



The Effects of Patient-directed Education in Laos on the Glycemic Control and Life Style in Type-2-Diabetics

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

Open Peer Review History:

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Original Research Article

Received: 25/05/2024

Accepted: 29/07/2024

Published: 02/08/2024

ABSTRACT

Background and purpose: The number of diabetic patients in the Laotian population is sharply rising. Therefore, there is an increased need for innovative thinking and effective treatment of diabetes. In Laos, diabetes schools have not previously been developed and implemented as part of the treatment. The aim of the study was to implement a 12-week diabetes school for adults with type 2 diabetes and investigate the effects primarily on fasting plasma glucose (FPG). Secondly, to evaluate effects on body weight, body mass index (BMI), waist to hip ratio (WHR), blood pressure, lipid profile, HbA1c and on the quality of life and the effects on the patient's own perception of the disease.

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Cite as: Bahne, Ulla, Vadsana Vongvandy, and Jens Rikardt Andersen. 2024. "The Effects of Patient-Directed Education in Laos on the Glycemic Control and Life Style in Type-2-Diabetics". *Asian Journal of Research and Reports in Endocrinology* 7 (1):87-95. <https://journalajrre.com/index.php/AJRRE/article/view/97>.

Materials and Methods: One hundred patients with type 2 diabetes (≥ 18 years) were randomized, 50 patients participated in a newly developed 3-day a week diabetes school, teaching nutrition, physical activity and understanding of the disease as well as knowledge about the management of late diabetic complications. The 50 patients in the control group received the usual treatment. The study was not blinded. Quality of life and the patient's own perception of their disease was evaluated using the questionnaire EQ-5D and semi-structured interviews by the staff.

Results: Twelve weeks of diabetic school reduced FPG significantly (intervention: -21.0 mg / dl (SD 88.8) versus control: $+18.6$ mg / dl (SD 48.8) ($P = 0.02$), and BMI was significantly reduced in the intervention group (-0.3681 kg / m² (SD 0.62) versus controls $+0.1042$ kg / m² (SD 0.90)). There were no significant effects of the intervention on HbA1c, blood pressure, WHR or lipid profile.

The focus group interviews clearly demonstrated, that most of the patients had very little insight in the consequences of their type 2 diabetes, and they do not think about the complications before these are a reality. Dietary treatment and physical activity are not established parts of the treatment of diabetes in Laos, so most health professionals know very little about the prevention of diabetic complications.

Conclusions: The 12-week diabetes school significantly reduced fasting blood glucose and BMI. Disease insight is modest in the Laotian patients with type 2 diabetes as well as in health professionals, but it was evident, that structured education of the patients have beneficial effects for the patients and probably for health professionals too.

Keywords: Diabetes mellitus; education; training; glycemic control.

1. INTRODUCTION

The prevalence-rate of diabetes mellitus (DM) are steadily increasing all over the world for the past three decades and dominantly so in low- and middle-income countries [1], where the growth are expected to be the highest the coming decades. Globally, the greatest decline in deaths from major NCDs (non communicable diseases) between 2000 and 2019 were from chronic respiratory disease (a 37% drop in age-standardized rates for all ages combined), followed by cardiovascular disease (27%) and cancer (16%). Deaths due to diabetes, however, increased slightly by 3% over the same period [2]. Epidemiological data are varying for South-East Asia as the region is defined differently by health organizations, but they all agree that the prevalence- and incidence rates of DM are increasing. In the WHO South-East Asia Region, more than 96 million people are estimated to have diabetes, and another 96 million to be pre-diabetic, causing at least 600,000 deaths annually. Half of all adults with type 2 diabetes are undiagnosed [3]. Most of diabetic patients in the developing countries are between 45 - 64 years old, much younger than in developed countries, and the prevalence-rate of diabetic complications are higher. Asian populations have a strong ethnic and genetic predisposition for diabetes and have lower thresholds for the environmental risk factors, which is air pollution, walkability, food environment, physical activity resources, and roadways proximity [4]. Probably

due to a combination of genetics and environmental factors, South-East Asians have up to four times higher risk of developing type 2 diabetes than other ethnic groups [5]. In addition, the South-East Asians diet is associated with diabetes risk factors [6].

On top of all these problems, we lack the experience in how to prevent and treat the patients with type 2 diabetes in the developing countries, although some experience is published in reviews from Malaysia [7] and the African Region [8]. Even in the western countries the methods are heterogeneous and the results debatable in a meta-analysis [9].

