

**Research Article****EFFECTIVENESS OF STRUCTURED TRAINING PROGRAM ON THE KNOWLEDGE AND SKILL OF PATIENTS SUFFERING FROM TYPE 2 DIABETES MELLITUS REGARDING SELF-MONITORING OF BLOOD GLUCOSE LEVEL AT THE SELECTED TERTIARY CARE HOSPITAL SETTING****<sup>1,\*</sup> Bhagyashri Pawar, <sup>2</sup> Libin Samuel and <sup>3</sup> Rohini Sharma,**<sup>1</sup>Nurse Educator at Apollo hospital Nashik, India<sup>2</sup>Nursing Superintendent Apollo Hospitals Nashik, India<sup>3</sup>Vice Principal Apollo School of Nursing Indraprastha, IndiaReceived 13<sup>th</sup> December 2022; Accepted 24<sup>th</sup> January 2023; Published online 17<sup>th</sup> February 2023

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**Abstract**

People with diabetes require regular blood glucose monitoring to help them achieve as close to normal blood glucose levels as possible. Patients in the hospital setting are likely to have inconsistent blood glucose levels as they are affected by changes in diet and lifestyle, surgical procedures, and the stress of being in a hospital. The physician will prescribe how regularly the blood glucose monitoring is performed, it is usually the responsibility of the nurse to carry out and it may continue after discharge by the patient and family. Self-glucose monitoring is an important part of self-care after discharge. However, it has been stated that discharged diabetes patients lack the required knowledge for glucose monitoring. The methodology used was a Qualitative approach. The sample selected was Type –II diabetes mellitus patients > 18 years of age group. The pre-test was taken, structured teaching was given, and a post-test was taken, which showed a significant increase in the knowledge of the sample regarding self-glucose monitoring and competency assessment conducted for each sample followed by demonstration learning. Pre-test means 4.48 and post-test 8.4 after administering Patient and family education.

**Keywords:** Self-monitoring of blood glucose level, Patient and family, Type 2 Diabetes mellitus.

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**INTRODUCTION****“Diabetes is not curable. It’s sustainable.” By Alvin Leung**

The number of people with diabetes rose from 108 million in 1980 to 422 million in 2014. Prevalence has been rising more rapidly in low- and middle-income countries than in high-income countries. Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke, and, lower limb amputation. Between 2000 and 2019, there was a 3% increase in diabetes mortality rates by age. In 2019, diabetes and kidney disease due to diabetes caused an estimated 2 million deaths. A healthy diet, regular physical activity, maintaining normal body weight, and avoiding tobacco use are ways to prevent or delay the onset of type 2 diabetes. Diabetes can be treated and its consequences avoided or delayed with diet, physical activity, medication, and regular screening and treatment for complications (WHO, 2022). Self-monitoring of blood glucose levels (self-monitoring of blood glucose level) is widely accepted as being beneficial for long-term glycemic control in type 2 diabetes, both with or without insulin therapy (Schnell *et al.*, 2013). However, limitations and poor adherence to regular self-monitoring of blood glucose levels exist due to inconvenience, and lack of knowledge about self-monitoring of blood glucose levels resulting in suboptimal glycemic control. In this study (H1 & H2) are achieved (H1 -There will be a significant improvisation in the skill of self-glucose monitoring, and H2-There will be a significant improvement in knowledge about self-glucose monitoring). H0 is rejected (H0- There are no significant changes in knowledge about self-glucose monitoring and improvisation in skill)

