International Journal of Biological Research, 13 (1) (2026) 28-33

International Journal of Biological Research

Website: www.sciencepubco.com/index.php/IJBR
https://doi.org/10.14419/d26svy37
Research paper

Impact of Video-Assisted Teaching on Short-Term Knowledge Of Microvascular Complications in Newly Diagnosed Type 2 Diabetes Patients: A Pilot Study

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Abstract

Background: Microvascular complications in diabetes cause significant morbidity if not detected and treated early. Patient education is critical, but traditional methods often fail to ensure knowledge retention. Video-assisted teaching (VAT) combines visual and auditory elements, offering a promising alternative. Objective: To assess the short-term knowledge gain and feasibility of video-assisted teaching on microvascular complications among newly diagnosed type 2 diabetic patients. Methods: A single-group pre-test/post-test pilot study was conducted among 60 newly diagnosed diabetic patients aged ≥20 years. Knowledge was assessed using a structured 35-item questionnaire before and after a 45-minute VAT session. Post-test assessment was performed on day eight. Data were analysed using paired t-tests. Results: Mean knowledge scores increased significantly from 11.80 ± 2.15 at baseline to 25.32 ± 2.14 post-intervention (mean difference: 13.52; $p < 0.001$). Significant improvements were observed across all knowledge domains ($p < 0.001$). The proportion of participants with adequate knowledge increased from 0% to 66.7%. Conclusion: VAT shows promise as a feasible educational approach associated with short-term knowledge improvement; however, controlled studies are required to confirm effectiveness.

Keywords: *Type 2 Diabetes Mellitus; Microvascular Complications; Patient Education; Video-Assisted Teaching.*

1. Introduction

Diabetes mellitus (DM) is a non-communicable chronic metabolic disorder characterised by persistent hyperglycaemia resulting from the body's inability to produce or effectively utilise insulin, leading to various health complications [1], [2]. In 2021, the International Diabetes Federation (IDF) reported that approximately 537 million adults worldwide are living with diabetes, a number which is expected to rise to 783 million by 2045 [3], and India, with an estimated 77 million diabetic adults, is often referred to as the "diabetes capital of the world" [4]. DM has become one of the most significant global health challenges of the 21st century, with a staggering prevalence.

DM complications are categorised into microvascular and macrovascular complications, with microvascular complications being particularly serious due to the effect on small blood vessels in various organs and tissues, leading to morbidity [5], [6]. Major microvascular complications are diabetic retinopathy, diabetic nephropathy, and diabetic neuropathy, which can lead to blindness, kidney failure, and debilitating nerve pain, respectively. The risk of developing these complications increases with poor glycaemic control and prolonged duration of diabetes. Early detection and timely intervention are essential to minimise the impact of complications on patients' quality of life [7], [8].

While pharmacological interventions are critical, effective patient education plays a vital role in enabling individuals to participate actively in their care, as informed patients are less likely to make medical errors and can better manage their health, leading to improved healthcare efficiency [9,10]. Diabetes Self-Management Education and Support (DSMES) programs aim to equip patients with the knowledge and skills necessary for effective management of their condition [11], [12]. Studies indicate that DSMES leads to improved treatment adherence, blood sugar control, and also helps reduce healthcare expenses [11-13]. However, traditional approaches, such as in-person counselling sessions and printed materials, while effective, often struggle or fail to fully engage patients because it relies on passive reading and potential for inconsistent delivery [14], [15].

To overcome these barriers, innovative and engaging educational modalities are required. Video-assisted teaching (VAT), a technology-driven method, has emerged as a promising educational approach in healthcare as it combines both visual and auditory stimuli to enhance comprehension, engagement, and retention with its standardised content. Studies have shown that video-assisted teaching can be effective, particularly for individuals with limited health literacy or for those overwhelmed by the complexities of managing a chronic condition [16-18]. Research indicates that structured, visually engaging interventions, such as VAT, lead to substantial improvements in patient awareness and adherence to lifestyle modifications, thereby improving healthcare outcomes [19], [20].

