

## Research Article

## The Effect of Care Provided at Home by Public Health Nurse on Control of Type II Diabetes Mellitus

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## Abstract

**AIM:** The aim of the study was to examine the effect of home care provided for patients with type II diabetes by public health nurse on HbA1c, and to investigate the opinions of these patients regarding diabetes.

**METHOD:** The quantitative aspect of the study consisted of a pre and posttest with the control group; the qualitative aspect consisted of a semi-structured interviewing technique. The sample size was 48 patients receiving treatment within the clinic of hospital during 11<sup>th</sup>-30<sup>th</sup> April 2016. Because some patients were excluded from the study, the research was completed with a sample size of 20 for the experiment and 20 for the control group. The following forms were used during data: Pre and post measurement and qualitative interview forms. A total of seven home visits were conducted for the experiment group and two home visits for the control group, during 2<sup>nd</sup> May to 27<sup>th</sup> October, 2016.

**RESULTS:** HbA1c decreased by 0.75% in the experiment group ( $p<0.05$ ). It was found that faulty usage of insulin was treated; all patients developed the habit of tracking blood glucose. Blood glucose of three patients continued to remain at high levels, and most of the patients failed to develop healthy eating habits and regular exercising.

**CONCLUSION:** According to these results, it is advised that long-term interventions be planned with the contributions of other experts.

**Keywords:** Diabetes mellitus, nursing, nursing care, Type 2 diabetes mellitus

## Introduction

Diabetes is an important public health problem because its prevalence rapidly increases, it causes the increased risk of acquiring cardiac and renal diseases, dental losses, infections, blindness, and disabilities due to amputations (Onat et al., 2006; World Health Organization, 2014). According to the International Diabetes Federation (IDF), the prevalence of type II diabetes worldwide was 8.8% in 2015 and is expected to be 10.4% in 2040. According to IDF, type II diabetes prevalence in Turkey was 12.8% in 2015, and Turkey has the third leading prevalence in the European region (International Diabetes Federation, 2015).

Studies in many places around the world demonstrated that more than half of the patients with type II diabetes had glycosylated hemoglobin (HbA1c)

levels higher than 7% and their blood glucose levels were not under control (Al-Maskari et al., 2013; Abebe et al., 2015; Rombopoulos et al., 2013; Valle et al., 1999). Studies in Turkey demonstrated that only 29% of patients with diabetes received treatment and their diseases were under control (Republic of Turkey Health Ministry, 2013); blood glucose levels in more than half of the patients with type II diabetes were not under control (Çelikel et al., 2007; Çıtıl et al., 2010; Oğuz et al., 2008). According to the World Health Organization, uncontrolled diabetes leads to complications, disability, or early death (World Health Organization, 2014).

International institutions emphasize organization of a continuous healthcare that adopts protection and prevention strategies to achieve diabetes control and to prevent the complications (Aykut et al., 1999; International Diabetes Federation, 2015). According

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to International Council of Nursing, nurses have a key role in control and protection of noncommunicable diseases (Benton, 2012). Nurses who reported to have a strategic importance in diabetes care may visit houses of patients with diabetes, may develop care plan with patients and their family's participation. The nurses may notice important findings belonging to the patients and their families by observations and interviews. Therefore, the nurses can detect acute and chronic complications at an early period and have an important role in providing effective and accessible care (Hartman et al., 2009; Milone-Nuzzo & Pike, 2001; Shaw et al., 2014). Public health nurse who is an important member of healthcare team may have the opportunity to recognize the family and the population in their real place, to detect the problems, to determine the priorities realistically with contribution of the person and the family, and to solve the problems also with their involvement (Bahar, 1998).

There are a limited number of studies in Turkey that evaluated effectiveness of care and follow up at home by the nurses for diabetes control (Boztepe, 2010; Kitiş, 2002). However many studies around the world have shown that healthcare, education, and follow-up at home by the nurses decrease HbA1c in patients with type II diabetes and is effective to improve other metabolic outcomes (Borgermans, 2007; Huang et al., 2004; Skelly et al., 2009; Taylor et al., 2005; Torres et al., 2014).

The purpose of this study is to determine the effect of home care services provided for patients with type II diabetes by public health nurses in a province on HbA1c levels; and to investigate the opinions of these patients regarding follow-up of blood glucose levels, drug use, nutrition, and exercise.

