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Impact of Pharmacist-administered education on medication and disease outcomes among diabetic patients

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Abstract

Objective: To evaluate the effectiveness of pharmacist-administered diabetes education and diabetes medication information on diabetes-related measures, clinical outcomes, knowledge and adherence to treatment.

Materials and Methods: Ambulatory diabetic patients seen at Riyadh Military Hospital (RKH), Riyadh, Saudi Arabia between September and December 2008 were invited and randomly assigned to either an intervention group (usual care plus added pharmacist input) or a control group (usual care only). On three consecutive visits, the intervention group met a pharmacist who educated and discussed with each patient regarding medication uses and diabetic treatment. This was accompanied with a survey form on patient adherence and knowledge to medication. Changes in HBA_1C (mg/dL)(usually taken from the labs results), total cholesterol (mg/dL), blood sugar level (mmol/L), blood pressure level (mmHg) were measured for each subsequent visit. Medication adherence and diabetic knowledge scores were measured.

Results: A total of 36 patients completed the survey, 20 (55.6%) in the intervention group and 16 (44.4%) in the control group. Overall mean age was 54.5 ± 16.4 years (range: 10-79 years) of which 35 (97.2%) were females. There was a significant difference in adherence and knowledge outcomes between the intervention group and the control group (p=0.001). Significant improvement of baseline to end-of-study adherence to medication was seen in the intervention group (71.1% to 95.4%, p=0.0001) than the

control group (44.5% to 58.6%, p=0.0928). Knowledge scores significantly improved among the intervention group compared to the control group (49.4 ± 16.6 to 90.7 ± 9.5, p=0.0001 and 34.8 ± 12.7 to 42.6 ± 13.9, p=0.1079, respectively). Significant improvements in systolic blood pressure (p=0.013), diastolic blood pressure (p=0.034), blood sugar (p<0.0001) and total cholesterol level (p=0.048) were seen in the intervention group. On the contrary, insignificant improvements in blood pressure, blood sugar and total cholesterol levels were observed in the control group.

Conclusion: Pharmacist-administered education for better knowledge and guidance for medications can help improve adherence and knowledge , thereby better outcome of treatment and quality of life.

Keywords: Pharmacist, consult, outcome, diabetes mellitus

Introduction

Studies have shown that non-compliance causes 125,000 deaths annually in the US, [(1)] leads to 10 to 25% of hospital and nursing home admissions, and is becoming an international epidemic. It is, in the words of The New York Times the world's "other drug problem". [(2)]

When examining reasons for non-compliance, Seal in 2000 suggested that the recognition of many factors involved has resulted in the idea of compliance in taking medication, being replaced by the terms adherence or concordance. [(3)]

Three generally accepted reasons for non-compliance (non-adherence) include (a) accidental, wherein the patient forgets to take the dose or takes the medicines incorrectly because the instructions were not well understood or could not be followed, (b) triggered, wherein the patient starts to feel better and stops taking the medicine, or conversely, the patient feels worse, and therefore believes that the medicine is doing no good, and (c) intentional, wherein the patient makes a conscious decision not to take the medicines as recommended. [(4)]

The current initiative set by the United Kingdom National Health Service (UKNHS) involves the patient in the treatment process and so improve compliance. The patient is informed about his or her condition and its various treatment options. He or she is

involved with the treatment team in the decision as to which course of action to take, and partially responsible for monitoring and reporting back to the team. [5]

Pharmacist-administered diabetes education and management services have been shown to improve glycemic control over standard treatment, as well as to improve control of blood pressure and hyperlipidemia. [6-11] Morello et al showed that 33% of patients who received care in a pharmacist managed diabetic clinic reached goal HBA_1c and BP values <7 and <130/80 mmHg. [7] Kiel et al showed up to 50% of patients improving their HBA_1C. [6]

Pharmacist intervention and patient-education programs significantly increased medication adherence. [12] Levels of total cholesterol, triglycerides, and low-density lipoproteins (LDL) were significantly reduced by 6%, 16.2% and 8.5% respectively [12] However, in a study conducted among 130 Muslim diabetics in Thailand showed no effect on glycemic control and outcome despite one-on-one patient education on diabetes. [13] Several other studies emphasized on reducing medication related problems such as multi-dosing and multi-drug therapy. [14-17]

This observational study was conducted to evaluate the effectiveness of pharmacist-administered diabetes education and diabetes medication information on diabetes-related measures, clinical outcomes, knowledge and adherence to treatment.

