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IMMO7

The Effects of Nursing Intervention for Metabolic Syndrome Prevention
Applying the Transtheoretical Model in Dietary and Exercise Behaviors
Among the Population at risk

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ABSTRACT

The purpose of this quasi – experimental design with two groups repeated measured at before, immediately after the intervention and follow up at the 8th week research was to study the result of nursing performance on prevention of metabolic syndrome by applied the theoretical transition stage on dietary consumption and physical exercises behavior for the population at risk in Naphoo sub-district, Pen district, Udon Thani province. The sample group ages were between 35 – 59 years old, who were at risk of metabolic syndrome. All subjects were randomly selected for the experimental group (n = 32) and the comparison group (n = 32). The experimental group received a nursing practiced for behavior changing on a dietary consumption and physical exercises by way of followed through the eight week steps of behavioral change. The study found that after the experiment and the followed-up period, the experimental group had an average score of the awareness and the dietary consumption and physical exercises behavior higher than before experiment and the comparison group, which was statistically significant ($p < 0.05$). Waist circumference and waist – hip ratio were significantly decreased lower than before the experiment ($p < 0.05$). As well as the transition steps in behavioral change was statistically significant differences from before experiment and the comparison group ($p < 0.05$).

Introduction

Metabolic syndrome was the condition of excessive amount of body fat (Saisamorn Pondongnok *et al*, 2015). Especially there was an accumulation of fat in the abdomen area and inside the abdominal cavity. As a result, waist circumference and hips circumference were larger. An occurrence of body shape around the central area was similar to apple fruit (Apple shape), also called "abdominal obesity" (Sunanta Youngwanichseth, 2015; National Heart Lung and Blood Institute, 2016). The most important cause of abdominal obesity syndrome was unbalanced dietary consumption, the metabolism that change food into new cells energy for growth, and the energy used of the body such that it caused the accumulation of sugar and fat in the blood vessels in various organs of the body.

The best way to prevent and control abdominal obesity was to change lifestyle, for instance having proper diet appropriated to nutrition flags and physical exercises based on the principle of consistency and accuracy (Department of health, Ministry of public health, 2007). Review of the literature found that most of the activities put emphasis on changing behavior toward practicing the behavior that set as a goal. Nevertheless, the preparation stage regarding changing behavior and managing for the consistency of that behavior was still inadequate. Activities that encourage healthy behavior changing to achieve a good result should considered the readiness, desires, and individual differences as a principle in order to get the participation in activities as well as an appropriate sustainable behavior changing. (Kanchana Prasarnpran, 1992; Chanika Jornjumris, 2007)

The Transtheoretical Model (TTM) (Prochaka *et al*., 2002) was the theory that gave important on the subject of preparedness on behavior changing of each individual that was different from one another. Also gave the importance to each individual in decision making. Activities were arranged appropriately for each individual by way of a group that divided by means of their characteristics of preparedness that were similar in the behavior. Activities arrangement as it should be appropriate for each group would increase the effectiveness of activities. Therefore, by the use of TTM on nursing performance activities to prevent the occurrence of metabolic syndrome by means of activities were arranged according to the stage of behavior changing that suitable for each individual, aimed toward awareness making, promoted self-ability acknowledged so as lead toward the solution to a problem properly on behavior changing. As a result, the behavior changing on population at risk of metabolic syndrome had occurred in the community.

The researcher, as a community nursing practiced, which roles and main duty in health promotion and disease prevention at the community level viewed that the design of nursing performance in preventing metabolic syndrome by applied the theoretical transition stage on dietary consumption and physical exercises behavior for the population at risk was probable to be a form of nursing practiced that appropriately help promote behavioral changing, as well as help prevent metabolic syndrome for a population at risk in the community.

Objectives of the study

1. To compare the effects after received the nursing intervention for prevention metabolic syndrome applying the TTM in dietary consumption and exercise behaviors, between pre-and post-intervention, and between the experimental group and the comparison group, on as followed

The National and International Graduate Research Conference 2017
March 10, 2017 : Poj Sarasin Building, Khon Kaen University, Thailand

IMMO7-3

1.1 Awareness for prevention metabolic syndrome.

1.2 Decisional balance for dietary consumption and exercise prevention metabolic syndrome.

1.3 Perceived self – efficacy for prevention metabolic syndrome.

1.4 Dietary consumption and exercise behaviors.

1.5 Different of waist circumference and waist/hip ratio.

2. To compare the stage of change between the experimental group and the comparison group after intervention.

Materials and methods

Research methods: This study was a quasi- experimental design with two groups repeated measured at before, immediately after the intervention and follow up at the 8th week.

