

ASSESSMENT OF A HOME HEALTH CARE PROGRAM POST-HOSPITALIZATION TO REDUCE GLYCATED HEMOGLOBIN LEVELS AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS

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Abstract. A variety of interventions can influence blood sugar levels among patients with diabetes mellitus. The aim of this study was to evaluate the effectiveness of a home health care program post-hospitalization on glycated hemoglobin (HbA1c) levels among type 2 diabetics in Riyadh, Saudi Arabia in order to inform future plans for this program. We retrospectively reviewed the charts of the patients who went through this program from January to December 2018. This program consisted of customized health care, including nursing services, medication management, education, social support, nutrition management, physiotherapy, and physician care post-hospitalization. We compared the level of HbA1c pre- and post-participation in this program. A total of 171 subjects were included in the study: 67 males and 104 females. The mean (\pm standard deviation (SD)) age of study subjects was 57 (\pm 22) years. Forty-one subjects were fed by feeding-tube, showing the majority of our study subjects were medically compromised and invalids. Thirty-two percent of subjects required an additional oral supplement in addition to their regular meals. The mean HbA1c level among study subjects prior to the home care program was 8.0% and after the program was 7.2% (95% confidence interval: -0.52 to -1.09; $p < 0.0003$). The home health care program resulted in a significant improvement in HbA1c levels among study subjects. Further studies are needed to determine if this program will be effective among patients who are not invalids.

Key words: diet glycated hemoglobin (HbA1c), health education, home health care program, type 2 diabetes mellitus.

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INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a major public health problem world-wide. The International Diabetes Federation estimated the number of adults world-wide with diabetes in 2011 was 366 Million

and will be expected to be 693 Million by 2045 (Whiting *et al*, 2011; Cho *et al*, 2018). In 2009, the proportion of Saudis with T2DM was estimated to be 32.1% (Alharbi *et al*, 2014), consuming more than 14% of the Saudi health expenditure. The number of patients living with diabetes worldwide is increasing due to comorbidity and lifestyle (Robert *et al*, 2017).

Glycated Hemoglobin (HbA1c) is used to monitor and diagnose T2DM (WHO, 2009; Sherwani, 2016). Saudi Arabia (SA) has a Home Health Care (HHC) program designed to care for patients with T2DM post-hospitalization. This program includes nursing services (wound care, intravenous therapy, education, and medication management), social support, nutrition management, physiotherapy and physician consultation (Renders *et al*, 2001; Corbett, 2003; Ditewig *et al*, 2010; Strand and Parker, 2012; Alonazi *et al*, 2016; Bonner *et al*, 2016). We conducted this study to determine if this HHC program could result in a reduction in HbA1c levels among patients with T2DM.

MATERIALS AND METHODS

This study was conducted retrospectively by reviewing the charts of patients with T2DM post-hospitalization during January-December 2018. Data collected from patient charts were demographic data and pre- and post-HHC program HbA1c levels.

Participants

Study subjects were T2DM patients diagnosed using American Diabetes Association (ADA) criteria (ADA, 2018) who received care through the HHC in Saudi Arabia during the study period: 171 patients. This study was approved by the Ethics Committee of King Saud University

(IRB 2018-67-882).

Statistical analysis

Statistical analysis was carried out using the Statistical Package for the Social Sciences Program (SPSS), version 23 (SPSS, Chicago, IL) and John's Macintosh Project (JMP), version 13 Statistical Analysis System. Pre-and post-intervention HbA1c levels were compared using the t-test ($p < 0.05$).

RESULTS

A total of 171 subjects met our inclusion criteria. The mean (\pm standard deviation) age of subjects was 57 (\pm 22) (range: 43-100) years. Ninety-six percent of subjects had other diseases in addition to T2DM. Nineteen percent of subjects were fed via nasogastric (NG) tube and 22% were fed via percutaneous endoscopic gastrostomy (PEG) tube. Only 25% of subjects had only an oral diabetic diet; 32% of subjects needed an oral supplement in addition to their meal (Table 1). Most of our subjects were severely compromised medically and were invalids.