### Hypotheses

H1-1. The care given by the public health nurse at home affects the decrease in HbA1c value of the patients.

### Research Questions

1. What are the opinions of patients regarding measuring and following up blood glucose?
2. What are the opinions of the patients regarding drug use?
3. What are the opinions of the patients regarding nutrition?
4. What are the opinions of the patients regarding exercise?

## Method

### Study Design

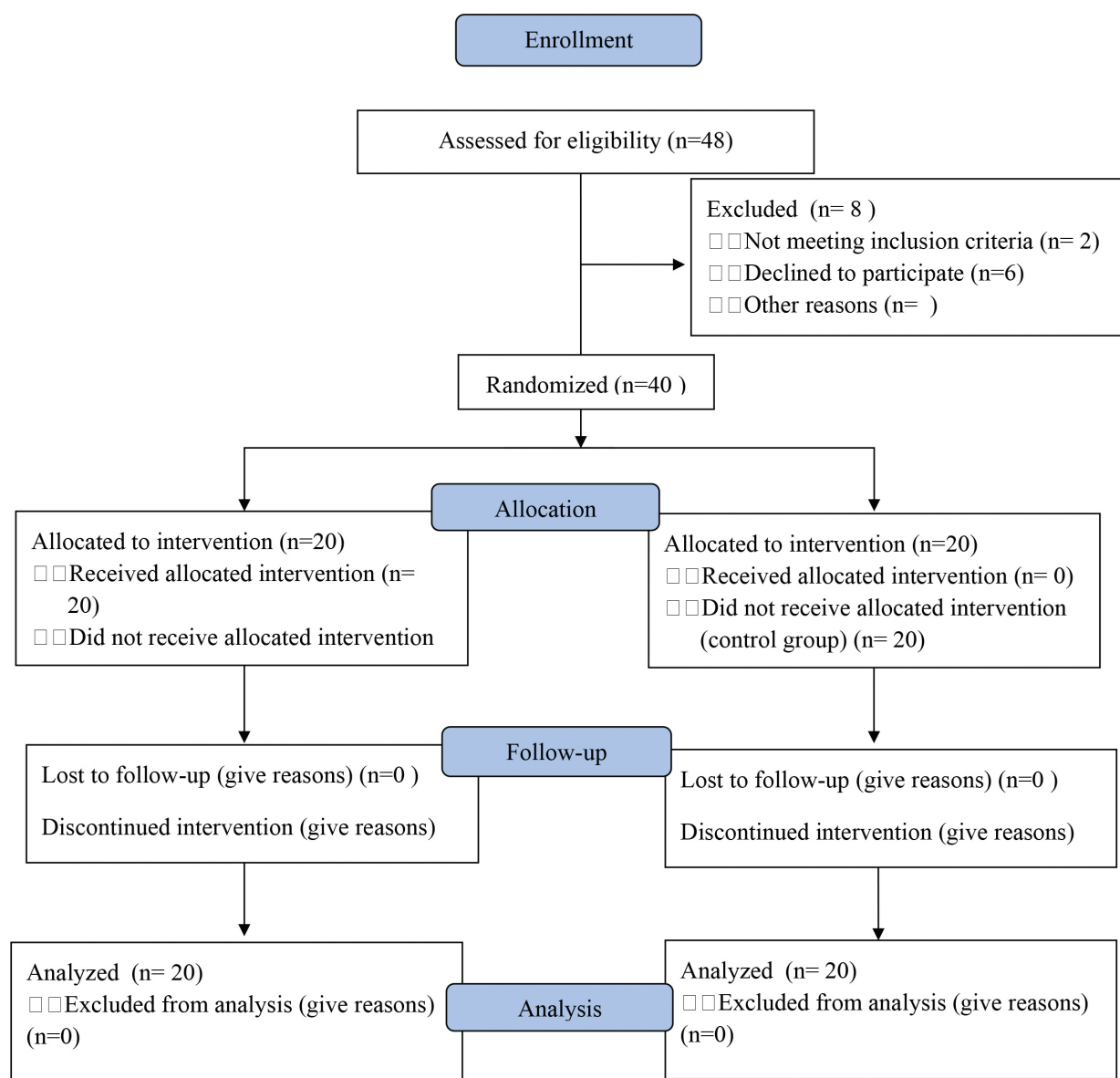
A mix method was used in this study. The quantitative aspect of the study consisted of a pre and posttest application with a control group, whereas the qualitative aspect consisted of a semi-structured interviewing technique.

