Nutrition Counseling with and without Modules towards Nutrition Knowledge, Attitude, and Macronutrient Intake among Prediabetic Women

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Summary Prediabetes is one of risk factors for degenerative diseases. One of the prevention efforts is by improving the knowledge of nutrition and attitude through a counseling program. Modules are used as the media to convey the message of health with the form of words and pictures. The purpose of the study is to analyze the difference between the influence of nutrition counseling with the module and without the module, toward the raise of nutrition knowledge, attitudes, and the adequacy of macronutrients (energy, protein, fat, and carbohydrates) in prediabetic women. This study used a quasi-experimental method with pretest-posttest control group design. The sample consisted of 29 women ages between 35–50 with prediabetes who were divided into 2 groups: a treatment group provided with modules ($n=15$); and a control group with no modules provided ($n=14$). The counselling was done 4 times in 15–30 min duration each session. Paired t test and wilcoxon were used for within group, while independent t -test and Mann-Whitney were used between two groups. In treatment group, there was a significant increase score of pre-test and post-test of knowledge ($p=0.01$) by 16.16 ± 21.56 and attitude ($p=0.04$) by 1.46 ± 2.66 . In control group, there was a notable increase score of pre-test and post-test of knowledge ($p=0.02$) by 10.71 ± 15.39 . There was no indicative difference in the improvement of knowledge score ($p=0.443$), score of attitude ($p=0.783$), energy intake ($p=0.693$), carbohydrates ($p=0.585$), protein ($p=0.458$), and fat ($p=0.495$) between the control group and the treatment group.

Key Words prediabetes, knowledge, attitude, intake, counseling, module

Prediabetes is a condition in which blood glucose levels are higher than normal but not high enough to be classified as diabetes. Prediabetes is indicated by three signs: Impaired Fasting Glucose (IFG) with fasting glucose 100–125 mg/dL, Impaired Glucose Tolerance (IGT) with blood glucose 2 h post load of 75 g oral glucose is 140–199 mg/dL, or both of them (1).

There are currently estimated 314 million people with prediabetes worldwide. This figure is projected to increase to 418 million in 2025 (2). The proportion of Indonesians aged ≥ 15 y old experienced IFG and IGT in 2013 of 29.9% and 36.6%, respectively (3, 4). Prediabetes is one of risk factors for Diabetes Mellitus and Coronary diseases. Individuals with IGT have the possibility of becoming Type 2 DM as much as 6–10% per year. Individuals with IFG and IGT, within 6 y, will increase the risk of becoming Type 2 DM by 65% compared to only 5% in normal individuals. Individuals with prediabetes have the potential for having cardiovascular almost twice higher than individuals without IFG and IGT (5).

According to the data from Semarang City Health

Profile in 2015, Type 2 DM was the second highest disease after Hypertension with the number of cases reaching 1790 cases (6).

The main principal of prediabetes management includes lifestyle modification, body weight control, and pharmacotherapy. Meal planning and diet modification are important elements in the successful management and prevention of Type 2 DM as well.

Various Programs for Prediabetes have been developed such as Diabetes Prevention Program (DPP), which is an evidence-based behavioral program through education, behavioral support, and motivation. The purpose of DPP education is to reduce 7% of participants weight within 6 mo by reducing energy intake with target intake of 1,200–1,800 kcal/d and physical activity of at least 150 min per week (7–9).

The success of meal planning depends on the individual's behavior in following the recommended diet. Disobedience in meal planning is one of the obstacles in the prevention and treatment of Type 2 DM (10). Human behavior is the result of all kinds of experiences, as well as interaction between men and the environment that manifested in the form of knowledge, attitude and action. Human behavior has a wide and complex scope (11). According to Bloom's theory, human behavior

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is divided into 3 domains: cognitive domain, affective domain, and psychomotor domain. In its development, Bloom's theory about the domain of human behavior was modified for measuring the results of health education into knowledge, attitude, and practice (12).