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In the context of diabetes education, VAT has been used for teaching insulin administration and lifestyle modifications [21]. Limited research has focused on its effectiveness in educating newly diagnosed diabetic patients about microvascular complications.
Due to the resource-intensive nature of a full-scale Randomised Controlled Trial (RCT), an initial pilot study was necessary to assess the feasibility of administering the VAT program in a clinical setting and to determine the magnitude of the short-term knowledge gain. This study, therefore, aims to evaluate the short-term impact and magnitude of knowledge improvement regarding microvascular complications following a VAT session among newly diagnosed Type 2 diabetic patients, providing critical data to justify future controlled research.

2. Methods

2.1. Research design, population, and sample

This was an exploratory, single-group pre-test/post-test pilot study designed to assess the magnitude of short-term knowledge gain and the feasibility of administering Video-Assisted Teaching (VAT) in a hospital setting. The study included newly diagnosed diabetic patients aged 20 years and above visiting the outpatient department of Apollo BGS Hospital, Mysuru, India, for the first time. The data was collected for a period of four weeks.
Participant recruitment utilised a non-probability convenience sampling method; this approach was deemed suitable for a pilot study focused on assessing feasibility and generating preliminary data on effect size in a real-world clinical setting. Over 100 potential patients were screened against pre-defined inclusion and exclusion criteria, resulting in a final sample of 60 participants. All participants who underwent the Pre-test and the VAT intervention completed the post-test assessment. The data was collected over 4 weeks.
Inclusion criteria: Newly diagnosed diabetic patients aged 20 years or above who can understand English. Willing to participate.
Exclusion criteria: Patients with cognitive, visual, or auditory impairments, or gestational diabetes.

2.2. Data collection tools and validation

A 35-item structured multiple-choice questionnaire was developed in English to assess participants' knowledge of microvascular complications. This self-administered tool was designed to evaluate participants' understanding across several domains, including the meaning and causes of complications, associated risk factors, clinical signs and symptoms, diagnostic measures, preventive strategies, and management. Face validity and content validity were ensured through expert review by professionals in Nursing and Medicine. Based on their suggestions, the questionnaire was finalised.

2.3. Reliability and pre-pilot study

The reliability of the questionnaire was determined using the Spearman-Brown split-half technique. The tool was found to be highly reliable with a correlation coefficient (r) of 0.83.
To ensure the questionnaire's adaptability, a pre-pilot study was conducted with a small sample of eight participants (n=8), who were subsequently excluded from the main study.

2.4. Score interpretation

Each correct answer was given a score of 1, and each incorrect answer was given a score of 0. The maximum score was 35. The knowledge score was interpreted as Adequate: 27-35, Moderate: 18-26, Inadequate: 0-17.

2.5. Intervention

The Video-Assisted Teaching VAT program consisted of a 45-minute educational video that used visuals and animations to explain microvascular complications, their early signs, and preventive measures. The video was designed to be interactive and engaging, catering to diverse learning preferences, and was reviewed by experts in the field of Nursing and Medicine.

2.6. Procedure

The study was conducted in three steps:
1) Pre-test: Participants completed the knowledge assessment questionnaire before the intervention.
2) VAT Intervention: Participants viewed the 45-minute video session.
3) Post-test: The post-test was administered on the eighth day to assess short-term knowledge retention, to mitigate the potential confounding effect of immediate recall, and to balance retention assessment with participant attrition risk in an outpatient setting.

2.7. Statistical analysis

Descriptive statistics, including mean, standard deviation, frequency, percentages, and graphical techniques, were obtained. Paired t-tests were conducted to evaluate the knowledge gain associated with the VAT. Statistical significance was determined at the 0.05 and 0.01 levels. Statistical analysis was carried out using SPSS 21.0 (IBM Corp.).

