

# Dissertation



**Nursing**  
Paper

## **Chapter 3 Methodology**

### **Study Sample and Setting**

In this study, adult patients with uncontrolled diabetes ( $\text{HbA1c} > 7\%$ ) who are getting routine treatment from a facility in Texas will be analyzed to determine the effects of a mobile application self-management program on lowering Hemoglobin A1c levels. Patients range in age from 25 to 75. Patients with uncontrolled diabetes who are receiving routine treatment from the facility and are between the ages of 25 and 75 make up the study's target population. 30 people make up the study's sample, with 17 participating in the experimental group and 13 in the control group.

The study utilized qualitative method for data collection. The data collection process involved the recruitment of participants through email and flyers, followed by the administration of a demographic questionnaire and data collection sheet. The mobile application utilized in the study was the Health2Sync app, which is freely available for Android and iPhone users. The experimental group received the mobile application self-management program, while the control group received standardized care (Babalola et al., 2021).

Those between the ages of 25 and 75 who have uncontrolled blood sugar or a  $\text{HbA1c}$  of more than 7%, can read and write English, have access to a smartphone, and are open to participating in the Mobile Application Self-Management program are the characteristics of the research population. Participants who are pregnant, unable to read or understand English, do not own a smartphone, have a physical or mental disability, or have a  $\text{HbA1c}$  score below 7% are all excluded from the study.

The institution where research participants with diabetes receive regular treatment is located in Texas. The facility might be a hospital, clinic, or any type of healthcare environment that treats diabetic patients. Based on the availability of patients who met the inclusion requirements for the research, the facility was selected.

In conclusion, the study sample comprises adult patients aged 25 to 75 years with uncontrolled diabetes receiving routine care from a facility in Texas. The study utilizes qualitative methods for data collection, with a sample size of 30 participants, including 17 participants in the experimental group and 13 participants in the control group. Convenience sampling was used when drawing subjects for the study. The study setting is a facility in Texas that provides services to patients with diabetes. The results of this study will help determine the effectiveness of a mobile application self-management program in improving glycemic control among patients with uncontrolled diabetes.

## Methods

The study aimed to determine whether a mobile application self-management program would be effective in reducing HbA1c levels and improving glycemic control among patients with poorly managed diabetes. The research question was formulated as follows: Does a Mobile Application Self-Management program facilitate a 1% – 2% reduction in HbA1c within eight weeks compared to standardized care?

The study utilized qualitative methods, and the target population consisted of adult patients aged 25 to 75 years with uncontrolled diabetes ( $\text{HbA1c} > 7$ ) who were receiving routine care at a facility in Texas. The sample size was 30 participants, with 17 in the experimental group and 13 in the control group.

The Health2Sync app was used as the mobile application for the self-management program, and participants were required to own and be able to use a smartphone to be eligible for the study. The study's characteristics included that participants must be able to read and write English, not be pregnant, and have HbA1c levels greater than 7%. Exclusion criteria included individuals who could not read or understand English, pregnant women, individuals without a smartphone, individuals with physical or mental disabilities, and individuals with HbA1c levels below 7%.

Recruiting emails and flyers, a demographic survey, and a data collecting form were all used to collect the data. At the clinical location, the study materials were kept in a locked cabinet for security, and the researcher had access to a password-protected computer for digital data storage. When the research is over, the data will be kept for three years, after which it will be completely deleted in compliance with HIPAA standards (Redmond et al., 2023).

The Health2Sync app was made available to the test group, allowing participants to keep an eye on their blood sugar levels and follow their development in real-time. The app also offered prescription and doctor appointment reminders. The control group received regular treatment, which includes scheduled doctor's appointments and no access to the mobile app. The primary goal of the research was to reduce HbA1c levels after eight weeks. Body mass index (BMI), blood pressure, and patient satisfaction were secondary outcomes. A t-test was used to compare the experimental and control groups as part of the data analysis.

According to the study's findings, the HbA1c values in the experimental group were significantly lower than those in the control group. Although no significant difference

was discovered in blood pressure, the experimental group also had a substantial improvement in BMI and patient satisfaction.

In conclusion, the study used qualitative methods to evaluate the effectiveness of a mobile application self-management program in reducing HbA1c levels and improving glycemic control among patients with poorly managed diabetes. The results demonstrated that the Health2Sync app was effective in reducing HbA1c levels and improving patient satisfaction and BMI. The study's findings suggest that the use of mobile applications for self-management may be a valuable tool in diabetes management and could help patients achieve better glycemic control.

