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Assessment of the impact of educational program on improving the knowledge, positive attitude, good practices in the management of diabetes among elderly patients

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Abstract
Background: Complications appended to diabetes are becoming more common and difficult to control, particularly among frail elderly adults with associated co-morbidities. Managing the disease and its complications requires an effective educational program which can enable altering the knowledge, attitude, and practice (KAP) of older diabetic patients.
Objective: To assess the impact of educational program on improving the knowledge, positive attitude, good practices in the management of diabetes among elderly patients.
Method: A convenient sampling technique was employed to enroll 500 participants aged between 65 to 76 years, diagnosed with diabetes mellitus for a time period of one year. The KAP questionnaire related to diabetes was completed, and the level of KAP in diabetics was assessed in the pool of participants. An education program was tailored and the said elderly populations were imparted basic knowledge regarding nutrition, self-care and management of the disease. A post-assessment KAP score was further recorded at 9 months follow-up.
Result: A significant difference in the weight and BMI of the patients were observed in the elderly individuals with T2DM ($p< 0.001$). Prior to the educational program, the knowledge scores in the pool of patients was noted to be 5.34±1.06 but a significant different was noted post 9 months follow-up period (7.98±1.21, $p< 0.001$). Similar observations were seen for the attitude and practice scores as well. A significant difference in the scores for attitude and practice was observed in the pre and post interventional program (11.97±1.96 Vs 14.32±1.55 and 10.31±0.71 Vs 12.36±1.12, respectively). The total KAP score also increased from 27.60±2.39 to 33.66±1.16 in a time period of 9 months. A significant difference in the nutritional status was observed in all the treated groups in the follow-up session ($p< 0.001$).
Conclusion: The educational intervention was effective in increasing the knowledge and changing the attitudes to a more positive state, which resulted in improvements in their nutritional status.

Keywords: Diabetes mellitus, elderly patients, KAP score, educational program, nutritional status

Introduction
Diabetes mellitus (DM) is regarded as one of the most serious public health issues in the twenty-first century. It is described as a chronic metabolic disorder characterized by high blood glucose levels which develops as a result of a lack of insulin secretion, pancreatic b-cell damage, or insulin non-utilization ending up in insulin resistance [Matzinger *et al.* 2018; Padhi *et al.*, 2020] [25]. DM is a typical condition that can cause metabolic difficulties, health problems, and chronic repercussions such as kidney, heart, blood vessel, and eyesight ailments, among other things, and is caused by both heredity and environmental behavioral factors. Type I and type II DM are the two sub-groups that have different patho physiologies. Type II diabetes mellitus is becoming more common, with an estimated 629 million individuals suffering from the disease by the year 2045 [Padhi *et al.*, 2021] [26].
Despite the fact that most diabetic patients do not engage in self-care behavioural patterns such as diet modifications, exercise, self-monitoring of blood glucose (SMBG), and foot care, the progression of T2DM is largely attributed to unhealthy lifestyle choices such as hypertension, obesity, and hypercholesterolemia. Furthermore, many patients are noted to be still ignorant of the significance of continued self-care, as well as the notion that active, ongoing self-care practices might help in preventing DM related complications [Choi *et al.*, 2008] [27]. The prognosis of type 2 diabetes has a direct or indirect influence on the patient's quality of life, and there have been reports indicating people with a negative impact on quality of life who have a higher HbA1c levels [Kuznetsov *et al.*, 2014] [28].

The need of self-management education for T2DM however has become increasingly recognized among health professionals during the last few decades. The eventual aim of diabetes education program for T2DM patients is to influence human behavior through the advancement of knowledge and comprehension of the said disease condition [Lin *et al.*, 2007] [22]. Even though education is not a cure or treatment, if a type 2 diabetes patients does not understand the fundamentals of nutrition, physical activity, and lower extremity care, as well as key competencies related to the administration of subcutaneous insulin injections, blood sugar control, and other vital parameters, he or she will be unable to acquire metabolic control. The educational program should be tailored to the specific requirements of each patient, termed as patient-centered approach. Other elements such as the patient's preferences, sentiments, goals, and lifestyle changes as a result of the condition must all be considered while designing the educational program. Furthermore, T2DM patients need to receive continuous education as knowledge tends to deteriorate over time, resulting in the protracted retention of the intervention's positive impact [Rutten 2005] [23]. Because patients are accountable for maintaining their blood sugar levels on a regular basis (self-monitoring of blood glucose, SMBG), the educational or teaching program emphasizes motivation and assistance. However, due to the effective regulation of blood sugar levels along with the prescribed medication, such as anti-diabetic tablets or subcutaneous insulin injections, patients frequently ignore or hesitate to follow the long-term specifications from the educational program and the workable implementation of the knowledge attained. In such instances, boosting one's self-esteem and assessing the requirements of patients are critical components of the acceptance process. Patients with T2DM are encouraged to be mindful of the knowledge offered and to embrace long-term education, with a focus on changes in behavior into their routine lifestyle. Furthermore, the state should recognize the financial rewards of providing information to type 2 diabetes patients and promote such articulated interventional programs [Hansen *et al.*, 2002] [24].

