Effectiveness of using technology as health education tool among diabetes patients in South India: A comparative analysis and community based intervention

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Abstract

Introduction: Type 2 diabetes mellitus is a serious, progressive condition presenting with chronic hyperglycemia. Its prevalence is gradually increasing at a global level. A diabetic has to make multiple choices daily about the management of their condition, such as appropriate dietary intake, physical activity and adherence to drugs. There is hardly any input from a healthcare professional for guidance on a daily basis. **Objectives:** The aims of this study were to assess the change in knowledge by using various methods of health education as intervention and to compare the effect of technology as a tool of health education as compared to conventional methods of health education. **Materials and Methods:** A community-based interventional study was done in the field practice area of our Institute in South India. Two groups of people were selected from 40 adopted houses. One from urban; for intervention with technology, that is, health education using videos and the second group from rural population; for intervention with conventional method of health education, that is, using charts. **Results:** The mean baseline knowledge score in urban and rural area was 3.76 and 9.97, respectively. There was statistically significant increase in knowledge among both the groups. By the use of technology in the urban population knowledge level increased from 3.76 to 10.15 and was found to be statistically significant. The difference in increase in knowledge was higher in the technology group as compared to conventional group. **Conclusion:** In the era of smartphone, technology-based health education can reduce the total health care manpower which is deficient. Technology is a boon to introduce lifestyle modification in chronic diseases like Diabetes Mellitus.

Keywords: Manpower, smartphone, urban-rural

Introduction

Diabetes, a global escalating public health problem, primarily because of the increasing prevalence, is estimated to affect 285 million individuals worldwide[1] (approximately 90% have type 2

diabetes mellitus). It causes economic damage worth billions; each year. Global estimates for the year 2030 predict a further growth of almost 50%.[2] In 2000, it was estimated that 2.8% of world's population had diabetes mellitus and that by 2030 this number will be 4.4% of the world's population.[2] According to WHO the 'top' three countries, in terms of the number of type 2 diabetes mellitus (T2DM) individuals with diabetes are India (31.7 million in 2000; 79.4 million in 2030), China (20.8 million in 2000; 42.3 million in 2030) and the US (17.7 million

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in 2000; 30.3 million in 2030). Gupta *et al*.[3] showed that the knowledge regarding the Diabetes Mellitus in the population is good; however there were lacunae in the attitude and practice towards the disease. A study done in tertiary care center, Goa shows that the awareness among the patients visiting the center, regarding Diabetic retinopathy is 34% and it also shows that practice pattern was strongly associated with knowledge.[4] There is a need for improvement in the knowledge of the population regarding the disease and new intervention tools are required for this. Age old methods of a one-time health education imparted during counselling visits will hardly be good enough; as it needs updating on a daily basis for the patients to be aware. The rise in the number of cases of noncommunicable disease such as Diabetes Mellitus is a warning sign for Indian health care system to be vigilant for adequate diabetes mellitus management.

Type 2 diabetes mellitus is a serious, progressive condition presenting with chronic hyperglycemia, and its prevalence is increasing globally. In the short term, type 2 diabetes may lead to symptoms and debility and in the long term to serious complications, including blindness, renal failure, and amputation.[5] Traditionally, treatment for the condition has centered on drug interventions to stabilize hyperglycemia. A diabetic has to make multiple choices daily about the management of their condition, such as appropriate dietary intake, physical activity, and adherence to drugs, often with minimal input from a healthcare professional.[6] In recent years, programs to educate people about self-management has become the focus of attention among healthcare professionals.

Objectives

The aims of this study were to assess the change in knowledge by using various methods of health education tools as intervention and to compare the effect of technology as a tool of health education versus conventional methods of health education.

Methodology

A community based interventional study was done during May 2018, over 6 months in the field practice area of a Tertiary Care Centre, Mangalore, South India. Two groups of people were selected from 40 adopted houses.
1. One was selected from urban population for intervention with technology, that is, health education using videos and
2. Second group from rural population for intervention with conventional method of health

Education, that is, using charts.

For Urban group, videos were sent using messenger on a weekly basis. For the rural group, health education was given using the Charts and Pamphlets at once. Ethical clearance was obtained from the Institute ethics committee, before the conduct of the study. Pretested and pre-validated questionnaire was used for data collection. Questionnaire had multiple sections in it relating

to risk factors, symptoms, management and complications. Section on risk factors had five questions; six questions were on symptoms, four questions on management, and six questions were related to complications. Informed written consent was obtained from the participants before the conduct of the study. Pre-intervention questionnaire was administered for all the individuals. After a month of health education, the same questionnaire was administered again.