In this study, we aimed at testing the well-established Danish principles [10] in Laos. The aim of the study was to implement a 12-week diabetes school for adults with type 2 diabetes and investigate the effects primarily on fasting plasma glucose (FPG). Secondly, to evaluate effects on body weight, body mass index (BMI), waist to hip ratio (WHR), blood pressure, lipid profile, HbA1c and on the quality of life and the effects on the patient's own perception of the disease.

2. MATERIALS AND METHODS

One hundred consecutive patients with type 2 diabetes (aged ≥ 18) were included in the study, and randomized by sealed envelopes to 50 in the intervention group (diabetes education) and 50 in

Table 1. Baseline characteristics in the intervention- and control group. Mean values. NS = not significant

Variable	Intervention group	Control group	Significance
Age - Male / Female	55 / 55	56 / 57	NS
Sex - Male / Female	20 / 30	17 / 33	NS
BMI - Male / Female	23.74 / 26.78	24.39 / 24.68	NS
Smoking, yes or no	45 non-smoker ≈ 92%	45 non-smoker ≈ 98%	NS
Alcohol, yes or no	41 no alcohol ≈ 84%	36 no alcohol ≈ 78%	NS
Diabetes medicine (yes)	46 ≈ 98%	36 ≈ 95%	NS
Other medicine (yes)	41 ≈ 87%	34 ≈ 89%	NS
Diabetes in the family	34 ≈ 69%	30 ≈ 65%	NS
Complications to Diabetes:			
One complication	21 ≈ 46%	20 ≈ 51%	NS
More than one	19 ≈ 41%	14 ≈ 36%	NS

the control group (usual care) (Fig. 1.). Patients were recruited in relation to a routine check in the department of endocrinology, and the 100 randomly selected Lao patients consisted of 37 males (age 36-78 years) and 63 females (34-78 years) (Table 1). Every patient in the clinic was asked for participation. Eight patients declined. None was excluded, but dementia and pregnancy were exclusion criteria. The intervention group at baseline is defined as "Intervention T0", and intervention group after 12 weeks intervention is defined as "Intervention T12". Control group at baseline is defined as "Control T0" and control group after 12 weeks is defined as "Control T12".

The education of the diabetic patients consisted of three group sessions of two hours duration with information, written informative material in Lao and possibility to ask question. The staff was invited to participate. One session had a focus on diet and nutrition, one with the focus on physical activity, and the third with focus on disease understanding and complications.

The design was an un-blinded non stratified Randomized Controlled Trial (RCT). The diagnosis of type 2 diabetes and impaired glucose tolerance was based on the WHO-IDF criteria [11]. HbA1c, serum total cholesterol, serum low density lipoprotein (S-LDL), serum high density lipoprotein (S-HDL), serum triglycerides (S-TG), creatinine, blood pressure, anthropometric characteristics, habitual diet, and co-morbidities was registered. Not all patients in the intervention group attended the training intended. The effects on self-reported quality of life were evaluated using the EQ-5D questionnaire and VAS. Interviews of the staff were performed as a qualitative, semi-structured focus group interviews, one with doctors from the

out-patient clinic, and one with both doctors and nurses from the nutrition department. The interview guide was translated into lao language. These were not exploratory interviews about future possibilities for improvement, but for the purpose of understanding the results.

The sample size (100 patients) was estimated as a clinically relevant reduction of fasting blood sugar of 50%, a risk of type-1-error of 5%, and type2-error of 20%. Statistical methods used were paired and unpaired two-tailed t-tests for data not significantly different from the t-distribution. For not-normally distributed data, the Mann-Whitney or Wilcoxon rank-sum-test, and correlations by the Spearman rank correlation test.

3. RESULTS

Eight patients (two died) corresponding to 16% in the intervention group did not attend any of the educational sessions. Out of the remaining 42 patients 39 (92.9%) attended the nutrition session, 33 (78.6%) attended the exercise and physical activity session, 33 (78.6%) attended the comorbidity session. 30 (71.4%) patients attended all three group sessions.

