



## Monitoring the standard of care of diabetes mellitus type 2 in a primary health care setting

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### KEYWORDS

Diabetes;  
Standard care;  
Monitoring;  
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**Abstract** *Background:* Complying of diabetic patients with the standard administered medical care at primary health care units is an important issue. Revealing the rates of compliance provide important information that can be used both by the medical staff to evaluate the administered medical care and by the patients to evaluate their efforts to control glycemia and its possible complications.

*Objectives:* Reveal compliance rates of diabetics with targeted levels of medical indicators of diabetes.

*Methods:* Two hundred type 2 diabetic patients from Al-Yarmouk Health Center were randomly selected and followed for 2 years. Four indicators, namely, glycated hemoglobin A1c (HbA1c), microalbuminuria (MA), low density lipoprotein (LDL), and fundus examination (FE) were measured at the start and end of the field period. Age, sex, and nationality of the studied patients were recorded and their association with complying to the studied indicators was illustrated.

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**Results:** The majority of the studied sample were females (53.5%), non-Kuwaitis (56.0%) with a mean age of  $51.2 \pm 8.8$  years. A significant improvement has been achieved for all the targeted indicators. Full complying increased from just 7.5% at the start of the intervention program to 24.6% at the end. The measure with the highest percentage at the end of the program was the control of MA (85.2%) followed by FE (76.6%) while the least controlled indicator was HbA1c (46.4%). Kuwaitis were more likely to control their LDL than non-Kuwaitis by the end of the trial after adjusting for age and gender.

**Conclusion:** Administering standard medical care significantly improved compliance of type 2 diabetics to achieve the targeted level of medical indicators. In view of the low rate of full complying and poor glycemic control, major efforts should be undertaken to substantially increase this rate among all individuals with diabetes.

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## 1. Introduction

The increasing prevalence of diabetes mellitus (DM) and its high burden on health care systems make diabetes mellitus a priority health problem.<sup>1–3</sup> The global burden of the disease was estimated to be 171 million (2.8%) in 2000.<sup>4</sup> The excess global mortality attributable to diabetes, in the same year, was estimated to be 2.9 million deaths, equivalent to 5.2% of all deaths.<sup>5</sup> Diabetes prevalence in some Eastern Mediterranean countries is among the highest in the world. Studies conducted in countries of the region reported high prevalence rates ranging between 7% and 25% among adults.<sup>1</sup> A recent study carried out in Kuwait during 2007 revealed that the overall prevalence rate of DM among adults aged 20–65 years was 12.6%.<sup>6</sup>

Diabetes is a chronic illness that requires continuing medical care and patient self-management education to prevent acute complications and to reduce the risk of long-term complications. Diabetes care is complex and requires that many issues, beyond glycemic control, be addressed. A large body of evidence exists that supports a range of interventions to improve diabetes outcomes. The American Diabetes Association recommended definite standards of medical care that should be administered to diabetics. These standards of care are intended to provide clinicians, patients and researchers with the components of diabetes care, treatment goals, and tools to evaluate the quality of care. The recommendations included are diagnostic and therapeutic actions that are known or believed to favorably affect health outcomes of patients with diabetes.<sup>7</sup>

Recently, the need for information about the quality of care services has increased. Information on treatment outcomes is usually preferred. However, this type of information is often unavailable and may not always be valid for use as a quality indicator.<sup>8</sup> Instead, process measures of quality, derived from clinical practice guidelines, are widely adopted as indicators of quality.<sup>9</sup> Thus the following study was designed to bridge the gap of knowledge in this area. The objectives of this study included revealing the extent of change, whether improvement or deteriorations, of achieving specific clinical targets, namely control of glycated hemoglobin (HbA1c), low density lipoprotein cholesterol (LDL), microalbuminuria (MA), and fundus examination (FE) after 2 years of administering standard medical care to diabetic patients and revealing its relationship to age, gender, and nationality of the patients.

## 2. Subjects and methods

The clinical experimental study design was adopted for this research. This technique allows applying intervention techniques and measuring the required indicators before and at the end of the trial. Although, it is relatively time consuming and needs more effort yet, it is a more powerful design than the other ones.

