

Continuity of Care in Primary Health Care Affecting Control of Diabetes

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Abstract

Background: Continuity of care is a distinguishing feature of primary care. Better continuity of care program showed a significant effect in controlling diabetes and its complications. This study explores the effect of continuity of care on control of diabetes mellitus in primary health care centres. **Objectives:** 1) To assess the effect of Continuity of care on controlling haemoglobin (Hb A1C) and fasting blood Sugar (FBS); 2) To compare the control of Diabetes by using (Hb A1C and FBS) indices on same patient before and after application of chronic illness clinic; 3) To identify the relation between age and gender affecting continuity of care in diabetic patient. **Methods:** It is a Prospective cohort study design. Included both gender and diabetic patient age above 24 years old. The data extracted from health care specialty center (HCSC) clinics in National guard hospital at Riyadh, through HCSC data base on three phases: 1) **Phase 1:** the data extracted of diabetic patients from October to November 2022 including MRN, diabetic patient, age, Hb A1C, Fasting blood glucose. 2) **Phase 2:** the same MRN extracted from phase 1 was extracted again retrospectively for six months from April to September 2022, to compare the indices before implanting the chronic illness clinic including Hb A1C, Fasting blood glucose. 3) **Phase 3:** prospectively from December 2022 to September 2023. **Results:** Among diabetic patients aged 60 years old and above showed better control of HbA1C and FBS comparing to these patients below age of 60 years old, with significant improvement of HbA1C after implanting chronic illness clinic. **Conclusion:** The significant improvement in the control of diabetic patients followed in primary health care centers reinforce the evidence of the importance of continuity of care.

Keywords

Continuity of Care, Primary Health Care, Diabetes Mellites

1. Introduction

Primary health care, as a distinct delivery system entity, provides more effective, equitable, and efficient care, the four primary care functions (first contact, person-focused care over time, comprehensiveness of services, and coordination) as a clinical mode of health services delivery have shown to have positive effects on a number of health-related phenomena, such as better recognition of patients' problems, more accurate diagnosis, better concordance with appointment keeping and with treatment advice, less use of emergency departments, and potentially avoidable hospitalizations [1].

Continuity of care is a distinguishing feature of primary care, and it is associated with lower costs as well as improved health equity and care quality [2]. Building on the idea that knowledge, trust, and respect have developed over time between the patient and provider, allowing for better interaction and communication [3]. The degree to which a series of discrete healthcare events is perceived by patients as coherent and interconnected over time and consistent with their health needs is reflected in continuity of care [4]. Care for people with chronic diseases is a significant challenge for our health-care system [5]. Eighty-seven percent of the population visits a PHC at least once a year, and primary care physicians provide most of the care to patients with chronic illnesses, particularly those with mild to moderately severe disease [5]. Thus, PHC plays an important role in strategies to combat the rise in chronic disease.

Diabetes is a chronic disease that affects 366 million people worldwide, a figure that is expected to rise to 552 million by 2030 [5]. It has several long-term complications that have a negative impact on people's quality of life and potentially their lifespans, causing negative consequences for both individuals and societies [6]. Diabetes complications are classified as either microvascular (nephropathy, neuropathy, or retinopathy) or macrovascular (cardiovascular and cerebrovascular disease) [6]. Diabetes management aims to postpone the onset and progression of disease complications, primarily by improving glycaemic control and lowering the risk of cardiovascular disease [6].

The Continuity of care of T2DM patients should be valued by PHC providers, and patients should be encouraged to maintain positive interactions with PHC clinicians during their visit. To improve blood glucose control and diabetes self-management in patients with diabetes who are single or have low educational levels, it is advised to strengthen Continuity of care.

In this study, we explore the correlation between the continuity of care in PHC and its effect on controlling diabetes (HgA1C, FBG) in patients with T2DM, and review what has been achieved and what we might yet need to do to achieve better

outcomes for people with Diabetes mellitus.

2. Methodology

The study was conducted in Chronic illness clinics in health care specialty center (HCSC) at national guard hospital in Riyadh, Kingdom of Saudi Arabia, which is open access clinics started at October 2022. This study includes male and female gender, all Adults age above 24 years old, diagnosed with diabetes and visiting (HCSC) clinic during this duration (from October to November 2022).

It is a Prospective cohort study design. The Records of patients who attended the chronic illness clinic on HCSC from October to November 2022 showed a total number of 16493 diabetic patients including some records had missing laboratory results Fasting blood sugar (FBS) and hemoglobin A1C (HbA1C) for 5000 patients during this specific period from October to November 2022, after cleaning the data 6209 diabetic patients had only Fasting blood sugar reading before and after starting chronic illness clinic. While 5284 diabetic patients had only HbA1C reading before and after implanting chronic illness clinic. In contrast total of 4592 diabetic patients had both fasting blood sugar and HbA1C reading before and after implanting chronic illness clinic.