To implement the Diabetes Prevention Program (DPP), Prediabetic Women should have a good knowledge. One way to gain knowledge is by providing nutritional counseling. This study aimed to determine the effect of nutrition counseling toward the knowledge, attitude and Macronutrient Intake practice of Prediabetic Women.

The success of nutrition counseling is strongly supported by good methods and media usage. Printed media is a static media that prioritizes visual messages, and generally consists of a number of words, images or photographs. Poster, leaflet, brochure, magazine, modules, and pocket books are some example of printed media. Module is one of printed media that can deliver health messages in book form, whether in the form of writing or picture (13).

Study is still needed on the effect of providing nutritional counseling interventions with module as the media for patients with prediabetes, especially for women aged 35–50 y old to change the level of the knowledge, attitudes, and adequacy of macronutrients (energy, carbohydrates, fats and proteins). The study was conducted on women because the proportions of patients with Type 2 DM and TGT in women tended to be higher than in men. The age group of 35–50 was chosen to prevent the incidence rate of prediabetes to Type 2 DM later in life; because according to the highest proportion of patients with impaired blood glucose level, the number was found the highest in the 55–64 y old age group (4). The purpose of this study is to determine the effect of nutritional counseling with modules and without the modules to change the level of knowledge, attitudes, and levels of macronutrient adequacy (energy, carbohydrates, fats, and proteins) in women prediabetes age range of 35–50 y old.

MATERIALS AND METHODS

Study subjects. The data were collected from April to June 2016 in Semarang City, specifically in the working area of Kedungmundu village health center. The area was chosen based on the data from the health service of the city of Semarang that represented the area with the highest prevalence of DMT2 cases in the city. The size of the samples that had been required was calculated using the unpaired numerical analytical formula, with the standard deviation of 9.6 and the minimum average increment of 11.23, which was obtained from the previous study (14). An additional 10% was added to account for any drop-out. A total of 14 people per group or 28 people for two groups were required to detect a difference at alpha of 0.05.

Inclusion criteria were women with age of 35–50 y old with fasting blood glucose of 100–125 mg/dL. Participants were recruited by two stages of screening. The first screening was performed to obtain female subjects

with BMI criteria ≥ 23 kg/m², waistline >80 cm, age 35–50 y old, do not drink alcohol, do not smoking, and neither being pregnant or breastfeeding. At the first screening, more than 200 potential participants were identified. The second screening was to obtain the participants with fasting blood glucose of 100–125 mg/dL. There were 32 participants identified for inclusion in the study. One person was failed to provide consent and two people dropped out because the data obtained was not complete, leaving a total sample size of 29. These were randomized, with total sample used in the study was 29 people consisting of two groups, 14 controls and 15 treatment groups.

Study methods. A pretest & posttest control group design was used as the method. The difference between counseling with and without learning module's effects were examined. Participants were allocated to receive the material by using random allocation. A four-part questionnaire and an education module were developed by the researcher for the study. This questionnaire includes demographic data, knowledge, attitudes, and an estimate level of the macronutrient intake. The questionnaire used as the first test, and the result was taken as the content of the study; and face the validity with 10 volunteers and then modified accordingly.

The counseling material and the education module that were designed by the researcher, refer to the previous research about Diabetes Prevention Program (DPP); which contains the explanation of prediabetes, recommended dietary intake, exercise, and regular blood test requirement for patient with prediabetes (7–9).

Individual counseling was delivered in a one-to-one, face to face session; 4 times across 2 wk. Each session lasted between 15 to 30 min each. Counseling was done with each respondent being taught by one counselor who remained present until the end of the study. The control group received the same intensity of counseling but did not receive the written module. The intervention group received a 27 pages of education module, as well as the counseling. Before the research was held, the counselors have provided counseling materials and technical counseling that allow counselors to have a certain standard. The intervention group counselors are also the same counselors for the control group.