Statistical analysis

A graded scoring system was done for the responses. Questions which are must know were given a score of +2 for the correct answer, whereas –2 was awarded for the incorrect answer. For the rest of the questions, +1 was awarded for the correct answer and –1 for incorrect answer. Data were cleaned and entered in Microsoft Excel and analyzed using SPSS software program, version 16.0. Paired *t* test was used to analyze the change in knowledge in each group. Independent T test was used in between the groups for analysis.

Results

The two groups consisted of a different set of people. One group was taken from rural area and other group from urban area. Rural group consisted of 35 individuals and urban group consisted of 39. Majority, that is 78% of the study participants belonged to the Hindu community and 65% of the study participants were male.

We could observe an increase in knowledge regarding the sections related to risk factors and management in both the groups; which was statistically significant. However, there was no change in knowledge regarding the complications of diabetes by any of the Health education methods adopted. As far as the management of diabetes is concerned, there was increase in knowledge which however, was not significant [Table 1].

As there were two different groups, the rural group had better knowledge with mean score 9.97 as compared to urban group; with mean score 3.76. There was a statistically significant increase in the knowledge among both the groups. By the use of technology in the urban population we could raise the knowledge level from 3.76 to 10.15 which is a large difference and it was found to be statistically significant. The difference in increase in knowledge was higher in the technology group

Table 1: The change in knowledge score in the various sections by conventional intervention method

Knowledge Scores	Conventional method group (*n*=35)				*P*
	Before		After		
	Mean	SD	Mean	SD	
Risk factors	1.51	2.42	3.60	1.88	<0.001*
Symptoms	2.02	2.13	2.40	1.37	0.177
Management	1.31	0.79	3.00	2.26	<0.001*
Complications	0.02	2.2	0.20	2.4	0.324
Total Score	9.97		13.45		<0.001*

Paired *t*-test, *P*<0.05 significant

as compared to conventional. The mean increase in technology group was 6.3, whereas the increase in conventional group was 3.48. The increase in the knowledge in technology was statistically significant as compared to conventional group [Table 2].

When assessed for knowledge on blood glucose level, it was observed that in the rural group 78% had knowledge about the high blood glucose level in the blood, which however, increased to 96% after the intervention. In group where we used technology as HE tool, the initial knowledge was low (58%) which increased to 98% post intervention; as described in Table 3 and Figure 1.

As in Figure 2, on assessment on increase in knowledge regarding the duration of treatment it was observed that in the group where technology was used it increased from 60% to 90%. Requirement of lifelong treatment for diabetes was emphasized.

Discussion

It was found in our study that there was significant increase in knowledge in both the groups post health education by two different methods. Similar study done in Sikkim showed that there was significant increase in knowledge regarding the risk factors, early symptoms, organs affected by diabetes, warning signs of hypoglycemia and personal precaution in diabetes.[7] In a study conducted by Alizadeh *et al.* on the impact of educational intervention based on interactive approaches on beliefs, behavior, hemoglobin A1C, and quality of life in diabetic women, the result showed that there was a significant difference between two groups in terms of the mean scores of knowledge.[8] However in our study there was no significant increase in the knowledge regarding complications of diabetes, probably because of short

duration of study. There is enough evidence suggesting that the health education improves the knowledge of the patients regarding the disease condition, This study attempted to prove it with the use of technology for the same. Use of the technology for the health education requires less of human resources dedicated to the same and also reduces the burden of health workers.

The baseline knowledge of both the group was found to be significantly different. The rural group had better knowledge than the urban group selected. There was a significant increase in the score post intervention in both the groups as evident by the T test. We also checked for the significance of difference in the two groups. The rural participants for whom conventional method of health education was used had better baseline knowledge, probably due to ASHA health worker's interventions. The significant improvement in knowledge was found even among those who had good baseline knowledge.