The Data extracted from best care medical records (through HCSC data base) on three phases:

- **Phase 1:** The data extracted for patients who attend the chronic illness clinic on HCSC from October to November 2022 including MRN, diabetic patient, age, Hb A1C, Fasting blood sugar.
- **Phase 2:** The same MRN extracted from phase 1 was extracted again retrospectively for six months from April to September 2022, to compare the indices before implanting the chronic illness clinic including Hb A1C, Fasting blood sugar.
- **Phase 3:** The same MRN extracted from phase 1 was extracted again prospectively from December 2022 to September 2023 including Hb A1C, Fasting blood sugar to explore the effect of continuity of care in controlling diabetes.

Data were analyzed by using the SPSS. Continuous variables were expressed as mean \pm standard deviation (SD) and categorical variables were expressed as percentages. The chi-square test is used for categorical variables. A p-value <0.05 was considered statistically significant.

3. Result

The total number of diabetic patients was extracted from health care specialty centre (HCSC) clinic from October to November 2022 were 16493 diabetic patients including some missing laboratory results (FBS and HbA1C) for 5000 patients during this specific period from October to November 2022 secondary to limited duration for the data collection in this study and since the chronic illness clinic just started on October 2022. Unfortunately, after cleaning the data 6209 diabetic patients had only Fasting blood sugar reading before and after starting chronic

illness clinic. While 5284 diabetic patients had only HbA1C reading before and after implanting chronic illness clinic.

In contrast total of 4592 diabetic patients had both fasting blood sugar and HbA1C reading before and after implanting chronic illness clinic. Accordingly, the Age characteristic of these Participants showed a total of 2638 (57.4%) aged 60 years and above and 1954 (42.6%) were below 60 years old, with mean age of 61 +/- SD 10.976. The minimum age in the sample was 24 years old and the oldest participant was 103 years old.

Total of 2758 (44.4%) of involved diabetic patients were uncontrolled by using the fasting blood sugar parameter, after implementing the chronic illness clinic the percentage of uncontrolled diabetes were decreased to 43.7% (**Table 1**).

Table 1. Fasting blood sugar of diabetic participant before and after establishing chronic illness clinic.

Phase 2: FBS before Chronic illness clinic		
	Frequency	Percent
Controlled < 7 mmol/L	3451	55.6%
Uncontrolled ≥ 7 mmol/L	2758	44.4%
Total	6209	100%
Phase 3: FBS After Chronic illness clinic		
	Frequency	Percent
Controlled < 7 mmol/L	3497	56.4%
Uncontrolled ≥ 7 mmol/L	2712	43.7%
Total	6209	100%

Additionally, the percentage of Uncontrolled diabetic patients by using HbA1C was 90.3% (4770), After starting chronic illness clinic the percentage of uncontrolled diabetes decreased significantly to 87.4% (4620) (**Table 2**).

Table 2. HbA1C of diabetic participant before and after establishing chronic illness clinic.

Phase 2: HbA1c before Chronic illness clinic		
	Frequency	Percent
Controlled < 6.5 mmol/L	514	9.7%
Uncontrolled ≥ 6.5 mmol/L	4770	90.3%
Total	5284	100%
Phase 3: HbA1c After Chronic illness clinic		
	Frequency	Percent
Controlled < 7 mmol/L	664	12.6%
Uncontrolled ≥ 7 mmol/L	4620	87.4%
Total	5284	100%

Furthermore, total of 4592 diabetic patients had both fasting blood sugar and HbA1C reading before and after implanting chronic illness clinic, these patients showed an improvement in controlling their diabetes with decreased in percentage from 55% to 53.6% by using FBS parameter. As well as for HbA1C, the percentage decreased from 91.6 % to 89.1% (Table 3).

Table 3. Fasting blood sugar and HbA1C of the same diabetic participant before and after establishing chronic illness clinic.

FBS	before Chronic illness clinic		After Chronic illness clinic	
	Frequency	Precent	Frequency	Precent
Controlled < 7 mmol/L	2067	45%	2130	46.4%
uncontrolled < 7 mmol/L	2525	55%	2462	53.6%
Total	4592	100%	4592	100%
HbA1C	before Chronic illness clinic		After Chronic illness clinic	
	Frequency	Precent	Frequency	Precent
Controlled < 6.5 mmol/L	388	8.4%	501	10.9%
uncontrolled <6.5 mmol/L	4204	91.6%	4091	89.1%
Total	4592	100%	4592	100%

In correlation between the age and control of diabetes after initiating the continuity of care program, 50.9% of patients aged 60 years old and above showed more success in controlling of Diabetes (decrease in reading) compared to 50.2% of patients aged below 60 years old by FBS with p value of <0.112.