**MATERIALS AND METHODS**

The study was conducted from August 2022 – to September 2022. A qualitative research approach with pre-test and post-test research design was used to assess the knowledge regarding self-monitoring of blood glucose levels at the Apollo Hospitals Nashik. Permission from the Medical Superintendent at Apollo Hospitals Nashik and ethical clearance from the organizational ethical committee were taken before starting the study. A total of 50 samples were taken (Type –II Diabetes mellitus). A convenient sampling technique was used for data collection. The inclusion criteria for sample collection is “Patients who suffer from type – II diabetes mellitus more than >18 years of age”. The subjects were given a structured questionnaire form to fill out and give responses. Before the questionnaire was given to the participants, consent was taken, and aims and objectives were explained to them. The structured questionnaire to assess the knowledge regarding self-monitoring of blood glucose levels has two sections. Section 1 consists of demography formality including 6 items to collect information on the subject’s demography characteristics (age, gender, Duration of illness, Type of diet, Educational status, Treatment/ Management prescribed by a doctor for Diabetes mellitus). Section 2 consists of a structured knowledge questionnaire including 15 multiple-choice questions to assess the knowledge regarding self-monitoring of blood glucose levels. The maximum score was 2 for each correct answer and no score was awarded for an incorrect answer. The pre-test was taken and then structured teaching was given with the help of a lesson plan (educational template) (Annexure 1) and demonstration method followed by this post-test and competency assessment performed for each individual (Annexure 2)

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The knowledge level grading criteria were considered as follows:

Score	Knowledge level
<50%	Poor
50-75%	Average
>76-100%	Good

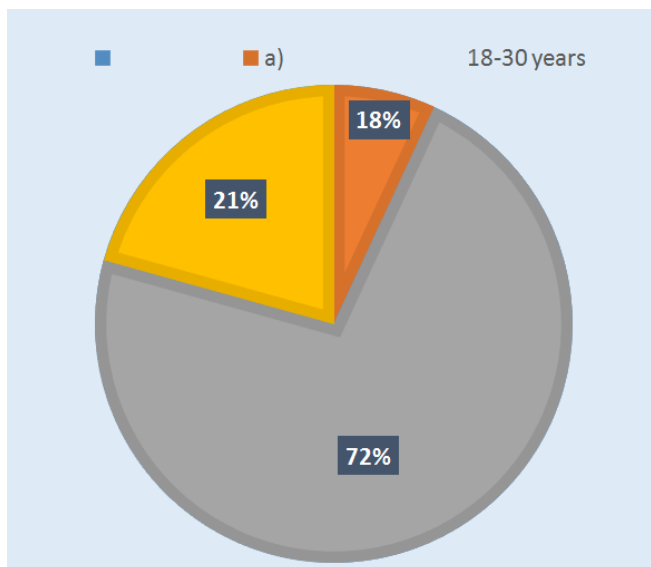
**RESULTS**

Descriptive (Frequency &percentage) and inferential statistics (t-test) were used to assess the effectiveness of patient education on self-monitoring of blood glucose levels.

**Table 1. Study sample distribution by sociodemographic characteristics**

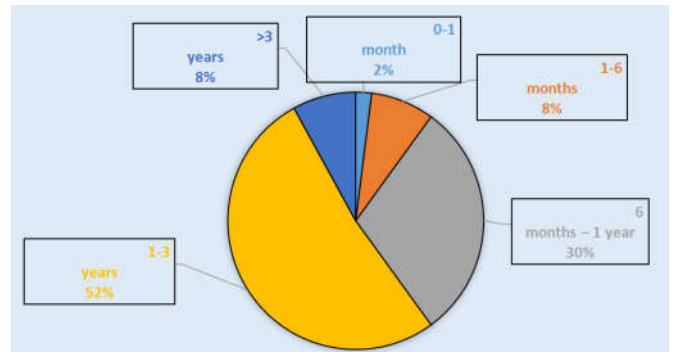
Variable	Option	Frequency	Percentage
Gender	Male	29	58
	Female	21	42
Age group	18-30 years	5	10
	30-60years	36	72
	>60years	9	18
	0-1 month	1	2
Duration of illness	1-6 months	4	8
	6 months – 1 year	15	30
	1-3 years	26	52
	>3 years	4	8
Type of diet	a) Vegetarian	18	36
	b) Non-vegetarian	31	62
	c) Vegan	1	2
Type of treatment	a) Antihyperglycemic agents	9	18
	b) Insulin therapy	7	14
	c) Other (Dietary management, lifestyle modification)	4	8
	d) Combination of above points	30	60
Educational Status	c) 5th- 10th	8	16
	d) Up to 12th	12	24
	e) Diploma/ Graduate	27	54
	f) PG or above	3	6