Population: A target population is a population at risk of metabolic syndrome in Napoo Tambon Phen District Udon Thani Province.

Sample: the samples are both male and female aged 35-59 years, with waist circumference more than criteria (males equal to or greater than 90 cm (36 inches) and women equal to or greater than 80 cm (32 inches), did not have Diabetes Mellitus, Hypertension, Hyperlipidemia and did not taking drug for reduce obesity.

Sample size: The sample size was estimated by Power Analysis. The effect size calculated from similar study (Boonchoo Leamtong, 2011) was 0.97, use 0.8 for power of test, and 0.05 for alpha; bases on Power Table (Cohen, 1988) resulting in 26 persons per each group. And add up for 20 % for cover the sample loss. There for 32 persons per each group.

Sampling technique: the study setting is Napoo sub-district that has two Health Promoting Hospitals. The first one that was randomly pick up by lottery method was assign to be the experimental group, it is Napoo Health Promoting Hospital, and the left is the comparison group; Ban Luang Health Promoting Hospital. Based on the data of annually screening population at risk of metabolic syndrome of each setting, the target population who met the inclusion criteria were simple randomly selection. After they were informed about the study activities, finally there were 32 per each group that voluntarily to join the study.

Research instrument

Research instrument consisted of 2 parts as follow:

Part 1 The instruments for measurement were as follows:

1.1.1 Personal information questions included age, gender, income, family history of genetic disease, weight, height, BMI, waist circumference, waist / hip ratio.

1.1.2 Awareness of metabolic syndrome scale, this scale composed of questions related to perceive risk and susceptibility to get metabolic syndrome that be caused by inappropriate dietary consumption and less exercise. There were 10 items with 4 points rating scale : strongly agree (4) to strongly disagree (1), with Cronbach' s alpha coefficiency = 0.80

The National and International Graduate Research Conference 2017
March 10, 2017 : Poj Sarasin Building, Khon Kaen University, Thailand

IMMO7-4

1.1.3 Decisional balance for dietary consumption and exercise scale, this scale including pros & cons decisional balance prior to practice for reducing metabolic syndrome. The pros questions composed of satisfaction and perceive benefit of behaviors change. The cons question related to barrier perception of perform healthy eating and frequently do exercise. This scale composed of 12 items (6 for pros and 6 for cons) of 4 points rating scale:- strongly agree (4) to strongly disagree (1), with Cronbach' s alpha coefficiency = 0.75

1.1.4 Perceived self-efficacy of dietary consumption and exercise scale, the scale composed of 10 items of questions asked about self-confidence to practice healthy eating and frequently do exercise for preventing metabolic syndrome. The response set were 4 points rating scale:- strongly confident (4) to strongly not confident, with Cronbach' s alpha coefficiency = 0.79

1.1.5 Preventing Behavior for metabolic syndrome scale, the scale composed of 10 items of question related with conducting healthy eating behaviors, e.g. low fat, high fiber, low carbohydrate, dietary approach based on the nutritional flag suggestion and regularly do exercise behavior. This was 4 points rating scale: - always practice (4) to did not practice (1), with Cronbach's alpha coefficiency = 0.88

1.1.6 Stage changes Scale, There were 2 forms; the first one was composed of 2 questions; one for dietary consumption behavior and another for exercise practice. The answers were 5 choices for choose one that fit with their stage of behavior. The Cronbach's alpha coefficiency = 0.78

The second form was composed of **assessment form of dietary consumption behavior change, and assessment form of exercise behavior change**. Each scale included 19 items of 4 points rating scale. The Cronbach's alpha coefficiency = 0.86, 0.80 responsively.

1.1.7 Physical measurement tools. A sphygmomanometer for monitor blood pressure, Weight Scale for weight, Tape measured waist and hip circumference that was calibrated based on the hospital standard.

