

Full Length Research Paper

Experimental intervening with a healthy lifestyle promotion against the high risk group of diabetes sufferers

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This study took the diabetes prospects of Chang Bin residents as the research object to test the effectiveness of a health promotion program. Base on a quasi-experimental design, the objects received a six-month health promotion program. Information gathered and compared for the research are physiological data, lifestyle, diet, and diabetes awareness through a structured questionnaire. A health promotion program is used as intervention to reveal the effects of such a program by measuring the changes of the participants by the end of the program. Data gained at the beginning of the program is used as the base to compare with those data at the end of the program. This research reports the changes gained from the program. This research provides evidence for the effectiveness of a health promotion program.

Key words: Intervention, health promotion, diabetes mellitus (DM), aboriginal.

INTRODUCTION

Life expectancy is around 80 years (82.66 for female; 76.15 for male, and 79.24 for both in 2010) in Taiwan. In addition, elderly population accounted for 12.75% in 2009 (MOI, 2011), and is bounding for 15% by the year of 2015. Welcome to the aging society. Like other developed countries in the world, an aging community tends to be characterized by a low fertility and mortality rate, yet fast prevalence of chronic disease. As the theory of morbidity expansion forecasted, the effective factors that caused mortality were cured along with the elaboration of modern medical science, by which turn such death-threaten diseases into chronic diseases (Gruenberg, 1977; Lynch et al., 2007). This lengthened the human beings' life expectancy in one hand, yet the chronic diseases prevailed in the other. This has also successfully explained why the aging and aged societies are becoming popular in the world (Lynch et al., 2007).

Diabetes mellitus (DM) is a typical chronic disease in an aging or aged society. In particular, the type II DM brought serious threats to the national health by causing death (Okeoghene et al., 2007; Trichopoulou et al., 2006; Miech et al., 2009; Schwandt et al., 2010) and or deteriorating in the patients' quality of life before its end of life (Robertson et al., 2006; Grant, 2007; Rafnsson and Bhopal, 2009). The nation and the patient were forced to consume a huge amount of financial resources during the illness period of a DM patient. DM had been reported often causing serious complications and high percentage of mortality. As part of the developed world, Taiwan suffered with DM as that has been one of the top five causes of death in the past two decades (Department of Health, DOH, 2010).

At present, the prevalence of diabetes mounted to the level of 9.2% in Taiwan, i.e. nearly one out of ten persons is suffering with diabetes. This is especially serious about male nationals who are 65 years old or older. The prevalence of diabetes in this particular group was 13.1% in the period of 1993-1996. It climbed up to 17.6% in 2002, and soared to 28.5% in the period of 2005 to 2008.

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In the other hand, female gender seems relatively stable with a 5.4% in 1993-1996, 7.5% in 2002, and slightly rose to 11.1% in the period of 2005 to 2008. As an effective indicator of DM, the 3H (Hyperlipidemia, Hyperglycaemia, and Hypertension) examination is often used by the physician and healthcare professionals to predict the possibility of incurring the DM and to signal the DM risk to the patients. Compared to the 3H data in 2002, today we have gained three more percentage points (DOH, 2010).

Preventing and slowing the deterioration of DM and associated cardiovascular disease complications thus become an urgent and important health issue for the country. The nation had launched a health promotion program specific for that high risk group of diabetes (Liou, 2008). The plan aimed to perform a positive intervention as soon as a high-risk individual was identified.

The current study took the high-risk group of diabetes from Chang Bin, a small village located in a remote and medicine-lacking area, as the research context. Base on the health examination data from the public health center of Chang Bin, the project identified prospects that were exposed to a high risk of DM. An intervention plan and a team specific for this mission were then developed and organized for a prevention program. The intervention plan was designed to help the prospects through a series of health education and promotion activities to motivate a health awareness manner, to instruct a healthy lifestyle. All of these actions come across with a hope to retard the progress of becoming the diabetes.

This research designs an intervention in a health promotion plan, and estimates its effects to blood biochemical data, quality and quantity of body composition, lifestyle, diet, and disease cognition of a high risk group of diabetes.

This research attempts to gain better insights on how a health program can help diabetes patients realize the risk factors and symptom of diabetes, and how to prevent the complications of such disease. The research thus seeks to answer the following questions:

1. Is there any change in participant's lifestyle occur after the intervention?
2. Is there any change in a participant's diet occur after the intervention?
3. Is there any change regarding a participant's perception toward diabetes and health?
4. Is there any change in the participant's general health status in terms of biochemical data, such as the levels of Cholesterol and Triglycerin, fasting blood sugar, glycosylated hemoglobin (HbA1C), and Body Mass Index (BMI, a ratio of waist to hip)?
5. Is there any change in participant's health beliefs?

