

Assessing the Effect of Self-Monitoring Blood Glucose (SMBG) on Glycaemic Outcome among Type-2 DM Patients of Aizawl, Mizoram

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Abstract

The present study aims to assess the effect of self-monitoring blood glucose(SMBG) on Glycaemic outcome among type-2 DM patients of Aizawl,Mizoram. A randomized control study was conducted on April 2023 to September 2023 at City Polyclinic, Dawrpui, Aizawl with a total of 60 diabetic patients (30 in experimental and 30 in control group). Interventional video on SMBG and its importance was given. Convenience sampling technique was used. Among the total of 60 samples, 80% did not have previous knowledge / teaching regarding SMBG (self-monitoring of blood glucose). From the DSMQ questionnaire focusing on SMBG questions, it was seen that majority (53% approx.) of the experimental group took their medicines (oral antidiabetics), practice SMBG and check their blood sugar regularly, especially after interventions were applied. The HbA1c result at the end of the study was 7.9% for the experimental group vs 7.7% for the control group with statistical significant difference ($p\text{-value} < 0.05$). Therefore, the study concluded that interventions on SMBG has a true impact on the result of Glycaemic control which directly improves the blood sugar of Type-2 DM patients. The study may be further introduced to larger samples for a more accurate and productive outcome.

Keywords: Interventional video, blood sugar, DSMQ questionnaire, oral antidiabetics, HbA1c

Introduction

Diabetes mellitus is a chronic multisystem disease related to abnormal insulin production, impaired insulin utilization, or both. Diabetes Mellitus has become a serious

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health problem throughout the world and its prevalence is increasing rapidly worldwide. In India, an estimated 40 million people have Diabetes in which the prevalence in urban areas is about 9% and in the rural areas 3%. Regardless of its cause, Diabetes is primarily a disorder of glucose metabolism related to absent or insufficient insulin supplies and/or poor utilization of the insulin that is available. Evaluating HbA1c(Glycated haemoglobin) level is the main method of determining the glycaemic control of diabetes mellitus patients in which HbA1c level $< 5.6\%$ are considered good glycaemic control and for diabetic patients maintaining HbA1c level $< 6.5\%$ can reduce the risk of further complications. One of the main components of Diabetes management that can reduce HbA1c(Glycated haemoglobin) level is self-monitoring of blood glucose(SMBG) whose main goal is to reduce symptoms, promote well-being, prevent acute complications of hyperglycemia, and prevent or delay the onset and progression of long-term complications. The goals are most likely to be met when the patient is able to maintain blood glucose levels as near to normal as possible. Self-monitoring of blood glucose(SMBG) is a cornerstone of diabetes management. By providing a current blood glucose reading, SMBG enables the patient to make self-management decisions regarding diet, exercise, and medication. SMBG is also important for detecting episodic hyperglycemia and hypoglycemia. The chief advantage of SMBG is that it supplies immediate information about blood glucose levels that can be used to make adjustments in food intake, activity patterns, and medication dosages. It also produces accurate records of daily glucose fluctuations and trends, as well as alerting the patient to acute episodes of hyperglycemia and hypoglycemia. The current study mainly aims to find the importance of SMBG and its effect in controlling Glycaemic outcome among Diabetic patients.

Objectives/aims of the study

The study aims to assess the effect of self-monitoring blood glucose (SMBG) on Glycaemic outcome among Type 2 DM patients of Aizawl, Mizoram.

Methodology

An experimental research approach was used to examine the effect of self-monitoring of blood Glucose (SMBG) on Glycaemic outcome among type-2 DM patients. Experimental research design, one group pre-test-post-test only design was found to be most suitable for studying the effect of SMBG on glycaemic outcome among type-2 DM patients. A total sample of 60 Diabetic patients attending city polyclinic, Aizawl were randomized and divided into two groups, one as experimental group (30) and the other as control group (30). Pre-test was conducted for both groups. Experimental group received interventional video on "Importance of SMBG" in

addition to routine care in which control group received only routine care. Demographic proforma and DSMQ(Diabetes Self-Management Questionnaire) were provided to collect data regarding personal data, self-care routine and practicing of SMBG. HbA1c test results were collected and compared in both groups before and after interventions were introduced. The data from two groups was collected in similar situations at different occasions.

