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EFFECTIVENESS OF INDIVIDUALIZED PATIENT TEACHING PROGRAM ON PRACTICE OF FIVE MOMENTS OF MEDICATION SAFETY AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS AND HYPERTENSION

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Abstract:
Health has always been the top priority among individuals, and the risk of disease is a major concern; commonly, the lifestyle disorders Type 2 Diabetes Mellitus and Hypertension are a trend. The errors encountered while using medication stand as a significant risk factor in the safety of patients, particularly among individuals with type 2 diabetes mellitus and hypertension. This study was conducted to assess the individualized patient teaching program (IPTP) effectiveness by practicing the Five Moments of Medication Safety (FMMS) technique. The study was performed among patients attending at Medical College Hospital in Chennai. A total of 60 participants were involved in the study. Following the random sampling method, the sample was divided into 30 in the study group and 30 in the control group. The results of FMMS were evaluated by performing a pre-test and post-test. Findings of the study showed a great statistical significance ($p<0.001$) among the study group compared to the control group, demonstrating the effectiveness of the intervention. Age and religion showed a significant association with medication safety practices with a p-value of $p<0.008$ and $p=0.050$, respectively. The number of medications taken per day also showed a significant association ($p=0.023$).The current study finds insight that highlights the need for structured patient education practice to enhance safety in taking medication and thus reduce errors and improve adherence to chronic conditions.

INTRODUCTION

Global mortality and morbidity are mainly due to the lifestyle disorder of Diabetes mellitus (DM). The incidence, prevalence, and deaths globally are reported as 22.9 million, 476.0 million and 1.37 million respectively in 2017[1]. Around 74.2 million individuals in India are influenced by diabetes mellitus, especially Type 2 Diabetes[2]. The increased risk of mortality in diabetes is mainly due to infections, cardiovascular disease, stroke, chronic kidney and liver diseases, and cancer[3]. The first line of treatment is through Oral hypoglycemic agents but insulin is suggested as alternate option for patients with uncontrolled hyperglycemia or surgery, severe infections and in case of pregnancy[4.] Approximately 3.2 million individuals rely on insulin for the management of diabetes in India alone[5]. Medical errors are a disastrous reality in the healthcare sector that causes serious concerns about the safety of the patient. This is not a new issue and it has been a topic of discussion since 1999, because of the unique report revealed more people died due to medical errors, especially from car accidents, breast cancer, or AIDS[6]. A statistical report states that an estimated of approximately 400,000 patients hospitalized suffer inevitable harm every year more than 200,000 mortality are reported annually due to medical errors. Errors often occur in high-complexity settings like critical care, influenced by human and organizational factors such as lack of knowledge, performance lapses, and system inefficiencies. Addressing these issues is crucial for patient safety.
Nurses are the key link between physicians and patients or caregivers and play a vital role in patients' health and safety. Medication error has been a major concern since 1999 patients' health and it is believed that through proper education, advocacy and proper monitoring such errors can be minimized7.Non-communicable diseases (NCDs) are the leading cause of global mortality, responsible for 41 million deaths annually and 71% of all deaths. The Cardiovascular diseases, cancer, respiratory diseases and diabetes account for 80% of premature NCD-related deaths, with the majority of population from the low- and middle-income countries (WHO, 2022)8. Many NCDs are preventable through risk factor management. Taking Medication error as a major risk factor this study was

designed to assess the effectiveness of an individualized patient teaching program on practice of five moments of medication safety among patients with Type 2 Diabetes Mellitus and Hypertension at a selected hospital in Chennai.

METHODOLOGY

Research Design

A quantitative approach was used in this study. A sample size of 60 patients was incorporated and were divided into two groups the Study Group (30) and the Control Group (30) by random sampling technique. The study group was given intervention practice (Individualized patient teaching program on the practice of five moments of medication safety) the method approved by the WHO along with Hospital routines. The intervention was performed for 15 days. In the control group, only the Hospital routine was followed. The Type 2 Diabetes and Hypertension patients attending the Private Hospital in Chennai were included in the study. Independent Variables, Dependent Variables, Demographic Variables and Clinical Variables were the Variables included in the study. The study was conducted after obtaining ethical clearance from the hospital's ethical committee in Chennai. All ethical principles were adhered throughout the study.

