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Compliance of Diabetic Clients: Effect of Nurse-Led Home Care Interventions and Monitoring

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Abstract

Objectives Type 2 diabetes impacts greatly on quality of life. Health-care providers must focus on efforts to detect, treat, and manage clients through supportive educative approach. This study aims to measure effectiveness of nurse-led home care interventions.

Materials and Methods This study among 103 diabetic subjects measured baseline blood pressure (BP), weight, and blood glucose levels. Information on compliance was obtained using a rating scale consisting of domains: dietary habits, exercise, rest, sleep, symptom management, prevention of complications, medication, and follow-up. Individualized comprehensive nursing interventions (education, testing, counselling) were provided, that were reinforced two times a week for 4 weeks, with minimum 7 home visits carried out by the researchers who are registered nurses and teaching faculty along with six interns of BSc nursing program. Post-tests were obtained at second and fourth weeks after start of intervention.

Results Significant improvement in blood sugar ($p < 0.05$), systolic BP ($p < 0.001$), and diastolic BP ($p < 0.001$) was observed. There was no change in body mass index (BMI) ($p > 0.05$). Post-hoc analysis found significant difference between pre-, post1- and post2-measures. Significant association was found between dietary habits and BMI ($p < 0.05$) and diastolic BP ($p < 0.05$). Compliance improved from 29 (28.2%) to 47 (45.6%), partially compliant from 55 (53.4%) to 45 (43.7%) and noncompliant 19 (18.4%) to 11 (10.7%), with a clear improvement in each of the domains of compliance.

Conclusion Individualized comprehensive interventions delivered at the natural environment of families by registered nurses effectively improve compliance to diabetes management.

Keywords
- nurse-led interventions
- home care nursing
- diabetes
- visiting nurses
- compliance

Introduction

Changes in human behavior and lifestyle over the last century have made dramatic increase in the incidence of diabetes worldwide. The number of people with diabetic mellitus (DM) is expected to reach 642 million by 2040. In South East Asia alone, 78.3 million live with type 2 diabetes mellitus (T2DM), at a prevalence rate of 8.3%, of which 40.8

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million (52.1%) are undiagnosed cases.[1] India stands second in the world with 69.2 million diabetics and accounts for one million diabetes-related deaths every year.[2] The prevalence has increased over 10-fold in the last three to four decades.[3,4] Indian Council of Medical Research (ICMR-INDIAB) study reported an increase in prevalence in urban (10.9–14.2%) and rural (3–8.3%) areas.[3] The prevalence of T2DM in Mangalore was 28.3% in 2017.[5]

T2DM evolves under the influence of environmental and behavioral factors such as sedentary lifestyle, overly rich nutrition, and high stress.[1] Diabetes imposes a heavy burden on clients and their families. On an average, lower income groups spend up to one-fifth of their income in direct and indirect costs of managing the disease. Besides, intangible costs include pain, anxiety, inconvenience, lower quality of life, and impact on family.[6] Studies have recommend creating awareness through health education.[7,8]

Diabetes management involves prevention of complications through the adoption of a healthy lifestyle and careful self-management, including behavior change in terms of diet, exercise, self-efficiency, social support, and self-monitoring. Comprehensive and tailored interventions focusing on individual characteristics have also been emphasized.[9,10]

Diabetes is difficult to control in terms of self-management as motivation and support is key. Self-care practices were found to be unsatisfactory in almost all aspects except for blood sugar monitoring and treatment adherence. As prevention of complications and better quality-of-life is the key, more efforts should be put to educate the people with diabetes. Consistent, patient friendly, accessible systems based on levels of patient knowledge, motivation, and cost effectiveness are necessary.[11,12] Prevention of diabetes and its control/management require integrated interventions that aim to bring down the premature morbidity and mortality.[13] Researchers have found that visiting nurse service is more effective compared to community-centered public health service.[12] This study is an attempt to study the effectiveness of nurse-led home care interventions in management of T2DM.

Materials and Methods

This field-based descriptive evaluative study employed pre-experimental design. One group repeated measures (time series). Altogether 624 adults aged 35 years or above who resided in four community field practice areas (urban) were screened for DM from January to September 2017, using the urine sugar test. All 103 subjects who presented with sugar in urine and who met the inclusion criteria were inducted as study sample. Sample size was calculated using G* power, estimated as 90. Official permissions were obtained from public health authorities; ethical clearance and informed consent were obtained.