Fasting plasma glucose was not significantly different between the intervention group and the control group at baseline or after 12 weeks, but the FPG from baseline to 12 weeks was a decrease in the intervention group (21.0 mg/dl (SD 88.8)), but an increase in the control group (18.6 mg/dl (SD 48.8 mg/dl)) ($p = 0.02$) (Fig. 2). At the same time, the intervention had a significant weight reducing effect (Fig. 3). The waist to hip ratio increased in the intervention group after 12 weeks (0.002 cm (SD - 0.01)), but decreased in the control group by 0.6 cm (SD

2.2) ($p=0.02$). HbA1c did not change significantly in any of the groups with a decrease in the intervention group by 7.7 mmol/mol (SD 5.2) and 13.4 mmol/mol (SD 2.7) in the control group.

The mean systolic blood pressure in the intervention group decreased by 5.6 mmHg (SD 17.4 mmHg) while it increased in the control group (1.8 mmHg (SD 15.5)) (Fig. 4). These differences were not significantly different.

Neither were the changes in the diastolic pressure.

After 12 weeks EQ-5D questionnaire was completed by 45 (90%) patients in the intervention group and by 46 (92%) of the control group (Fig. 5).

Neither plasma creatinine nor plasma lipids changed significantly during the 12 weeks in either group.

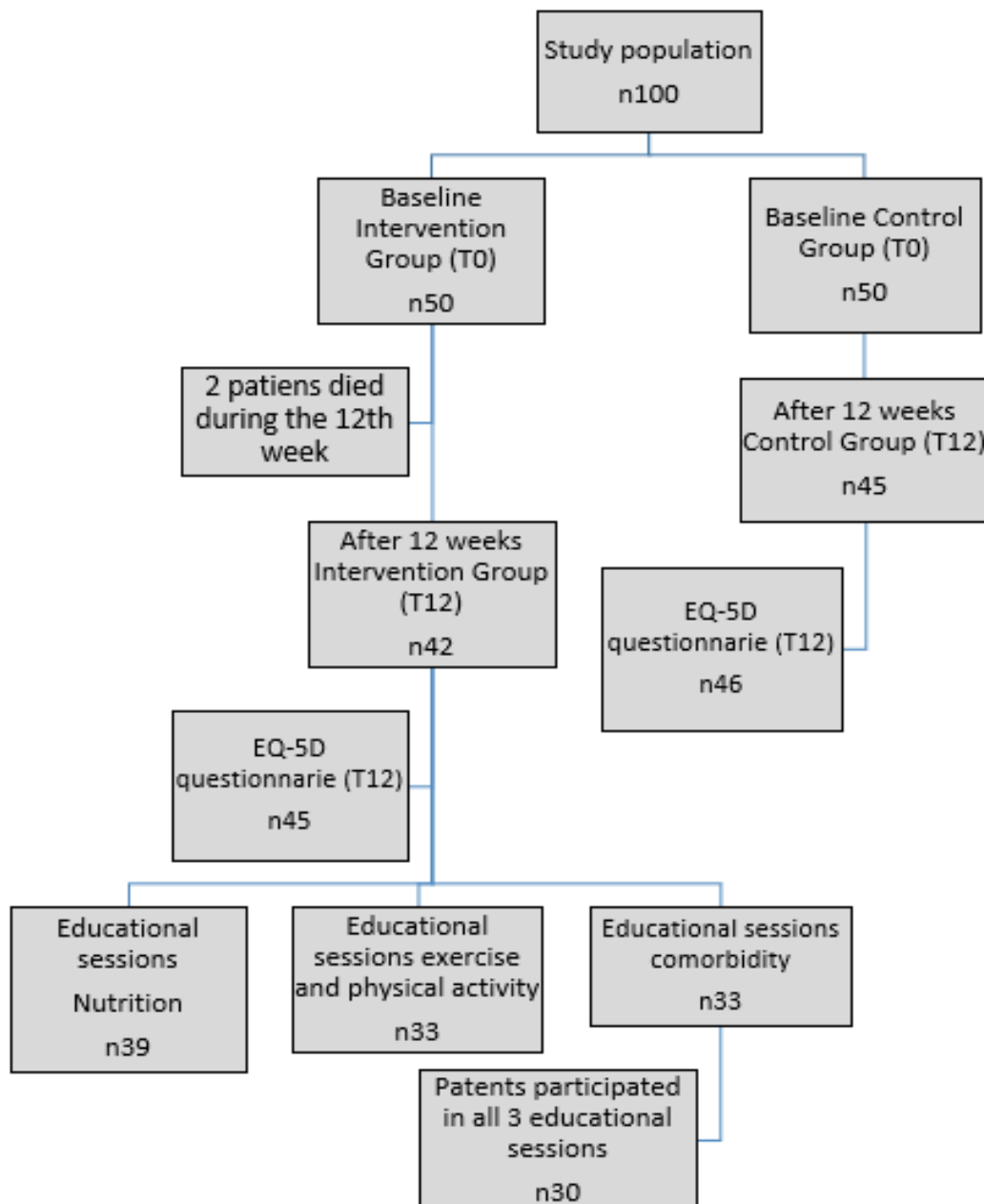


Fig. 1. Patient flow in the study of the effects of patient education.

