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**Research Article**

# Solving the barriers to diabetes education through the use of multimedia

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**Abstract** Diabetes mellitus is a chronic disease that affects > 180 million people worldwide. It is persistent in Thai communities in spite of much effort in prevention and control. This study examined the knowledge capacity of villagers in the Klongmai community of Nakhon Pathom, Thailand, regarding diabetes by way of action research. A health status assessment and a survey of the community were carried out and used as the basis for designing an educational video on diabetes that is accessible regardless of age and educational background. Evaluations of the pre- and poststudy questionnaires were carried out using statistical analysis. The results indicated that the devised educational materials were effective in encouraging the community's self-awareness and perception of diabetes at the significance level of 0.05. Most importantly, the participants demonstrated proficiency in adapting the knowledge gained from the workshop to their own lifestyle.

**Key words** action research, chronic disease, diabetes mellitus, health education, self-awareness, self-reliance.

## INTRODUCTION

Diabetes mellitus poses a major public health concern by reason of its associated morbidity, mortality, and expenditures (Rubin *et al.*, 1994; American Diabetes Association, 2006). The disease is a complex, chronic, metabolic syndrome. A lack of suitable treatment typically leads to complications such as cerebrovascular and coronary heart disease, nephropathy, retinopathy, and gangrenous feet (The Diabetes Control and Complications Trial Research Group, 1993; United Kingdom Prospective Diabetes Study Group, 1998; Brownlee, 2001). A plethora of campaigns have been initiated worldwide in efforts to curb the increase of diabetes mellitus through various media including television, radio, the Internet, brochures, and health-care professionals (Gucciardi *et al.*, 2006). Abundant information is available on diabetes mellitus; despite this, the current trend does not indicate any reduction in the prevalence of diabetes mellitus. It has been forecast that, by 2030, the prevalence of diabetes will have increased twofold, from 2.8% (171 million people) to 4.4% (366 million people) (Wild *et al.*, 2004). In fact, diabetes is an epidemic in Asia, with > 110 million individuals currently living with diabetes (Yoon *et al.*, 2006; Chan *et al.*, 2009). The increasing prevalence of diabetes mellitus, in spite of massive campaigns, necessitates a careful look into the matter.

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The main objectives of diabetes education are to improve health and to prevent complications by providing the participants with the necessary background (Barclay & Mathers, 2008; Jackson, 2009). Adequate knowledge has been identified as the key to achieving suitable behaviors for diabetes care (Sprague *et al.*, 1999; Lee *et al.*, 2007). Moreover, diabetes knowledge was shown to provide a sense of empowerment and improved quality of life for the participants (Padgett *et al.*, 1988; Brown, 1990; Beaser *et al.*, 1994; Bruce *et al.*, 2003). Karter *et al.* (2007) agreed that adequate knowledge was essential for good behavior. However, the main impeding factors, as cited by educators, included a lack of awareness, limited access to education, barriers to follow-up (Sprague *et al.*, 1999), and a lack of motivation (Funnell *et al.*, 1992). Similarly, the barriers to awareness and control of diabetes for Hispanic Americans were poor language comprehension, poor physician–patient communication, cultural differences, a low educational level, and a lack of health insurance (Aranda & Vazquez, 2004). Gucciardi *et al.* (2007) proposed that an effective design for health education should take the following factors into consideration: the duration of participation, the conciseness of the content, and the convenience for the target population.

The Clear Health Initiative, launched by Pfizer to combat the problem of health illiteracy, helped writers and designers of health education to develop materials that are easy to read and understand (Doak & Doak, 2009). Several authors pointed out that multimedia and audiovisual resources were effective for health education when literacy is an issue (Gucciardi *et al.*, 2006; Kamel Boulos *et al.*, 2007). Therefore,


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a suitable health education model is essential for stimulating self-awareness, which would lead ultimately to self-reliance.

To achieve this goal, regular visits to the community of Klongmai, Nakhon Pathom, Thailand were made to discern and solve potential health problems. On the basis of initial community health surveys, it was discovered that chronic diseases, such as diabetes mellitus, was a pressing issue inflicting the community. Therefore, an educational multimedia video concerning diabetes mellitus was created for the villagers to view, after which their perspective on the chronic disease was evaluated by an exit survey. The results suggested that the educational multimedia video was effective in informing the villagers, as well as raising their self-awareness.