The study was carried out in Al-Yarmouk Health Center in Kuwait that was randomly selected out of the centers in Capital Governorate. The catchment area of this center includes a definite domestic residence district (Yarmouk) in Kuwait Capital City. The target population of this study were all diabetic patients attending the selected center. Two hundred diabetics were sequentially blindly recruited out of the daily attending diabetic patients.

The study was carried out during June 2006 to June 2009. Patients examination was performed on January 2007 and January 2009. During this period the selected patients were encouraged to regularly attend to the center and continuous health education was carried out about the care required for diabetes and how to avoid complication and adhere to the required standard administered medical care at the center. Inclusion criteria were type-2 diabetic patients attending Yarmouk Health Center for receiving medical care, male or female and any nationality. Newly discovered cases and those depending solely on diet and/or exercise were excluded from the study. The sampling unit was diabetic patient.

A fasting blood sample was aspirated from each patient and analyzed to reveal the fasting blood glucose, HbA1c, and LDL. A urine sample was analyzed for MA. Also FE was carried out by an ophthalmologist. Targeted HbA1c was < 7%, while a level of 2.6 mmol/L and 19 mg/L were adopted for LDL and MA, respectively. Patients' records were revised.<sup>7</sup>

Approval of the Medical Ethical Committee in Kuwait was obtained before carrying out this research. A written consent of the educated patients or a relative for illiterate patients was obtained after explanation of the purpose and importance of the research.

### 2.1. Statistical analysis

The Statistical Package for Social Sciences was utilized for both data entry and analysis. As the size of the file was relatively small, quality of data entry was checked by manual revision of a hard copy. Descriptive statistics were used as frequency,

percentage, arithmetic mean, and standard deviation. Pre-post statistical tests for categorical data were utilized. Multiple logistic regression analysis was also utilized as a multivariate analysis tool to reveal significant predictors after adjustment for other factors. Variables selected for the forward likelihood binary logistic regression were those with  $P$  values  $\leq 0.10$  detected at multiple logistic regression using all predictors. The level of significance adopted for this study was  $P < 0.05$ .

### 3. Results

Table 1 portrays characteristics of the studied diabetic. Age of the studied patients ranged from 33 to 84 years with a mean of  $51.2 \pm 8.8$  years. Females formed 53.5% of the studied patients while non-Kuwaitis constituted 56% of the sample. Table 2 showed medical findings of the participants at the start and end of the follow up period. A significant improvement has been achieved for all the administered types of medical care to the studied patients along the follow up period. The highest ratio of improvement can be observed for fully complying with all the types of medical care "full complying" increasing from just 7.5% at the start of the intervention pro-

**Table 1** Personal characteristics of 200 type-2 diabetic patients.

Characteristics	No.	%
<i>Age</i>		
< 50	93	46.7
50–59	76	38.0
$\geq 60$	31	15.3
<i>Sex</i>		
Male	93	46.5
Female	107	53.5
<i>Nationality</i>		
Kuwaiti	88	44.0
Non-Kuwaiti	112	56.0

gram to 24.6% at the end. The measure with the highest percentage at the end of the program was the control of MA (85.2%) followed by FE (76.6%) while the least controlled indicator was the HbA1c (46.4%).

Table 3 demonstrates the proportions of those who have either improved (controlled) or deteriorated by the end of the research. The highest improved indicator was FE (71.0%) followed by MA (56.1%) and LDL (40.5%). Full complying with the standard medical care indicators showed the least improvement (20.7%) and the highest deterioration (26.7%). The lowest indicator showing deterioration was the LDL control (2.3%).

Studying the factors affecting controlling the studied standard medical indicators showed that only LDL was affected by personal factors. Kuwaiti patients were more likely to control their LDL than non-Kuwaitis by the end of the trial period after adjusting for age and gender as revealed by multiple logistic regression analysis (OR = 0.4, 95% CI: 0.2–0.9).

