Physician's Compliance with Diabetic Guideline

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Objective: To assess the blood sugar control of type 2 diabetic patients at primary health care (PHC) setting and physician's compliance to the diabetic guideline.

Setting: Bahrain Defense Force Hospital, Primary Health Care, Bahrain.

Design: A Retrospective Study.

Method: A retrospective analysis of type 2 diabetic patients from January to December 2009 and from January to December 2014 was performed. The following were documented: personal characteristics, history intake, physical assessment, investigations and patients' education. Physician's compliance and glycemic control were assessed.

Result: One hundred ninety-four patients in 2009 and 100 in 2014 were reviewed. In 2009, 123 (63.4%) had two visits to the diabetes clinic, compared to 43 (43%) patients in 2014. In 2009, 18 (9.3%) patients had HbA1c ≤ 6.5% and 14 (14%) patients in 2014.

In 2009, the following were assessed: weight in 175 (90.2%), blood pressure in 187 (96.4%), feet in 185 (95.4%), fundus in 173 (89.2%) and neurological examinations in 157 (80.9%), compared to 2014, 77 (77%), 95 (95%), 47 (47%), 78 (78%) and 44 (44%) respectively.

In 2009, the following investigations were performed: creatinine in 177 (92.1%), lipids in 189 (97.4%), microalbuminuria in 166 (85.6%) and HbA1c in 166 (85.6%) compared to 2014, 100 (100%), 100 (100%), 100 (100%), and 100 (100%) respectively.

Conclusion: Overall physician's compliance with PHC diabetic guideline is 73.2% in 2009 compared to 47% in 2014. The majority of patients had poor glycemic control. Smoking history was rarely documented and foot care advice was given to 11% of the patients.

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The diabetic patient is at an increased risk of cerebrovascular, atherosclerotic cardiovascular and peripheral arterial diseases[1]. The prevalence of diabetes is increasing especially in GCC countries[2]. The six GCC nations rank among the top 12 countries which have the highest incidence of the disease in the world [3].

In Bahrain, the prevalence rate is 44.4% including IGT. A similar study in 1996 revealed nearly the same prevalence[4]. Although this prevalence was based on old World Health Organization (WHO) criteria, it is very high[4]. To reduce the risk of its long-term complications and prevent its acute complications, continuing high-quality medical care and patient self-management education are recommended.

Both United Kingdom Prospective Diabetes Study (UKPDS) trials and Diabetes Control and Complications Trial (DCCT) have shown that intensive glycemic control is associated with reduced rates of retinopathy, nephropathy and neuropathy[5]. Regular recall and review of people with diabetes were shown to improve the outcome[6]. Controlling hypertension in diabetic people was found to reduce the risk of both microvascular complications and cardiovascular disease[7]. Microalbuminuria is an indicator of possible vascular disease and requires aggressive intervention to reduce cardiovascular risk[8]. International guidelines recommended annual screening for microalbuminuria[8-12].

The aim of this study is to assess the blood sugar control of type 2 diabetic patients at primary health care (PHC) setting and physician's compliance to the diabetic guideline.

METHOD

Type 2 diabetic patients were reviewed from January 2009 to December 2009 and from January 2014 to December 2014. Diabetic patients came for refill medications only or medical illnesses other than diabetes; type 1 diabetic patients were excluded from the study.

The following data were documented: sex, age group and the number of visits, history of smoking habits, hypoglycemic episodes, drugs, diet, exercises, weight or BMI, blood pressure, neurological assessment, fundus and feet examination. The

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following investigations were requested: blood creatinine, lipids profile, microalbuminuria and HBA1C.

The data was entered in MS Excel and analyzed using SPSS version 12 in 2009 while in 2014, SPSS version 20 was used. Descriptive Statistics was used to summarize the outcome variables.

RESULT

One hundred ninety-four type 2 diabetic patients were studied in 2009, and 100 patients in 2014. In 2009, 104 (53.6%) patients were female, age ranged from 47-70. One hundred twenty-three (63.4%) had 2 visits in a year, compared to 43 (43%) in 2014, see table 1.