## METHOD

### Aim

The aim of the present study was to utilize the knowledge gained from primary health status data and preliminary interviews in developing an effective educational multimedia video in order to assess the level of understanding of diabetes mellitus and the participants' perception and self-awareness on issues related to diabetes mellitus.

### Ethical considerations

This research was submitted to Mahidol University's Institutional Review Board for approval. The Institutional Review Board considered that this research was minimal-risk research as it could not place the subjects at risk of damaging their social standing or reputation. Furthermore, the study also was deemed to be of benefit to the community in health education. Participation in the study was voluntary and the anonymity of the participants was preserved.

### Community of Klongmai as the study location

The location that was selected for this study was the community of Klongmai, which is located in Sampran district of Nakhon Pathom province. Klongmai is unique in that it is located in the suburban area of Bangkok (40 km south of Bangkok). Most of the Klongmai villagers are farmers, with a comparable proportion working in 22 industrial factories. The community has both primary and secondary heath-care service units overseeing the population of 14 692 in a community comprising > 2359 families in six villages. The health problems of national concern that affect the community are chronic diseases such as diabetes mellitus, hypertension, and hyperlipidemia.

### Research design

In light of the thriving problem of chronic conditions, such as diabetes, in the Klongmai community, action research (AR) was utilized to address the impediments of diabetes education. Action research involves the utilization of a collection of research methodologies in order to instigate action (i.e. change) and research (i.e. understanding) (Avison *et al.*, 1999). Particularly, AR is an iterative process that focuses on bringing about change to the participants, followed by a reflection on those results and their implications (Hult & Lennung, 1980; Reason & Bradbury, 2001; Hampshire, 2008). The usefulness and benefits of AR have led to its extensive application in a broad spectrum of disciplines such as management and health care (Baskerville & Wood-Harper, 1996; Eden & Huxham, 1996; Meyer, 2000; Coughlan & Coghlan, 2002).

The initial phase of the study involved the use of primary health status data, which were obtained from a health check-up by the Mobile Health Unit of the Faculty of Medical Technology, Mahidol University, and in-depth interviews to assess the villagers' general knowledge and understanding of diabetes mellitus. The second phase involved the planning and devising of the educational model, based on information gained from the initial phase, for empowerment of the attendants. The third phase entailed the use of pre- and poststudy questionnaires to evaluate the perception and self-awareness of the villagers regarding diabetes after viewing the educational multimedia video. Action research was used to resolve or reduce the barriers to diabetes education in the community by analyzing the problems that were hindering the learning process and to instigate change by means of an educational video, followed by evaluation of the effectiveness of the devised educational multimedia video. The schematic representation of the AR process that was used in this study is illustrated in Figure 1.

### In-depth interviews

Two interview sessions were carried out to gain insight about the behavior and perception of diabetes of the villagers and to allow the participants and their family the opportunity to share their ideas and experiences on diabetes knowledge and care. The first interview was used for the design and planning of the educational multimedia video in order to obtain the villagers' general perceptions and understanding of diabetes. Eight villagers were randomly selected from the community and were interviewed individually. The second in-depth interview was carried out with a villager with severe diabetes, as identified from the village map. Particularly, this villager had been living with a leg amputation and had been cared for by his wife and family members for > 10 years.

### Preparation of the educational materials

An educational multimedia video was developed for use in the diabetes education program as a means of empowering the workshop participants to comprehend the information in an easy-to-understand manner. It was developed based on the preliminary interview in phase 1 of the study, as described previously. The video is comprised of two components: (i) three-dimensional (3-D) cartoon animation; and (ii) a video recordings of the in-depth interviews. The video contents were created based on the initial planning of the storyline, followed by rendering the cartoon characters in 3-D animation. Video clips from one villager with a severe case of diabetes were included in the educational multimedia video.