Instruments/tools: Tools used were baseline proforma of the clients (questionnaire), Benedict test/Uro sticks to screen for urine sugar, glucometer to monitor blood glucose level, and compliance scale to identify the compliance status. Content validity of the tools was ascertained. Compliance rating scale consisted of 31 items with domains such as dietary habits, exercise, rest, sleep, symptom management, prevention of complications, medication, and follow-up. The reliability of compliance tool was $r = 0.86$. Instruments used for measuring blood pressure (BP), weight, and blood glucose levels were calibrated. Inter-rater reliability was obtained. Audio visuals (10 sets of standardized Flipcharts) were prepared for individualized health teaching and were validated by experts. Required translation was done for the tool and the interventions. Pretesting and pilot study were carried out to refine and make modifications.

Intervention and data collection procedure: Each subject was visited by a team of nurses and the interns at their homes. Baseline measures like BP, weight, and blood glucose levels were obtained. Information on compliance or lifestyle practices was collected. Individualized comprehensive nursing interventions (education, testing, counseling) were provided, which was reinforced two times a week for 4 weeks, with minimum seven home visits carried out by the researchers who are registered nurses and teaching faculty along with 6 interns of BSc nursing program who were trained and mentored by the researchers. Post-tests were obtained at second and fourth weeks after start of intervention.

Results

Demographic profile: Nearly equal number of subjects (48; 47%) belonged to age group of 41 to 60 years and those below 40 years were (6; 5.8%). More than half (69; 67%) patients were females. Majority of patients were Hindus (88; 85.4%) and completed high school (77; 75%) and nearly a quarter (23; 22%) had no formal education. Maximum were unemployed (67; 64%), and 50% subjects had income ranging between Rs 5000 and Rs10, 000 and (17; 16.5%) had less than Rs 5000 per month. All were married and majority of patients (63; 61%) had one child. Fifteen patients (14.6%) had habits like smoking, (29%), chewing tobacco (47%), and alcoholism (27%).

Profile of clients related to DM: Among 103 subjects (35; 34%) had family history of DM, out of which (22; 63%) had two subjects with first-degree relatives with DM. Maximum subjects (40; 39%) were diagnosed with DM from the last 6 months. Ninety-two (90%) patients consumed mixed diet and majority of patients had three meals per day (87; 85%). However, 16 (15.5%) patients consumed only two meals. Only two (1.9%) patients used home remedies, 14 (13.6%) patients practiced yoga, and 3 (2.9%) patients followed alternative systems of medicine such as ayurveda and homeopathy. Majority of patients used private facilities (68; 66%) for transportation. Only 51 (49.5%) patients claimed to have self-care information received from friends/relatives (13; 25.5%), whereas, 37 (73%) from health team members and 1 (2%) from the mass media.

Effect of nurse-led home care interventions on clinical variables: A significant improvement is found in blood sugar, systolic BP, and diastolic BP. However, no change was found with BMI. Post-hoc analyses showed that the difference was

Table 1 Effect of nurse-led home care interventions on clinical profile of DM clients ($n = 103$)

Parameter		Mean ± SD	ANOVA	*p*-Value
Body mass index	Pre	24.91 ± 4.61	0.52	0.597
	Post1	25.81 ± 3.92		
	Post2	24.84 ± 4.40		
Diastolic BP	Pre	85.73 ± 9.86	14.13	0.001[a]
	Post1	81.46 ± 9.74		
	Post2	82.82 ± 9.01		
Systolic BP	Pre	137.28 ± 18.95	7.60	0.001[a]
	Post1	133.79 ± 16.16		
	Post2	133.98 ± 14.71		
Random blood sugar	Pre	199.03 ± 62.93	10.34	0.001[a]
	Post1	178.07 ± 60.41		
	Post2	191.03 ± 58.25		

Abbreviations: ANOVA, analysis of variance; BP, blood pressure; DM, diabetes mellitus; SD, standard deviation.
[a]Significant values.