Material and Methods

Ambulatory diabetic patients seen at Riyadh Military Hospital (RKH), Riyadh, Saudi Arabia between September and December 2008 were invited to the study. Consenting patients were asked to report to the outpatient pharmacy clinic of RKH and were randomly assigned to either an intervention group (usual care plus added pharmacist input) or a control group (usual care only. On three consecutive visits (at baseline, at one month after, and at two months after), the intervention group met a pharmacist who educated and discussed with each patient regarding medication use and side-effects, disease outcomes and complications and diabetic treatment. This was accompanied with a survey form on patient adherence and knowledge to medication. Medication knowledge and adherence was assessed using composite scores of percentage of correct answer

Changes in HBA_1C (mg/dL), total cholesterol (mg/dL), blood sugar level (mmol/L), blood pressure level (mmHg) were measured for each subsequent visits. Medication adherence and diabetic knowledge scores were measured.

Statistical analysis

All data were entered into MS Excel 2007 (XP Professional edition) and imported into Statistical Package for Social Sciences volume 15.0 (SPSS Inc., Chicago, Illinois, USA) for analysis. Numerical variables were expressed as mean ± standard deviation whereas

categorical variables were expressed as percentages and frequencies. To evaluate the differences between individual means for continuous variables, Mann-Whitney test was performed. Chi-square test was used for categorical variables. Correlations were performed using the Pearson's correlation coefficient. P values <0.05 were considered statistically significant.

Results

General demographics

A total of 36 patients, 16 (44.4%) in the control group and 20 (55.6%) in the intervention group completed the study survey. Overall mean age was 54.5 ± 16.4 years (range: 10-79 years). There were 35 (97.2%) females and 1 (2.8%) male. At baseline, mean systolic blood pressure (SBP) was 148.6 ± 21.4 mmHg, mean diastolic blood pressure (DBP) was 86.3 ± 12.6 mmHg, mean total cholesterol was 4.6 ± 0.8 mmol/L and mean blood sugar was 11.9 ± 3.0 mmol/L

Control group

Of the 16 patients included in the control group, mean age was 57.9 ± 11.9 years (range: 28-74 years). In this group, there was an insignificant decrease in BMI from a mean of 32.8 ± 6.3 kg/cm^2 at baseline to 32.5 ± 6.5 kg/cm^2 at third month of study (p=0.8954). SBP insignificantly increased from baseline mean of 146.5 ± 21.5 mmHg to 150.3 ± 22.5

mmHg at third month of study (p=0.6288). (Figure 1) DBP insignificantly decreased from baseline mean of 87.7 ± 8.3 mmHg to 86.9 ± 9.5 mmHg at end of study (p=0.7215). (Figure 2) Mean HbA_1C levels did not significantly change after 3 months of follow-up (baseline 10.4 ± 1.9 to end of study 10.5 ± 1.9, p>0.05). (Figure 3) Blood sugar level insignificantly increased from mean baseline value of 13.7 ± 2.4 mmol/L to 14.6 ± 2.9 mmol/L at third month of follow-up (p=0.3465) (Figure 4) and total cholesterol insignificantly dropped from baseline mean of 4.7 ± 0.7 mmol/L to 4.7 ± 0.4 mmol/L at third month of follow-up (p=1.000). (Figure 5)

Knowledge score improved insignificantly from mean baseline score of 34.8% ± 12.7% to 42.6% ± 13.9% at 3rd month of follow-up (p=0.1079). Adherence to medication likewise improved, however insignificant from baseline mean score of 44.5% ± 20.5% to 58.6% ± 25.2% at 3rd month of follow-up (p=0.0928).