Table-1 depicts subject distribution by socio-demographic characteristics



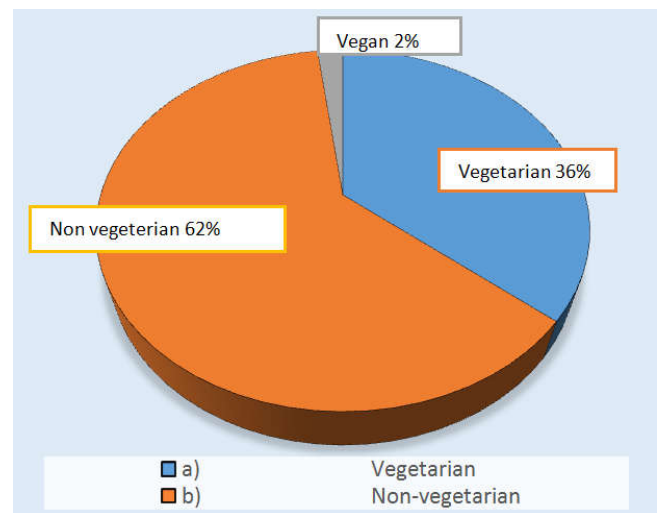
**Figure 1. Frequency & percentage of subject according to age**

Figure-1 depicts that the highest percent (58%) of the study samples were male and the lowest percent (42%) of the study samples were female. In this subject group (18%) of the (18-30 years age group), (72%) of them in the (30-60) years age group, (21%) of them (>60) years age group.



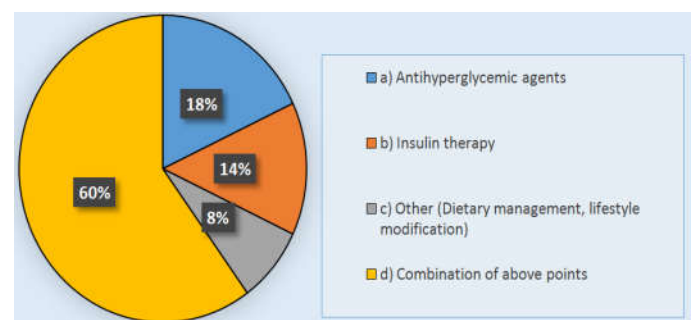
**Figure 2. Frequency & Percentage of subject according to Duration of illness**

Figure-2 depicts that the highest percent in this subject group (52%) of the (1-3years duration of illness), (30%) of them at the (6 months -1 year duration of illness), (8%) of them in (> 3 years duration of illness), (8%) of them at the (1months -6 months duration of illness, and (2%) of them in (0-1 month duration of illness)



**Figure 3. Frequency & Percentage of subject according to Type of diet**

Figure-3 depicts the highest percentage in this subject group (62%) of (non-vegetarians), (36%) of them (vegetarians), (2%) of them (vegan).



**Figure 4. Frequency & Percentage of subject according to Type of treatment**

Figure-4 depicts that the highest percent in this subject group (60%) of the (combination of the above points), (18%) of them at the (Antihyperglycemic agents), (14%) of them in (Insulin therapy), (8%) of the (other –dietary management, lifestyle modification).

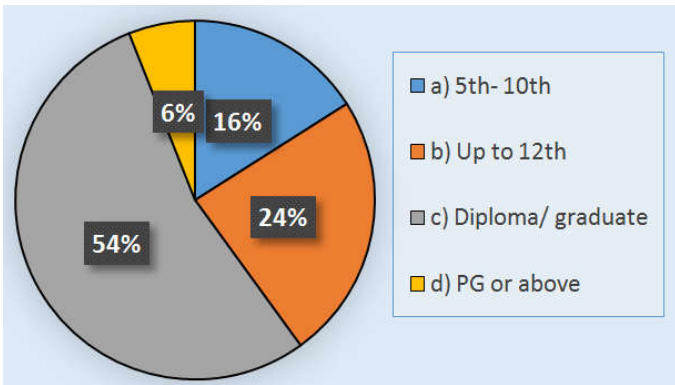


Figure 5. Frequency & Percentage of subject according to educational status

Figure-5 depicts that the highest percent in this subject group (54%) of the (diploma/graduate), (24%) of them at the (up to 12th), (16%) of them (5<sup>th</sup>-10<sup>th</sup>), (6%) of them (PG or above).