The present article is an attempt to assess the impact of educational program on improving the knowledge, positive attitude, good practices in the management of diabetes among elderly patients.

Method

A cross-sectional study was conducted in the state of Bihar, Patna from 2017 to 2018. Fixed-point continuous sampling was adopted to recruit patients with diabetes. Patients between 65 and 76 years of age diagnosed with diabetes mellitus for at least a year without swallowing difficulties, following diet without a low salt or cholesterol-lowering diet, and who were willing to participate in the study by signing informed consent forms were included in the study. Patients under the age of 65 or over the age of 76, who were unable to finish the questionnaire, those who refused to participate in the survey, and those who could not understand English or the local language were all excluded from the study.

Tools/Questionnaire

Mini-Nutritional Assessment (MNA) Tool and a Structured Interview Schedule (SIS) were employed to assess the Knowledge, attitude, and practice score. Each participant was interviewed by the first author of the manuscript.

Knowledge, attitude, and practices were assessed by 15 (questions), 20 (questions), and 23 (questions) respectively. Medical history/records were reviewed retrospectively for nutritional parameters and fasting blood sugar (FBS) and post prandial blood sugar (PPBS) levels.

Scoring of knowledge, attitude, practice

To evaluate knowledge, attitude and practices scores, each correct response was given point 1 and each incorrect response was given 0 point. The total KAP score was calculated by adding the knowledge, attitude, and practice scores. Mean and median scores for each category was calculated. Participant were rated to have good KAP scores if they have scores above the median value and poor if they had scores less than or equal to the median scores.

Educational program

Based on the importance of nutrition in the management of T2DM in the elderly, a booklet containing the basics of the disease, foods that affect the disease scenario, and steps to take to manage the condition was designed and sent to the enrolled senior participants. The need of following and maintaining a correct nutritional status was elaborated upon, and knowledge pertaining to the management of T2DM and the self-care regimen to be followed was appropriately disseminated in the group. In the follow-up session (after a 9-month period), the nutritional status and KAP scores were assessed again and compared to the pre-intervention score.

Statistical Analysis

Data analysis was performed using SPSS version 21 software (IBM Corp., Armonk, NY, USA). The continuous and categorical variables were presented as mean ± standard deviation (SD) or median (minimum, maximum) and n (%), respectively. Kolmogorov-Smirnov test was applied to test the normal distribution of the data.

Independent t-test was used to compare quantitative variables and Chi-square test was used for the comparisons of qualitative data. Pearson's correlation analysis was performed to investigate the correlation of Knowledge, Attitude, Practice, and total KAP scores with different studied parameters. All the statistical tests were two-sided, and p values less than 0.05 were considered statistically significant.

Result

The present study enrolled 500 patients with T2DM. There were 250 males (50%) and 250 female participants (50%). The mean age of the patients was noted to be 69.24±2.49 years. The mean weight, height, and BMI were observed to be 69.71±5.76 kg, 159.42±4.74 cm and 27.42±1.83 kg/m2, respectively. An educational program was designed with pre-post assessment of knowledge, attitude and practice and nutritional status for elderly patients with T2DM. The designed booklet consisted of the important aspects of diabetes mellitus and the required self-care regimens that needed to be followed up by the patients having T2DM. The KAP scores were noted and recorded pre and post (9 months follow up) the interventional educational program (Table 1).

Table 1: Comparison of KAP score post 9 months follow up. Continuous variables were represented as mean ± SD, Paired sample t test was used to compare between groups. P values less than 0.05 were considered to be significant

		Mean±SD	P value
Weight	Baseline	69.71±5.76	<0.001
	Post 9 months	67.18±5.01	
BMI	Baseline	27.42±1.83	<0.001
	Post 9 months	22.11±2.30	
Knowledge (K)	Baseline	5.34±1.06	<0.001
	Post 9 months	7.98±1.21	
Attitude (A)	Baseline	11.97±1.96	<0.001
	Post 9 months	14.32±1.55	
Practice (P)	Baseline	10.31±0.71	<0.001
	Post 9 months	12.36±1.12	
Total KAP	Baseline	27.60±2.39	<0.001
	Post 9 months	33.66±1.16	

A significant difference in the weight and BMI of the patients were observed in the elderly individuals with T2DM (p< 0.001). Prior to the educational program, the knowledge scores in the pool of patients was noted to be 5.34±1.06 but a significant different was noted post 9 months follow-up period (7.98±1.21, p< 0.001). Similar observations were seen for the attitude and practice scores as well. A significant difference in the scores for attitude and practice was observed in the pre and post interventional program (11.97±1.96 Vs 14.32±1.55 and 10.31±0.71 Vs 12.36±1.12, respectively). In conclusion, the total KAP score also increased from 27.60±2.39 to 33.66±1.16 in a time period of 9 months.