Group	Pre-test	Intervention	Post-test
R-study-group	O1	*X	O2
R-control group	O1	*	O2

R = Randomization, **O1=** Pre-test, **X =** Individualized patient teaching program on practice of five moments of medication safety, **O2** = Post-test after 15 days of intervention.*= Hospital routine

Inclusion Criteria and Exclusion Criteria

The inclusion criteria include Patients diagnosed with Type 2 Diabetes Mellitus and/or Hypertension, Patients available at the time of the study, Patients taking an oral medication, Individuals proficient in English or Tamil, and Patients aged 41–80 years. Exclusion criteria include Patients unwilling to participate and Patients on psychiatric or immunodeficiency medications.

Demographic and Clinical Variables:

Demographic variables such as age, gender, marital status, religion, family type, educational status, occupation, monthly income, place of residence, and diet pattern were evaluated for all the samples. Clinical variables, diagnosis, disease duration and the number of medications taken daily were evaluated.

Intervention Tool:

Five moments for medication safety engagement were implemented for the patients in the study group each moment included five critical questions like Starting medication, Taking medication, Adding medication, reviewing medication and Stopping medication. A PowerPoint presentation was prepared to educate the details of the prescribed medications for each patient and the checklists were completed in 30–45 minutes. The reliability of this method was tested following the test-retest method, the reliability score of r = 0.97 was obtained using the Karl Pearson correlation method.

Data Analysis:

The data were collected from all the patients with Type 2 Diabetes Mellitus and Hypertension and, the collected data were coded, edited, organized and analysed. Descriptive and inferential statistical methods were implemented for data analysis. All the statistical procedures were performed using STATA software version 15.0; p-values <0.05 were considered statistically significant. The chi-square test and ANOVA test were used for statistical evaluation.

RESULTS

Medication error is nowadays an important problem that increases the risk to a patient's health. This study was performed to assess the effectiveness of individual teaching programs on medication safety following the practice of five moments for medication safety engagement among patients with Type 2 Diabetes Mellitus and Hypertension. A total of 60 samples were obtained for the study, by random sampling they were divided into two groups Control group and the Study group with 30 samples each. The demographical data analysis revealed that most of the patients in the study group were in the age group of 51-70, whereas in the control group, the patients were in the age range of 41-60. The male ratio was higher in the study group with a percentage of (66.7%), while the female ratio was dominant in the control group (60.0%). While analyzing the diet pattern the major contributors were non-vegetarians with a percentage of 66.7% and 86.7% in the study and control group respectively, for further details refer to Table 1.

Table 1: Demographic variables of patients with Type 2 Diabetes Mellitus and Hypertension in study and control group

Demographic variables	**Study Group (n = 30)**		Control group (n = 30)	
	No.	%	**No.**	**%**
Age Group				
1. 41 – 50 years	12	**40.0**	11	**36.7**
2. 51 – 60 years	12	**40.0**	10	**33.3**
3. 61 – 70 years	5	**16.7**	8	**26.7**
4. 71 – 80 years	1	**3.3**	1	**3.3**
Gender				
1. Male	20	**66.7**	12	**40.0**
2. Female	10	**33.3**	18	**60.0**
Marital status				
1. Married	27	**90.0**	26	**86.7**
2. Unmarried	0	**0.0**	0	**0.0**
3. Widow	3	**10.0**	3	**10.0**
4. Divorced	0	**0.0**	0	**0.0**
5. Separated	0	**0.0**	1	**3.3**
Religion				
1. Hindu	19	**63.3**	9	**30.0**
2. Muslim	4	**13.3**	12	**40.0**
3. Christian	7	**23.3**	9	**30.0**
Family Type				
1. Joint family	18	**60.0**	19	**63.3**
2. Nuclear family	12	**40.0**	11	**36.7**
3. Extended family	0	**0.0**	0	**0.0**
Educational status				
1. **Illiterate**	1	**3.3**	3	**10.0**
2. **Primary**	17	**56.7**	17	**56.7**
3. **Middle**	10	**33.3**	6	**20.0**
4. **High school**	1	**3.3**	1	**3.3**
5. **Intermediate/Diploma**	0	**0.0**	1	**3.3**
6. **Graduate**	1	**3.3**	1	**3.3**
7. **Professional degree**	0	**0.0**	1	**3.3**
Occupational status				
1. Unemployed	0	**0.0**	0	**0.0**
2. Unskilled	19	**63.3**	16	**55.2**
3. Semi-skilled	10	**33.3**	10	**34.5**
4. Skilled	0	**0.0**	0	**0.0**
5. Semi profession	0	**0.0**	2	**6.9**