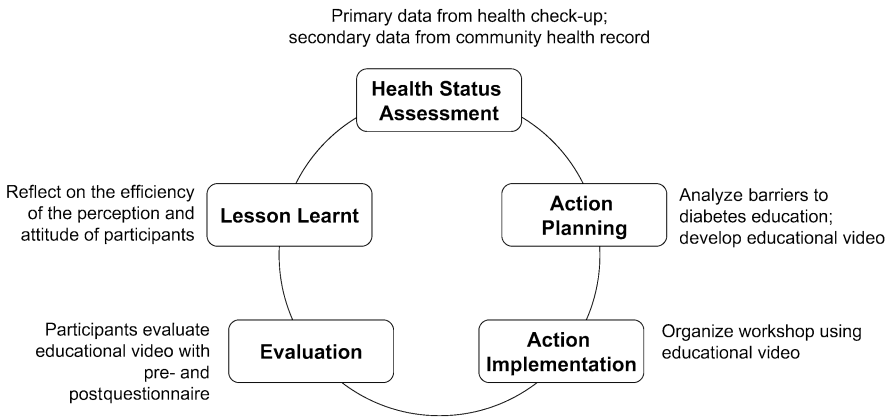


**Figure 1.** Schematic representation of the action research method used in this study.

The cartoon animation and video clips were then combined and compiled into a full-length video of 15 min.

### Questionnaire

The questionnaire, which was developed for this study, was used to assess the progression of the participants on their understanding of diabetes before and after their education with the devised video. The contents of both the pre- and post-questionnaires dealt with the five dimensions of diabetes, which is comprised of: (i) definition; (ii) symptoms; (iii) risk factors; (iv) complications, and (v) severity. The five dimensions of diabetes education were selected as they were identified to be the five core areas in which the villagers lacked general understanding. The questionnaires were scored as follows: (i) the questions that were answered correctly were given 1 point; (ii) the questions that were answered incorrectly were given –1 point; and (iii) the unanswered questions were given 0 points. The questionnaires are shown in Tables 1 and 2 for the pretest and post-test, respectively.

### Participants and diabetes education program

Those participating in the questionnaires consisted of 68 members of the elder society of Klongmai community who were literate. This target group was selected because the elder society participated in regular activities, including a health check-up (e.g. blood glucose monitoring) and various health education programs by the primary health care unit of the community. The participants' mean age was 68.84 years and the majority was female (82%, $n = 56$). Most of the participants did not have diabetes (65%, $n = 44$); of these, 39 (89%) were female. Seventeen (71%) of those with diabetes were female.

The diabetes education program was delivered by means of a workshop that was comprised of four sessions, where 17 of the 68 participants took part in each round. Each session began with the participants taking the pretest, followed by viewing the educational multimedia video, and finally taking the post-test. The questionnaires were administered under the supervision and guidance of the research team. Each questionnaire took ~ 20 min. Evaluations were then made using statistical analysis in order to assess the level of understanding and improvement of the participants. Particularly, the Student's *t*-test was carried out on all 68 participants. Then, the participants were divided into two groups (those with diabetes and those without diabetes), followed by analysis using the Wilcoxon's Matched-Pairs test and the Student's *t*-test, respectively.

## RESULTS

### Health status assessment

The Faculty of Medical Technology, Mahidol University, in collaboration with the primary health care unit and the local administration of Klongmai community, carried out a risk survey in order to determine the participants' health status. The results, as shown in Table 3, indicated that there was an increasing prevalence of diabetes: there was an increase in prediabetes, from 17.70% in 2003 to 28.66% in 2006, and an increase in diabetes, from 8.64% in 2003 to 17.83% in 2006. There was a concomitant increase in the Body Mass Index (BMI) > 25 kg/m$^2$, from 36.63% in 2003 to 43.87% in 2006. A wide array of diabetes educational resources was available at the hospital or health service unit including brochures, leaflets, consultation, and group therapy. In spite of the abundant health infrastructure that was present in the community, the incidence of chronic disease, such as diabetes, was still high.

The in-depth interview data revealed that the majority of the participants tended to think of health problems that were of close concern to themselves, such as obesity, diabetes mellitus, and hypertension. When asked about their knowledge of diabetes mellitus, self-care, and methods of care and treatment, the participants demonstrated basic knowledge of the relationship between diabetes and behavior:

> . . . From what I can see, those who have diabetes are usually obese . . .

