, and estimated to rise to 366 million by 2030. The increasing number caused by the increasing of age, obesity, and urbanization of the world population. Diabetes was the fifth leading cause of death in the world in 2000 (Diabetes Prevention Program Research Group, 2009). The prevalence of diabetes mellitus in Indonesia was increased from 5.7% and 6.2% respectively in 2007 and 2015 (Soewondo, Ferrario, & Tahapary, 2013). The disease and its complications have a broad impact both to the patients themselves and to other aspects of their life such as their families, communities, health care system, and even they own country's economies (Naemiratch & Manderson, 2006; Ramachandran, Wan Ma, & Snehalatha, 2010). In terms of macrovascular, individual with diabetes may suffer from cardiovascular disease such as angina pectoris, myocardial infarction, and stroke. In terms of microvascular, diabetes complications are retinopathy and neuropathy. All of these conditions will reduce their health-related quality of life (Solli, Stavem, & Kristiansen, 2010).

The trend of increasing diabetes prevalence is correspondingly followed by the prevalence of people with risk for diabetes. Recent report of International Diabetes Federation stated that approximately 318 million, or 6.7% of adult people in the world are at risk to develop diabetes (Zhao et al., 2016). In Indonesia, a result of study that conducted nation-wide throughout 33 provinces across Indonesia, show that 10% of adult population was at risk for diabetes. The number of risk population was almost twice higher than the prevalence of diabetes (Soewondo & Pramono, 2011). The progression of risk people developed into type 2 diabetes is not happen acutely, it develops gradually over time. The incidence of risk population become diabetes may took time around 5 to 7 years and the incidence are varied among different countries and race. More interestingly, the statement of American Diabetes Association, the percentage of progression of individuals at risk into diabetes can reach 70%. Hence, prevention of diabetes is the ultimate opportunity to address the personal and societal burden of type 2 diabetes (Whittemore, 2011). Therefore, since 2006, the prevention of diabetes has become a resolution of the United Nations (UN) which stated that diabetes as a serious global condition which need urgent prevention. Every member of the UN is called to develop and to implement programs towards this goal through national policies (Ramachandran et al., 2010).

In Indonesia, some of the challenges that arise in efforts to control diabetes and other NCDs include the following aspects: 1) un-optimal support on the programs; 2) community behavior who are at risk; 3) un-optimal service capacity; and 4) weak data availability for program management (Indonesia Ministry of Health, 2017). Community-based care defines as care in which people can receives care while their living in their home, aiming to fulfill the needs of people, and the activities are involving the participation and responsibility of people which is fit to their community (Rachlis et al., 2013). Community-based care is mandated by law in Indonesia as

stated in the Indonesia Presidential Decree (Indonesia Presidential Decree, 2012), the involvement of community to achieve the goal of health need to be conducted. In the Indonesia presidential decree also state that the national health system will function optimally if the program supported by empowerment of individuals, families and communities. Community is not merely as the target of health development, but also as subjects or organizers and actors of health development. Therefore, community empowerment become very important in order to achieve the ability and willingness of community to act as the actors of health development in Indonesia. According to Naylor & Buhler-Wilkerson (1999), implementation of a community-based program must be culturally relevant to local custom and linguistic preferences.

A community-based care program, therefore, can support the prevention of diabetes and other NCDs in Indonesia because as stated by Indonesia Ministry of Health (2017), the approach to prevention of non-communicable diseases in Indonesia which refers to global and regional agreements that apply following basic principles such as equality (equity), cross-sector and stakeholder involvement, and community empowerment. Community-based care is important because it has chance to give a care based on characteristics of the community (Kucukyazici, Verter, & Mayo, 2011).

Development of a community-based care program to prevent type 2 diabetes mellitus has been conducted through an action research, because action research has similar characteristics with those statement of the Indonesia Ministry of Health. Action research has characteristic of participative, which means an approach that invite the participants to be aware of the need to change and voluntarily play an active role in conducting the research process and change process. This approach can draw information which was suite to the cultural and social context of the selected community. Action research is also democratic, in which the participants are considered equal to each other. Thus, researcher and participants discussed together about how the process of this research conducted and what exactly their problems in the community as well as to decide what action should be done. The other characteristic, action research concurrently contributing to generate new knowledge and social change (Koshy, Koshy, & Waterman, 2011). When community member involved in problems that need to address, it stimulates a motivation for regular participation to implement action plans. In other words, if individuals were part of identifying and creating their activities environments, positive direction and action would be achieved (Streubert & Carpenter, 2011).