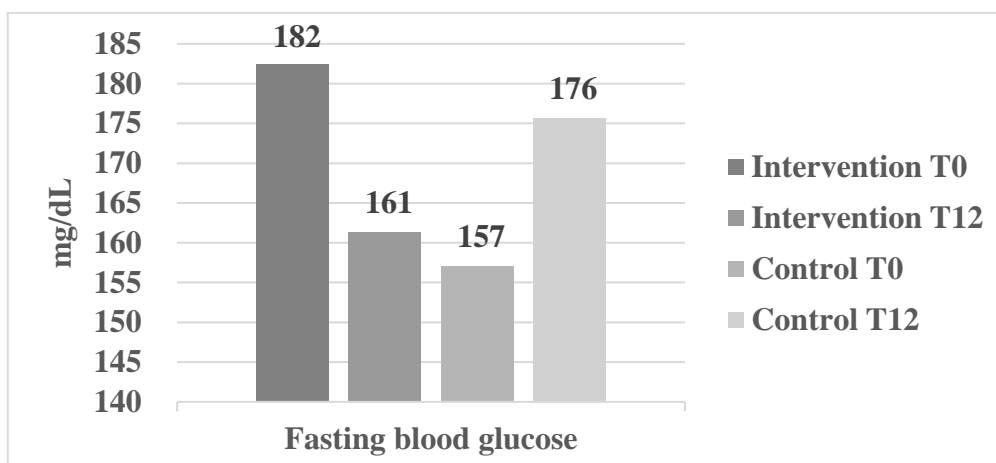


Fig. 2. The effect of patient education on fasting blood glucose. Intervention group n= 35, control group n=33. The decline in the intervention group was significant. T0 = at baseline, T12 = after 12 weeks

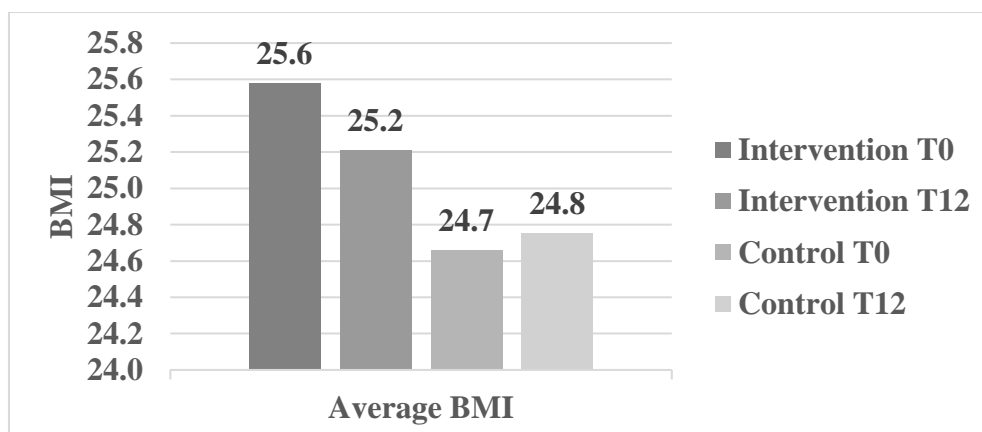


Fig. 3. Effect of the diabetes school on BMI compared to a randomized control group without patient education. The intervention group N= 42, control N= 45. T0 = at baseline, T12 = after 12 weeks. Differences were not significant