The high risk group of diabetes

It is estimated that 50% of diabetic patients (about 800 million people) in the United States were not being duly

identified. Because diabetes can cause minor blood vessel disease and major vascular disease, of which would easily further cause the patient to suffer blind, uremia, amputation, infection, stroke and coronary artery diseases (Aiello et al., 1998; Ioachimescu et al., 2007; Schwandt et al., 2010). No prescription could be ordered when a patient was absent. A hidden DM prospect needs hard to be identified no matter what socio-economic status is from the public health points of view. Careful examination and diagnosis along with proper health education are, nevertheless, an important issue for national's health.

Some rules of identifying DM prospects are developed in the last century. The Expert Committee on The diagnosis and Classification of Diabetes Mellitus (2000) had suggested that those who meet the following conditions shall be periodically screened for possible diabetes:

1. Adults who are of age 45 or older shall take an examination once three years.
2. Adults who are of age lower than 45; the following rules shall be applied:
 - (a). Obesity: weight \geq 120% of ideal body weight or body mass index \geq 27 kg/m².
 - (b). Direct family member that ill with diabetes.
 - (c). Races in high risk, such as Hispanic, African American or Native American.
 - (d). History of the gestational diabetes, or the mother whose newborn baby weighed 9 pounds or above.
 - (e). Hypertension (\geq 140/90 mmHg).
 - (f). High-density cholesterol levels \geq 35 mg/dl or triglyceride \geq 250 mg/dl.
 - (g). A high level of Impaired Glucose Tolerance (IGT) or having a glucose obstacle when fasting.

Diabetes epidemiology

With the advances of medicine, people change their lifestyle. The obesity people have increased gradually. Therefore, the diabetes has become the most important public health issue of the world in the 21st century. It is estimated that there are 190 million diabetic patients in the world. The World Health Organization (WHO) estimated that by 2025, there will be 330 million patients (Yang et al., 2008). Most of them suffered the type II diabetes. In Taiwan, since 1987, diabetes has ranked as the fifth cause of death, and the growth rate of causing mortality is the fastest one in the past two decades (10.8/100, 000 in 1982, 34.9/100, 000 in 2009) (DOH, 2010).

According to the research on the diabetes prevention by "the Diabetes Prevention Program, DPP", the lifestyle adjustment, diet, and physical activity can help reducing blood sugar preventing diabetes for the high risk group of diabetes, this has been further confirmed by a large-scale intervention in epidemiological studies with no significant

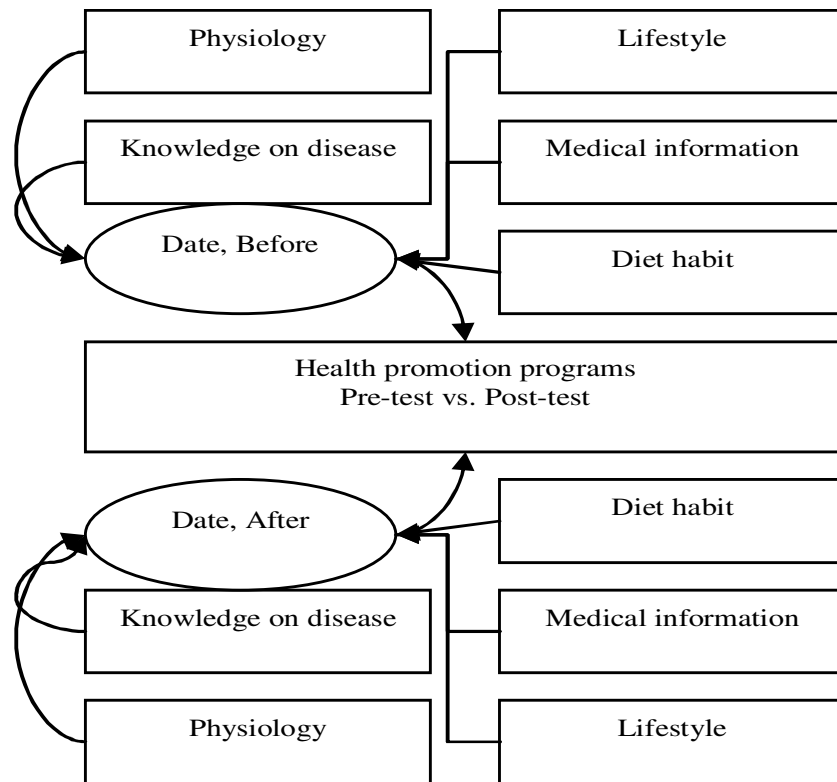


Figure 1. Intervention of health promotion.

difference in gender (DPP et al., 2002; Trichopoulou et al., 2006) and across country or racial/ethnic differences (Caro et al., 2004; Castro et al., 2009; Rafnsson and Bhopal, 2009; Schwandt et al., 2010).