Part 2 The nursing intervention for metabolic syndrome prevention applying the transtheoretical model on dietary consumption and exercise behaviors. This intervention program had 3 activities in 5 weeks for modifying eating and exercise behaviors based on the process of change, provided activities fit with the stages of behavior and follow up the maintenance of behavior in the 8th week

Intervention Protocol

The experimental group received the nursing intervention for metabolic syndrome prevention applying the transtheoretical model in dietary consumption and exercise behaviors for 3 sessions as follows:-

The 1st session at the 1st week, for Pre-contemplation stage, the intervention aimed to raise awareness of metabolic syndrome. Within 1.30 hours, the activities composed of self-evaluation and subgroup discussion of inappropriate behavior on current dietary consumption, physical activities and exercise behaviors. The problems and obstacles to perform appropriate behavior were criticized. The researcher summarized and group working for a mutual plan on modifying their behavior. Presented the positive role model who successful for motivation toward behavior change..

The National and International Graduate Research Conference 2017
March 10, 2017 : Poj Sarasin Building, Khon Kaen University, Thailand

IMMO7-5

The 2nd session at the 3rd week, for Contemplation – preparation stage, the intervention aimed to enhance decisional balance on dietary consumption and exercise behaviors for metabolic syndrome prevention. This toke 2.30 hours activities for training the respondents in calculation the amount of food intake and the energy burned for each type of exercise, how to record food intake and exercise practice in daily life. Group discussion for problem solving and find the way to come over the obstacles of practice. In case of respondent still do not change the stage, they received counselling and help them until they achieved as same stage as group

The 3rd session at the 5th week, for the Action stage, the intervention aimed to maintenance the good dietary consumption and exercise behaviors changed. The activities took 1.30 hours for sharing experiences about dietary consumption and exercise behaviors changed, helping those who are unable to change their behavior to find the solution, encouraging those who can change their behavior effectively for reinforcement. Before started the new intervention the respondents were assessed for the stages change, if there was any individual did not stage move up ,they were received counselling from the researcher and reassessment until stage up as same as group.

Comparison group received advice on to conduct themselves normally from sub-district Health Promoting Hospital, receiving brochures about the metabolic syndrome and received summarized health education on behavior changing about proper dietary consumption and physical exercises on prevention of metabolic syndrome occurred at the end of the research.

Data collection

Data were collected by self-administered questionnaire for 3 times at before, immediate after the completion of intervention plan, and follow up at week 8.

Data analysis

Demographic data were analyzed by using descriptive statistics included the frequency, Percentage, Mean, standard deviation, Chi - square was also tested to explain the variables studied.

For hypothesis testing used two way repeated measure ANOVA for testing the difference of mean between two groups within three times:- at before, after intervention, and at follow up. Compared the mean score among experimental group and comparison group by independent t- test, and compare mean that come from three time of measurements within group by used one way repeated ANOVA, and pair comparison with Bonferronni. Paired t-test was used for compare two means whitin group.

Stage of change were analyzed by using Chi - square and t- test.

Results

1.1 General Characteristics of the sample

The samples in this study were both males (3.1%) and females (96.9%), ages were between 35 – 59 years olds, with waist circumference in males were more than or equaled to 90 cm (36 inches), in females were more than or equaled to 80 cm (32 inches). Both of the sample groups (experimental trial and comparison trial) were females which equally in number that was to say 96.9 percent, graduated from primary school 66.8 percent

The National and International Graduate Research Conference 2017
March 10, 2017 : Poj Sarasin Building, Khon Kaen University, Thailand

IMMO7-6

(Experimental group) and 75.0 percent (Comparison group), respectively. Famers were 81.3 percent and 87.5 percent, respectively. Income was in the range of 1,000 – 5,000 baht with a rate of 62.5 percent (Experimental group) and 78.1 percent (Comparison group), respectively. The majority of them had no history of illness with genetic disease in the family (Experimental group showed 65.6 percent, Comparison group showed 62.5 percent).