Statistical analysis was performed using IBM SPSS statistics version 24 and graph were prepared using Graph pad prism.

Result

1. Demographic proforma:

The demographic characteristics of control group and experimental group has been shown in Table 1. The proportion of age 60yrs and above is found to be higher in control group(66%) as compared to experimental group(36%) in which maximum(40%) of the samples are found to be between 50-60yrs in experimental with a significant difference($p < 0.05$) between the two groups in terms of age. There is no significant difference between both groups in terms of gender, BMI(body mass index), anti-diabetics taken and previous teaching about SMBG.

Table 1: Demographic characteristics of both control and experimental group

	Variable	Control (n = 60) N (%)	Experimental (n = 60) N(%)	Significance difference
1	Age (in years)			
i.	30-40	3%	10%	p<0.05
ii.	40-50	10%	13%	
iii.	50-60	20%	40%	
iv.	60 and above	66%	36%	
2	Gender			
i.	Male	60%	63%	ns*
ii.	Female	40%	36%	ns
3	BMI(Body Mass Index)			
i.	≤ 25 (Normal)	60%	40%	ns
ii.	24-30 (Overweight)	30%	53%	
iii.	≥ 30 (obese)	6%	3%	

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4	Anti-diabetics taken			
i.	One Anti-diabetics	50%	46%	ns
ii.	Two Anti-diabetics	46%	53%	ns
5	Previous teaching about SMBG			
i.	Yes	23%	16%	ns
ii.	No	76%	83%	