Study group

Among the 20 patients included in the intervention group, mean age was 51.6 ± 19.2 years (range: 10-79 years). In this group there was an insignificant decrease in BMI from baseline mean of 30.7 ± 5.6 kg/cm^2 to 29.9 ± 4.3 kg/cm^2 at 3rd month of follow-up (p=0.6394). There was a significant decrease in SBP form mean baseline of 150.5 ± 18.4 mmHg to 129.3 ± 9.1 mmHg at third month of follow-up (p=0.0001). (Figure 1) Mean

DBP also significantly decreased from baseline mean of 84.9 ± 11.5 mmHg to 75.6 ± 8.8 mmHg at third month of follow-up (p=0.0066). (Figure 3) Mean blood sugar level significantly dropped form baseline mean value of 8.7 ± 0.8 mmol/L to 7.4 ± 0.9 mmol/L at third month of follow-up (p<0.0001). (Figure 4) and total cholesterol level significantly dropped from mean baseline level of 4.5 ± 0.9 mmol/L to 3.8 ± 0.5 mmol/L at end of study (p=0.0067). (Figure 5)

Knowledge score significantly improved from mean baseline score of 49.4% ± 16.6% to 90.7% ± 9.5% after 3 months of follow-up (p<0.0001). Adherence score significantly improved from mean baseline score of 71.1% ± 25.8% to 95.4% at third month of follow-up (p<0.0001).

Intervention group versus control group

There were significant differences in the knowledge and adherence scores between the intervention and the control group. Better baseline to end-of study knowledge improvement was seen among those patients who went for pharmacist intervention than the control group (X^2=0.001). Furthermore, with significant improvements in knowledge to medication, significant improvements with adherence was observed more among those who were intervened by the pharmacist than those with the control group (X^2=0.001).

Likewise, better outcome and control of blood pressure, blood sugar and total cholesterol were observed among the intervention group than the control group (p<0.0001)

A significant correlation was found to be correlated between adherence and age of the patient (r=0.400, p=0.017). Better adherence to medication was seen among younger patients. Better adherence was also associated with significant decrease in SBP (r=-0.406, p=0.021), significant decrease in DBP (r=-0.360, p=0.034) and significant control of blood sugar level (r=-0.374, p=0.025). Increased knowledge of medication is significantly associated with age (r=-0.512, p=0.002), BP control (r=-0.563, p<0.0001) and blood sugar control (r=0.593, p=0.006)

Discussion

Previous studies have demonstrated the effect of pharmacist intervention through patient education and counseling which significantly improves treatment outcomes. [6-11]) In our study, a pharmacist consult was able to improve adherence through better medication and disease knowledge. Furthermore, outcome measures such as levels of blood sugar, total cholesterol, HbA_1C and blood pressure all significantly improved in our intervention group signifying the benefit of increased knowledge. This could be attributed to patient benefits of improved medication knowledge which resulted in a positive impact in our intervention group. Our control group did not show any significant improvement in

disease outcomes such as levels of blood pressure, blood sugar, cholesterol and HbA_1C levels paralleled by <10% increase in patient's knowledge of medication and disease, whereas our intervention group showed 41% increase in knowledge which could have raised the adherence to 95.4 % at the end of our 3-months study period. Despite our short time of study (i.e. 3 months of follow-up), our results clearly indicated the positive effect of pharmacist intervention on disease management and treatment outcomes.

In contrast to the study done in Thailand, [13] our results showed significant glycemic and blood pressure control. This could be attributed to test-to-test variability which includes the design by which the study was directed to or aimed at. Inclusion of a meticulous protocol designed to educate the patient of adherence factors aimed to increase patient's knowledge is an important and necessary tool in these kinds of studies. Another is the population by which the study is to be conducted. Each population has its own unique characteristic/s, such that a suitable and simplified approach may be warranted. The issue of accidental, triggered or intentional non-adherence [4] could be reinforced by constant monitoring and pervasive approach when following up a patient. Patients usually feel remorse not only of their disease but much more of the medication they have to gobble up especially among diabetics.

Unlike previous studies which emphasized on reducing medication-related outcomes, age and other related issues, [14-17] our study focused on increasing knowledge and thereby

increasing adherence, thus improving health-related outcomes and quality of life as a whole. Although our study was not able to assess quality of life, by improving adherence and improving health related outcomes, eventually, patients will enjoy symptom-free episodes related to diabetes. The significant overall improvement in the clinical status of our intervention group showed the potentiality of intervention which lies in the better understanding and knowledge of medication indication, enhance patients' perception and eventually better adherence. Our study was able to demonstrate the effect of increased perception to the disease, its severity and the benefit of treatment. In conclusion, pharmacist intervention through patient education and counseling improves knowledge and adherence to medication. Improvement in knowledge of medications increases adherence thereby resulting into better outcome of management.