Furthermore, the participants demonstrated an understanding of the relationship between diabetes and genetic heredity:

> . . . I think that this disease is related to genetics, as seen from one of my neighbors, where both the mother and child have diabetes . . .

**Table 1.** Preliminary assessment of the workshop participants' knowledge of diabetes mellitus prior to viewing educational video

| Questions | Answers |
|---|---|
| A person having diabetes is likely to have the following disease (may select more than one choice) | Hypertension<br>Cardiovascular disease<br>Severe wound requiring amputation<br>Kidney disease<br>Blindness<br>Other . . . |
| What is the severity of diabetes? | Can be treated by taking medication<br>Cannot be treated but can be controlled<br>Could be life-threatening |
| What is diabetes mellitus? | High blood glucose<br>Urine attracts ants<br>Other . . . |
| How can we acquire diabetes? | Genetics<br>Food<br>Have pre-existing disease such as . . . |
| Which of the following symptom(s) are indicative of diabetes? (may select more than one choice) | Frequent urination<br>Eating too much<br>Don't know<br>Other . . . |
| Have you ever received any information about diabetes?<br>How many times? | Yes<br>No<br>Number of times |
| If yes, from which source? | Medical doctor<br>University professor<br>Book<br>Television<br>Primary health care unit/hospital |
| How can the blood glucose level be reduced? | Eating less<br>Exercise<br>Avoiding sweets<br>Other . . . |
| Have you ever complied with all of the above activities?<br>If not, which activities did you abide by? | Yes, complied with all<br>No, not complied with all<br>Time won't allow<br>Not brave enough to comply<br>Did not comply as there are no obvious benefits<br>Other . . . |
| Are you taking any medication for lowering the blood glucose level? | I used to, but not at the moment<br>Yes, I am presently taking medication<br>Never taken medication before |
| If yes, how is the blood glucose level? | Increase<br>Decrease, but still at the abnormal level<br>Remains the same |
| How long have you taken medication? | Number of days<br>Number of months<br>Number of years |
| Do you take medication regularly? | Regularly<br>Irregularly |

**Table 2.** Post-assessment of the workshop participants' knowledge of diabetes mellitus after viewing educational video

| Questions | Answers |
|---|---|
| Do you have diabetes mellitus? | Yes<br>No |
| Section 1: Knowledge of diabetes | |
| After viewing the educational video, do you feel that you have more knowledge about diabetes? | Yes<br>No<br>Other . . . |
| What is the meaning of diabetes? | High blood glucose<br>Low blood glucose<br>Don't know<br>Other . . . |
| What is the severity of diabetes? | Can be treated by taking medication<br>Cannot be treated but can be controlled<br>Could be life-threatening |
| Who is at higher risk for diabetes? (may select more than one choice) | Parents have diabetes<br>Eat too much sweets<br>Low blood pressure<br>Don't know<br>Other . . . |
| What are the symptoms of diabetes? (may select more than one choice) | Frequent urination<br>Eat too much<br>Don't know<br>Other . . . |
| If a person having diabetes is unable to control his/her blood glucose level, he/she will have which disease? (or what are the sequelae?) | Hypertension<br>Cardiovascular disease<br>Severe wound requiring amputation<br>Kidney disease<br>Blindness<br>Other . . . |
| Section 2: Behavior change | |
| Do you have an increase in awareness of the importance (dangers) of diabetes? | Yes, I have an increase in awareness<br>No, I don't have an increase in awareness<br>Don't know<br>Other . . . |
| For the participants without diabetes | |
| After viewing the educational video, how would you like to adapt your lifestyle? (may select more than one choice) | Be conscious in diet selection and eat nutritious food<br>Exercise regularly<br>Will not change my behavior because . . .<br>Don't know<br>Other . . . |
| How will you make use of the new knowledge that you have just learned? | Transfer the knowledge to others (e.g. family and friends)<br>Use the knowledge as a guideline for diabetes prevention<br>Use the knowledge for observing whether I have diabetes or not<br>Will not make use of the knowledge because . . .<br>Don't know<br>Other . . . |
| For the participants with diabetes | |
| After viewing the educational video, how would you like to adjust your lifestyle? (may select more than one choice) | Be conscious in diet selection and eat nutritious food in order to control blood glucose level<br>Exercise regularly<br>Monitor health status regularly<br>Will not change my behavior because . . .<br>Don't know<br>Other . . . |
| How will you make use of the new knowledge that you have just learned? | As a guideline for healthy diet selection<br>As a guideline for exercising properly and regularly<br>As a guideline for preventing diabetes complications<br>Will not make use of the knowledge because . . .<br>Don't know<br>Other . . . |
| Section 3: Video format | |
| How do you feel when viewing the video? | I think that the video is interesting<br>I think that the video is boring<br>I fell asleep when watching the video<br>I feel that the video does not make a difference in my perception<br>Other . . . |
| Do you feel satisfied with your level of understanding of diabetes? | I feel satisfied because . . .<br>I feel unsatisfied because . . . |