*ns means Not significant

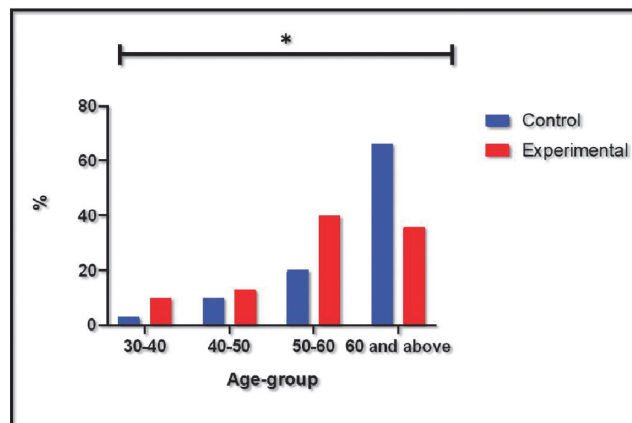


Fig 1 : Demographic characteristics - Age

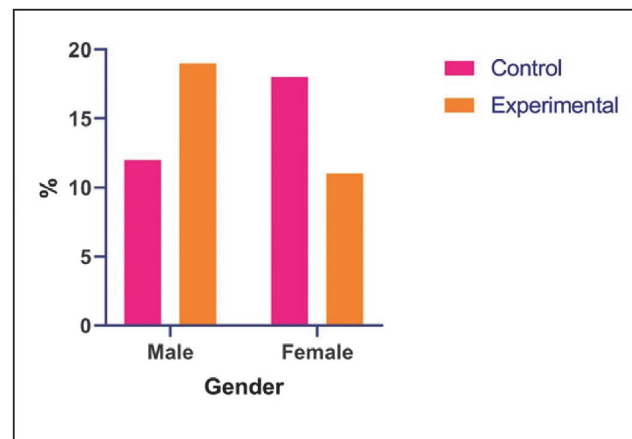


Fig 2: Demographic characteristics - Gender

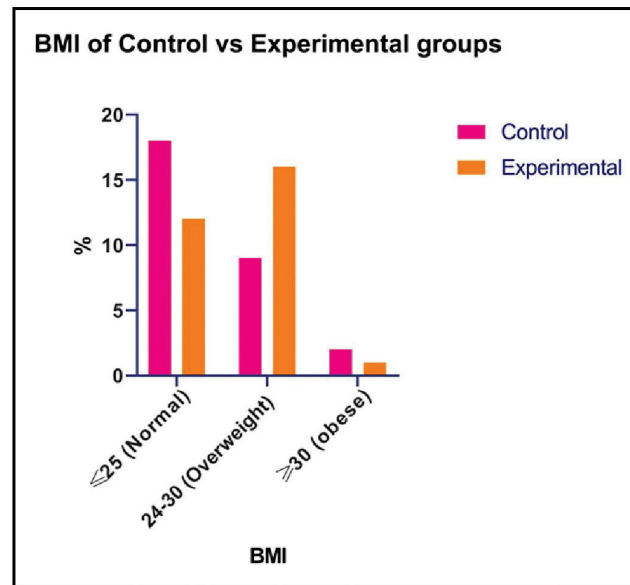


Fig 3 : Demographic characteristics – BMI of both groups

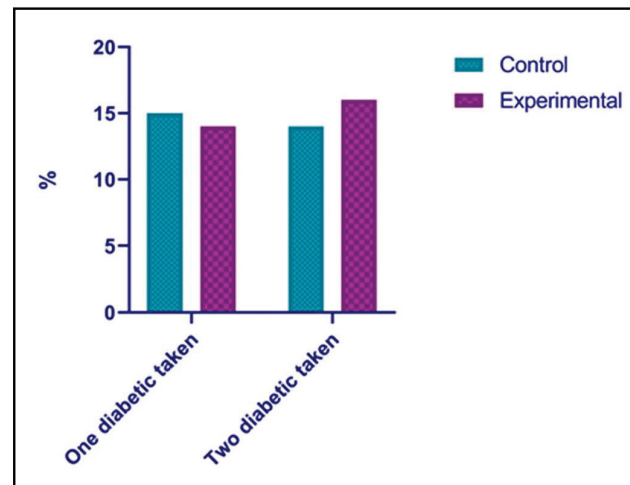


Fig 3: Number of oral diabetics taken by both control and experimental group

2. Comparison of DSMQ(Diabetes self-management questionnaires):

The responses of the DSMQ on both groups are as shown in table 2. DSMQ mainly targets diabetes self-care and assess behaviours associated with metabolic control within common treatment regimens for type 1 and type 2 diabetes in adult

patients. Item no. 1,4,6,10 & 12 mainly focuses on self-management of blood glucose(SMBG) and treatment regimens. A comparison of the parameters shows that 36% of the experimental group response to “Applies to me very much” in item 1 and 53% in item 4 regarding compliance to treatment and self-monitoring of glucose level where 6% and 20% of control group response towards the same.