The mean HbA1c level among study subjects prior to the HHC intervention was 8.0% and after the intervention was 7.2% ($p < 0.0003$) (Table 2).

DISCUSSION

To the best of our knowledge, this is the first retrospective study examining the effect of HHC services among Saudis with diabetes. In our study, the HHC program resulted in a significant reduction in the mean HbA1c level among study subjects. Ninety-six percent of the subjects in our study had other diseases, similar to other studies from Saudi Arabia (Alnozha *et al*, 2004; Alotaibi *et al*, 2017), and other countries where the percentage of T2DM

Table 1
Selected characteristics of the study subjects ($n=171$).

Characteristics	Number	Percentage
Male	67	39
Female	104	61
No other diseases than T2DM	7	4
Other diseases in addition to T2DM	164	96
Fed via nasogastric tube	32	19
Fed via percutaneous endoscopic gastrostomy tube	37	22
Oral diet only	44	25
Oral diet and an oral supplement	55	32
Oral diet and tube feeding	3	2

T2DM: type 2 diabetes mellitus.

Table 2
HbA1c levels among study subjects
before and after home health care.

Indicator	Value
HbA1C Pre-intervention, %	8.0
HbA1C Post-intervention, %	7.2
Mean Difference, %	-0.8
95% confidence interval	-0.52 to -1.09
<i>p</i> -value	< 0.0003

HbA1c: Hemoglobin Alc.

patients with other diseases ranged from 50-78% in Malaysia, Libya, India, China, and Iran (Afkhami-Ardekani and Zahmatkash, 2009; Liu *et al*, 2010; Abougambou *et al*, 2011; Roaeid and Kadiki, 2011; Vaz *et al*, 2011).

The majority of our subjects had poor glycemic control prior to the HHC, similar to studies among similar populations (Alhussein, 2008; Aldossari *et al*, 2020). Another study from Saudi Arabia found glycemic control of T2DM patients to be

poor in subjects from both government and private hospitals (Qari, 2005). Another study from Saudi Arabia reported 88.5% of hospital patients did not achieve the glycemic control targets compared to 39.1% of clinic patients (Al Shaikh, 2006). Al Rowais (2014) conducted a hospital-based study in Riyadh and found 87% of T2DM patients had poorly controlled blood sugar levels based on HbA1c levels, similar to 80% from another study (Azab, 2001). These show Saudi Arabia has a problem with poorly controlled T2DM.

The HHC evaluated in our study was designed using a multi-disciplinary approach (Willens *et al*, 2011; Gugiu *et al*, 2013) which is believed to be the reason for the success of this approach (Haynes *et al*, 2019). This type of multi-disciplinary integrated approach has been proven effective in a study reviewing the results of 62 international studies (Si *et al*, 2008). Included in the HHC is patient education, which has also been shown to improve patient outcomes (Alonazi *et al*, 2016; Jiang *et al*, 2019; Soylyar and Ozer, 2019).

Social support is incorporated in our HHC program. Poor social support and poor patient involvement have been reported to be associated with failure to diabetic control programs to achieve adequate outcomes (Alhyas and McKay, 2010; Alkhudairy *et al*, 2014). Engagement of family to support patient care has been shown to result in improved compliance with treatment regimens set out by the HHC team (Han *et al*, 2017). The clinical outcomes of diabetes improve when they are motivated to participate in physical exercise with friends (Heisler, 2014). A systematic review of 100 studies found 80% of reviewed studies showed improved outcomes when social support encouraging compliance with treatment was given to patients and their families (Hogan *et al*, 2002).

Our study was limited by small sample size, its retrospective nature, and the lack of inclusion of other labs than HbA1c levels and the fact that nearly all the subjects were invalids. Therefore, our findings cannot be applied to other groups. This study was conducted at a single tertiary level hospital, so the results cannot be generalized to other populations. Future studies of large size involving non-invalid subjects at a variety of health care levels need to be conducted if the HHC can be applied to other populations and is cost effective.

In our study, the HHC among invalid T2DM resulted in improved glycemic controls, showing it is effective in this patient population.

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