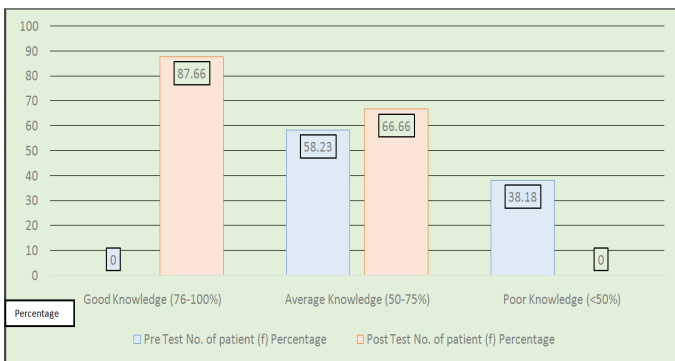


Figure 6. Pre-test and Post-test analysis

Figure-6 depicts the frequency and percentage distribution of the subjects' pre-test and post-test knowledge scores. The data presented in figure 6 shows that (38.18%) of subjects had poor knowledge, (58.23%) of subjects had average knowledge in the pre-test regarding knowledge of self-monitoring of blood glucose level, and most (87.66%) subjects had good knowledge, (66.66%) subjects had average knowledge and no subjects had poor knowledge in post-test regarding knowledge on self-monitoring of blood glucose level

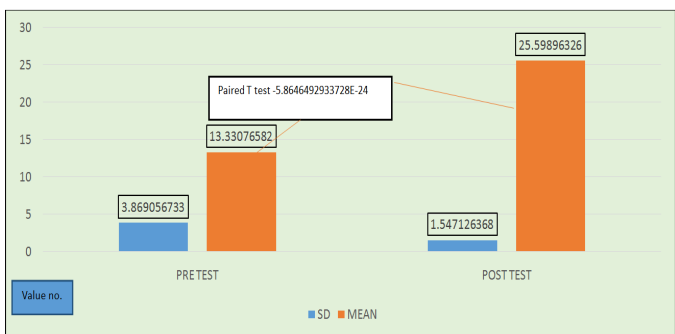


Figure 7. Frequency & distribution of subject Mean, SD, Paired t-test value related pre-test & post-test

Figure-7 depicts the mean, standard deviation, and paired t-test scores of structured knowledge questionnaires. The mean score & standard deviation of the post-test (mean 25.59, SD = 1.54) were significantly higher than the mean score & standard deviation of the pre-test (mean 13.33, SD = 3.86) the average result of the pre-test and post-test (5.8646492933728E-24) as per the paired t-test.

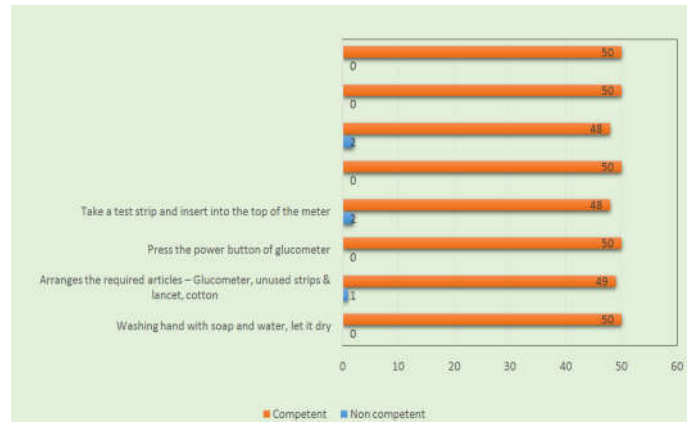


Figure 8. Subject competency mapping

Figure 8 depicts the competency assessment of subject demonstration for self-monitoring of blood glucose level by individual subjects followed by demonstration education in this 98% of all subjects demonstrated self-monitoring of blood glucose level appropriately. So the research hypothesis is accepted (H1) and the null hypothesis (H0) is rejected.