3. Results

Table 1: Demographic Characteristics of Study Participants (N=60)

Variables	Frequency (n)	Percentage (%)
Age in years		
20 -30 years	18	30.00
31 -40 years	23	38.33
41 -50 years	11	18.33

> 50 years	8	13.34
Gender		
Male	30	50.00
Female	30	50.00
Education status		
Primary School	6	10.00
Secondary School	8	13.33
Higher secondary school	10	16.67
Under graduate	20	33.33
Post graduate	16	26.67
Occupation		
Heavy worker	8	13.33
Moderate Worker	27	45.00
Sedentary worker	25	41.67
Diet Type		
Vegetarian	13	21.67
Non-Vegetarian	47	78.33
Monthly Income		
INR. 10,000 – 20,000	21	35.00
INR. 20,001 – 30,000	17	28.33
INR. 30,001 – 40,000	15	25.00
Above INR. 40,000	7	11.67

The demographic profile of the study participants (Table 1) shows notable distribution across various characteristics. The study comprised 60 newly diagnosed diabetic patients, with the highest representation in the 31-40 years age group (38.33%, n=23), followed by the 20-30 years (30%, n=18. The gender distribution was equally balanced, with males and females each accounting for 50% (n=30). Educationally, a significant proportion had completed undergraduate studies (33.33%, n=20), indicating a potential to comprehend and engage with educational interventions. In terms of occupation, moderate workers formed the largest group (45%, n=27), with sedentary workers comprising 41.67% (n=25), pointing to lifestyle factors contributing to diabetes. Dietary habits revealed that 78.33% (n=47) of participants were non-vegetarians, which could influence management strategies for diet-related diseases. Socioeconomically, the majority of participants fell within the Rs. 10,000–20,000 monthly income bracket (35%, n=21). The high incidence of diabetes among younger individuals aligns with research findings that have reported an increasing prevalence of diabetes in young adults across India [22], [23].

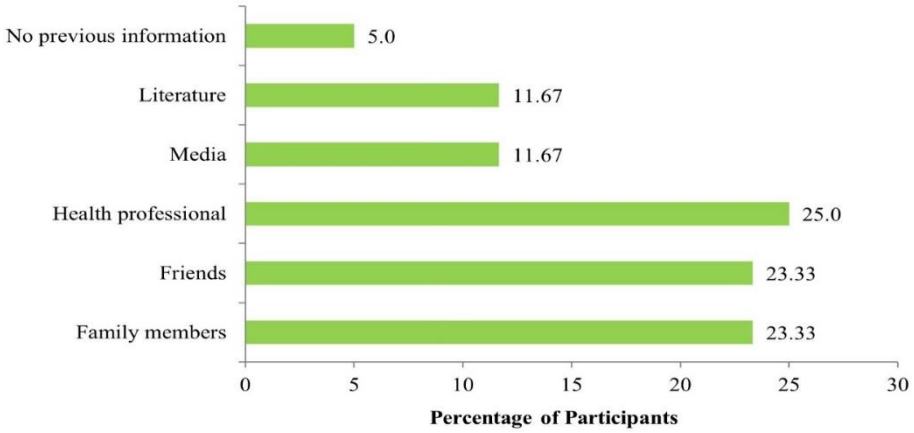


Fig. 1: Sources of Prior Knowledge on Diabetes Mellitus Microvascular Complications.

Figure 1 reveals that participants had varied sources of prior knowledge (pre-test) about diabetes mellitus microvascular complications. Health professionals were the most prominent source, with 25% (n=15) of the participants citing them as their primary information provider. Family members and friends each accounted for 23.33% (n=14). Media and literature were less significant, each being relied upon by only 11.67% (n=07) of participants. Notably, 5% (n=03) of the participants reported having no prior knowledge of the topic. This data indicates gaps in awareness and education.