### Sample

The study population consisted of 471 patients with type II diabetes who were treated at the internal medicine clinic of the hospital in 2015. The sample group of the study included 48 patients admitted to same clinic between 11<sup>th</sup> and 30<sup>th</sup> April 2016 and met the inclusion criteria. By randomization using a computer program, 24 patients were assigned to the experiment group and 24 patients were assigned to the control group. Two patients from the experiment group were excluded because they had other medical problems, and two patients were further excluded because they declined to participate; whereas from the control group four patients were excluded because they declined to participate. At this stage, power analysis, performed with 95% confidence interval (CI), calculated alpha as 0.05, beta as 0.20 and power of the test was found to be 90.2%. This power for sample volume was thought to be adequate and the study was completed including 20 patients in the experiment group and 20 patients in the control group. The inclusion criteria were as follows: living within the city and in a home, HbA1c level at or above 7%, having no medical problem or disability that prevents exercising, being open to verbal communication, and no previous education regarding diabetes. The inclusion process is shown in the flow charts (Figure 1).

### Data Collection

During the period of May 2<sup>nd</sup> to October 27<sup>th</sup>, 2016, seven home visits were made for the experiment group and two home visits for the control group in which only data collection tools were utilized. Data collection tools were utilized for the first home visit to the experiment group; current problems, diabetes and related complications were discussed in the second visit; measurement and monitoring of blood glucose levels and drug use were discussed in the third visit; care and education regarding nutrition and exercise was provided in the fourth visit. Observations were made during the fifth and sixth visits, and data collection tools were reutilized



**Figure 1**  
The Flow Chart of the Inclusion Process (TREND Statement)

during the seventh visit. Interventions implemented in the experiment and control groups are provided in the procedural schemas (Table 1).

The patients in the experiment group, in their second, third, and fourth visits, were trained by adhering to an educational plan prepared according to the literature on foot care, follow-up blood glucose levels, nutrition, and exercise, in the order presented here (American Diabetes Association, 2015; International Diabetes Federation, 2009; Turkey Diabetes Nursing Association, 2015; Turkey Endocrinology and

Metabolism Society, 2014). Whether any wounds or infections developed in their feet was assessed by observing their feet at every visit.

In the home visits for experimental group, whether they adapted certain behaviors on nutrition, exercise, drug use, and monitoring of blood glucose was assessed by using the qualitative interview form. Qualitative data of the study were collected using a qualitative interview form that included questions that were asked at the beginning and end of the study. In the qualitative interview form, behaviors of

**Table 1**  
*Procedure Schema*

The Experimental Group	The Control Group	Procedure
<p><b>First home visit</b> Data collection form was applied. HbA1c value that was measured before the procedure was recorded into pre and post measurement form. Questions in the quantitative interview form to be asked in the first interview were asked.</p>	<p><b>First home visit</b> Data collection form was applied. HbA1c value measured before the procedure was recorded into pre-post measurement form.</p>	<p><b>First application</b></p>
<p><b>Second home visit</b> Interventions were performed for problems determined in the physical examination. Acute and chronic complications of diabetes were explained. Feet were observed. What to do for foot, eye, and kidney health were also explained. Blood pressure, blood glucose, and weight of the family members were measured and a patient with high blood pressure was recommended to the doctor.</p>	<p><b>No intervention was made.</b></p>	<p><b>Second application</b></p>
<p><b>Third home visit</b> Status of the problems determined during the physical examination was questioned. Feet were observed and feet complaints were found to continue. Information provided in the previous visit was questioned. Status of measuring blood glucose, reading the result, and interpretation were questioned and deficient and incorrect behaviors were corrected. Blood glucose monitoring chart was applied and they were told to monitor blood glucose. Form of anti diabetic drug use was questioned; patients who were using irregularly were instructed to take anti diabetic drugs after meals and meal hours were regulated. Forms of insulin use of the patients were measured; incorrect and deficient applications were corrected. A patient whose blood pressure was measured to be high in the previous visit was recommended for hypertension diagnosis and started antihypertensive drugs.</p>		
<p><b>Fourth home visit</b> Status of the problems determined during the physical examination was questioned. Feet were observed; complaints from dryness and cracks in the feet were less frequent, but burning sensation and fungus problem continued. Information provided in the previous visit was questioned. Blood glucose monitoring charts were evaluated, and blood glucose was found to be elevated in 17 patients. Two patients were recommended to start using antidiabetics regularly. The reason for irregular insulin use in a patient was hypoglycemia. A monitoring chart was taken from the patient for showing it to the doctor. Nutrition was assessed and all the patients were determined to feed incorrectly; importances of feeding and correct nutrition in diabetes were explained. Daily exercise habits of the patients were questioned and only two patients were found to walk regularly. A 30-min walk every day was suggested.</p>		