In addition, 56.6% of patients aged 60 years old and above were able to reduce their reading compared to only 52.3% among younger participants by using HbA1C, this difference was statistically significant (p value < 0.001) (Table 4).

Table 4. Comparison of control of diabetes after implanting chronic illness clinic by using FBS and HbA1C between patient aged 60 and above and below 60 years old.

FBS			
Age	Success (decrease reading)	Percent	P value
Below 60	981/1954	50.2%	<0.112
Above 60	1344/2638	50.9%	
HbA1C			
Age	Success (decrease reading)	Percent	P value
Below 60	1021/1954	52.3%	<0.001
Above 60	2515/2638	56.6%	

4. Discussion

This study identified the beneficial effects of continuity of care in controlling diabetes, many studies have assessed the effects of continuity of care in diabetes and

health outcomes in other countries such as, Australia, China, united states and Saudi Arabia. Most of these studies showed similar outcomes as the result of this study, that continuity of care has a good impact on controlling diabetes. To the best of our knowledge, there is no study yet conducted in HCSC at national guard hospital, Riyadh, kingdom of Saudi Arabia. A total number of diabetic patients in this study was 16493 including some missing laboratory results (FBS and HbA1C) for 5000 patients during this specific period from October to November 2022, after cleaning the data 6209 diabetic patients had only Fasting blood sugar reading before and after starting chronic illness clinic. While 5284 diabetic patients had only HbA1C reading before and after implanting chronic illness clinic. In contrast total of 4592 diabetic patients had both fasting blood sugar and HbA1C reading before and after implanting chronic illness clinic. The continuity of care program showed significant success in controlling of Diabetes as showed in this study. Among patients aged 60 years old and above showed better control of FBS and HbA1C comparing to these patients below age of 60 years old, therefore the percentage of FBS decreased from 50.9% to 50.2% as well as the percentage of HbA1C decreased from 56.6% to 52.3% respectively.

Many studies showed promising outcomes of continuity of care in achieving better control of Diabetes, prevent the complications, and reduce mortality rate. A prospective cohort study done in five community health centres from 1994 to 1996 on the Texas-Mexico border found that continuity of care with primary care physician is linked to better glucose control by measuring HbA1C on T2DM patients, this link appears to be mediated by change in patients' behaviour regarding diet [7]. Another study done at California in 2000 a cross-sectional study found that patients who is frequently missed their appointment had poor glycaemic control by measuring estimated HbA1C [8].

In previous retrospective cohort study (July 2013-June 2018) conducted in Australia showed adherence to frequent HBA1C testing was related with improve glycaemic control [9]. In Hong Kong China a Systematic review carried out in 2021 showed a strong association between increase continuity of care, reduced mortality rate, complication risks, health service utilization (hospitalization, A&E attendance, healthcare expense, medication expense) and health indicators (mortality rates, complications, HbA1C, BP, Lipd profile and BMI) among DM and/or Hypertension [10].

In contrast, other retrospective study conducted in king Faisal specialist hospital and research centre in Riyadh (2023) showed that no association between continuity of care and improvement of health indicators included (BMI, smoking statues, BP, Past medical history, preventive health screening completed, HbA1C, urine albumin creatine ratio, and lipid profile), the reason behind contradicting findings are the small sample size was 352 patients only and single centre study. Thus, larger sample size provides stronger and more reliable result [11].

There are several limitations of the study. First is the limited duration for the data collection (from April 2022 to September 2023), in addition, the chronic

illness clinic just started on October 2022, second is the accessibility to data extraction from HCSC data base as gender, Optical coherence tomography (OCT) and Albumin creatinine ratio.

5. Recommendation

Since the continuity of care program showed significant effect in controlling diabetes and its complications in multiple previous studies done around the world and supported by this study. Accordingly, it is recommended to implant, keep and expand the continuity of care program in primary health care centres to have better control of diabetes worldwide.

6. Conclusion

Continuity of care enhances care quality, and this has been regularly demonstrated for patients with chronic diseases such as diabetes mellitus. This study found that HbA1c successfully decreased after implanting chronic illness clinic. The significant improvement in the control of diabetic patients followed in primary health care centers reinforce the evidence of the importance of continuity of care, despite limited access to certain data including urine albumin creatine ratio, OCT and gender. Further studies are required to assess the control of diabetes and its complications around several cities in Saudi Arabia.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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