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Figure 1. *Outcome of SBP (intervention vs. control group)*

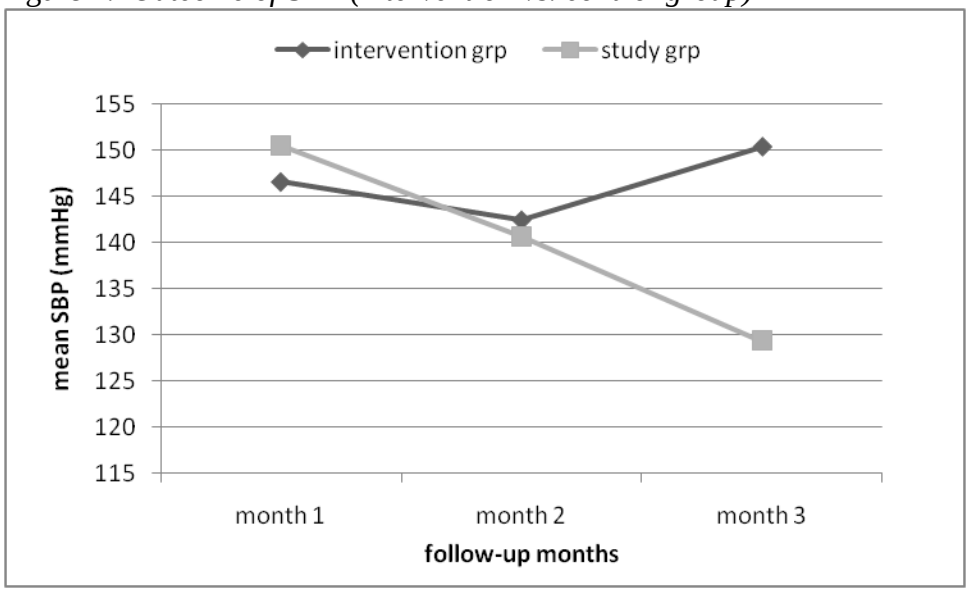

Figure 2. *Outcome of DBP (intervention vs. control group)*

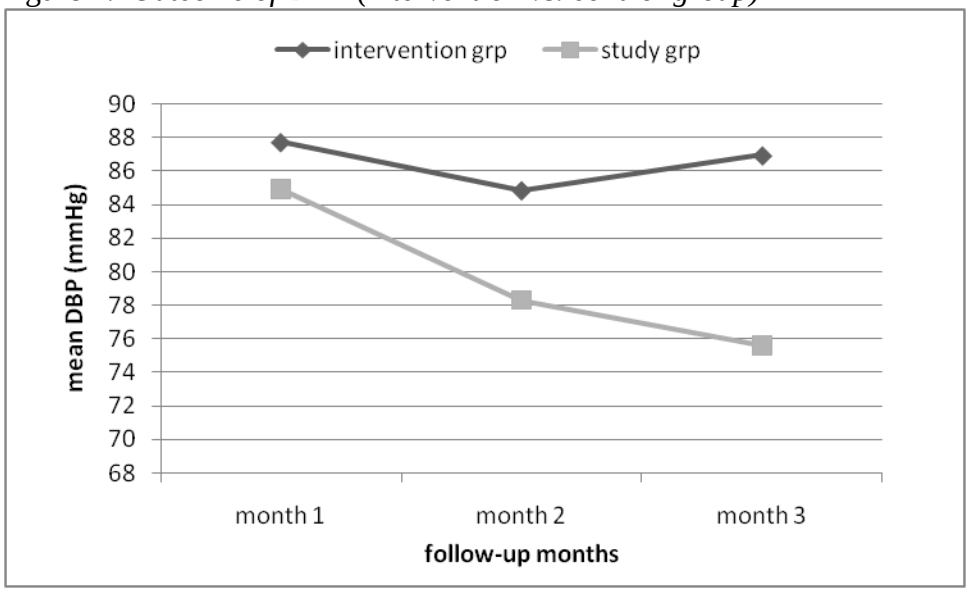