1.2 Awareness for prevention metabolic syndrome.

The results found that before the experiment, the average score of awareness for prevention of metabolic syndrome, between experimental and comparison groups, there were no statistically significant differences (t = .288, p‑value = .774). after the experimental, an average score of awareness of metabolic syndrome prevented, in experimental group was greater than the comparison group, was statistically significant (t = 5.044, p‑value < .05) (Table 1), and in the followed‑up, the average awareness of the prevention of metabolic syndrome in the experimental group greater than the control group, was statistically significant (t = 2.123, p‑value <. 0.05). (Table 1)

1.3 Decisional balance for dietary consumption and exercise prevention metabolic syndrome.

The results found that the average score of decisional balance for dietary consumption and exercise to prevention metabolic syndrome, in before the experimental, after the experimental and follow up period of the experimental and the comparison groups, there were no statistically significant differences (p‑value = .217, p‑value = .370, p‑value = .475). (Table 1)

1.4 Waist circumference.

The average score of waist circumference in the period of before experimental and followed‑up the results of the experimental group and the comparison group, there were no statistically significant differences (p‑value = .222, p‑value = .636), respectively. (Table 1)

The experimental group had an average score of waist circumference in the followed‑up period lower than before the experimental, which was statistically significant (t = 4.39, df = 31, p‑value <.001). While the average score on waist circumference of the comparison group in the before experimental and followed‑up period were not statistically significant differences (t = .476, df = 31, p = .673). (Table 1)

1.5 Waist / hip ratio.

The average score of waist/hip ratio in the period of before experimental and followed‑up, the results of the experimental group and the comparison group were no statistically significant differences (p‑value = 1.000, p‑value = .133), respectively. (Table 1)

The experimental group had an average score of waist/hip ratio in the period of followed‑up the results lower than before the experimental, which was statistically significant (t = 2.66, df = 31, p‑value = .012). While the comparison group had an average score of waist/hip ratio in the period of before experimental and followed‑up, the results, were not statistically significant differences (t = -.336, df = 31, p‑value = .739)

Table 1 : Comparison of the differences of variables studied in before the experimental, after the experimental and follow - up between the experimental group and the comparison group.

Variables	Experimental group (n = 32)		Comparison group (n = 32)		t	p - value
	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
Awareness for prevention metabolic syndrome.						
Baseline	31.47	4.76	31.09	5.63	.288	.774
Post-test	32.78	4.61	27.44	3.83	5.044	.000*
Follow-up	30.16	5.86	27.25	5.06	2.123	.038*
Decisional balance for dietary consumption and exercise prevention metabolic syndrome.						
Baseline	35.53	4.10	34.16	4.71	1.246	.217
Post-test	38.13	3.35	37.41	3.02	.902	.370
Follow up	33.53	1.80	33.25	1.30	.719	.475
Waist circumference						
Baseline	91.38	8.53	89.13	5.82	1.233	.222
Follow up	89.72	8.36	88.84	6.20	.476	.636
	t = 4.39, df = 31, p = .000*		t = .476, df = 31, p = .673			
Waist / hip ratio.						
Baseline	.899	.049	.899	.044	.000	1.000
Follow up	.885	.046	.901	.036	-1.522	.133
	t = 2.66, df = 31, p = .012*		t = -.336, df = 31, p = .739			

* p – value < .05

1.6 Perceived self – efficacy for prevention metabolic syndrome.

The average score of self-efficacy in the prevention of metabolic syndrome is different from the after intervention between groups, accordingly the test average of difference the average scores of self-efficacy in the prevention of metabolic syndrome between groups. The results found there were difference the average scores of self-efficacy in the prevention of metabolic syndrome in before the experimental, after the experimental and follow up of the experimental and the comparison groups, there were no statistically significant differences. (Table 2)

1.7 Dietary consumption and exercise behaviors.

The average score of dietary consumption and exercise behaviors is different from the after intervention between groups, accordingly the test average of the difference the average scores of dietary consumption

The National and International Graduate Research Conference 2017
March 10, 2017 : Poj Sarasin Building, Khon Kaen University, Thailand

IMMO7-8

and exercise behaviors between groups. The results found there were difference the average scores of difference the average scores of dietary consumption and exercise behaviors in before the experimental, after the experimental and follow up of the experimental and the comparison groups, there were no statistically significant differences. (Table 2)

Table 2 : Comparison of the differences of variables studied in the before the experimental, after the experimental and follow up between the experimental group and the comparison group.