### DISCUSSION AND CONCLUSION

This study was conducted to analyze the effectiveness of a structured training program on the knowledge and skill of patients suffering from Type 2 Diabetes mellitus regarding self-monitoring of blood glucose levels. A quantitative, one-group pretest-posttest design research approach was used to collect the data. The target population was patients who have a type-II diabetes mellitus. The data collection period lasted for months from July 22 to September 22. After collecting the data using a structured tool from the patients, the data were analysed using descriptive and inferential statistics. The present study findings were revealed in terms of the objectives of the study. Data shows that (38.18%) of subjects had poor knowledge, (58.23%) of subjects had average knowledge in the pre-test regarding knowledge of self-monitoring of blood glucose level, and most (87.66%) of subjects had good knowledge, (66.66%) subjects had average knowledge and no subjects had poor knowledge in post-test regarding knowledge on self-monitoring of blood glucose level. The calculated average result of the pre-test and post-test is (5.8646492933728E-24) as per paired -t-test. The present study findings reveal that the knowledge of subjects increased after administering structured teaching programs on self-monitoring of blood glucose levels, The results of this study are congruent with the study conducted by Nitendra Chaurasia in rural Nepal where 61 (31.77%) has poor knowledge, 110 (57.29%) had average knowledge score and 21 (10.93%) had good knowledge of diabetes mellitus [3]

### Recommendations

Based on the conclusions, the study recommended the following:

1. Further study with replication of the current study on a larger sample is recommended to achieve wider utilization of the designed educational program for a better quality of care.
2. Nurse's ongoing motivation for patient education regarding self-monitoring of blood glucose level with demonstration.

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4. <https://ctsi.ucla.edu/researcher-resources/files/docs/sop-glucose-monitoring.pdf>

ANNEXURE

Annexure 1. Structured teaching education template on self-monitoring of blood glucose level<sup>[4]</sup>

**SELF BLOOD GLUCOSE MONITORING EDUCATION TEMPLATE FOR PATIENT & FAMILY**

**Haemoglobin A1C Test value:**

**Procedure:**

1. Have the participant wash hands with soap and warm water.
2. Wash hands with soap and warm water. Use appropriate personal protective equipment (PPE).
3. Choose a clean, dry work surface and make sure you have the glucose meter, washed sterile lancet, and test strip.
4. Press the power button. When the code number appears, it must match the code number on the bottle of test strips.
5. **Use of lancet:** Insert a new, sterile lancet into the lancet holder if applicable. Hold the lancet firmly and gently twist and pull off the cap. Obtaining a **drop of blood:** Hold the lancet firmly against the side of the finger to engage or Press the top of the pen and hold it applicable. Separate the finger gently while holding the hand down. Local the palm if blood does not flow easily.
6. Apply a drop of blood to the test strip as directed (read manufacturer's instruction prior to use as test strip insertion and blood application may vary).
7. Note the elapsed time interval given for testing as indicated by the digital clock or count-down phase on the glucose meter screen.
8. The meter displays your result in <math>\leq 30</math> seconds.
9. Press the power button to turn off the meter.
10. Appropriately dispose of sharp and bio-hazard materials.
11. Wash hands.
12. Document the result on the appropriate form/chart with the date & time.
14. Report abnormal results to the doctor if they occurred or less and present with signs and symptoms.

**Supply needed for Self-Monitoring of Blood Glucose:**

- a. Blood glucose meter.
- b. Test strips for your meter. Each meter has its own strips. You must use the strips that came with your meter.
- c. A needle to prick your finger (lancet). **Do not** use a lancet more than one time.
- d. A device that holds the lancet (lancet device).
- e. A journal or log book to write down your results.