6. Professional	1	**3.3**	1	**3.4**
7. Clerical	0	**0.0**	0	**0.0**
Monthly income				
1. Rs. 47348 and above	2	**6.7**	9	**30.0**
2. Rs. 23674 – 47347	4	**13.3**	0	**0.0**
3. Rs. 17756 – 23673	5	**16.7**	2	**6.7**
4. Rs. 11837 – 17755	1	**3.3**	1	**3.3**
5. Rs. 7102 – 11836	10	**33.3**	9	**30.0**
6. Rs. 2391 – 7101	8	**26.7**	9	**30.0**
Place of residence				
1. Urban	17	**56.7**	16	**53.3**
2. Rural	13	**43.3**	14	**46.7**
Diet pattern				
1. Vegetarian	10	**33.3**	4	**13.3**
2. Non vegetarian	**20**	**66.7**	**26**	**86.7**

Table 2: Descriptive Statistics Post-Test practice on five moments of medication safety among Patients with Type 2 Diabetes Mellitus and Hypertension for Study and Control Group

Practice Domain in post-test	**Study Group n=30**		**Control n = 30**		**Independent t – test value and p - value**
	Mean	**SD**	**Mean**	**SD**	
Starting Medication	3.60	0.68	2.10	0.61	**t = 9.050 p = 0.000 *****
Taking Medication	3.80	0.66	2.10	0.66	**t = 9.930 p = 0.000 *****
Adding Medication	3.97	0.72	2.00	0.74	**t = 10.424 p = 0.000 *****
Reviewing Medication	2.93	1.14	1.93	0.58	**t = 4.269 p = 0.000 *****
Stopping Medication	3.03	1.13	2.03	0.62	**t = 4.260 p = 0.000 *****
Overall practice	**17.40**	**2.44**	**10.10**	**2.02**	**t = 12.603 p = 0.000 *****

Note: ***-p<0.001 Level of Significant

Table 2 shows the comparison of five moments of medication practice between the study and control group based on the post-test evaluation. It was interesting to observe that the overall mean score of the study group was higher at 17.40 ± 2.44 compared to the score in the control group of 10.10 ± 2.02. While evaluating the score values on every step involved in the practice it was observed that the performance of the study group outperformed

consistently compared to the control group. Statistical analysis revealed that all the score values were significant with a p-value of p = 0.000 highlighting the effectiveness of the five moments of medication safety practices.

Table 3: Comparison of Overall Post-test practice on five moments of medication safety among Patients with Type 2 Diabetes Mellitus and Hypertension for Study and Control Group

Level of Overall practice	Study Group n= 30		Control Group n = 30		Chi-square value and p-value
	No.	%	No.	%	
Inadequate	0	0.0	26	86.7	**χ 2 = 46.207**
Moderately Adequate	25	83.3	4	13.3	**p = 0.000 *****
Adequate	5	16.7	0	0.0	
Total	**30**	**100.0**	**30**	**100.0**	

No: Number6, ***-p<0.001 Level of Significant

Table 3 shows the overall practice of five moments of medication safety in the rate of percentage based on the different level scores obtained. The overall practice is being rated as Inadequate, Moderately Adequate, and Adequate Practice. While looking into the overall performance of the five-moment medication safety it was appealing to observe that in the study group, nearly 83.3% were categorized under Moderately Adequate practice and 16.7 % were under Adequate practice while in the control group**,** 86.7% were with inadequate practice and only 13.3% with moderately adequate practice**.** The statistical analysis confirmed a highly significant difference**,** these appreciating results once again proving the effectiveness of the intervention.