Table 2 Post-hoc analysis of significant parameters in ANOVA test ($n = 103$)

Parameter	(I) Factor 1	(J) Factor1	Mean difference (I–J)	SE	*p*-Value
Diastolic BP	Pre	Post 1 Post 2	4.27 2.91	0.89 0.80	0.000[a] 0.001[a]
	Post 1	Post 2	− 1.4	0.77	0.240
Systolic BP	Pre	Post 1 Post 2	3.50 3.30	1.00 1.09	0.002[a] 0.009[a]
	Post 1	Post 2	− 0.19	0.93	1.00
Random blood sugar	Pre	Post 1 Post 2	20.96 8.00	5.45 4.15	0.001[a] 0.171
	Post 1	Post 2	− 12.96	4.25	0.009[a]

Abbreviations: ANOVA, analysis of variance; BP, blood pressure; SE, standard error.
[a]Significant values.

significant in the clinical parameters after the intervention between the time periods of pre-, post1-, and post2- measures (►**Tables 1** and **2**).

Effect of nurse-led home care interventions on compliance status: Improvement was seen overall and across all the five domains of compliance of diabetic clients; there was a significant improvement with the nurse-led home care intervention (►**Fig. 1**; ►**Tables 3** and **4**).

Association of clinical parameters, compliance, and selected variables: No significant association was found between selected demographic variables with clinical parameters except dietary habits and BMI ($p = 0.043$); dietary habits and diastolic BP ($p = 0.041$). No significant association was found between compliance scores and demographic variables or clinical variables.

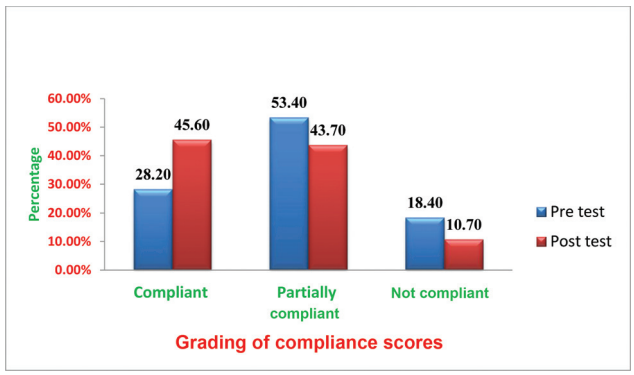

Fig. 1 Description of compliance scores of clients with diabetes mellitus (DM) before and after intervention.

Discussion

Baseline Variables

Profile of subjects related to DM: Maximum subjects (40; 39%) were diagnosed with DM in the last 6 months. A study among adolescents with T2DM found the average duration of diabetes was 2.0 years.[14] Another study in Jamaica found the median duration of DM was men, 7 years; women, 10.5 years.[15]

Subjects consumed mixed diet and majority had three meals per day (87; 85%). In another study, however, 16 (15.5%) patients consumed only two meals. Majority of

Table 3 Effect of nurse-led home care interventions on specific compliance parameters of DM clients ($n = 103$)

Domain	Preintervention	Postintervention	*t*	*p*-Value
	Mean ± SD	Mean ± SD		
Dietary	9.76 ± 2.15	10.31 ± 2.32	2.44	0.016[a]
Habits	1.69 ± 0.611	1.76 ± 0.59	1.15	0.252
Exercise, rest, sleep	2.40 ± 1.023	2.70 ± 0.93	2.63	0.010[a]
Prevention and management	3.92 ± 1.46	4.40 ± 1.32	3.18	0.002[a]
Medication, follow-up	4.13 ± 1.27	4.39 ± 1.11	2.64	0.010[a]

Abbreviations: DM, diabetes mellitus; SD, standard deviation.
[a]Significant values.

Table 4 Effect of nurse-led home care interventions on overall compliance of DM clients ($n = 103$)

Domain	Mean ± SD	*t*	*p*-Value
Preintervention	21.89 ± 4.02	3.69	0.0001[a]
Postintervention	23.55 ± 4.13		

Abbreviations: DM, diabetes mellitus; SD, standard deviation.
[a]Significant value.

subjects consumed more meals per day (80%) and did not include their regular sweetened food intakes in their daily meal plan (80%), or were inactive in daily life (54%).[16] Patients reported frequent episodes of overeating, drinking sugary drinks, and eating fast food. More than 70% of patients reported exercising ≥2 times a week, but 68% reported watching ≥ 2 hours of television daily. Forty-six percent described diet and/or obesity as contributing factor to their diabetes. Eighty-five percent had consulted a dietitian but only 56.4% reported being on a "special diet." Only 16.5% reported not taking any sugar.[14,15]