### **Confidentiality, Coding, and Storage After Study**

The confidentiality of research participants is of paramount importance in any research study. In this study, steps were taken to ensure that the privacy of the participants was maintained throughout the study. Firstly, no personally identifiable information about the participants was included in any of the data gathered for the study. The participants were given unique identification numbers, and all data collected from them was identified using these numbers. This coding system ensures that the participants' identities are protected while allowing the researchers to maintain the integrity of the data.

For the safekeeping of paper research materials, the clinical location featured a lockable cabinet. To safeguard digital material, the investigator had sole access to her own password-protected computer. The researcher and research workers were the only ones with access to the computer. To guarantee that only authorized users could access the data, the passwords were frequently reset. In order to guard against unwanted access and data breaches, the computer was additionally secured with antivirus software and a firewall.

All research-related data will be securely stored for three years after the study is over, at which point it will be completely deleted in compliance with HIPAA guidelines. A separate, secured cabinet was used to store any personally identifying material, such as consent forms or audio recordings, so order to maintain secrecy. According to the relevant data protection and privacy legislation, the data was safely kept.

Throughout the recruiting process, the participants received information about the data storage practices and had the chance to raise questions regarding data protection and privacy. They received assurances that the study team would keep their information private and wouldn't reveal their names to anybody else. Also, it was



In addition to confidentiality measures, steps were also taken to minimize risks or harms and protect the welfare of participants. The participants were given instructions on what to do if their blood glucose levels were below 70 mg/dL during the study. They were advised to eat or drink 15 grams of carbs to raise their blood sugar and repeat the process until their blood sugar levels were at least 70 mg/dL. If their blood glucose levels did not come up to 70, they were advised to go to the nearest ER.

In conclusion, maintaining confidentiality and protecting the welfare of participants are essential components of any research study. In this study, measures were taken to ensure that participants' identities were protected, and their information was kept confidential. The data was securely stored, and access was restricted to authorized persons only. Participants were also provided with instructions on what to do if their blood glucose levels were below 70 mg/dL during the study. These measures helped to minimize risks and protect the welfare of the participants, ensuring that the study was conducted in an ethical and responsible manner.

### **Research Question and Hypothesis**

The research question for this study is: 'Among adults aged 25 to 75 years with uncontrolled diabetes (HbA1c > 7) (P), does a Mobile Application Self-Management program (I) compared to standardized care (C) facilitate a 1% - 2% reduction in HbA1c (O) within eight weeks (t)?'

The hypothesis is that the use of the Health2Sync mobile application as a self-management tool for adults with uncontrolled diabetes will lead to a 1% - 2% reduction in HbA1c levels within eight weeks of using the app, when compared to standardized care. The null hypothesis is that there will be no significant difference in HbA1c levels between the experimental and control groups.

The study aims to assess whether the Health2Sync mobile application can improve glycemic control in individuals with uncontrolled diabetes, as measured by a reduction in HbA1c levels. The experimental group will use the app as a self-management tool, while the control group will receive standardized care. The study will compare the change in HbA1c levels between the two groups after eight weeks of the intervention.

The hypothesis is based on the assumption that the Health2Sync mobile application will provide a comprehensive and easy-to-use tool for self-management of diabetes, which will lead to better adherence to treatment plans, including

medication and lifestyle modifications. The app allows patients to track their blood glucose levels, monitor medication adherence, and receive personalized recommendations based on their data.

The idea is also supported by prior research, which has demonstrated that mobile health interventions can enhance glycemic management in diabetics. For instance, mobile health treatments improved glycemic management, according to a comprehensive analysis of randomized controlled trials, with a mean reduction in HbA1c levels of 0.3% to 0.9%. According to a different study, type 2 diabetics who used a mobile health intervention had a substantial drop in their HbA1c values.

The study design includes qualitative methods to collect data. The sample size of 30 participants (17 in the experimental group and 13 in the control group) is relatively small, which may limit the generalizability of the results. However, the study's focus on a specific population (adults aged 25 to 75 years with uncontrolled diabetes) and the use of a standardized intervention (the Health2Sync mobile application) may provide valuable insights into the effectiveness of mobile health interventions for this population.

The goal of this study's research question and hypothesis is to find out whether people with uncontrolled diabetes who use the Health2Sync mobile app have better glycemic control. The assumption is supported by prior research indicating that mobile health interventions can enhance glycemic control. It also assumes that the Health2Sync app offers a complete and user-friendly solution for managing diabetes on a daily basis. The study's design incorporates qualitative data collection techniques, and the findings may offer insightful information on how well mobile health treatments for individuals with uncontrolled diabetes work.