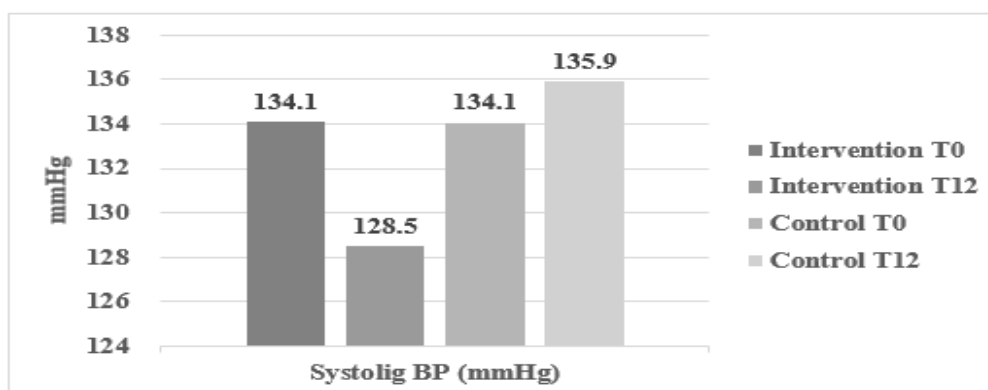


Fig. 4. Development in systolic blood pressure before and after a 12 weeks intervention with education, diet and exercise. (N= 37 in the intervention group, 31 in the control group). T0 = at baseline, T12 = after 12 weeks. The changes were not significant

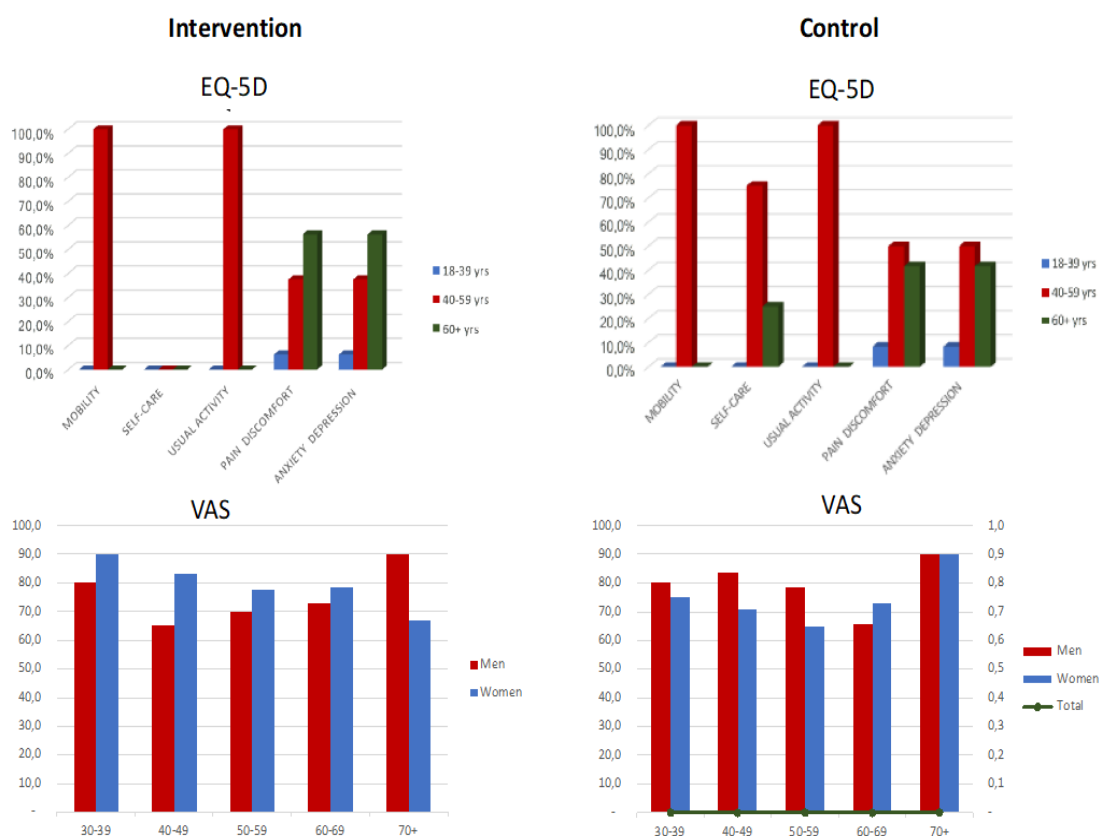


Fig. 5. The patient's own opinion about their disease during the 12 weeks of observation. The intervention group had teaching and dietary/training, the control group was only observed