**Alerts/Referrals: to the hospital**

- > Blood glucose level  $\leq 57$ mg/dl
- > Blood glucose level  $\leq 40$ mg/dl

**Emergency Room Referral for symptomatic participants with alert level glucose includes but is not limited to the following:**

- Shortness of breath
- Nausea and vomiting
- Visual disturbances
- Breath that smells fruity
- Blurredness or loss of good vision quality
- Headache
- Dilated eye pupils

**Emergency contact details for Apollo Hospitals, Nashik**

APOLLO HOSPITALS, NASHIK  
 Survey No. 2873/A1, Plot No.1,  
 Swamnarayan nagar, Off Mumbai - Agra Highway  
 Panchsari, Nashik - 422001  
 Tel: +91-253-2310250/330-830338

**General consideration for blood glucose monitoring**

**1. Strip and Meter Handling for Self-Monitoring of Blood Glucose:**

- a. Meter and test strips should be handled with clean, dry hands.
- b. Test strips are for single use and unique for each meter. Test strips must be kept in the original container, as any moisture can affect the integrity of the strip, and the containers should be kept closed. Check for the expiration date.
- c. Strips can be tested for accuracy with the control solution provided initially with each meter and should be checked for expiration date. The control glucose range for the strip appears on the canister.
- d. The amount of blood required is usually very small. Many meters easily pull the blood drop into the end of the strip. An inadequate sample can be a source of error.
- e. Keep the meter and supplies in a cool, dry area, not in the car or in sunlight.

**2. Lancing Procedure for Self-Monitoring of Blood Glucose**

- a. Site preparation: Clean the area with warm, soapy water and dry it. Fused residue can be a source of false high blood sugar values.
- b. Lancet devices to obtain blood can vary and all use a lancet to prick the skin. Thin, sharp lancets are more comfortable. Lancets should not be reused or cleaned, as they quickly become dull.
- c. Depth setting on the lancet device controls the penetration of the stick and can be adjusted for the test comfort and size of the blood sample. Most meters require very small samples—less than a small teardrop.
- d. Lancet should be applied firmly to the clean, dry finger, but not with force!
- e. Sides of the finger should be used, as there is less pain. Use of the third, fourth, and fifth digits may be preferable to the square index finger and thumb.

**3. Result accuracy reading for Self-Monitoring of Blood Glucose:** To avoid false readings, your test strips and glucose meter must be in good condition. Make sure that:

- a. The expiry date printed on the test-strip container has not been reached or exceeded.
- b. The test-strip container was not left open after you took out a test strip.
- c. The test strips are in their original container.
- d. The test strips have been kept away from moisture and stored at a temperature between 4 and 36 degrees Celsius.
- e. The test strips have not been contaminated by dust or other substances.

**4. Alternate test sites (upper arms and thighs) are approved for many meters. Fingertips or the outer pads are preferred and are more accurate.**

**5. Obtaining blood samples should be a gentle "milking" from the base of the finger to the lancet tip. Pressure directly on the site of lancing is not recommended.**

**6. Disposal of lancets and SMBG testing supplies should be done according to local laws for sharps. In many locations, a hard plastic container with a screw top can be disposed of in the household trash.**

**7. Refresh accuracy reading for Self-Monitoring of Blood Glucose:** To avoid false readings, your test strips and glucose meter must be in good condition. Make sure that:

- a. The expiry date printed on the test-strip container has not been reached or exceeded.
- b. The test-strip container was not left open after you took out a test strip.
- c. The test strips are in their original container.
- d. The test strips have been kept away from moisture and stored at a temperature between 4 and 36 degrees Celsius.
- e. The test strips have not been contaminated by dust or other substances.

**CONCLUSION**

Self glucose monitoring technique is very necessary to know patients so they can manage their blood glucose levels at home by themselves without any dependencies. In this template, all the content prepared based on research and guidelines.

Annexure 2. Nurse giving structured teaching program on self-monitoring of blood glucose level



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