**Table 3.** Health status record of the participants

| Characteristic | Year 2003 N | 2003 % | 2006 N | 2006 % |
|---|---|---|---|---|
| Participant total | 248 | | 158 | |
| Sex | | | | |
| Male | 94 | 37.90 | 43 | 27.22 |
| Female | 154 | 62.10 | 115 | 72.78 |
| Age range (years) | | | | |
| 11–20 | 32 | 12.90 | 1 | 0.63 |
| 21–30 | 40 | 16.13 | 12 | 7.59 |
| 31–40 | 49 | 19.76 | 15 | 9.49 |
| 41–50 | 49 | 19.76 | 23 | 14.56 |
| 51–60 | 33 | 13.31 | 25 | 15.82 |
| 61–70 | 29 | 11.69 | 45 | 28.48 |
| 71–80 | 14 | 5.65 | 29 | 18.35 |
| 81–90 | 2 | 0.81 | 8 | 5.06 |
| Body Mass Index (kg/m$^2$) | | | | |
| Underweight (< 18.5) | 20 | 8.23 | 6 | 3.87 |
| Normal weight (18.5–24.9) | 134 | 55.14 | 81 | 52.26 |
| Overweight (25.0–29.9) | 76 | 31.28 | 59 | 38.06 |
| Obesity (≥ 30) | 13 | 5.35 | 9 | 5.81 |
| Blood pressure (systolic and diastolic: mm Hg) | | | | |
| Normal (< 120 and < 80) | 54 | 22.13 | 28 | 18.18 |
| Prehypertension (120–139 and 80–89) | 84 | 34.43 | 31 | 20.13 |
| Hypertension stage I (140–159 and 90–99) | 69 | 28.28 | 62 | 40.26 |
| Hypertension stage II (≥ 160 and ≥ 100) | 37 | 15.16 | 32 | 20.78 |
| Fasting blood glucose (mg/dL) | | | | |
| Normal (< 100) | 179 | 73.66 | 84 | 53.50 |
| Prediabetes (100–125) | 43 | 17.70 | 45 | 28.66 |
| Diabetes (≥ 126) | 21 | 8.64 | 28 | 17.83 |

In terms of the diagnosis of the disease, two of the participants made the following comments:

> . . . if the urine is left for a while and ants are present, then it means that there is [a] high sugar level in the blood . . .

> . . . I don't have diabetes because whenever I had a cut, it would heal quickly, so I know that I don't have it . . .

Moreover, the view of the participants on caring for diabetes was as follows:

> . . . If I want to know whether I have diabetes or not, I would go to the clinic for a blood analysis, and if I do have diabetes, then I would go to the clinic for drugs . . .

## Barriers to improvement

There is plentiful information on diabetes and its care; however, its prevalence is still high. The strategies and approaches that control its further escalation is a pressing challenge. It is well accepted that the key to successful diabetes care is sufficient diabetes knowledge (Beaser *et al.*, 1994). The benefits include a sense of empowerment, reduced complications, and an improved quality of life (Brown, 1990; Asha *et al.*, 2004). Funnell *et al.* (1992) suggested that the barriers to diabetes education were patients' lack of motivation and lack of financial support, the cost of education materials, and a lack of support from physicians. Sprague *et al.* (1999) stressed the importance of understanding the educator's perceptions of the barriers to patients attending education.