The participants identity were obtained through a questionnaire. Anthropometric data of body weight was measured using OMRON brand digital weight scales with 0.1 kg precision and height measured using GEA Microtoise brand with 1 mm accuracy. Fasting blood glucose data were obtained from vena glucose examination. The score of knowledge and attitude were obtained at each counseling session by using the validated questionnaires; while macronutrient intake data was obtained by using a one month semi-quantitative FFQ (Food Frequency Questionnaire) form.

Statistical analyses. This research was a quasi-experimental using predetermined inclusion criteria participation. Bivariate analysis was used to determine the differences between two variables. The difference in the scores of knowledge, energy intake, carbohydrates, and

Table 1. Characteristics and initial data of the sample.

Characteristics	Intervention (n=15)	Control (n=14)	p
	Average $\pm$ SD	Average $\pm$ SD	
Age (y)	42.53 $\pm$ 3.833	44.64 $\pm$ 3.75	0.146 ^a
Body Mass Index (kg/m ²)	28.096 $\pm$ 3.18	28.98 $\pm$ 2.70	0.444 ^a
Waist Circumference (cm)	89.43 $\pm$ 5.53	88.83 $\pm$ 7.29	0.543 ^b
Fasting Blood Sugar (mg/dL)	101.62 $\pm$ 10.04	97.93 $\pm$ 9.31	0.332 ^a
Pretest of Knowledge	64.16 $\pm$ 16.94	65.17 $\pm$ 16.39	0.872 ^a
Pretest of Attitude	78.26 $\pm$ 2.71	78.71 $\pm$ 5.18	0.771 ^a
General Educational Grade (y)	13.26 $\pm$ 3.47	10.92 $\pm$ 4.28	0.08 ^b
Education Grade			
Not passed elementary school (%)	14.2	6.6	
Elementary school (%)	7.14	0.0	
Junior High School (%)	7.14	0.0	
Senior High School (%)	50.0	53.3	
College (%)	21.4	40.0	
Occupation			
Entrepreneur (%)	14.2	20.0	
Labor (%)	21.4	20.0	
State Employee (%)	21.4	40.0	
Housewife (%)	42.8	20.0	

^aIndependent *t*-test.^bMann Withney.

fats between before and after intervention were analyzed using paired *t*-test; whereas differences in attitude and protein intake before and after intervention were analyzed using Wilcoxon.

Differences in the changing of the scores for knowledge, energy intake, carbohydrate and fat in the treatment group (together with the control group) were analyzed using Independent *t*-test. While differences in the changing of attitude scores and protein intake in the treatment group (along with the control group) were analyzed by using Mann Whitney method.

Ethical considerations. The purpose of the study was explained to all the participants before conducting the research. All of the data collected were analyzed with complete anonymity. The study procedures were performed in accordance with the declaration of Helsinki. This study was approved by the Ethical Committee of the Medical Faculty Diponegoro University and dr. Kariadi Hospital Semarang in 12 October 2016.

RESULTS

The total sample used in this study was 29 people, divided into control group and the intervention group. 14 people are in the control group and 15 people are the intervention group. The treatment group was counseled with module aids while the control group was given counseling without module aids. The clustering was done based on the distance of the sample house location to prevent leakage of the counseling material of the treatment group in the control group.

The comparison of characteristics and the preliminary data before treatment between groups are shown

in Table 1. The characteristics obtained are included age, BMI, fasting blood glucose level, and the level of education. The preliminary data which compared before the treatment are the pre-test score of knowledge and attitude in both groups. Based on the result of statistical analysis, there were no differences between the characters in both groups ($p > 0.05$) and the preliminary data between the intervention group and control group ($p > 0.05$).

Table 2 shows the comparison of the score of knowledge and attitude between the intervention group and the control group. There was a significant increase ($p < 0.05$) between pre and post knowledge scores in both the intervention and control group. However, there was no statistically significant difference in knowledge scores between the intervention group and the control group ($p > 0.05$). The attitude scores between before and after treatment were increased significantly in the treatment group ($p < 0.05$). There were no significant increases in the attitude scores in the control group ($p > 0.05$). However, there was no statistically significant difference in the deviation of the attitude score between the intervention group and the control group ($p > 0.05$).

