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
and compliance scale to identify the compliance status. A study 
for urine sugar, glucometer to monitor blood glucose level, 
estimated as 90. Of consent were obtained. 

in the world with 69.2 million diabetics and accounts for one 
life, and impact on family. 

indirect costs of managing the disease. Besides, intangible 
tality.

T2DM evolves under the influence of environmental and 
behavioral factors such as sedentary lifestyle, overly rich 
nutrition, and high stress. Diabetes imposes a heavy burden 
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. Studies have recommend creating 
awareness through health education.

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.

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. Prevention of diabetes and its control/management require integrated interventions that aim to bring down the premature morbidity and mortality. Researchers have found that visiting nurse service is more effective compared to community-centered public health service. 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 homoeopathy. 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
significant in the clinical parameters after the intervention between the time periods of pre-, post1-, and post2- measures (Table 1 and Table 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; Table 3 and Table 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.

**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. Another study in Jamaica found the median duration of DM was men, 7 years; women, 10.5 years.

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

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

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

Abbreviations: ANOVA, analysis of variance; BP, blood pressure; DM, diabetes mellitus; SD, standard deviation.

*Significant values.

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>(I) Factor 1</th>
<th>(J) Factor 1</th>
<th>Mean difference (I–J)</th>
<th>SE</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diastolic BP</td>
<td>Pre</td>
<td>Post 1</td>
<td>4.27</td>
<td>0.89</td>
<td>0.000*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post 2</td>
<td>2.91</td>
<td>0.80</td>
<td>0.001*</td>
</tr>
<tr>
<td></td>
<td>Post 1</td>
<td>Post 2</td>
<td>−1.4</td>
<td>0.77</td>
<td>0.240</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>Pre</td>
<td>Post 1</td>
<td>3.50</td>
<td>1.00</td>
<td>0.002*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post 2</td>
<td>3.30</td>
<td>1.09</td>
<td>0.009*</td>
</tr>
<tr>
<td></td>
<td>Post 1</td>
<td>Post 2</td>
<td>−0.19</td>
<td>0.93</td>
<td>1.00</td>
</tr>
<tr>
<td>Random blood sugar</td>
<td>Pre</td>
<td>Post 1</td>
<td>20.96</td>
<td>5.45</td>
<td>0.001*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post 2</td>
<td>8.00</td>
<td>4.15</td>
<td>0.171</td>
</tr>
<tr>
<td></td>
<td>Post 1</td>
<td>Post 2</td>
<td>−12.96</td>
<td>4.25</td>
<td>0.009*</td>
</tr>
</tbody>
</table>

Abbreviations: ANOVA, analysis of variance; BP, blood pressure; SE, standard error.

*Significant values.
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%). 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.

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 good/acceptable compliance. Compliance was better in good/acceptable compliance. Compliance was better in 89.62% patients and 10.38% had full compliance with medications. Another study revealed better compliance among the clients. 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. 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. Another study in adults found only 45% reporting full compliance with medications. 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. 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.

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

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

Abbreviations: DM, diabetes mellitus; SD, standard deviation. 
*aSignificant value.

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

<table>
<thead>
<tr>
<th>Domain</th>
<th>Mean ± SD</th>
<th>t</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preintervention</td>
<td>21.89 ± 4.02</td>
<td>3.69</td>
<td>0.0001a</td>
</tr>
<tr>
<td>Postintervention</td>
<td>23.55 ± 4.13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: DM, diabetes mellitus; SD, standard deviation. 
*aSignificant value.

### 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). 

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
the doorsteps of clients. The nurse-initiated intervention at
diabetes in their homes and deliver nurse-led services at
home is a cost-effective strategy that can be emulated in

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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