II. OBJECTIVES

The objective of this study was to develop a community-based care program to prevent type 2 diabetes mellitus in rural areas of Indonesia.

III. METHODOLOGY

This study employed action research, and carried out by following the spiral steps of action research process. Action research is cyclical in the sense that it represents an action cycle consisting of look, think, and act (Stringer, 1996). This study took place on two sub-districts, part of Deli Serdang district, North Sumatera Province, West part of Indonesia archipelago. In this study, one village was chosen from each sub-district, village 1 and village 2 with inclusion criteria of having people who are at risk of type 2 diabetes from each village and willing to participate in the whole process of the project.

Participants involved consisted of 2 village headmen (one from each village), 2 health care providers (one from each village), 11 health volunteers (6 from village 1 and 5 from village 2), and 53 risk people of type 2 diabetes mellitus (26 from village 1 and 27 from village 2). To recruit participants who were at risk for type 2 diabetes mellitus, researcher and health volunteers worked together on screening in the two villages by using Indonesian version of the Finnish Diabetes Risk Score (the FINDRISC). Then, person whose total score of ≥ 9 were randomly asked to be participants in this study. Technic of recruiting participants was employed by purposive sampling.

Since this study is action research, a qualitative research, thus the researcher is automatically become the instrument in this project (Pezalla, Pettigrew, & Miller-Day, 2012). In addition, there were five instruments also used in this research as follows: 1) questionnaire to screen risk people of type 2 diabetes. The questionnaire was the Finnish Diabetes Risk Score (the FINDRISC) form, which consist of eight items: age, body mass index, waist circumference, consumption of fruit or vegetables every day, physical exercise for at least 30 minutes per day, history of using anti-hypertensive drugs, family history of experiencing diabetes, and history of elevated blood glucose levels. This questionnaire has proven to be reliable, and valid on research conducted in more than 15 countries worldwide (Zhang, Zhang, Zhang, Hu, & Chen, 2014). The researcher has had permission to use and to translate it into Indonesia language. The questionnaire was translated by the Australia Centre Medan which are managed and run by English-speaking native people from Australia and local Indonesians who are fluent in English; 2) questionnaire to collect demographics data of risk people of type 2 diabetes mellitus consisting of age, sex, marital status, ethnicity, education level, family monthly income, employment status, and smoke history; 3) questions guideline to conduct focus group discussion (FGD) for risk people of type 2 diabetes. The questions guideline consisting of questions to ask about perception, self-care, obstacles to do self-care, and policy on prevention of type 2 diabetes mellitus; 4) questions guideline to conduct FGD for health volunteers.; 5) questions guideline to conduct in-depth interview for village headmen and health care providers. The questions guideline for health volunteers, village headmen, and health providers consisting of questions to ask about perception, community activities, obstacle to conduct the community activities, strengths and weaknesses community activities, and policy on prevention of type 2 diabetes mellitus. A tape recorder was used to record conversation during FGD and in-depth interview. Participant observation and field notes were taken during the whole research process to capture and record what researcher saw and heard, as well as to record researcher's own reflection.

In this study, researcher followed criteria to maintain trustworthiness of the study result, which consisted of credibility, transferability, dependability, and confirmability (Farrelly, 2013). The techniques to establish trustworthiness in this study conducted as follow: 1) credibility, which is parallel to validity, conducted by prolonged engagement, member checking, and persistent observation; 2) transferability, which is parallel to external validity, conducted by purposive sampling; 3) dependability, which is parallel to reliability, was done by external audits and audit trail; 4) confirmability, which is parallel to objectivity, was also done by external audits and audit trail. This research process commenced after researcher get approval from Ethical Committee for Human Research of Khon Kaen University, Thailand (Reference No. HE602213). Researcher also applied ethical consideration in each step of the research activities. As guidance, researcher followed ethical principles for the protection of participants which is known as autonomy, beneficence and justice.