Table 3 shows the comparison of the difference in the intake of energy, carbohydrates, fats, and proteins between the intervention group and the control group. There was no significant change ($p > 0.05$) in the intake of energy, carbohydrates, fats, and proteins between before and after the treatment in both groups. The statistical analysis also shows there were no significant differences in the deviation of the intake of energy, carbohydrates, fats, and proteins between the intervention

Table 2. Differences of knowledge and attitudes in both groups.

	Knowledge		Attitude	
	Control	Intervention	Control	Intervention
Pre (%)	65.17±16.39	64.16±16.95	78.71±5.18	78.26±2.71
Post (%)	75.89±21.06	80.33±13.94	80.42±3.93	79.73±1.83
<i>p</i> value	0.022 ^{*a}	0.012 ^{*a}	0.121 ^b	0.046 ^{*b}
Δ pre and post (%)	10.71±15.39	16.16±21.56	1.71±3.83	1.46±2.66
<i>p</i> value	0.443 ^c		0.783 ^d	

^a Paired *t*-test.^b Wilcoxon.^c Independent *t*-test.^d Mann Withney.

* Different meaningful.

Table 3. Differences in macronutrient intake in both groups.

Variable	Pre	Post	<i>p</i> value	Δ Pre and Post	<i>p</i> value
Energy Intake					
Control	120±48.12	105.06±45.06	0.199 ^a	14.9414±42.07	0.693 ^c
Intervention	86.39±36.35	76.38±32.65	0.088 ^a	10.00±20.63	
Carbohydrate Intake					
Control	119.68±5.51	100.79±54.43	0.140 ^b	18.89±44.66	0.585 ^c
Intervention	88.13±29.05	76.94±38.79	0.105 ^a	11.18±29.28	
Protein Intake					
Control	80.78±27.61	76.95±26.77	0.699 ^a	3.82±36.20	0.458 ^d
Intervention	65.96±36.83	66.03±30.64	0.706 ^a	0.075±25.9	
Fat Intake					
Control	142.7±70.74	114±51.19	0.271 ^a	27.95±73.23	0.495 ^c
Intervention	94.11±51.00	81.08±31.69	0.450 ^a	13.02±33.99	

^a Paired *t*-test.^b Wilcoxon.^c Independent *t*-test.^d Mann Withney.

group and the control group.

DISCUSSION

Characteristics of subjects by age, fasting blood glucose, BMI, waist circumference, educational level, pre knowledge score, and pre attitude score between treatment group and control group had $p>0.05$. This suggests that the characteristics of the subject between the control group and the treatment were similar. The test is performed before the intervention so that the initial characteristics of the subject between the two groups are equal. Homogeneity of preliminary data is required for experimental research to reduce the occurrence of bias.

The results of this study indicate that although the knowledge of both groups experienced a significant increase between pre-test and post-test, but indepen-

dent test of *t*-test showed no significant difference in the increasing score of knowledge between treatment group and control group.

The results of this study were similar to those of Mostafa et al. Who stated that both counseling with modules and without modules effectively increased the knowledge score, but there was no significant difference in the increase of knowledge scores between groups who were counseled with modules and without modules. Effective module counseling improves knowledge and attitude because information in the form of writing and drawing allows respondents to extract information through modules after counseling. However, education without the use of modules is also effective because this method can initiate innovative thinking and active participation of respondents (15).

The statistical different tests showed that there was

no significant difference between attitude changes in the counseling intervention group using modules with the control group. This is in line with the study by Mostafa et al. There is no significant difference between the change in attitude scores of the group who were given the module and the attitude score of the educational group without the module (15).

Improved attitudes between before and after counseling were only significant in the group using the module. This is because the control subject does not get the visualization of the material from the image in the module. Information will be more easily remembered, understood, and interpreted by the image visualization. Education through the sense of hearing will produce 15% success while education through the sense of hearing and vision will produce 35–55% (16).