**Table 1**  
*Procedure Schema (Continue)*

The Experimental Group	The Control Group	Procedure
<p><b>Fifth home visit</b></p> <p>Status of the problems determined during the physical examination was questioned. Feet were observed; dryness and cracks in the feet resolved in a few patients and fungus formation resolved in a patient. Information provided in the previous visit was questioned. Insulin dosage of two patients who were found to have hypoglycemia in the previous visit was decreased by two units, which was told to the patients. Blood glucose monitoring charts were evaluated. Hyperglycemia was detected in 17 patients. Feeding, drug use, and exercise status of patients with hyperglycemia were questioned again. Monitoring charts of two patients who started regular exercise and had hypoglycemia were taken to show to the physician. Incorrect feeding habits were continuing, 2 patients started to use antidiabetics regularly and 12 patients started to exercise regularly.</p>		
<p><b>Sixth home visit</b></p> <p>Status of the problems determined during the physical examination was questioned. Feet were observed; dryness and cracks in the feet and skin problems were resolved, but burning sensation continued. Insulin dosage was decreased by two units for two patients found to have hypoglycemia in the previous visit, which was told to the patients. Blood glucose monitoring charts were evaluated. Among 17 patients who previously had hyperglycemia, blood glucose levels decreased to normal levels in 14 but remained high in 3 patients. Four patients were still not using antidiabetics regularly and all patients were using insulin regularly. Six patients changed their incorrect nutritional habits. Fourteen patients continued to exercise regularly. Importance of regular feeding and regular exercise habits was explained again to patients who had not developed these habits.</p>		
<p><b>Seventh home visit</b></p> <p>Status of the problems determined during physical examination was questioned. Feet were observed; dryness and cracks in the feet in most patients and fungus formation in a patient were resolved. Blood glucose monitoring charts were evaluated. It was determined that blood glucose in 14 patients reduced to normal levels, but remained high in 3 patients. Four patients were still not using antidiabetics regularly and all patients were using insulin regularly. One patient discontinued bread completely, 5 patients reduced bread amount by half, 2 patients started to exercise regularly, and 10 patients started to exercise irregularly. Questions to be asked in the latest interview from the quantitative interview form were asked. HbA1c value was measured after the procedure and was recorded into pre and post measurement form.</p>	<p><b>Second home visit</b></p> <p>HbA1c value measured in this visit was recorded into pre and post measurement form.</p>	<p><b>Third application</b></p>

the patients regarding nutrition, exercise, drug use and following-up blood glucose levels and if present, reasons for incorrect behaviors were questioned. Their nutritional habits were assessed by asking questions through the qualitative interview form on how many meals a day they ate, the food that they consumed the most, and the reasons for the difficulty in changing their dietary habits. Their exercise habits were assessed by asking how often they walked and why they did not walk. Their use of drugs was assessed by asking how they used drugs and the reasons for continuing to misuse drugs. Their habits of monitoring blood glucose were assessed by asking whether they regularly monitored their blood glucose and the reasons for not monitoring blood glucose regularly.

Quantitative data in this study were collected using data collection forms: A physical examination form and pre-post measurements form. The data collection forms were developed by the researchers taking the literature into account (Bayraktar, 2008; Bayram, 2010; Can, 2006; Cooppan, 2008; Görgülü, 2014; Kitiş, 2002; Leahy & Cobb, 1966; Öztekin & Kubilay, 2011; Selçuk-Tosun, 2015). The data collection form questions cover descriptive features of the patient and the family members, duration of diabetes, type of treatment, nutrition and exercise status, and following-up blood glucose level status. With the physical examination form, signs and symptoms of all organs and systems were reviewed from head to toe. The HbA1c levels measured before and after the procedure were recorded in the pre-post measurement form.