This action research was carried out by following action research steps suggested by Stringer (1996) which consisted of phases of look, think, and act. Look phase aimed to build a picture which consisted two process of data gathering and communication process. Think phase aimed to use interpretive process to distill the information gathered and to identify key features and elements of people experiences. Think phase consisted of two process of data analysis and problem analysis. Act phase aimed to resolving the problem. The purpose of act is to plan and implement practical solutions to problems as well as to evaluate the implementation of action plan.

IV.   RESULTS

General Information of Participants

General information of risk people for diabetes type 2 who participated in this study are displayed on table 1.

Development of A Community-based Care Program

The purpose of this research was to develop a community-based care program to prevent type 2 diabetes mellitus in rural areas of Indonesia through action research. As a summary, this study results displayed in figure 1.

Look

In the look phase, two activities were employed, gathering data and communication. The gathering data conducted by screening process to identify people at risk for type 2 diabetes mellitus, FGD and in-depth interview were conducted to obtain data from participants about perception, community activity, self-care, obstacle to conduct the community activities, strengths and weaknesses community activities, and community policy on the prevention of type 2 diabetes mellitus in their villages. Then, the data were transcribed and written in paper. These data were communicated to the participants in order to be validated. The validated data were obtained and analyzed.

Think

In the think phase, there were two activities conducted, qualitative data analysis and problem analysis. Qualitative content analysis was employed to analyze data obtained from FGD and in-depth interview. Qualitative data analysis was undertook guided by Elo & Kyngäs (2008). There were five themes emerged from qualitative content analysis: 1) meaning of diabetes mellitus; 2) diabetes mellitus risk factors; 3) low self-care; 4) insufficient activities; and 5) no community policy. Problem analysis aimed in identifying problems, prioritizing the problems, and identifying the problems which unable to address. To conduct the problem analysis, researcher and participants followed steps of modified Nominal Group Technique (NGT) proposed by Nilvarangkul (2002). In this process, by a democratic sphere, a consensus was gained to decide problem statement. In conclusion, the problem statement was lack of knowledge about diabetes and its prevention.

Act

In the act phase, there were three activities conducted: planning, implementing, and evaluation. The purpose of planning activity was to identify an action plan to address the problems. Because the problem was lack of knowledge about diabetes and its prevention, thus, the objective of action plans was to increase the knowledge of risk people of type 2 diabetes mellitus about diabetes and its prevention. To reach the objective of action plan, a diabetes education prevention program was established.

The purpose of implementing was to commence the action plan that has been developed in planning process. To address the problem of lack of knowledge about diabetes and its prevention, researcher implemented action plan by providing education to risk people of type 2 diabetes mellitus in both villages. To conduct this activity, researcher have been developed a booklet about diabetes mellitus and its prevention which was easy to understand by participants. The booklet was developed by using words and sentences which can be easy to understood by lay person. The booklet was developed in Indonesia language. The booklet developed based on what exactly the participants need. The content of the booklet for education of diabetes mellitus were definition and type, risk factor, signs and symptoms, complication, how to diagnose, prevention, and treatment of type 2 diabetes mellitus. In addition, material on healthy diet and physical activity also included in the booklet. Healthy diet education session was focused on how to choose foods (rice and bread) and snacks, drinks, type of vegetables and its servings, type of fruits and its servings, limitation of alcohol consumption, type of meat, and how to choose fats. In the physical activity education session, participants were advised in implementing of several type of physical activities. For participants who have sedentary lifestyle and have light physical activity were requested to be physically active as many as 3 – 5 day a week, for at least 30 minutes per day, total of 150 minutes per week. In addition, for participants who works as laborers, farmworkers, and those who were physically active were advised to continue their routine activities.

The last activity was evaluation. The purpose of evaluation is to evaluate the objective of action plan. In this study, evaluating process was held after one and a half month since the implementation of action plans. To conduct the evaluation

process, FGD was held aimed to evaluate the objectives of the action plan.