Table 2: Comparison of DSMQ responses

SI No	Parameters	Does not apply to me (%)			Applies to me to some degree (%)			Applies to me to a considerable level (%)			Applies to me very much (%)		
		Control	Exp. Initial	Exp After 12 week	Control	Exp. Initial	Exp After 12 week	Control	Exp. Initial	Exp After 12 week	Control	Exp. Initial	Exp After 12 week
1	I check my blood sugar levels with care and attention	23	30	6	33	26	13	36	20	43	6	23	36
2	The food I choose to eat makes it easy to achieve blood sugar levels	26	16	13	40	36	30	30	23	23	3	23	33
3	I keep all doctors appointments recommended for my diabetes treatment	16	20	10	33	30	23	30	20	26	20	30	40
4	I take my diabetes medication (e.g. insulin, tablets) as prescribed	20	36	20	26	23	16	33	6	10	20	33	53
5	Occasionally I eat lots of sweets or other foods rich in carbohydrates	36	46	40	33	30	23	23	10	16	6	13	20
6	I record my blood sugar levels regularly (or analyse the value chart with my blood sugar level)	26	43	40	16	30	20	33	13	16	23	13	23
7	I tend to avoid diabetes-related doctors' appointments	33	30	23	33	20	10	13	16	23	20	33	43
8	I do regular physical activity to achieve optimal blood sugar levels	20	33	23	33	33	33	30	16	20	16	16	13
9	I strictly follow the dietary recommendations given by my doctor or diabetes specialist	13	23	13	36	26	30	30	40	36	20	10	20
10	I do not check blood sugar levels frequently enough as would be required for achieving good blood glucose control	40	23	20	26	33	23	16	20	23	16	23	33
11	I avoid physical activity, although it would improve my diabetes	26	36	30	30	40	33	33	6	6	10	16	33
12	I tend to forget to take or skip my diabetes medication (e.g. insulin,tablets)	40	30	23	23	20	6	26	26	33	10	23	36
13	Sometimes I have real 'food binges' (not triggered by hypoglycaemia)	26	20	13	30	23	30	33	43	40	26	3	16
14	Regarding my diabetes care, I should see my medical practitioner more often	20	13	6	20	33	23	33	30	33	26	23	36
15	I tend to skip planned physical activity	23	36	30	40	40	33	26	10	16	10	13	20
16	My diabetes self-care is poor	26	20	10	26	26	16	36	23	33	10	30	40

3. Comparison of HbA1c(Glycated hemoglobin) result:

The HbA1c test of both control and experimental group(both initial and after 12th week) are as follows in table 3. There was a significant difference between control group(initial and after 12th week) and experimental group(initial and after 12th week) in terms of the HbA1c result (p -value <0.0001). The percentage of experimental group(after 12th week) HbA1c exceeds control group with 7.9%.

Table 3: HbA1c result comparison

Group	%	P value	Sig. diff.	Sig. diff.
Control Group				
HbA1c (Initial)	7.69	<0.0001	Yes	Yes
HbA1c (After 12th week)	7.7			
Experimental Group				
HbA1c (Initial)	7.69	<0.0001	Yes	
HbA1c (After 12th week)	7.9			

Discussion

The study found out that majority(83%) of the participants do not have a knowledge or received teaching regarding SMBG. Demographic variables of gender, age were analysed in which 66% of the participants are of 60 years and above; as for gender, majority(63%) are male. In terms of data collected from DSMQ, 36% agrees in applying to recording and checking blood sugar level regularly. There is a significant improvement in HbA1c of control and experimental groups with significant difference in glycaemic control between the two groups at the end of the study. HbA1c result can be drastically changed with patients choosing to follow self-care regimens regularly especially regarding diet, exercise and SMBG. The control group has HbA1c reduction of 0.01% while the experimental group had a reduction of about 0.2% in which there is a statistical difference. A reduction in HbA1c greatly relieve the risk of chronic complications and death due to diabetes. For people living with Diabetes, access to affordable treatment, including insulin, is critical to their survival. Several studies highlighted the influence of Self-monitoring of blood glucose (SMBG) among type-2 diabetes Patients which may vary between those using oral hypoglycaemics and insulin. A study of the effect of SMBG among diabetes patients is considered important as it can drastically improve the glycaemic outcome although it may differ from patient to patient. Further and wider studies needs to be implemented on the same population with larger samples for a more accurate results and analysis on SMBG effects on glycaemic outcome.

Conclusion

In conclusion, the study mainly represents the importance of SMBG and its influence in controlling blood sugar level and glycaemic outcome for diabetic patients. The results and findings are analysed from 60 samples with limited access to the sampling frame and poor follow-up to the interventional videos due to inconvenience

from the samples may bring to the study limitations. However, for improvement of results outcome, more studies need to be done in a respective time framed.

Acknowledgement

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Ethical consideration

The Mizoram University Human Ethics Committee gave its clearance in conducting the present study.

Declaration

The present study is an extract of Ph.D. thesis of Lalnuntluangi Hnamte who is the main author, not published in any form for any other purposes.

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