### Statistical Analysis

Quantitative data of the study were evaluated by chi-square test, dependent samples *t*-test, Wilcoxon *t*-test, and Mann-Whitney *U* test. The value of  $p < 0.05$  was considered significant.

Qualitative data of the study were analyzed descriptively by transferring recorded interview notes to a computing environment. All interviews were collected under the relevant question on the interview form. The interview notes were then read again and grouped under categories as defined nutrition, exercise, drug use, and follow-up blood glucose levels. In the next stage, the interview notes were read again and classified under the relevant concepts. Findings were directly supported by quotations when necessary.

### Ethical Consideration

Before starting the study, ethics committee approval was obtained from the Kırşehir Ahi Evran University Faculty of Medicine Clinical Ethics Committee (Approval number: 2016-01/04) and written consent was taken from the hospital. The purpose, confidentiality, and procedure of the study were told to the patients with type II diabetes forming the study sample and written informed consents were obtained. After the procedure, home visits were made for patients in the control group and education and counseling were provided regarding acute and chronic complications of diabetes, drug use, follow-up blood glucose levels, nutrition, and exercise.

### Results

In the study, the HbA1c value of the patients with diabetes in the experiment group decreased by 0.75% (95% CI: -1.75% to -0.47%,  $p = 0.002$ ). There was a statistically significant difference between the first and the last measurements ( $p < 0.001$ ). There was no statistically significant difference between the first and the last HbA1c values of the control group ( $p > 0.05$ ; Table 2).

Skin problems such as dryness, redness, rash and itching, skin infection under the breast and genital itching, determined during the physical examination

**Table 2**

*Distribution of the Difference in Hba1c Values Between the First and the Last Measurements*

Variable	The Experimental Group				The Control Group			
	The First Measurement	The Last Measurement	Difference (Lower-Upper)	Test	The First Measurement	The Last Measurement	Difference (Lower-Upper)	Test
	Median (min-max)	Median (min-max)			$\bar{X} \pm SS$	$\bar{X} \pm SS$		
HbA1c	8.55 (7.0 to 13.2)	7.80 (5.4 to 11.9)	0.75 (-1.7 to -0.47)	$z = -3.063$ $p = 0.002$	$10.1 \pm 2.07$	$9.59 \pm 1.87$	0.57 -1.81 to 0.67	$t = 0.962$ $p = 0.348$



**Table 3**

Opinions of diabetic patients in the experiment and the control groups on drug use, nutrition, and exercise

Categories	Concepts	Statements
<b>Drug use</b>	Incorrect/irregular insulin application	<p>"Last night we visited our neighbour, I had no insulin, I did not take it. The sugar level increased because we sat down late." (M, 55 years)</p> <p>"My drugs finished; I have to get them. I have to go to the hospital but I don't know how to get an appointment." (F, 56 years)</p> <p>"I want to lose weight, the belly is already there, and they say that insulin makes fattier so I don't apply it from my abdomen." (F, 43 years)</p>
	Irregular use of antidiabetics	<p>"I should say that I don't take them regularly; especially when my grandchildren come I really become confused. (F, 58 years)</p> <p>"I forget, I say who will get it." (F, 54 years)</p> <p>"I forget the meds, I focus on my work and forget the other things." (F, 45 years)</p> <p>"I don't remember to get the drugs because of the housework." (F, 52 years)</p>
<b>Feeding</b>	Unbalanced and irregular feeding	<p>"I can't leave my workplace, there is no one to look at my place, things are not clear, sometimes there is extra work, I care about all of them. That's why I can't pay much attention to what I eat." (M, 55 years)</p> <p>"I don't remember to eat because I run after my grandchild." (F, 54 years)</p> <p>"All the thing I'm busy with is my husband. I can't find time to eat. (F, 52 years)</p> <p>"I don't feel that I got enough when I don't eat bread; I am used to eating bread; also, there is nothing to eat other than bread"(F, 60 years)</p> <p>"I'm coming home hungry, I'm eating everything over the table, then I also eat fruit " (M, 51 years)</p> <p>"We do not pay attention, if only we could refrain ourselves. We prepare and eat bread, pie, donut." (F, 55 years)</p> <p>"I don't pay attention to what I eat, I have become accustomed to eat dumplings, buns, pies" (F, 59 years)</p> <p>"We gathered with some friends the other day, there were refreshments and I ate from all of them" (F, 64 years)</p> <p>"Last night, Baklava was served, I ate and so my glucose level increased." (M, 56 years)</p> <p>"I eat much bread these days and so my glucose level increased, I know myself." (F, 63 years)</p> <p>"When I was with my nephews I could not pay attention to what I eat and I ate everything with them." (F, 56 years)</p> <p>"Last week I made a quilt, I was so tired. I couldn't pay attention to what I ate. " (F, 50 years)</p>
<b>Exercise</b>	Not exercising regularly / inactivity	<p>"Who will go out? I don't want to go out." (F, 59 years)</p> <p>"Because of the children's school and housework, I can't go out and walk." (F, 43 years)</p> <p>"I am at work or on the steering wheel from morning to night." (M, 55 years)</p> <p>"I'm tired of pursuing my grandchildren, and aside from walking I do not even have time for housekeeping." (F, 63 years)</p> <p>"I'm so tired, I'm dealing with my husband all the time, I'm afraid he will die." (F, 52 years)</p> <p>"I sit and wait till my husband comes, I do not have many visitors and I do not leave home frequently." (F, 50 years)</p>