Figure 3. *Outcome of HbA_1C (intervention vs. control group)*

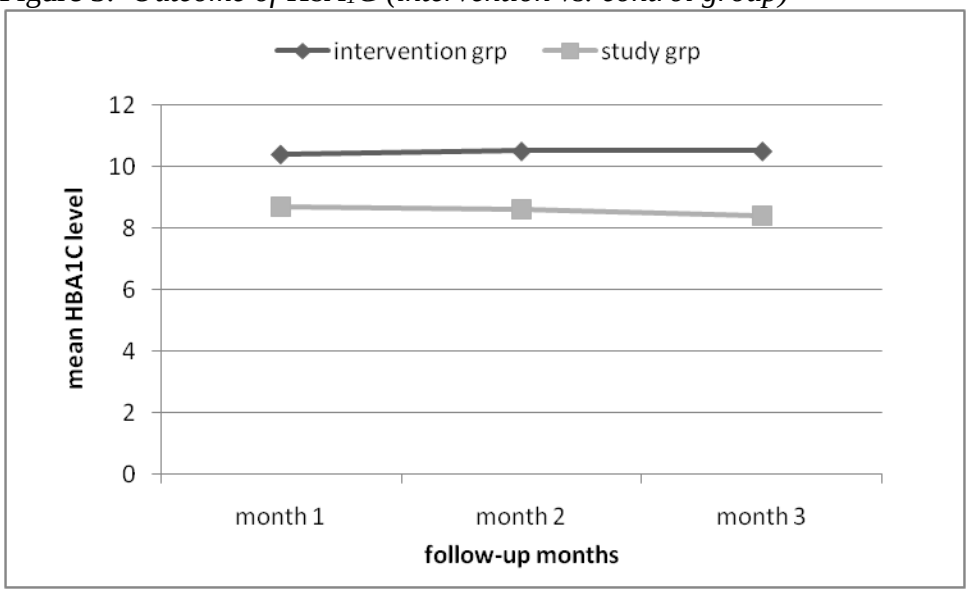

Figure 4. *Outcome of blood sugar levels (intervention vs. control group)*

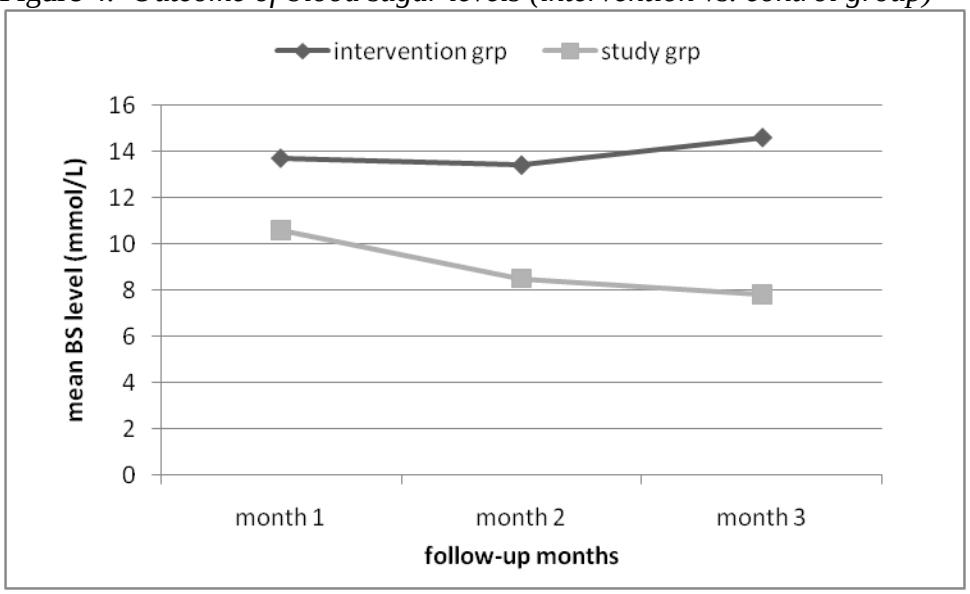

Figure 5. *Outcome of total cholesterol levels (intervention vs. control group)*