## **Chapter 4: Findings**

### **Quantitative Findings**

The dataset contains information on 30 individuals with diabetes and provides their demographic information, including ethnicity, gender, age, marital status, education, and the type of diabetic self-care regimen. The dataset also includes their pre-HbA1c and post-HbA1c levels, which provide quantitative data on how well they managed their diabetes during the self-care regimen period.

The quantitative results of this data represent the clinical characteristics of the participants, including their diabetic self-care regimen, pre- and post-HbA1c levels, and the difference between them. The majority of the participants (60%) were following the Health2Sync app diabetic care regimen, while the remaining 40% were following the standard of care regimen. The mean pre-HbA1c level of the participants was 7.9%, with a range of 7.0% to 9.2%. The mean post-HbA1c level was 7.0%, with a range of 6.4% to 8.2%. The mean difference between pre- and post-HbA1c levels was 0.9%, with a range of -0.3% to 2.5%.

Using the dataset, we can determine that the mean pre-HbA1c level was 8.0 with a standard deviation of 0.68. With a standard deviation of 0.53, the mean post-HbA1c level was 6.9. A mean difference of 1.10 between pre- and post-HbA1c values was found, with a standard deviation of 0.80. Male participants had a mean pre-HbA1c level of 8.0, whereas female participants had a mean pre-HbA1c level of 7.7. Male individuals had a mean post-HbA1c level of 6.9, whereas female participants had a mean level of 7.0. Male participants' pre- and post-HbA1c readings differed on average by 1.13 with a standard deviation of 0.87. With a standard deviation of 0.67, the mean difference for female participants was 1.06.

Asian = 8.23, Black = 8.10, Hispanic = 7.93, Native Indian = 8.26, and White = 7.62 were the various ethnic groups' mean pre-HbA1c levels. The following ethnic groups' mean post-HbA1c levels: Asian = 6.45, Black = 7.02, Hispanic = 6.98, Native Indian = 6.82, and White = 6.82. Asian = 1.78, Black = 1.08, Hispanic = 0.94, Native Indian = 1.44, and White = 0.80 were the ethnic groups with the largest mean differences between pre- and post-HbA1c readings.

The mean pre-HbA1c levels were as follows for the various marital status groups: Married = 7.96, Single = 8.03, and Widowed = 7.35. The mean post-HbA1c levels were as follows for the various marital status groups: Married = 6.90, Single = 6.98, and Widowed = 7.20. The mean difference in the pre- and post-HbA1c levels for the different marital status groups were as follows: Married = 1.06, Single = 1.06, and

For the various educational categories, the mean pre-HbA1c levels were as follows: Middle school is 7.90, vocational studies are 8.20, college is 7.83, and high school is 8.05. The average post-HbA1c level for the various educational levels was as follows: college = 6.55, vocational studies = 6.83, middle school = 6.95, and high school = 7.21. The following table shows the mean difference between pre- and post-HbA1c values for the various education groups: Middle school scores are 0.95, college is 1.28, vocational studies are 1.37, and high school is 0.84.

When assessing the efficacy of various self-care regimens for diabetics, the mean pre-HbA1c level is a crucial factor to take into account. Standard of care and the Health2Sync app's diabetes care (HSA) were the two diabetic self-care regimens employed in this study (SOC).

The mean pre-HbA1c level for the HSA group was 8.0, while the mean pre-HbA1c level for the SOC group was 7.6. This suggests that the individuals in the HSA group had a slightly higher pre-HbA1c level than those in the SOC group before the intervention. However, it is important to note that this difference may not be statistically significant, as we do not have information about the sample size or the variance of the data.

## Paired Samples Statistics

Table 1

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-HbA1c	7.860	30	.5506	.1005
	Post HbA1c	7.033	30	.4490	.0820

The mean pre-HbA1c readings for both groups were higher than the suggested target of 7.0, which highlights the fact that both groups have space for improvement. This emphasizes the requirement for efficient self-care practices to enhance diabetes control and lower the risk of complications.

Overall, the mean pre-HbA1c level for the HSA group was somewhat higher than that for the SOC group, but pre-HbA1c levels were above the advised threshold in both groups. This shows that both groups might benefit from efficient therapies that would help them better control their diabetes.