The difference of food intake between treatment group and control group did not differ significantly according to statistical test. The results of this study are similar to the research by Kang HJ, Shin and Kim in Korea who gave education for adults with Diabetes Mellitus using modules. The research by Kang HJ, Shin and Kim showed an increase in knowledge, but the practice of feeding intake did not change significantly (17). This is also similar by Ostad Rahimi stated that there was no significant change in intake in the group given counseling with and without modules. The process of changing practices is not only influenced by knowledge, but also social and psychological factors as well as some practical help and through close contact with skilled health workers (18).

Health promotion should be tailored to the determinant (factors that affect behavior). According to Lawrence Green's theory, individual behavior is influenced by 3 factors including predisposing factors, enabling factors, and reinforcing factors (19).

Predisposing factors are factors that facilitate the formation of individual behavior (12, 19). These factors include knowledge and attitudes of respondents to prediabetes which includes the understanding about prediabetes, risk factors of prediabetes, prevention of prediabetes, and the danger of prediabetes. Prior to counseling intervention, pre-test was conducted in both groups to determine the knowledge and attitudes of respondents regarding prediabetes. The degree of knowledge and attitudes of respondents forms a habit, in this case is the level of macronutrient intake.

Enabling factors are those factors that enable or facilitate the formation of a behavior or action (12, 19). What is included in the enabling factors include the existence of facilities and infrastructure for the formation of a behavior. In this study, the enabling factor for the formation of behavior is the existence of counseling education about prediabetes. Counseling aims to increase knowledge. Then the increase in knowledge will form a new attitude toward a problem. The practice phase is at an advanced stage when a person has enough knowledge and attitude, as well as a commitment to change behavior. In addition, resource availability is also an important factor for changes in eating

intake practices including the capability in economy, energy and time to provide food in accordance with recommended dietary suggestions.

According to theory of Lawrence Green, in this study, respondents were given counseling as an enabling factor to increase the level of knowledge and attitude. After counseling, it was found that in both research groups there was an increase in knowledge and attitude. However, there has been no change in the practice of eating intake. This is due to several other factors such as the availability or absence of resources to make changes in eating behavior and social support to respondents to change behavior.

Most respondents who are workers complain of not having time to cook their own vegetables and are forced to consume what is available in their work environment, such as fast food. Some of the other respondents complained about the lack of funds so they could not afford to provide fruit in their homes every day. Although the knowledge and attitude of the respondents has increased, but not enough to change the practice of eating.

The third factor of behavior formers is the reinforcing factor. Reinforcing factors are the factors that encourage or strengthen the formation of behavior or action. For the example is the support of influential figures (12, 19). In this study, support can come from the immediate environment of the respondent ie family. In addition, a success story from people who successfully make a behavioral changes becomes healthier can also be given as a boost to respondents to make changes.

Bandura's cognitive social theory also explains that behavior can change when there is cognitive and social change. The influence of family and the environment is include in the social influence. Cognitive influence is related to one's beliefs and beliefs in performing a behavior. This theory explains the predictors of behavioral changes such as self-efficacy, expectations of behavioral change, and knowledge. Bandura explains that knowledge allows one to predict what happens when an event occurs. Knowledge is derived from the process of observation or modeling through the condition of others or the observation of a model. Bandura theory emphasizes that in addition to knowledge, social influences and social interactions are important in learning behavior (20).

In this study, respondents have been through the modeling process of an artificial visualization in the form of counseling with modules for respondents treatment and counseling without module for control respondents. Thus allowing respondents to predict what happens if the respondent does or does not make dietary changes. When one observes the events in his environment and observes how people act on the event, the person will get knowledge of everything that is happening in his environment, including the behaviors that he or she believes can be useful for a particular situation and the outcome of the behavior. Changes in respondent behavior will occur better if there is full support from the environment, especially the families of

respondents (21).

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There is no conflicts of interest to be declared in this paper research.

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