at the home visit to the patients in the experiment group, were completely eliminated as a result of the care given at home. A total of 11 of the 14 patients who had dryness on foot, 1 of the 4 patients with fungus on foot, and 10 of the 11 patients with cracks on foot were healed. However, problems such as

burning sensation of foot, blurred vision, missing tooth, gum bleeding, mouth dryness, constipation, and polyuria were not resolved.

During home visits in the experiment group it was determined that 17 patients correctly used the glu-

cometer and measured blood glucose; 5 of these patients were able to use the glucometer but did not understand the value because they were illiterate, and 3 of them were unable to use the glucometer because they did not know how to use it or afraid of it. These patients and their relatives were taught to use a glucometer. Blood glucose monitoring charts were given, and the patients were asked to fill them. On the next visit, the blood glucose monitoring chart was assessed and it was determined that blood glucose was elevated in 17 patients due to over-feeding, non-regular drug use, inability to take time for self-care due to daily work, or inactivity. Blood glucose was found to be low in one patient, and for this patient insulin was reduced by two units after consulting the physician.

During the visits to the experiment group, three patients incorrectly applied insulin to inside of the arms and legs; it has been determined that some of them made mistakes in the transportation, storage, supply, and regular application of insulin. A total of 6 of the 17 patients who used anti diabetic drugs said they neglected or forgot to take their drugs because of work such as housework and child care. As a result of care given at home, all patients started using insulin correctly and regularly. Four patients, all female, did not start using drugs regularly because of housework, daily routines, and care giving to a spouse or a grandchild.

During the visits to the experiment group, most patients stated that they missed meals due to work intensity, housework, or care giving. In addition, seven female patients, stated that they were tired of caregiving to a grandchildren/patient and that they could not eat regularly. All patients, except two, stated that they consumed one or more loaves a day. As a result of care given at home, six patients changed their eating habits; a patient stopped eating bread completely; the other five patients also halved the amount of bread they consumed. The remaining 14 patients, however, could not change their eating habits because of housework, work intensity, caregiving, financial insufficiency, inability to change eating habits, and neglect.

During the visits to the experiment group, only two patients reported that they regularly walked every day, a patient reported that he walked sometimes although not every day and seven patients reported that they never moved during the day. The remain-

ing 10 patients stated that they were tired because of housework, children, grandchildren, or patients at home and they could not exercise. As a result of the care given at home, blood glucose monitoring schedules of two patients who stated that they walked every evening were examined and hypoglycemia was detected; insulin doses of both patients were reduced by two units after consulting the doctor. Two patients continued to walk regularly. Ten patients started to take nonregular walks for less than half an hour. Six patients did not start walking because of exhaustion, lack of time, and neglect. In this study, blood glucose levels were high in three patients who did not change their eating habits, consumed a lot of bread, flour, and sugary food, and were immobile during the day. Seventeen other patients developed the ability to maintain metabolic control by keeping blood glucose within normal limits. Qualitative findings showing the opinions of patients on drug use, nutrition, and exercise are shown in Table 3.