Based on our survey of the community, it was found that diabetes mellitus is a prevalent problem in the community. Furthermore, these results indicated that the participants had some knowledge about diabetes but still required additional elicitation and education. The knowledge perception barriers in the community that were found corresponded with the following underlying reasons as the limiting factors to diabetes education: (i) the complexity of the education content; (ii) language difficulty; (iii) an unattractive education format; and (iv) the inability to apply the knowledge to one's lifestyle (Ministry of Public Health, 2005–2007). From the analysis of these limitations, the education material was prepared by using the educational multimedia video as a means to reduce the barriers of communication.

## Development of the educational video

Three-dimensional cartoon animation, along with video clips, were integrated and used as education materials in the

**Figure 2.** The educational multimedia video components.

community workshop. It was anticipated that the cartoon format would increase the appeal and comprehension of the five dimensions of diabetes education. Likewise, video clips of the interview with a patient suffering from severe diabetes were included to help the audiences to become aware of and to understand the concepts of diabetes in a more tangible manner and to reflect on their personal lifestyle. In the video clips, the patient shares his personal experiences on living with diabetes, the underlying reason for his inevitable leg amputation, and his nutritional habits before and after knowing that he had diabetes (Fig. 2). The relatives of the patient also were included in the interview in order to reflect on how they cared for the patient.

## Evaluation of the educational video

The 68 participants in the diabetes education workshop held in the community of Klongmai were elders, 24 of whom had diabetes and 44 of whom did not have diabetes. The average age of all the participants was 69.96 ± 6.92 years and > 93% of the participants had a BMI > 25 kg/m$^2$. In relation to their fasting blood glucose level, > 70% of the participants had a blood glucose level that was higher than normal, 36.96% had prediabetes, and 34.78% had diabetes (Table 4).

The pre- and post-questionnaires were used to assess the progression of the level of understanding of the five dimensions of diabetes education. All the participants ($n = 68$) were found to gain in their understanding of all the dimensions of diabetes education, with the statistical significance using the Student's *t*-test at an $\alpha$ of 0.05, as shown in Figure 3. The results for the group with diabetes were further analyzed

**Table 4.** Health record of the 68 participants from the diabetes educational workshop

| Topic | N | % |
|---|---|---|
| Participant total | 68 | |
| Diabetes history | | |
| Diabetes | 24 | 35.29 |
| No diabetes | 44 | 64.71 |
| Age range (years) | | |
| 51–60 | 9 | 13.24 |
| 61–70 | 32 | 47.06 |
| 71–80 | 23 | 33.82 |
| 81–90 | 4 | 5.88 |
| Body Mass Index (kg/m$^2$) | | |
| Underweight (< 18.5) | 3 | 6.82 |
| Normal weight (18.5–24.9) | 19 | 43.18 |
| Overweight (25.0–29.9) | 18 | 40.91 |
| Obesity (≥ 30) | 4 | 9.09 |
| Blood pressure (systolic and diastolic: mm Hg) | | |
| Normal (< 120 and < 80) | 4 | 9.09 |
| Prehypertension (120–139 and 80–89) | 6 | 13.64 |
| Hypertension stage I (140–159 and 90–99) | 21 | 47.73 |
| Hypertension stage II (≥ 160 and ≥ 100) | 13 | 29.55 |
| Fasting blood glucose (mg/dL) | | |
| Normal (< 100) | 13 | 28.26 |
| Prediabetes (100–125) | 17 | 36.96 |
| Diabetes (≥ 126) | 26 | 56.52 |