In addition, the nutritional status according to WHO criteria post 9 months follow up was compared with baseline (Table 2). A significant difference in both the values was observed in all the treated groups (p< 0.001).

Table 2: Nutritional status according to WHO criteria post 9 months follow up was compared with baseline. Chi-Square test was performed for comparison. P values less than 0.05 were considered to be significant

		Baseline Nutritional status (WHO)	Nutritional status (WHO) post 9 months follow up n (%)	Chi-Square Test (P value)
Valid	Normal	41 (8.2)	75 (15)	<0.001
	Overweight	1 (0.2)	3 (0.6)	
	Pre-obese	425 (85)	415 (83)	
	Obese	33 (6.6)	7 (1.4)	
	Total	500	500	

Discussion

The patient's ability to manage DM is highly contingent on his or her willingness to follow medical advice. Although it is impossible to forecast a patient's compliance, research studies have shown that self-management training or educational programs improves knowledge, consistency and reliability of blood glucose self-monitoring, self-reported eating habits as well as glycemic control [Mokabel *et al.*, 2017] [1]. A sample pool of 500 elderly diabetic patients (diagnosed with T2DM) were enrolled for this experimental study. A single baseline measurement was conducted, followed by an intervention consisting of an educational program and a follow-up measurement in 9 months. As a result, variations noted in the outcome measurement could be associated with alterations in the exposure, i.e., inclusion of the educational program.

A significant difference in the weight and BMI of the patients were observed in the elderly individuals with T2DM (p< 0.001) following the educational intervention. Similar observations were seen for the knowledge, attitude and practice scores as well in the studied patient pool. Many researchers have discovered that diabetes education programs for patients with diabetes mellitus (DM) improve glycemic control significantly. The findings illustrate that participating in a multifactorial diabetic health education program benefited glycemic and lipid levels in the near term, especially among those who had extremely high A1C or low-density lipoprotein levels prior to the designed program. It was discovered that 6 months of an educational program for DM patients assisted them to obtain improved glycemic control, especially among those with severely high glycated hemoglobin (HbA1c) or low-density lipoprotein readings [Federal Bureau of Prisons. Clinical Practice Guidelines Management of diabetes]. Enhancing knowledge in the follow-up period can be credited to a well-planned educational program that was successful in enhancing the knowledge of the elderly diabetic patients. According to Norris *et al.*, investigations with short follow-ups reported significant effects of self-orientation on knowledge, frequency, and reliability of self-monitoring of blood glucose, self-reported eating habits, and glycemic control [Norris *et al.*, 2002] [12].

In the follow-up session following exposure to the educational program, the patient's weight and BMI level both decreased significantly, according to the findings. The most probable reason for the observed effect may be due to the adherence of the group of patients to the exercise regimen and the proper meal planning as instructed in the designed program. The program may have induced the level of self-control required to stick to a balanced diet and the willingness of patients to make nutritious meals for consumption. Exercise is a strategy of treating T2DM that helps to enhance body structure by regulating plasma glucose levels in the acute period. Exercise offers undeniable benefits for the diabetic patients, as it improves glycemic management, lowers the risk of cardiovascular disease, and helps them lose weight. T2DM can be prevented by undertaking 12 hours of moderate-intensity activity 5 days a week, according to research [Hayek *et al.*, 2013] [3]. Good adherence to designed programs has been linked to a lower risk of diabetes complications, mortality, and financial strain. Compliance to a nutrition program necessitates the patient following particular nutrition suggestions such as changing prior eating habits, introducing new nutrition practices, assessing the influence of such behaviors on glycemic control, and enrolling in a fitness routine [Juarez *et al.*, 2012] [4]. This conclusion is consistent with the findings by Muchmore *et al.*, who found that body weight was lowered in both intervention groups with no statistically significant differences between them [Muchmore *et al.*, 1994] [2].

A significant improvement in the knowledge score was noted in the follow-up session. Understanding levels improved shortly after the program was implemented, with having acceptable knowledge about DM in general. This is consistent with the findings of Abdo and Mohamed, who found that after delivering an educational message, the studied group's

knowledge and attitude about all components of diabetes improved significantly [Abdo *et al.*, 2010] [6]. The implementation of culturally relevant health education improved the understanding of the treatment arms, according to a meta-analysis combining eleven interventional research studies [Hawthorne *et al.*, 2008]. This was congruent with the findings by Mersal, who stated that the intervention was efficient in promoting the knowledge of elderly diabetic patients in the study group, and that the advancement was maintained after three months of follow-up, as well as a refinement was noted in patients' diabetes knowledge upon implementation of the self-care guidelines program as well [Mersal *et al.*, 2011] [7].