## Discussion

Each 1% decrease in HbA1c decreases mortality due to diabetes by 21%, myocardial infarction by 14%, and microvascular complications by 37% (Stratton et al., 2000). In this study, there was a statistically significant difference between the first and the last HbA1c values in the experiment group ( $p < 0.05$ ). There was no statistically significant difference between the first and the last HbA1c values of the control group ( $p > 0.05$ ). There was a 0.75% decrease in HbA1c value in the experiment group and 95% CI range was  $-1.75\%$  to  $-0.47\%$  (Table 2). Thus, the H1-1 hypothesis was supported. Many previous studies have shown decreases in HbA1c levels in patients who get nursing care similar to this study (Barr-Taylor et al., 2003; Ebrahimi et al., 2016; Huang, et al., 2004; Ishani et al., 2011; Kitiş, 2002; Selçuk-Tosun, 2015; Shaw et al., 2014; Skelly et al., 2009; Taylor et al., 2005; Watts et al., 2011; Weinberger et al., 1995; Welch et al., 2010; Wichit et al., 2017). In addition, a study in which visits were performed by nurses for 32 months showed a 5.7% decrease in HbA1c and this great decrease in HbA1c level was explained by a long duration of visits (Dontje & Forrest, 2011). Accordingly, the prolongation of the intervention period may lead to a further reduction in HbA1c levels.

As a result of the care given to the experiment group at home, most of the foot problems of the patients



such as dryness and cracks were eliminated, and the foot fungus reduced in a patient. Also, skin problems and genital itching problem were resolved. In many studies, it was determined that the nursing care provided by nurses similar to this study improved the foot care behaviors in patients with type II diabetes and the patients were inspecting their feet more often (Kitiş, 2002; Li et al., 2017). Accordingly, by giving care at home, chronic complications of type II diabetes such as diabetic foot can be recognized early and can be prevented.

In the experiment group, all patients learned how to measure blood glucose and developed a habit of monitoring it. In one study, it was determined that group visits by nurses similar to this study increased the frequency of blood glucose monitoring for patients with type II diabetes (Dontje & Forrest, 2011). In this study, it was initially determined that blood glucose levels of 17 patients were high due to not using insulin and antidiabetic drugs correctly and regularly, consuming too much flour and sugary foods, and immobility. Taking into account the reasons for elevated blood glucose; first the defective and incomplete behaviors of insulin use were noticed, they were intervened immediately, and all the patients developed a proper and regular habit of insulin application. Previous studies have also shown that similar to this study nursing interventions improved drug use and insulin application behaviors, developed self-care behaviors, and facilitated treatment compliance (Dontje & Forrest, 2011; Esegbe, 2015; Hansen, 2000; Kitiş, 2002; Ko et al., 2011; Maislos & Weisman, 2004; Renders et al., 2000; Retrig et al., 1986; Wichit et al., 2017). However, four patients using antidiabetic agents did not use their drug regularly as a result of home-based care; their reasons were housework, child or patient care, and daily routines. Because all of these patients were women, it can be said that the obligations such as housework, childcare, and patient care that are associated with being a woman can make diabetes control difficult in women and that being a woman is a risk factor in control on diabetes. In the context of home-based care, education was given about nutrition; six of the patients changed their eating habits. Other individuals have not been able to change their eating habits for reasons such as work intensity, homework and caregiving, financial insufficiency, and the inability to change food culture. In the survey, most of the female patients stated that they neglected to feed regularly because of their