Table 1: Personal Characteristics

Variables		2009	2014
Sex	Males	90 (46.4%)	48 (48%)
	Females	104 (53.6%)	52 (52%)
	Total	**194 (100%)**	**100 (100%)**
Age	<30	1 (0.5%)	1 (1%)
	30-45	28 (14.4%)	12 (12%)
	46-60	108 (55.7%)	49 (49%)
	61-70	49 (25.3%)	32 (32%)
	>70	8 (4.1%)	6 (6%)
	Total	**194 (100%)**	**100 (100%)**
Visits	1	40 (20.6%)	12 (12%)
	2	123 (63.4%)	43 (43%)
	3	30 (15.5%)	40 (40%)
	4	0 (0%)	3 (3%)
	5	1 (0.5%)	1 (1%)
	6	0 (0%)	1 (1%)
	Total	**194 (100%)**	**100 (100%)**

In 2009, 18 (9.3%) patients were documented for smoking history while in 2014, history was documented in 6 (6%) patients, see table 2 and 3. In 2009, hypoglycemic episodes were documented in 117 (60.3%), while in 2014, one (1%) was documented, see table 4. One hundred fifty-six (80.4%) drug history was documented in 2009, while only two (2%) in 2014, see table 5. One hundred sixty-nine (86.6%) diet history was documented in 2009, while in 2014, five (5%) were documented, see table 6. Exercise in 2009 was documented in 160 (82.5%), while in 2014, 7 (7%) were documented, see table 7.

Table 2: History of Smoking

Smoking documented	2009	2014
Documented in all visits	18 (9.3%)	6 (6%)
Documented in some visits	10 (5.2%)	7 (7%)
Not Documented	166 (85.6%)	87 (87%)
Total	**194 (100%)**	**100 (100%)**

Table 3: Percentage of Smoker

Smoking Habit	2009	2014
Smoker	18 (9.3%)	4 (4%)
Non-smoker	6 (3.1%)	4 (4%)
Former Smoker	4 (2.1%)	5 (5%)
Not documented	166 (85.6%)	87 (87%)
Total	**194 (100%)**	**100 (100%)**

Table 4: Hypoglycemic Episodes

Hypoglycemic Episodes	2009	2014
Documented in all visits	117 (60.3%)	1 (1%)
Documented in some visits	53 (27.3%)	10 (10%)
Not Documented	23 (11.9%)	89 (89%)
Not Applicable*	1 (0.5%)	0 (0%)
Total	**194 (100%)**	**100 (100%)**

*Patient is on diet control and exercises only

Table 5: History of Drugs Intake

Drugs History	2009	2014
Documented in all visits	156 (80.4%)	2 (2%)
Documented in some visits	29 (14.9%)	38 (38%)
Not Applicable*	1 (0.5%)	1 (1%)
Not Documented	8 (4.1%)	59 (59%)
Total	**194 (100%)**	**100 (100%)**

*Patient is on diet control and exercises only

Table 6: Diet History

Diet Documented	2009	2014
Documented in all visits	168 (86.6%)	5 (5%)
Documented in some visits	20 (10.3%)	58 (58%)
Not Documented	6 (3.1%)	37 (37%)
Total	**194 (100%)**	**100 (100%)**

Table 7: History of Exercises

Exercises Documented	2009	2014
Documented in all visits	160 (82.5%)	7 (7%)
Documented in some visits	26 (13.4%)	57 (57%)
Not Documented	8 (4.1%)	35 (35%)
Not Applicable*	0 (0%)	1 (1%)
Total	**194 (100%)**	**100 (100%)**

*Due to physical inability

In 2009, weight was documented in 175 (90.2%), see table 8. Blood pressure was documented in 187 (96.4%), see table 9. In 2014, weight was documented in 77 (77%) patients and 95 (95%) had their blood pressure documented, see tables 8 and 9.

Table 8: Weight Assessment

Weight	2009	2014
Documented in all visits	175 (90.2%)	77 (77%)
Documented in some visits	11 (5.7%)	17 (17%)
Not Applicable*	2 (1.0%)	2 (2%)
Not Documented	6 (3.1%)	4 (4%)
Total	**194 (100%)**	**100 (100%)**

*Due to physical inability

Table 9: Blood Pressure

Blood Pressure	2009	2014
Documented in all visits	187 (96.4%)	95 (95%)
Documented in some visits	5 (2.6%)	5 (5%)
Not Documented	2 (1%)	0 (0%)
Total	**194 (100%)**	**100 (100%)**

In 2009, 157 (80.9%) had a neurological assessment, see table 10. One hundred seventy-three (89.2%) had fundus examination, see table 11. One hundred eighty-five (95.4%) had foot examination, see table 12. In 2014, neurological assessment was performed in 44 (44%), fundus examination in 78 (78%), while foot examination in 47 (47%), see tables 10, 11 and 12.