The patient's own opinion about their disease during the 12 weeks of observation did not display major differences between the randomization groups (Fig. 5) judged by the results of EQ-5D and visual analogue scales (VAS) for patients self-rated health status on a graduated scale (0-100). Both groups reported good mobility. No one reported, "I am confined to bed" in the intervention group, but some had problems with self-care in the control group (Fig. 5). All patients complained about pain discomforts, and the severity increased with age ≥ 60 years. The severity and number of patients reporting anxiety and depression follows the distribution of pain, increasing with age. Quality of life evaluated by VAS the patient's self-rated health status on a graduated scale (0-100) shows a trend towards decreasing quality of life with age, regardless of sex. The women in general reported lower quality of life than the men in the intervention group, but the opposite in the control group. None of these trends reached statistical significance.

3.1 Results of Qualitative, Semi-Structured Focus Group Interviews with Doctors from the Outpatient Department

In short the dominating opinion among the staff members about the patient's reactions to type 2 diabetes was, that the patients with type 2 diabetes clearly underestimates the severity of the disease and the risk of complications. The compliance to medication (including insulin) and life style modifications is poor. They feel that the patients believe more in herbs, ayurvedic medicine or advertising seen on Facebook or television. Another problem is that many patients are not referred to the nutrition team. The doctors stated that the patients were not attentive to preventive advices about nutrition and physical activity. Many patients are acutely admitted and recommended to attend the OPD after discharge, but many does not, and if starting at the OPD, the doctors estimated that only about 70% of the patients return for results of tests and follow-up

although recommended. Many patients prescribed insulin didn't know how to inject the drug.

The qualitative interviews with doctors and nurses from the nutrition team confirmed, that they considered the knowledge about prevention of complications is very poor, concerning both healthy foods, nutrition and exercise and the effects on blood glucose and atherosclerotic complications. One nurse stated that this knowledge had only been in the team for very few years. The team confirmed the lack of referral of patients to the team, and estimated that only 5-10 % of the referred patients show up. In general, all the members of the nutrition team feel, that the patients always believe more in a grandmother, mother or sister and listen more to their advice, than the advices from any doctors or nurses. It is a frequent problem as well as the lack of trust concerning changes in life style. Especially young people with type 2 diabetes have major problems understanding and accepting, that they can't drink alcohol, can't eat a lot of fast food and/or drink a lot of cola or juice. The nutrition team explain that it is difficult because the young patients just want the same lifestyle as their friends.

4. DISCUSSION

Only few data were available from baseline, as it is not possible to send out questionnaires to the patients by post or email as many of the patients have troubles with reading and writing. This and other logistic problems constitute a selection bias, as only the best patients were able to participate in the study. Another similar problem was the difficult transport to the clinic, as the patients have to pay themselves. Patients with mobility problems had major problems in that aspect too. This also means that self-care is necessary in many aspects and tight clinical and biochemical control is unrealistic. The nature of EQ-5D leads to a high ceiling effect in the assessment of the health status and contributes to the general overestimation of results obtained [12]. It is well documented, that life style interventions are an important part of the treatment of type 2 diabetes among these diabetes self-management education (DSME). DSME can be delivered in many forms, and DSME is important for all individuals with diabetes who want to improve diabetes care and to achieve successful health related outcomes [13]. Group based DSME is a cheaper method than individual consultations and another

advantage is, that group based DSME allow patients to meet and discuss [14]. Steinsbekk et al. showed, that group-based DSME for patients with type 2 diabetes results in improvements in lifestyle, clinical and psychosocial outcomes [15]. In the study "Education of type 2 why not in group" Lozano et al. concluded, that group education may be effective, especially because of the increase in knowledge about the disease improves the motivation for a change to a healthier life-style [16]. Adachi et al. also demonstrated the effectiveness of lifestyle education for patients with type 2 diabetes in Japan finding a reduction in HbA1c after six months of education [17]. Using a 12-weeks education program Tan et al. demonstrated significant results in poorly regulated type 2 diabetes patients on both glycemic control, dietary intake, physical activity, medication adherence rate, and self-monitoring of blood glucose compared to a control group [18].

5. CONCLUSION

The 12-week diabetes school significantly improved diabetes control. Disease insight is modest in the Laotian patients with type 2 diabetes and health professionals, but structured education of the patients have beneficial effects for both groups. This type of patient education is recommended for countries in a similar situation as Laos.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

The protocol was approved by the Ministry of Health National Ethics Committee for Health Research.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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