Variables	Experimental group (n = 32)		Comparison group (n = 32)		p - value
	$\bar{d}$	S.D.	$\bar{d}$	S.D.	
Perceived self – efficacy for prevention metabolic syndrome.					
Post-test - Baseline	1.59	4.42	3.13	4.76	.187
Post-test - Follow-up	2.63	3.99	1.63	5.01	.381
Follow-up - Baseline	-1.03	5.11	1.50	5.01	.050
Dietary consumption and exercise behaviors.					
Post-test - Baseline	1.59	4.42	3.13	4.76	.187
Post-test - Follow-up	2.63	3.99	1.63	5.01	.381
Follow-up - Baseline	-1.03	5.11	1.50	5.01	.050

1.8 Stage of change dietary behavioral.

In followed up phase, the experimental group was in the stage of preparation (87.5 %), while the comparison group was in the stage of contemplation (68.75 %). When compared between the experimental group and the comparison group after the experimental and followed-up periods found that there were statistically significant differences (p - value < .05). (Table 3)

Table 3 : Number and percentage stage of change dietary behavioral at follow up.

stage of change dietary behavioral	Experimental group (n = 32)		Comparison group (n = 32)	
	Number	percentage	Number	percentage
Contemplation	0	0	22	68.75
Preparation	28	87.5	10	31.25
Action	4	12.5	0	0
χ^2 = 34.526, df = 2, p – value = .000*				

The National and International Graduate Research Conference 2017
March 10, 2017 : Poj Sarasin Building, Khon Kaen University, Thailand

IMMO7-9

1.9 Stage of change exercise behavioral

The experimental group was mostly in the stage of preparation (96.07 %), whereas the comparison group was still in the stage of contemplation (78.12 %). When compared the difference stages of change exercise behavior of the experimental group and the comparison group after the experimental and followed-up found that the difference was statistically significant (p - value < .05). (Table 4)

Table 4 : Number and percentage stage of change exercise behavioral at follow up

stage of change exercise behavioral	experimental group (n = 32)		comparison group (n = 32)	
	Number	percentage	Number	percentage
Contemplation	0	0	25	78.12
Preparation	31	96.07	7	21.88
Action	1	3.13	0	0
χ^2 = 41.158, df = 2, p – value = .000*				

Discussions

After the intervention, it was found that the experimental group had an average score of awareness for prevention metabolic syndrome, the average score of the decisional balance for dietary consumption and exercise prevention metabolic syndrome, the average score of perceived self – efficacy for prevention metabolic syndrome, the average score of dietary consumption and exercise behaviors were higher than the comparison group, nevertheless, there were no statistically different. This could be explained that the experimental group was received activities to analyze their own health behavior regarding of the metabolic syndrome prevented, had been encouraged to notice the advantages (pros) in behavioral change appropriately. Pointing at the obstacles (Cons) that could not be appropriately changed the behavior. Set goal on behavior changing, practicing skill so that to choose dietary intake and physical exercise appropriate for each individual. However, such behavior was still not long-lasting for the proper behavior. Due to the lack of samples had induced the behavior that carried on.

In the followed-up period, it was found that the experimental group had waist circumference and waist / hip ratio lower than before the intervention. However, there was no difference from the comparison group. Activities arrangement for the experimental group was to receive knowledge about behavior changing on proper dietary intake and physical exercise; as a result, therefore, the experimental group had a decrease in the circumference in a good propensity.

The findings in this study supported the transtheoretical model that indicated the readiness to change the behavior of each individual was the key factor that caused a person to change behavior. In the followed-up period, it

The National and International Graduate Research Conference 2017
March 10, 2017 : Poj Sarasin Building, Khon Kaen University, Thailand

IMMO7-10

found that the experimental group who received nursing performed in this research had three stages order of change in dietary and physical behavior, namely; prudent, prepare, and perform differs from the comparison group, which was statistically significant. This reflected that such activities could be arranged according to the desires of each individual in behavior changing so as to make the individual prevailed over the stage of behavioral change.

Conclusions

The transtheoretical model was a beneficial theory by means of brought about the conceptual framework of nursing practiced to change the behavior of dietary and exercises for the population at risk of metabolic syndrome occurred. It was the program to help high risk population transformed to healthy behavior. This intervention should be tailored to the context of the other studies and the characteristics of the population.

Acknowledgements

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The National and International Graduate Research Conference 2017
March 10, 2017 : Poj Sarasin Building, Khon Kaen University, Thailand

IMMO7-11

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