TABLE 1. General information of people at risk for diabetes mellitus type 2

	Village 1 (n = 26)	Village 2 (n =27)
Gender (n, %)		
Female	23 (88.5)	24 (88.9)
Male	3 (11.5)	3 (11.1)
Ethnicity (n, %)		
Javanese	23 (88,5)	26 (96.3)
Bataknese	2 (7.7)	3 (3.7)
Others	1 (3.8)	-
Education (n, %)		
Primary school	11 (42,3)	14 (51.9)
Secondary school	5 (19.2)	5 (18.5)
High school	-	8 (29.6)
Bachelor	1 (3.8)	-
Occupation (n, %)		
No work	10 (38.5)	15 (55.6)
Merchant	3 (11.5)	-
Government employee	3 (11.5)	-
Private employee	2 (7.7)	-
Farmer	-	4 (14.8)
Others	8 (30.8)	8 (29.6)
Income, monthly (IDR) (n, %)		
Less than 1,000,000	17 (65,4)	19 (70.4)
1,000,000 – 3,000,000	5 (19.2)	8 (29.6)
4,000,000 – 6,000,000	4 (15.4)	-
Smoking status (n, %)		
No	25 (96.2)	25 (92.6)
Yes	-	2 (7.4)
Quit	1 (3.8)	-
Age, years (mean, ± SD)	55.4 (12.5)	52.2 (10.59)
BMI (mean, ± SD)	27.1 (3.94)	26.3
WC (mean, ± SD)	95.3 (7.34)	91.8
Diabetes Risk Score		
Mean ± SD	14.2 (2.98)	13.8 (2.04)
Median	13	13
Mode	12	12

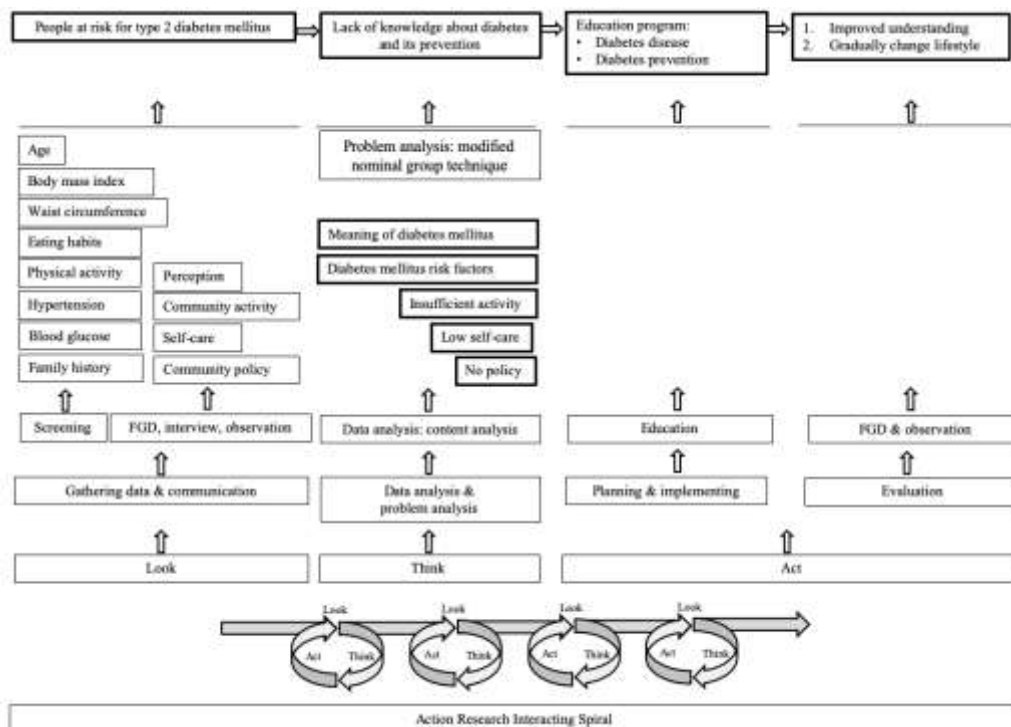BMI = body mass index; IDR = Indonesia Rupiah; WC= Waist Circumference

Figure 1. The strategy to develop community-based care program to prevent type 2 diabetes mellitus through an action research.

The result of evaluation was consisting of two themes: 1) improved understanding about diabetes and its prevention; and 2) gradually followed lifestyle to prevent type 2 diabetes mellitus. However, even though there were improved understanding and gradually followed lifestyle change, there were some obstacles faced by participants for the continuum of the program. For example, they said that they had joint pain to do physical activity. They also said that they lack of time (busy) to implement the lifestyle change regularly and properly. For these reasons, in the next phase of this action research, there should be available other action plans in order to facilitate the continuity of this program.