Table 2: Pre and Post–Intervention Knowledge Score on Micro-Vascular Complications

Knowledge on	Pre-test Mean ± SD	Post-test Mean ± SD	Mean Difference	t-test value	P- Value
Introduction and definitions	0.83±0.83	1.57±0.53	0.74	4.88	<0.001**
Anatomy and physiology	1.90±0.82	3.82±1.07	1.92	11.15	<0.001**
Cause and risk factors	1.75±0.82	3.47±1.03	1.72	10.41	<0.001**
Signs and symptoms	2.63±1.29	5.73±1.77	3.10	11.40	<0.001**
Diagnostic measures	1.80±0.99	4.27±1.47	2.47	11.34	<0.001**
Management and treatment	1.27±0.95	2.82±1.14	1.55	7.49	<0.001**
Preventive measures	1.62±0.92	3.65±0.90	2.03	10.60	<0.001**
Overall score	11.80±2.15	25.32±2.14	13.52	32.91	<0.001**

*Indicates significant at p<0.05; **Indicates significant at p<0.01.

The findings from Table 2 demonstrate a significant, high-magnitude improvement in participants' knowledge following the intervention. The "Signs and Symptoms" category showed the greatest improvement, with a mean difference of 3.10. Similarly, notable gains were evident in "Preventive Measures" and "Diagnostic Measures," with mean differences of 2.03 and 2.47, respectively. Statistical analysis further supports the intervention's strong association with knowledge gain, with t-test values confirming significance at $P < 0.001$ across all domains. The overall mean knowledge score increased sharply from 11.80 (SD=2.15) in the pre-intervention to 25.32 (SD=2.14) in the

post-intervention, reflecting a substantial mean difference of 13.52. These results strongly suggest the positive impact of VAT on short-term knowledge gain.

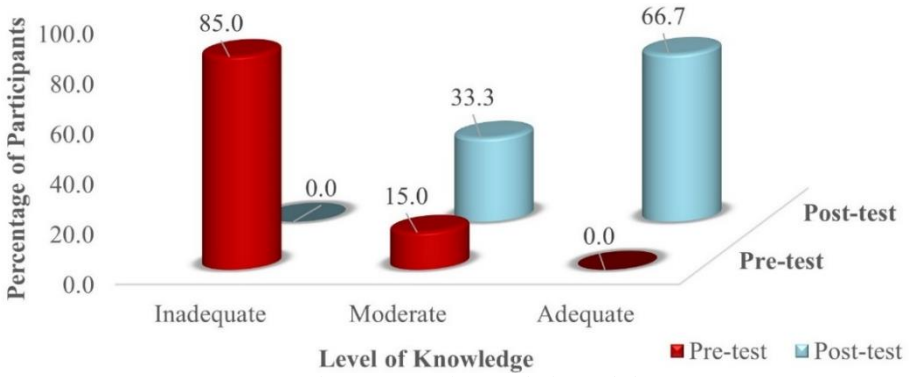


Fig. 2: Pre and Post-Intervention Level of Knowledge Score.

From Figure 2, the pre-intervention data revealed a significant lack of adequate knowledge, with 85% displaying inadequate levels of awareness, and 15% demonstrating moderate knowledge, with none possessing adequate understanding. Following the VAT session, results show a remarkable shift, with 66.7% of participants achieving adequate knowledge and 33.3% demonstrating moderate knowledge, while none remained at an inadequate level. This transformation underscores the strong magnitude of short-term knowledge gain associated with the VAT intervention.

4. Discussion

This pilot study demonstrates the significant positive short-term impact of video-assisted teaching (VAT) on knowledge of microvascular complications among newly diagnosed type 2 diabetic patients. The intervention produced a substantial increase in scores, with the mean rising from 11.80 to 25.32, and two-thirds of participants attaining adequate knowledge levels. These findings underscore VAT's feasibility and highlight its potential for systematic incorporation into diabetes education. The importance of such educational interventions is reinforced by evidence showing that complications such as diabetic retinopathy continue to represent a major cause of preventable morbidity among individuals with diabetes in India [24]. Given the dramatic improvement in knowledge about 'Signs and Symptoms, VAT can empower patients to recognise early warnings, potentially leading to earlier intervention.