Table 4 Comparison of effective practice score on five moments of medication safety among Patients in study group

Effective practice Domain	Study Group n=30 (Pre-Test)		Study Group n=30 (Post-Test)		P – value
	Mean	SD	Mean	SD	
Starting Medication	1.90	0.66	1.70	0.79	**p = 0.000 *****
Taking Medication	2.00	0.64	1.80	0.81	**p = 0.000 *****
Adding Medication	1.90	0.66	2.07	1.05	**p = 0.000 *****
Reviewing Medication	1.93	0.58	1.00	1.41	**p = 0.000 *****
Stopping Medication	2.00	0.59	1.03	1.19	**p = 0.000 *****
Overall practice	**9.70**	**1.71**	**7.70**	**2.94**	**p = 0.000 *****

SD: Standard Deviation, ***-p<0.001 Level of Significant

Table 4 shows the clear comparison of the scores obtained in all the domains and the overall practice scores between the pre-test and post-test results of the study group. The study group showed significantly better **medication safety practices post-test compared to the pre-test.** Their **overall mean practice score** was **7.70 ± 2.94,** much higher in the post-test when compared to the score of 9.70 ± **1.71** in the pre-test. Talking about the statistical significance it was observed all the parameters showed a significant p value of 0.000.

Discussion:

The occurrence and predominance of type 2 diabetes are increasingly high, and the cases of the disease have escalated from 171 million in 2000 and are estimated to reach 366 million by 2030[10,11]. Hypertension is a frequent comorbidity, associated with diabetes and approximately 70% of the patients suffering hypertension[12]. The co-occurrence of hypertension and diabetes considerably intensifies the complications associated with these diseases namely ischemic cerebrovascular disease, retinopathy, and sexual dysfunction[13]. Proper medication interventions are critical for managing patients with the incorporation of lifestyle modifications and obesity that play a significant role in maintaining blood glucose and regulating blood pressure. Diabetes is a well-known disorder that can cause a diversity of complications that include macrovascular and microvascular problems and other serious health issues[14]. It is identified that medication errors pose a serious intimidation to patient well-being, their incidence and impact are often undervalued. To prevent hypertension in people with type 2 diabetes, there is still a critical priority to reduce the risks of related health[15].

This study aims to fill the gap between the patient and mediation practice by creating proper guidance for the intake of medicine especially in the case of Diabetes. Nowadays medication error is one of the major concerns with patient's health and safety. Few studies have been done to focus on medication error among diabetes and hypertension Parra and his colleagues[16] had concentrated on the medication error and followed an individual teaching nursing intervention to monitor and educate the medication and thus showed significant improvement in the Blood sugar level and decreasing glycated HbA1c levels and a similar study was conducted by Metha[17] and her team educating on the usage of insulin injection technique and showed a significant impact on the Type 2 Diabetes patients.

Our study is similar to one that focuses on the implementation of five-movement medication safety among diabetes and hypertension patients. The study was carried out in a private college hospital in Chennai in which a total of 60 patients were included. The results were monitored in the Pre-test and Post-test and was interesting to note that the post-test result had a great statistical significance among the patients after the teaching practice 83% of patients were Moderately Adequate practice and 16.7% fell under the category Adequate Practice. While looking into the overall practice score interestingly, there was a great deal of significance of 7.70 ± 2.94 and 9.70 ± 1.71 before and after practice. The sample size was (n =60), and the study was conducted in a particular medical college among nursing students for a short duration. We have not recorded the value of blood glucose and blood pressure was rated based on improvement observed before and after the five-moment medication practice. Further studies have been extended that include a large sample size monitoring the intervention for a long duration and evaluating the significant difference using glycemic control, Blood pressure, and other major interventions.

CONCLUSION

To conclude, this study emphasises the efficacy of personalized teaching program focusing on the medication safety employing the five moments for medication safety protocol approved by the WHO. The results showed a remarkable improvement in medication safety practices among Type 2 Diabetes Mellitus and Hypertension patients in the study group compared to the control group. Statistical analysis revealed a significant difference, spotlighting the value of the intervention strategy implemented. These findings shed a ray of light into the importance of employing a structured educational practise among patients to uphold safety measures during medication, errors minimization and ultimately enhancing wellbeing of the patient.

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