V. DISCUSSIONS

In this study, the problem in the community was lack of knowledge on type 2 diabetes prevention. This study revealed that low self-care was related to the lack knowledge of community members regarding diabetes mellitus accurately, especially its risk factors, complication, and prevention.

In line with this study, several studies have revealed that lay persons generally lack of knowledge about diabetes mellitus. This issue is not only found in Indonesia, but also in other developing and developed countries around the world. In India, a community-based study was undertook to assess the knowledge on diabetes mellitus revealed that adult population (both with self-reported diabetes and no self-reported diabetes) was lacking of knowledge as well as average awareness regarding diabetes mellitus (Qurieshi, Ganesh, Leelamoni, & Kurian, 2016). In Thailand, people at risk for diabetes in Chiang Mai Province, were found lacked of knowledge about diabetes, including nutrition, diabetes risk factors as well as resources to access health information (Sranacharoenpong & Hanning, 2011). A result of a study in Oman (both with self-reported diabetes and no self-reported diabetes) revealed that lay persons' knowledge about diabetes mellitus was suboptimal. It stated that only 17%, 21%, and 30% of participants understood that a positive family history, obesity, and physical inactivity, respectively, were diabetes risk factors (Al Shafaee et al., 2008). Even in developed country, adult people in Oregon who had high risk of diabetes were also unconcerned about their risk for developing the disease (Kemple, Zlot, & Leman, 2005). More interestingly, those people who have suffered from diabetes for many years, they still lacked of knowledge about the disease and self-care (Chavan et al., 2015).

When risk people understand about diabetes mellitus, thoughts will arise about the importance of diabetes prevention activities. As stated by Siguroardóttir (2005), knowledge about diabetes are prerequisites for effective self-care. As knowledge accumulates, changes in attitudes are initiated and over a period, it results in behavior change. In addition, it is also clear that knowledge on chronic disease such as diabetes is crucial element in development of strategies to control and to prevent the disease (Al Shafaee et al., 2008). In this study, action plans to increase knowledge was obtained based on the consensus of all community members who participated in this action research. Action research focuses on working with people that are stakeholders in real situations, to access and identify problems, to implement and action the research process and ultimately, to achieve change that is sustainable. It encompasses four basic themes: empowerment of participants, collaboration through democratic participation, acquisition of knowledge, and individual & social change (Kongvattananon, 2013).

Action research is scarce conducted in Indonesia, specifically, in diabetes mellitus prevention. Thus, this study might be the first one. Studies on type 2 diabetes mellitus are mainly conducted using survey design and quasi experimental design, and focus more on individuals or patients with type 2 diabetes rather than its prevention. For example, a study was conducted to identify information on diabetes management, complication, awareness of self-control, and quality of life of patients with diabetes (Soewondo et al., 2010), and a study aimed to identify the physicians' awareness agreement, adoption, and adherence on type 2 diabetes mellitus guidelines (Widyahening, van der Graaf, Soewondo, Glasziou, & van der Heijden, 2014).

The results of this study have shown that action research can be used to develop a community-based care program to prevent type 2 diabetes mellitus and giving benefits to the increasing knowledge people at risk for type 2 diabetes mellitus in the community. However, this study only conducted in one cycle. Therefore, to gain more comprehensive and effective results, another cycle of action research is needed. In the next cycle, there are some action plans proposed. Firstly, a workshop for health volunteers to strengthen they knowledge about diabetes and its prevention. Secondly, a poster campaign that whole citizen in the village can see the important of diabetes prevention. Thirdly, home visit for those people who are at risk for type 2 diabetes mellitus. Home visit can be done by assigned those health volunteers who has been had eligible knowledge about diabetes and its prevention or collaborate with health care provider from community health center.

VI. CONCLUSION

People at risk for type 2 diabetes mellitus were lacking of knowledge regarding diabetes and its prevention which result in low self-care to prevent type 2 diabetes mellitus. In addition, insufficient activities and no policy to prevent type 2 diabetes mellitus also contributed to low self-care among them. Based on the results of this study, the first step in developing a program for prevention of type 2 diabetes in the community is to increase community members' knowledge about diabetes mellitus accurately. Hence, to increase community knowledge about diabetes and its prevention, a diabetes education prevention program is needed to established.

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