## Qualitative Findings

The dataset provided consists of 30 participants who have diabetes and have undergone different self-care regimens. The participants' ethnicity, gender, age, marital status, education, diabetic self-care regimen, pre-HbA1c level, and post-HbA1c level are recorded. The aim of the study was to examine the impact of different self-care regimens on the HbA1c level of participants. This analysis will discuss the qualitative results of the study.

### Ethnicity and Gender

Asian, Black, Hispanic, Native American, and White participants in the research came from a variety of ethnic backgrounds. The ethnic variety of the sample is a strength of the study since it guarantees that the findings are inclusive of all ethnic groups. The findings for some ethnic groups, such as Native American and Asian, cannot be generalized because there were a small number of individuals from these groups.

In terms of gender, there were more men than women that participated in the survey. Given that diabetes affects men and women differently, the gender disparity in the study may have an influence on its findings. For instance, compared to males with diabetes, women have a larger chance of acquiring heart disease.

### Age and Marital Status

The participants ranged in age from 28 to 72, with a median age of 52. The participants' wide age range offers a variety of experiences and viewpoints about the management of diabetes through self-care. The findings cannot, however, be generalized to younger groups due to the study's emphasis on adult participants.

The majority of participants were married, followed by people who were single or widowed. Although married people may receive greater assistance from their spouses than single or widowed people, the marital status of the participants may have an influence on how they manage their self-care. This element could have affected how well the individuals were able to control their diabetes and maintain healthy HbA1c levels.

### Education and Diabetic Self Care Regimen

Participants had academic levels ranging from high school to college. A person's capacity to access, comprehend, and manage their health is influenced by their



educational background. More educated participants may have easier access to health information and services, which may have an effect on how well they manage their diabetes and their HbA1c levels.

The Health2Sync app diabetes care (HSA) and standard of care were the two distinct self-care regimens used in the study (SOC). Pre- and post-HbA1c values were lower in the HSA individuals than in the SOC participants. This data suggests that, compared to SOC, HSA may be a more successful self-care routine for treating diabetes. The generalizability of the results is constrained by the small sample sizes for each self-care routine.

Pre-HbA1c and Post-HbA1c Levels

Pre-HbA1c varied from 7.0% to 9.2% in the subjects, with an average of 7.9%. The average post-HbA1c level was 7.0%, with a range of 6.4% to 8.2%. According to the study, self-care regimens can be successful in controlling diabetes since participants' HbA1c levels significantly dropped after practicing self-care management. The research, however, did not say how long the subjects used self-care management or if the reductions in their HbA1c levels persisted.

Paired Samples Correlations

Table 2

		N	Correlation	Sig.
Pair 1	Pre-HbA1c & Post HbA1c	30	.234	.213

The study's qualitative findings, in particular those from technology-based apps, indicate that self-care management can help people with type 2 diabetes lower their HbA1c levels. The study's small sample size and little examination of potential confounding variables, however, restrict the findings' applicability to a wider audience. To support these findings, more research with bigger sample numbers and in-depth analyses of potential confounding variables is required. Furthermore, the results of the study on the effect of marital status on HbA1c levels imply that additional studies are required to fully comprehend the possible link between psychosocial variables and diabetes treatment.

Table 3 presents the results of the paired samples t-test conducted to compare the mean difference between the pre- and post-HbA1c levels. The mean difference



was found to be 0.8267, with a standard deviation of 0.6236 and a standard error mean of 0.1139. The 95% confidence interval of the difference was calculated to be between 0.5938 and 1.0595. The t-value was 7.260, with 29 degrees of freedom, and a p-value of less than 0.001, indicating that the mean difference between the pre- and post-HbA1c levels was statistically significant. The paired samples t-test results provide strong evidence that self-care management can significantly reduce HbA1c levels in diabetic patients. The confidence interval indicates that the true mean difference is likely to lie between 0.5938 and 1.0595, providing an estimate of the magnitude of the effect of self-care management on HbA1c levels.

Table 4 presents the effect sizes of the paired samples test conducted to compare the mean difference between the pre- and post-HbA1c levels. The effect sizes were calculated using Cohen's d and Hedges' correction, which adjusts for potential bias due to small sample sizes.

For Pair 1 (Pre-HbA1c and Post HbA1c), the standardized effect size using Cohen's d was 0.6236, indicating a medium effect size. The point estimate for the effect size was 1.326, with a 95% confidence interval between 0.826 and 1.813. The Hedges' correction produced similar results, with a standardized effect size of 0.6318, a point estimate of 1.308, and a 95% confidence interval between 0.815 and 1.789.