Administration of technology in the urban group of people was done in our study as urban population had more accessibility for technology. The baseline knowledge of the urban participants was found to be low. This could be due to the small sample size taken for the pilot study, the participants might not be completely representative. The increase in knowledge was found to be significant even with the use of technology. The advantage of using technology for health education is that number of home visits or community visits for health education can be reduced. And also, once video is sent, individual can watch it multiple times at any time convenient for them. This is especially helpful in the working class of the society where attending health
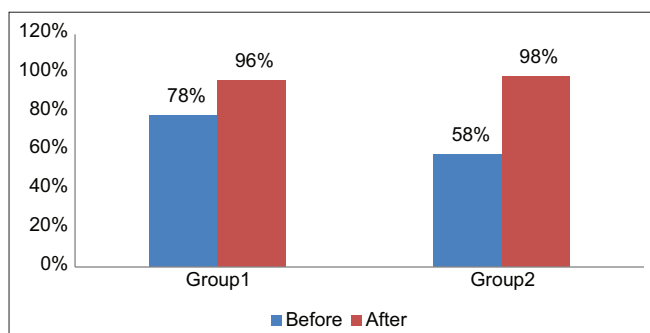

Figure 1: Showing change in knowledge regarding the blood glucose level in diabetes post intervention. For Group 1 conventional methods were used and for Group 2 technology was used
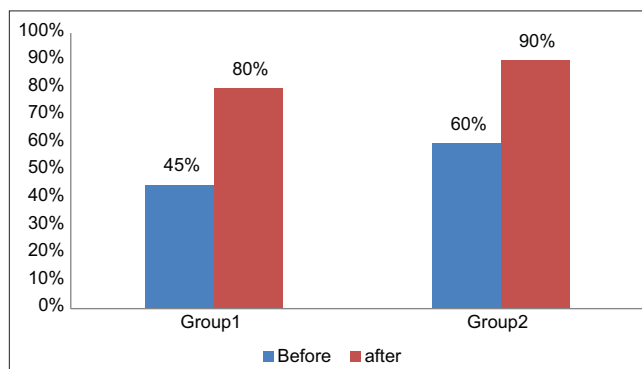

Figure 2: Showing increase in knowledge regarding duration of treatment in diabetes post intervention. For Group 1 conventional methods were used and for group 2 technologies were used

Table 2: The change in the knowledge score in the two groups pre and post health education					
	Baseline Score (Mean)	SD	Post Health Education score (Mean)	SD	Difference in Increase of knowledge (Mean)	SD
Conventional method group (*n*=35)	9.97	5.36	13.45	5.23	3.48	5.33
Technology used group (*n*=39)	3.69	5.33	10.15	5.93	6.30	5.36
t-test (*P*)	7.12 (<0.001)		12.09 (0.01)		3.89 (<0.001)	

Independent *t*-test, *P*<0.05 is significant

Table 3: The change in knowledge score in the various sections by technology-based intervention method

| Knowledge Scores | Technology based Group (*n*=39) | | | | *P* |
| | Before | | After | | |
	Mean	SD	Mean	SD	
Risk factors	-0.58	1.95	1.82	1.69	<0.001*
Symptoms	0.97	3.03	1.48	2.74	0.08
Management	-0.89	2.50	0.87	2.33	<0.03*
Complications	-0.87	2.65	-0.87	2.57	-
Total Score	3.69		10.15		<0.001*

Paired *t*-test, *P*<0.05 significant

education session might not be possible for individuals. The limitation of using technology for health education is that of accessibility. Moreover, knowledge on use of technology might be lacking in the target population. So, in the era of smartphone, technology-based health education can reduce the total health care manpower which is deficient.

With the use of health education tool, for promoting self-care among the diabetics on chronic medication, it was found that they can improve their knowledge about self-management, risk assessment, medications and care. This will help in creating an aura of knowledge specification. Instead of thrusting upon our opinion on them, we can allow them to choose what they want to see and foresee. It can be compared to a cafeteria, ready to aid you in increasing health education. The array of options given, thus needs to be provided to the right person, at the right time and right duration.

Limitations

Both groups were found to have different baseline knowledge regarding the disease at the onset of the study. The urban group which had less baseline knowledge was administered the technology-based intervention, whereas the rural group was given health education by conventional method. To avoid this, we made comparison of each group with their own baseline values instead of comparing it to each other.

Conclusion

With the increasing burden of the non-communicable diseases like diabetes in the developing countries, technology may aid as a very beneficial tool for health education. The knowledge regarding the disease significantly increased post, health education. The technique was found feasible and acceptable in the era of technological advancements. The novelty about being adequate with knowledge to take care of self and be health literate will go a long way in reducing unnecessary consultations.

Ethics

The study was conducted with all measures of confidentiality and ethical values. Appropriate ethical clearance was taken from the Institute's ethics committee.

Conflicts of interest

There are no conflicts of interest.

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