### 4. Discussion

Globally the prevalence of diabetes is increasing at an alarming rate imposing a large economic burden on the health care system and on families, and the World Health Organization (WHO) in its recent publications has pointed out the need for urgent action to halt the growing threat of this chronic disease.<sup>10</sup>

Many of the complications of diabetes can be prevented through adherence to monitoring guidelines, which include recommendations for evaluation and treatment of elevated glucose levels, hypertension and hypercholesterolemia, and the early detection and treatment of microvascular and macrovascular complications.<sup>11,12</sup> Diabetic persons require not only effective treatment but also continuity of care, and adequate information and support, so that they can achieve self-management to the greatest possible extent. A comprehensive medical care system is needed to meet the complex needs of diabetics. A shift from fragmented healthcare delivery to an organized prevention based multi-component approach is

**Table 2** Medical findings of 200 type-2 diabetic patients at start and end of the study.

Finding	Base line (2007)		End of follow up (2009)		$P$ value
	No.	%	No.	%	
Controlled HbA1c (< 7%)	62	31.0	90	46.5	< 0.001
Controlled microalbuminuria (< 20 mg/L)	141	70.5	161	85.2	< 0.001
Fundus examination	107	53.5	151	76.6	< 0.001
Controlled LDL (< 2.6 mmol/L)	68	34.0	105	53.0	< 0.001
Full complying	15	7.5	49	24.6	< 0.001

**Table 3** Improvement and deterioration of medical findings by the end of the study.

Finding	Improvement		Deterioration	
	No.	%	No.	%
Controlled HbA1c (< 7%)	43/133	32.3	14/61	23.0
Controlled microalbuminuria (< 20 mg/L)	32/57	56.1	3/132	2.3
Fundus examination	66/93	71.0	19/104	18.3
Controlled LDL (< 2.6 mmol/L)	53/131	40.5	15/67	22.4
Full complying	38/184	20.7	4/15	26.7

necessary along with a real partnership between patients and clinicians, and between primary and secondary care.<sup>13–15</sup>

The current study was designed to reveal the impact of administering standard medical care to diabetic patients on their complying with specific targeted medical indicators, namely, HbA1c, LDL, MA, and FE after 2 years of follow up.

The results of the current study revealed that significant improvement could be achieved for the complying of diabetic patients with all of the studied indicators as evidenced by achieving the targeted level of each indicator at the end of the study period. The highest achieved levels of complying were MA, followed by FE, and LDL. Full complying with of the studied indicators (24.6%) and HbA1c were the least complied indicators by diabetic patients. Although three out the studied four indicators showed complying of diabetic patients by the end of follow up yet, only 24.6% complied with the four indicators together. This indicates that just four of them could achieve the final required target. The proportion of diabetics achieving the targeted HbA1c, in this study, is higher than that revealed by a previous study, in Kuwait, that showed that only 17.9% of the studied diabetics could achieve the targeted HbA1c.<sup>16</sup>

Diabetic patients might cope more with their disease and they might achieve a better understanding about the factors that affect their disease. Adherence to the targeted screening examinations, investigations, and pharmacological treatment is necessary to control both the micro- and macro-vascular complications of diabetes.<sup>17–19</sup> Detailed analysis of the current results showed that, large proportions did not comply with the targeted achievements and even some of them could not maintain their controlled indicators, at the start of the study, and lost their control. The highest rates of deterioration were observed for full complying (26.7%), which is higher than the improvement rate (20.7%), followed by HbA1c (23.0%), and LDL (22.4%). MA showed the least deterioration rate (2.3%). This should illustrate the need, not only to encourage and educate diabetics with uncontrolled indicators, but also, to continue caring for and educating those with controlled indicators to continue maintaining their achievement. Failure to comply with the targeted indicators, especially glycemic control can lead to serious complications that add more deteriorations of the health status of the patients and more load and cost on the administered health services.

A complex interplay of both demographic and personality characteristics may influence whether patients comply with achieving the targeted indicators and whether it has a positive impact on full compliance.<sup>20–22</sup> Multivariate analysis of the current study showed that only nationality played a significant role in complying of diabetic patients with the targeted LDL. Kuwaiti patients were more likely to comply with the targeted LDL by end of the follow up period than non-Kuwaitis. Although, it is difficult to explain this finding, however, high attendance rates of Kuwaitis and greater availability of the expensive drugs that improves the level of LDL can be behind this finding.

Administering standard medical care significantly improved compliance of type 2 diabetics to achieve the targeted level of medical indicators. In view of the low rate of full complying and poor glycemic control, major efforts should be undertaken to substantially increasing this rate among all individuals with diabetes. Barriers to increasing attendance and full utilization of available sources should be dealt with and managed. Consistent communication between the patient and health care

professional is essential to effective implementation of comprehensive standard medical care program for diabetics.

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