Health promotion as intervention

Some studies have pointed out that the most effective health education, is to change the knowledge, and then to affect people's behavior. There are positive effects to both knowledge and behavior changes by either using the group education, multimedia education, posters, propaganda, or telephone interviews to track (Galper et al., 2003; Caro et al., 2004). Moreover, using the multiple intervention strategies as intervention would have a higher effectiveness for DM prevention (Kuo et al., 2008; Gillies et al., 2008).

The World Health Organization (WHO) had continuously advocated that the health education emphasizes on the awareness and behavior of the public in 1981. The aim is to encourage people to select a healthy lifestyle, being sensitive to using health services, and accordingly people can individually or collectively decide and improve their own health status and quality of life (Chiang and Huang, 1992). The Task Force on Community Preventive Services (2002) suggests effective adopting education interventions to reduce morbidity and mortality from

diabetes. This means health education could be carried to empower people's health knowledge, change people's attitude toward health, develop people's healthy lifestyle, and carry out the health behavior (Knight et al., 2006; Pedersen et al., 2009).

METHODOLOGY

Research framework

This research adopted a quasi-experimental design. The objects of the study accepted to receive a six-month health promotion program. The research collected biological data and to compare changes of the results before and after the program attendance. Data to be collected and compared are consistent with previous studies, such as weight, waistline, hipline, body mass, cholesterol, triglycerides, glucose, hemoglobin, and blood pressure (Liou, 2008; Yank et al., 2008). The framework of this study is shown as the Figure 1.

Samples

This study took the high risk prospects with an age over 40 in Chang Bin town of Taitung country as the object of the research. Partly because of locating in the far eastern part of Taiwan and partly because of the majority of residents are aboriginals, this small township is characterized with extremely low economic activities. This had made the residents of the area rather isolative (in the mid-point of two medium cities in the east) from other parts of the island. It is logical to assume the residents in such an isolated district exposed to a higher risk of DM due to low medical resource access

Table 1. Basic information on respondents (N=43).

Description	n	%
Gender		
Male	18	41.8
Female	25	58.2
Age		
40-50 years	1	2.3
51-60 years	5	11.6
61-70 years	19	44.1
71-80 years	14	32.6
81 years and up	4	9.3
Birth Origin		
Hokennian	8	18.6
Mainlanders	1	2.3
Aboriginal	34	79.1
Education		
Illiterate	18	41.7
Elementary	25	58.1
Occupation		
Agriculture	38	88.4
Housewife	5	11.6
Avg. household income		
NT\$ 5,000-10,000	28	65.1
NT\$ 10,001-20,000	13	30.2
NT\$ 20,000-30,000	2	4.6

(Castro et al., 2009). Objects included in this research are those who were identified by either of the following examinations in the past. These screening examinations are "integrated screening", "free adult health examination", "1824 screening", "outpatient screening" and other examinations that were deemed by a physician as equivalent.

Measurements and methods

A structured questionnaire was used as the instrument to collect personal information and record the biological data for both before and after the intervention. The questionnaire was developed to include data of physiology, lifestyle, medication history, dietary habit, knowledge on diseases, as well as demographic information of the respondents (Huang and Chiou, 1997). An intervention program was designed based on the advices of the medical professionals of the team and is included in the educational program (Burchfiel et al., 1995). Participants were measured and recorded their biological status in the personalized questionnaire by a registered nurse. A second measurement was conducted again after six months has lapsed (Huang et al., 2006). Several visiting were performed between test one and test two to assure the objects' adherence to the instructions provided in the first round of intervention. A comparison analysis is then performed to detect the difference since the first examination.

RESULTS AND ANALYSES

Sample description

This research identified and successfully collected information from 43 responses, among which male gender is 18 (41.8%), female is 25 (58.2%), and 86% of them are 60 years old or older. The data also indicated that respondents of this area are aboriginal (79.1%), non- or low- educated, making rather low income (less than 30,000 NTD, or 1,000 USD) through agricultural activities, as shown in Table 1.

Changes in the blood biochemical data

Cases in question that maintained a normal blood pressure (130/80 mmHg) increased from 20.9% of the respondents to a new level of 41.9%. A 21 percentage-point gained after a six-month health promotion intervention, as shown in Table 2. The respondent with the normal level of glycemic control (120) improved from

Table 2. Changes of biochemical data (N = 43).