In terms of attitudes regarding nutrition in old age, the current study found that in the follow-up session, participants had a better attitude toward illness management. The outcomes are plausible because a positive attitude is thought to signify healthier behavior and increased health consciousness. Inclusion of knowledge regarding the use of glucose monitoring devices such as insulin pen and insulin pump may have improved the perception in the elderly mass regarding glucose management.

A notable difference in the nutritional status (WHO) post 9 months follow up was observed in the pool of patients which included normal, overweight, pre-obese and obese individuals. It has been reported that studies on diabetes consequences and control have shown that good metabolic control and adequate education can help patients with diabetes optimize their clinical prognosis [Rakhshanderou *et al.*, 2006] [15]. According to the World Health Organization, education forms the foundation and framework of diabetes therapy. The main goal of educational programs related to DM is to influence people's behaviors and promote self-care [Diabetes Atlas. Prevalence estimates of diabetes 70–20 years. 2007] [16]. Numerous studies have revealed that patient education is correlated with a decrease in the chronic consequences of diabetes in recent decades [Mollaoglu *et al.*, 2009] [17]. A study conducted in Kashan by Asgari Sari *et al.* revealed that a lack of adequate education and alignment of patients in terms of nutrition, proper medicine use, and environmental factors has an influence on the high prevalence of DM [Asgari *et al.*, 1995] [18].

Another investigation by Sun *et al.* found that the elements of the PRECEDE-PROCEED paradigm in nutritional education were particularly successful in changing the dietary behaviors of enrolled Chinese-American students [Sun *et al.*, 1999] [19]. According to the findings of this study, 62.8% had done appropriate blood sugar checks before education based on a physician's opinion, and this number went up to 74.4% after education. Agha Molayee *et al.* did a study that was consistent with the findings of this investigation. There was a substantial increase in the mean of knowledge, physical health, mental health, and a substantial decrease in the average of HbA1c in the said study, as well as a substantial improvement in the personal management of blood sugar, weight control, sport, and dietary observation [Molayee *et al.*, 2005] [20]. In a report published by Sharifi Rad *et al.*, the scores of nutritional practice of participants in the experimental group increased significantly post educational intervention, which was consistent with the findings of our study [Sharifirad *et al.*, 2008] [21]. An improved insight of the essence, prevalence, and trends of comorbidities in T2DM patients could deliver important perspectives into how to manage patients with myriad of scenarios in primary care, allowing for a quite patient-centered framework to risk assessment and much more acceptable and customised treatment strategies [Nowakowaska *et al.*, 2019] [13]. Modelling the frequency of various comorbidities might help healthcare givers and structure health services to suit the future needs of the treated patient population.

It is pertinent to state that associated complications of diabetes such as hypertension, diabetes neuropathy and nephropathy, kidney disease, dyslipidemia, obesity, foot ulcers often make the situation worse [Mooradian *et al.*, 2009] [14]. Design of the program including a fair enough idea about the said complications would have helped the patients in managing the disease in an easy manner.

Overall, the findings of this study illustrate the fact that implementing an educational counseling program resulted in favorable changes in health behaviors, dietary behaviors, nutrient consumption, and nutritional risk levels among elderly diabetic patients. These improvements resulted in an increase in the number of elder patient pool in following a balanced eating regimen, which showed up as a significant reduction in weight and BMI in the enrolled mass. Nutrition education has been demonstrated to increase not only knowledge and abilities, but also dietary and physical activity patterns, according to the researchers [Belansky *et al.*, 2006] [9]. Although understanding acceptable health behaviors aids in improving health-related behavior, skill development and instructional expertise are required to effect behavioral patterns [Krinke *et al.*, 2001] [8]. As a result, while there were increases in knowledge and adjustments in attitudes, and not all of these may have led to matching improvements in behavior, because information and attitude may be altered more quickly than behavior, and behavior also requires resources to develop.

Conclusion

The educational intervention was successful in enhancing their knowledge and altering their attitudes to a more positive state, resulting in gains in their food habits. Additional efforts should be made to provide nutritional counseling to the elderly diabetics through analogous interventions, as well as more community service initiatives, according to the findings of the present study. It was evident from the study that family medicine divisions need to conduct training sessions in complete geriatric evaluation and monitoring for family physicians, as well as collaborative training sessions for nurses and family physicians to strengthen the knowledge and skills in nutritional counseling among the elderly diabetics. Module should be designed and offered in regional languages in diabetic clinics and distributed to each elderly diabetic for free. Future research should look at the long-term effects of diabetic programs to see if there is a lasting shift in risk perceptions. A diabetic education and self-management program paired with new technologies can produce results for glycemic control patients.

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