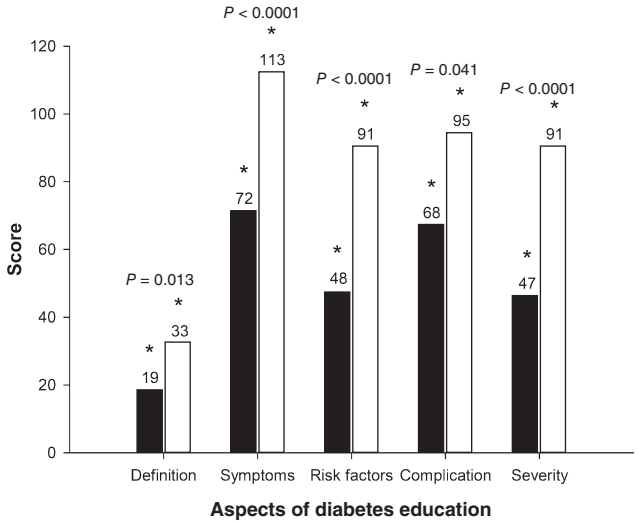


**Figure 3.** Knowledge assessment of all 68 workshop participants on the five domains of diabetes education using pre- and post-questionnaires. (■) pre-questionnaire; (□) post-questionnaire. * denotes that the parameter is statistically significant.

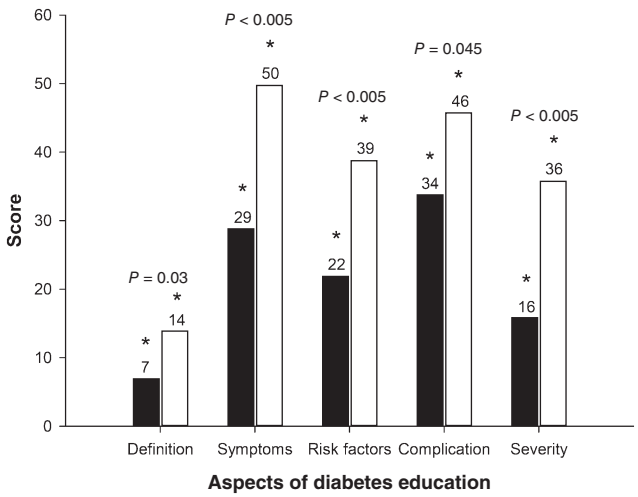


**Figure 4.** Knowledge assessment of the 24 participants with diabetes on the five domains of diabetes education using pre- and post-questionnaires. (■) pre-questionnaire; (□) post-questionnaire. * denotes that the parameter is statistically significant.

by using the Wilcoxon's Matched-Pairs test. Interestingly, a significant difference was found for all the dimensions in the group with diabetes (Fig. 4). Meanwhile, only three of the five dimensions, including "symptoms", "risk factors", and "severity", were shown to be statistically significant for those without diabetes (Fig. 5). Although not statistically significant, improvements were observed for the remaining two dimensions of diabetes education, where a 1.58-fold and a 1.44-fold increase were observed for "definition" and "complication", respectively.

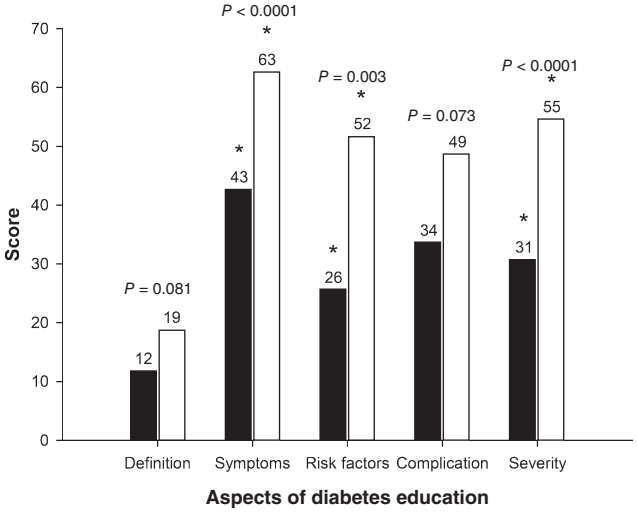


**Figure 5.** Knowledge assessment of the 44 participants without diabetes on the five domains of diabetes education using pre- and post-questionnaires. (■) pre-questionnaire; (□) post-questionnaire. * denotes that the parameter is statistically significant.