Only 51 (49.5%) patients claimed to have self-care information that they received from friends/relatives (13; 25.5%), 37 (73%) from health team members, and 1(2%) from the mass media. Another study found most subjects receiving advice on the importance of self-care in the management and recognized its importance. Sixty-seven subjects (53%) scored below 50% in their diabetes-related knowledge.[16]

Clinical Variables

A significant improvement was found in the clinical parameters of diabetic clients after the intervention in blood sugar ($p < 0.05$), systolic BP ($p < 0.001$), and diastolic BP ($p < 0.001$). However, no change was found with BMI ($p > 0.05$). Post-hoc analysis showed there was a significant change in the clinical parameters after the intervention between the time periods of second and fourth weeks. Another study found self-care scores were inversely related to hemoglobin A1c % (HbA1c%) ($p = 0.008$), BMI ($p = 0.001$), sugar intake ($p = 0.005$), and were lowest in the area of weight control and exercise. Only 23% had blood glucose controlled to HbA1c ≤ 6.5%. In women, HbA1c% levels were inversely related to compliance with medication ($p = 0.004$). Glycemic control in adults with diabetes mellitus is related to their self-care practices, especially weight control, exercise, and medication compliance.[15] Yet another study found patients in the intervention group significant improvement in HbA1c, BP, body weight, efficacy expectation, outcome expectation, and diabetes self-management behaviors.[17] Another study found subjects with medication nonadherence (46%) also tended to have higher fasting blood glucose levels. Predictors of knowledge deficit and poor self-care were low level of education ($p = < 0.01$), older subjects ($p = 0.04$) and T2DM subjects on oral antihyperglycemic medication ($p = < 0.01$).[16]

Compliance

Compliance improved from 29 (28.2%) to 47 (45.6%), partially compliant from 55 (53.4%) to 45 (43.7%) and noncompliant from 19 (18.4%) to 11 (10.7%) with a clear improvement in each of the domains of compliance. Another study revealed better compliance among the clients.[18] A telephone survey of 103 diabetic adolescents found more than 80% of patients reported ≥ 75% medication compliance, and 59% monitored blood glucose > 2 times daily.[14] Another study among 106 study subjects with poor glycemic control in a tertiary care hospital observed poor compliance was in 89.62% patients and 10.38% had good/acceptable compliance. Compliance was better in above 60 years age group, in males, in married, and educated persons. Noncompliance factors acted mostly in combination.[19] Another study in adults found only 45% reporting full compliance with medications.[15]

Another study found significant reduction in the average number of barriers to medication adherence from pre (3.7) to post (2.2; $p < 0.001$) in those who completed the program.[20] Another study identified strategies for improving patient outcomes in T2DM, increasing provider adherence to evidence-based management guidelines, streamlining practice systems, and promoting patient lifestyle changes through intensive education.[18]

Conclusion

In diabetes self-management education, the close involvement of patients and care givers is encouraged. Educated patients can positively affect the outcome of the disease in multiple ways. Reinforcement of education ensures long-

term blood glucose control, as the person remains adherent to what has been taught, checks the accuracy of acquired knowledge, has access to new data or even facilitates the development of new practices and new behavior patterns.

Management of a disease like diabetes is more related to lifestyle and less related to the quality of the provided health care and services. It is assumed that the home visit component will enhance acceptability and readiness of clients, thereby improving the acceptance of services by the nurses. Compliance status will help plan strategies for improvement in health of clients. Standardized teaching/education materials and approach help improve dissemination of information to clients in the community and to provide comprehensive knowledge base for clients that will contribute towards health and disease prevention. Coaching of behavior change through communication by nurses and nurse practitioners is a feasible alternative for primary care towards improving patient self-management of T2DM.

This study attempted to screen the communities for diabetes in their homes and deliver nurse-led services at the doorsteps of clients. The nurse-initiated intervention at home is a cost-effective strategy that can be emulated in community health nursing practice for early detection and management. The success of the nurse-led home care intervention will ensure the applicability of the concepts into health-care practices in the community.

Conflict of Interest
None declared.

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