homework and caregiver roles and a working male patient neglected because of the working intensity. In addition, some women have expressed that they cannot turn back so they consume the food served in public meals and at the invitations. A qualitative study conducted in Delhi found that patients with type II diabetes were aware of the severity of the disease but were not sensitive enough to control the disease and were found to be unable to modify their faulty behaviors even if they knew the importance of diabetes control, and they had difficulty identifying diabetes care needs, due to ignorance and economic inadequacies (Khan et al., 2013). A study conducted in Turkey found that although the patients actively participated in care they had difficulty to create a change in behavior on issues such as exercise and they gave up what they have learned quickly and continued their old behaviors (Kitiş, 2002). In this study it was thought that although most of the patients in the experiment group knew incorrect behaviors and the food that disturbs them, they could not be able to change their eating habits because of ignorance, economic inadequacies, inability to change food culture, and social behaviors during meals that are eaten in public. It has been determined that interventions conducted by a team consisting of healthcare professionals and lasting more than 6 months provided proper nutrition habits for patients with type II diabetes and reduced body mass index in these patients (Barr-Taylor et al., 2003; Bastiaens et al., 2009; Borgermans, 2007; De Baca, 2010; Ersoy et al., 2006; Ishani et al., 2011; Ko et al., 2011; Kollannoor-Samuel et al., 2016; Maislos & Weisman, 2004; Maislos et al., 2002; North, & Palmer, 2015; Siminerio et al., 2005; Shojania et al., 2006). Accordingly, inability to change eating habits in this study may be due to the fact that the duration of the procedure was short, and care was not provided by specialists such as physiotherapists, and dietitians. In addition, nutrition care, education, and counseling are provided within the scope of home care, but the socio-cultural characteristics and the socioeconomic status of the patient may have created obstacles to changing their eating habits. In this study 18 patients did not walk at all in the beginning of the procedure; but as a result of the intervention, at the end this number dropped to six. In a study conducted in Korea, nursing care to patients with type II diabetes led to a decrease in the number of non-exercisers from 41 to 19 (Ko et al., 2011). In other studies, it was determined that the daily amount of exercise was increased in patients

with type II diabetes cared by the nurses or the team that included a nurse (Dontje & Forrest, 2011; Ho, 2007; Hu et al., 2015; Li et al., 2017; Schafer, 2013). In the experiment group, six patients, all being women, have never started exercise because of being tired due to daily routines, not having time to exercise, and neglecting exercising. In some qualitative studies, similar to this study, it was determined that patients with type II diabetes did not have time to physical activity, and their misbehavior about exercise was difficult to change although they knew the importance of exercise in diabetes control (Khan et al., 2013; Torres et al., 2014). In this study, women also stated that they had no energy to exercise as they were tired due to housework and child/patient care. The fact that housework and caregiving are seen as responsibilities of women and that there is no sharing of responsibilities with family members in this regard has made it difficult for women to spend time for themselves and prevented them from starting to exercise.

In this study, as a result of home-based care, blood glucose in 14 of the 17 patients with high blood glucose decreased to normal levels by decreasing amount of bread consumed and starting to exercise. In many studies, it has been determined that blood glucose reduced in patients with type II diabetes receiving care from a nurse or a team including nurses (Ishani et al., 2011; Ko et al., 2011; Maislos & Weisman, 2004; Wang & Abbott, 1998). Among patients whose blood glucose returned to normal levels, two patients who started to exercise regularly and decreased the amount of bread consumed were found to have experienced hypoglycemia and the insulin doses were reduced by two units in cooperation with the physician. One of these patients completely abandoned the use of bread and at the end of the practice; afternoon insulin of this patient was completely removed by the physician. Accordingly, home visits conducted by the nurse not only provided early recognition of hypoglycemia, but also improved blood glucose control. A previous study found that nurses' close communication with patients could improve metabolic outcomes in patients with type II diabetes without needing a physician visit (Barr-Taylor et al., 2003).

### Study Limitations

This study has strengths in that the care given by a nurse at home decreased the people's HbA1c levels and that many variables were identified through

qualitative data to affect diabetes control positively or negatively. Our study was limited to a certain extent due to the fact that the patients who were assigned to the experiment and control groups were selected only from among the people admitted to the hospital, and the fact that there was a limited number of experiment and control groups.

### Conclusion and Recommendations

This study is important in that it shows how the care provided by a public health nurse based on the development of an observation, interview, and care plan in the environment in which the people lived affected type II diabetes control. In this study, blood glucose levels were high in three patients who did not change their eating habits, consumed a lot of bread, flour, and sugary food, and were immobile during the day. Seventeen other patients gained the ability to maintain metabolic control by keeping blood glucose within normal limits. In conclusion, we recommend that an effective role should be given to the nurses and home visits in diabetes care, interventions should last longer, physiotherapists and dietitians should be included in the team offering diabetes care, activities should be planned those target communities and increase awareness about a balanced diet and regular exercise, and studies should be planned that further analyze the factors related to social, cultural, vocational, and gender roles that prevent diabetes control.

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