Items	Before		After		Percentile gained
	n	%	n	%	
Blood Pressure					
≤130/80mmHg	9	20.9	18	41.9	+21.0
>130/80mmHg	34	79.1	25	58.1	-21.0
AC sugar					
>120	5	11.6	20	46.5	+34.9
≤120	38	88.4	23	53.5	-34.9
Cholesterol					
>200	15	34.9	23	53.5	+18.6
≤200	28	65.1	20	46.5	-18.6
Triglyceride					
>150	7	16.3	15	34.9	+18.6
≤150	36	83.7	28	65.1	-18.6

Table 3. Change of physiological indexes (N = 43).

Items	Before		After		Percentile gained
	n	%	n	%	
BW					
±0kg	43		22	51.2	
0.5-1kg			20	46.5	
≤2kg			1	2.3	
Waistline					
<80cm	5	11.6	5	11.6	0.0
81-90cm	17	39.5	16	37.2	-2.3
>90cm	21	48.8	22	51.2	+2.4
BMI					
<18	2	46.5	2	46.5	0.0
18-24	4	9.3	5	11.6	+2.3
>24	37	86.0	36	83.7	-2.3

11.6% of the respondents to the level of 46.5%, a 34.9 percentage-point gain. The percentage of respondents who maintain normal cholesterol and triglyceride levels had also improved from 34.9 and 16.3% to 53.5 and 34.9% respectively. The data provide a clear evidence of the success of the health promotion intervention program.

Physiological changes

The changes in respondents' physiological indexes are also delightful. More than 97% of respondents reported no or less than 0.5 kg body weight loss after this

intervention program, as shown in Table 3. This means almost all cases could follow the program in a healthy way, and without any cost of losing weight, Waistline and BMI remain roughly unchanged, of which a large portion of the respondents may need further improvement. For example, an ideal BMI index for an adult should be between 18 and 24, yet cases in question are mostly higher than 24.

Conclusion

Causes of DM are multiple. Although more and more risk

factors were identified, various controlling methods were developed, and our understanding on the chronic diseases was proliferating, the number and the percentage of DM patients escalates to new levels. Especially noteworthy in the recent studies is that the diabetes mellitus patients were found in the younger ages. This denotes forms of intervening actions should be effectively taken prior to the incidence of a DM. Consistent with previous studies. No particular discrepancies among race and gender on the outcomes of intervention were found in this research (Caro et al., 2004; Trichopoulou et al., 2006; Castro et al., 2009); in addition, we further provide evidence to show how a health promotion program could be used to intervene in the DM prevention. An effective health promotion intervention program can help identifying prospective DM patient, reducing the prevalence rate. It will be wise to expand the health promotion program to every corner, and to integrate ways of preventing chronic diseases into health education in every level of school education. As far as the preventive medicine concern, the abnormal information the BMI and other biophysical testing carried may bring earlier warning to the victims as well as the healthcare professionals (Rafnsson and Bhopal, 2009; Schwandt et al., 2010). Compare to professional biological testing, BMI may be less important in providing the health status of an individual. However, an acceptable BMI is generally recognized as a rather reliable indicator of physical health. Since BMI and waistline could be easily assessed by any individual, it is particularly recommended including this practice in any health education possibilities in the schools and in the hospitals.