## DISCUSSION

### Educational video as an effective medium for diabetes education

The preliminary assessment of the community suggested that the major barrier to diabetes education was the complexity of the contents and the sophisticated language used to explain these concepts. The educational video included two sections: an animated cartoon about the five dimensions of diabetes education and real-life experiences from the patients with diabetes. The 3-D cartoon format was used as a means to transfer this knowledge in an easy-to-understand manner through the use of animated characters. It was once said that a picture is worth a thousand words; therefore, motion pictures or animation is invaluable in conferring key concepts rather than reading from static pamphlets or brochures. In order to bring a sense of familiarity, the real-life experience of an individual living in the community with diabetes and severe complications was selected so that the viewers could relate to the story.

It was anticipated that the educational multimedia video could help activate the participants' interest in playing an active role in the prevention and care of diabetes. The results indicated that 83% ($n = 20$) and 80% ($n = 35$) of the participants with diabetes and without diabetes, respectively, found the educational multimedia video to be interesting. The effectiveness of the video was evaluated from the questionnaires taken before and after viewing the educational multimedia video. As described previously, the results pointed out that all the participants became more knowledgeable in all the dimensions of diabetes education. However, two of the five dimensions (definition and complication) of diabetes education were not statistically significant for the participants without diabetes. A plausible explanation might be related to

the fact that those without diabetes were more concerned about preventive measures (symptoms, risk factors, and severity), particularly knowing whether they were at risk of the disease, whether they or their family had acquired the disease, or the extent of disease treatment and the method of caring once they had the disease, rather than merely knowing the definitions and complications of the disease.

### Translation of the acquired knowledge into practice

Seventy-one percent and 75% of those with diabetes and without diabetes, respectively, indicated that their awareness of the importance of diabetes increased. In particular, five and three dimensions of diabetes education, respectively, showed statistically significant improvements. Taking a closer look at the participants without diabetes, it should be mentioned that, on the basis of the statistical analysis, the other two dimensions of diabetes education (definition and complication) showed non-statistically significant improvements. This result indicated that these two dimensions need special attention, as it suggested that the villagers lacked an understanding of these two important domains of diabetes education. This serves as a warning to health-care providers that much more attention should be placed on the fundamentals of diabetes education in order to raise awareness among people without diabetes and to provide them with more sufficient knowledge on how to adapt a health-care lifestyle for themselves and for others. Both the participants with and without diabetes showed a tendency toward behavioral change in relation to the topics of nutrition and exercise, as observed from the increase in their perception by 87.5% and 54.6%, respectively.

### Strengths and limitations of the study

The present study focused on elderly participants as they were more conscious of their health status. Future studies on other age groups are particularly suggested to observe any discrepancy with the studied age group. The assessments of the questionnaire were based on the feelings and opinions of the participants, which are subjective in nature. Therefore, the reported degree of improvement may or may not reflect the actual level of improvement. However, if the participants feel that they have gained more knowledge, this signifies that they have a higher sense of understanding that possibly could lead to improved lifestyles and behaviors. Although the devised video was designed to address many issues that limit diabetes education, there is still room for improvement; in particular, some dimensions of diabetes education could be strengthened. For example, more real-life situations and experiences could be incorporated into the video in order to highlight the practical utilization of the knowledge learnt. Furthermore, the produced cartoon animation could reduce the barriers of diabetes education by making the contents easily comprehensible. Moreover, video clips of the interviews place the contents within a familiar context as the interviewees are members of the community; therefore, the participants easily can adapt the lessons learnt to their own lifestyle. The experiences that are shared by the interviewee help the participants to reflect on general issues not typically found in diabetes information resources. These reflections help to clarify the concept of diabetes so that it is not a distant problem but something that can affect anyone, including the participants themselves. In effect, this helps to increase self-awareness and influences the habits and behaviors of the participants so that they can care for themselves. However, there is an increasing need for health-care professionals to change their perception and to focus more on health promotion activities rather than treatment.

## CONCLUSION

The barriers to communication play an important role in limiting diabetes education. In the present study, this factor was taken into consideration in the development of an educational multimedia video that is easy to understand. It was observed that the educational multimedia video was efficient in increasing the awareness of the participants in relation to the contents of diabetes education. This approach could be adapted easily to other types of disease and could be used for the education of audiences of all educational backgrounds in order to promote a healthy lifestyle, the prevention of disease, and an improved quality of life.

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