The data revealed striking knowledge gaps as none of the participants possessed adequate knowledge, and 5% had no awareness at all. Although healthcare professionals were the most common source of prior information, many patients relied on family and friends, while media and literature contributed little. This aligns with earlier reports that conventional counselling and printed material often fail to ensure sustained engagement or comprehension [9], [14], [15]. VAT, by combining visual and auditory elements, appears to be well-suited to bridge these gaps by delivering consistent and engaging content.

The magnitude of improvement observed in this study is consistent with prior work showing the effectiveness of structured teaching tools. Studies using self-instructional modules (SIM) and individualised planned teaching programmes (IPTP) demonstrated significant gains in awareness of diabetes complications [25], [26]. Our findings extend this evidence by showing that VAT offers additional benefits of interactivity, multimedia reinforcement, and scalability. Success has been reported in similar studies utilising video-based methods for interventions targeting self-care, insulin administration, and lifestyle modification [19], [21], [22]. Together, these findings support VAT as a credible alternative to traditional methods for newly diagnosed patients.

Demographic analysis strengthens the relevance of VAT. A substantial proportion of participants were young adults, an age group facing a rising burden of diabetes in India [22], [23]. Early education in this demographic is particularly important to prevent long-term complications, and VAT provides an efficient means to engage younger populations who are often more receptive to technology-based interventions. The balanced gender representation supports broader applicability, while the predominance of sedentary or moderately active occupations highlights opportunities to integrate lifestyle modification advice into future VAT modules.

Socioeconomic findings are also noteworthy, with many participants falling within lower income brackets, groups often at higher risk of poor disease management due to limited healthcare access. VAT's cost-effectiveness and ease of implementation make it a particularly suitable tool for addressing disparities and promoting equity in diabetes education. Unlike unstructured informal sources of knowledge, VAT ensures standardised and reliable information that can be adapted across socioeconomic contexts.

From a practice perspective, VAT can be integrated into outpatient and primary care settings as part of routine counselling, allowing healthcare professionals to deliver standardised education efficiently while freeing time for individualised support. At the policy level, incorporating VAT into national diabetes education frameworks could help reduce the burden of complications through early and equitable patient empowerment.

The single-group pre-test/post-test design without a control group restricts causal inferences, and the relatively small, convenience-based, English-speaking sample limits generalisability. Furthermore, outcomes were measured only in the short term; long-term retention, behavioural change, and clinical outcomes remain unknown. As a pilot feasibility study, the primary aim was to estimate short-term knowledge gain and assess intervention feasibility rather than establish causal efficacy. These limitations underscore the need for larger, controlled, or randomised studies with multilingual and diverse populations, alongside extended follow-up to evaluate the sustainability of knowledge gains and impact on clinical endpoints.

In summary, this pilot provides strong preliminary evidence that video-assisted teaching is a feasible, scalable, and impactful strategy for patient education. By producing large, statistically significant improvements in short-term knowledge of microvascular complications, VAT addresses critical gaps in traditional approaches and offers promise for integration into clinical and public health practice. Larger controlled trials are warranted to confirm its long-term effectiveness and role in improving self-management and reducing the burden of diabetes-related complications.

5. Conclusion

VAT shows promise as a feasible educational approach associated with short-term knowledge improvement; however, controlled studies are required to confirm effectiveness. Given its scalability, affordability, and patient-centred approach, the strong preliminary results suggest VAT can be a valuable component of diabetes education programs and warrants progression to large-scale, controlled, or randomised studies to confirm sustained effectiveness and impact on long-term clinical outcomes.

Acknowledgment

The authors would like to thank the Apollo BGS Hospital, Mysuru, for the infrastructure and support provided. We also thank all the study participants.

Declarations

Funding

None.

Conflict of Interest

None declared.

Ethical Approval

The study was approved by the Institutional Human Ethics Committee of the Cauvery Group of Institutions with Reference number: CCON/147/2018-2019.

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