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REFERENCES

- Aiello LP, Gardner TW, King GL, Blankenship G, Cavallerano JD, Ferris FL, Klein R (1998). Diabetic retinopathy. *Diabetes Care*, 21(1): 143-156.
- Burchfiel CM, Sharp DS, Curb JD, Rodriguez BL, Hwang LJ, Marcus EB, Yano K. et al. (1995). Physical activity and incidence of diabetes: the Honolulu Heart Program. *Am. J. Epidemiol.*, 141(4):360-368.
- Caro JJ, Getsios D, Caro I, Klittich WS, O'Brien JA (2004). Economic evaluation of therapeutic interventions to prevent Type-2 diabetes in Canada. *Diabetic Med.*, 21(11):1229-1236.
- Castro FGL, Shaibi GQ, Boehm-Smith E (2009). Ecodevelopmental contexts for preventing type 2 diabetes in Latino and other racial/ethnic minority populations. *J. Behav. Med.*, 32(1):89-105.
- Diabetes Prevention Program Research Group (DPP), Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, Nathan DM (2002). Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N. Engl. J. Med.*, 346:393-403.
- DOH, Department of Health (2010). Causes of death statistics - The main cause of death in Taiwan, 2008. [http://www.doh.gov.tw/statistic/data/ Summary of death / 97 / Table 1. xls](http://www.doh.gov.tw/statistic/data/Summary%20of%20death%20/97/Table%201.xls).(2010/10/29)
- Galper DI, Taylor AG, Cox DJ (2003). Current status of mind-body interventions for vascular complications of diabetes. *Fam. Comm. Health.*, 26(1):34-40.
- Gillies CL, Lambert PC, Abrams KR, Sutton AJ, Cooper NJ, Hsu RT, et al. (2008). Different strategies for screening and prevention of type 2 diabetes in adults: Cost effectiveness analysis. *Br. Med. J.*, 336(7654):1180-1185.
- Grant PJ (2007). Diabetes mellitus as a prothrombotic condition. *J. Int. Med.*, 262:157-172.
- Gruenberg E (1977). The failures of success. *Milbank*, 55:3-24.
- Huang CL, Chen SF, Tang SM, Dai YK (2006). To research the before, and after effects that the intervention of health education to diabetic patients. *Formosa Med. Manage. Mag.*, 2:28-35. (In Chinese)
- Huang YH, Chiou CJ (1997). Assessment of the health - promoting lifestyle profile on reliability and validity. *Kaohsiung J. Med. Sci.*, 12:529-537.
- Ioachimescu AG, Brennan DM, Hoar BM, Kashyap SR, Hoogwerf BJ (2007). Serum uric acid, mortality and glucose control in patients with Type-2 diabetes mellitus: a PreCIS database study. *Diabetic Med.*, 24(12):1369-1374.
- Knight KM, Dornan T, Bundy C (2006). The diabetes educator: trying hard, but must concentrate more on behaviour. *Diabetic Med.*, 23(5):485-501.
- Kuo YL, Chang SC, Chang M, Wong YW, Ye SC (2008). The effects of multi-approach health education on people with pre-diabetes. *J. Evid. Based Nurs.*, 4(4):297-306.
- Liou YM (2008). Strategy and practice in the prevention of type-2 diabetes. *J. Nurs.*, 55(1):70-74. (In Chinese)
- Lynch C, Holman CDJ, Moorin RE (2007). Use of Western Australian linked hospital morbidity and mortality data to explore theories of compression, expansion and dynamic equilibrium. *Austra. Health Rev.*, 31(4):571-581.
- Miech RA, Kim J, McConnell C, Hamman RF (2009). A growing disparity in diabetes-related mortality U.S. Trends, 1989-2005. *Am. J. Prevent. Med.*, 36(2):126-132.
- Okeoghene OA, Chinenye S, Onyekwere A, Fasanmade O (2007). Prognostic indices of diabetes mortality. *Ethn. Dis.*, 17(4):721-725.
- Pedersen SS, Denollet J, Erdman RAM, Serruys PW, van Domburg RT (2009). Co-occurrence of diabetes and hopelessness predicts adverse prognosis following percutaneous coronary intervention. *J. Behav. Med.*, 32(3): 294-301.
- Rafnsson SB, Bhopal RS (2009). Large-scale epidemiological data on cardiovascular diseases and diabetes in migrant and ethnic minority groups in Europe. *Eur. J. Pub. Health.*, 19(5):484-491.
- Robertson LA, Kim AJ, Werstuck GH (2006). Mechanisms linking diabetes mellitus to the development of atherosclerosis: a role for endoplasmic reticulum stress and glycogen synthase kinase-3. *Can. J. Physiol. Pharma.*, 84(1):39-48.
- Schwandt HM, Coresh J, Hindin MJ (2010). Marital status, hypertension, coronary heart disease, diabetes, and death among African American women and men: Incidence and prevalence in the Atherosclerosis Risk in Communities (ARIC) study participants. *J. Fam. Iss.*, 31(9):1211-1229.
- Task Force on Community Preventive Services (2002). Recommendations for healthcare system and self-management education interventions to reduce morbidity and mortality from diabetes. *Am. J. Preventive Med.*, 22(Suppl4):10-14.
- The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (2000). Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care*, 23:S4-S19.
- The Ministry of Interior (MOI) (2011). Life expectancy of 2010. Taipei: Department of Statistics, Ministry of Interior.
- Trichopoulou A, Psaltopoulou T, Orfanos P, Trichopoulos D (2006). Diet and physical activity in relation to overall mortality amongst adult diabetics in a general population cohort. *J. Int. Med.*, 259:583-591.
- Yang CB, Huang CN, Chang SS, Tsau DH (2008). The Type-II diabetes patients exercise intervention theory and application. *Prim. Med. Care.*, 23(2): 55-60.