Table 10: Neurological Assessment

		2009	2014
Neurological	**Yes**	157 (80.9%)	44 (44%)
	No	37 (19.1%)	56 (56%)
	Total	**194 (100%)**	**100 (100%)**

Table 11: Fundus Examination annually

		2009	2014
Fundus Examination	**Yes**	173 (89.2%)	78 (78%)
	No	20 (10.3%)	22 (22%)
	Not applicable*	1 (0.5%)	0 (0%)
	Total	**194 (100%)**	**100 (100%)**

*Due to Cataract or Blindness

Table 12: Feet Examination Annually

		2009	2014
Feet Examination	Yes	185 (95.4%)	47 (47%)
	No	9 (4.6%)	53 (53%)
	Total	**194 (100%)**	**100 (100%)**

Creatinine was tested in 177 (91.2%) in 2009, while 100 (100%) patients were tested in 2014, see table 13 and 14. Lipids were assessed in 183 (94.3%) in 2009, while in 2014, 100 (100%) patients were tested, see table 15 and 16. Microalbuminuria was tested in 166 (85.6%) in 2009 and 100 (100%) in 2014 were tested, see tables 17 and 18. HbA1c was tested in 192 (99%) in 2009 compared to 100 (100%) in 2014, see figures 1 and 2.

Table 13: Creatinine Annually

		2009	2014
Creatinine	Yes	177 (91.2%)	100 (100%)
	No	17 (8.8%)	0 (0%)
	Total	**194 (100%)**	**100 (100%)**

Table 14: Reasons for Not Checking Creatinine

	2009	2014
Dr. given request but the patient did not go for the test	1 (5.8%)	0
Dr. given the request in 2009 but the patient done it in 2010	8 (47.1%)	0
Dr. did not give a request	8 (47.1%)	0
Total	**17 (100%)**	**0**

Table 15: Lipids Annually

		2009	2014
Lipids tested	Yes	183 (94.3%)	100 (100%)
	No	11 (5.7%)	0
	Total	**194 (100%)**	**100 (100%)**

Table 16: Reasons for Not Checking Lipids

	2009	2014
Dr. given the request in 2009 but the patient done it in 2010	11 (100%)	0
Total	**11 (100%)**	**0**

Table 17: Microalbuminuria Annually

		2009	2014
Microalbuminuria Tested	Yes	166 (85.6%)	100 (100%)
	No	28 (14.4%)	0
	Total	**194 (100%)**	**100 (100%)**

Table 18: Reasons for Not Checking Microalbuminuria

	2009	2014
Dr. given request but the patient did not do it	7 (25%)	0
Dr. given the request in 2009 but the patient done it in 2010	13 (46.4%)	0
Dr. did not give a request	8 (28.6%)	0
Total	**28 (100%)**	**0**

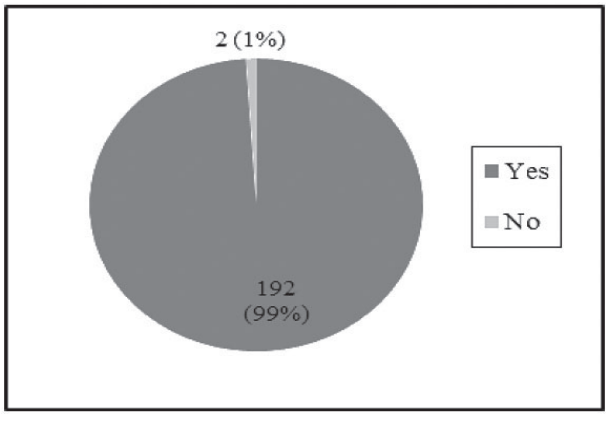

Figure 1: HbA1c in 2009

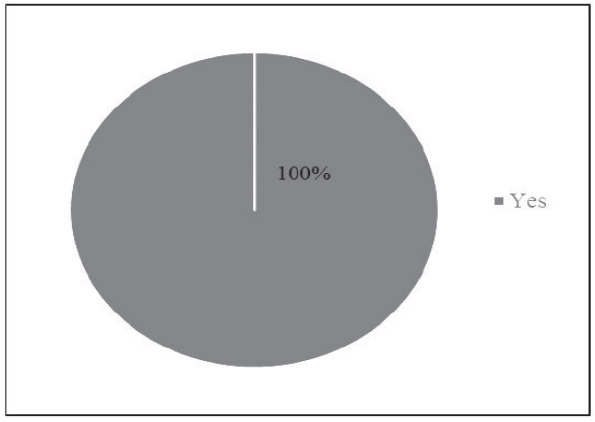

Figure 2: HbA1c in 2014

In 2009, 174 (90.6%) patients were not controlled for their blood sugar and only 18 (9.4%) were controlled, see figure 3; in 2014, 86 (86%) were not controlled and only 14 (14%) were controlled, see figure 4.

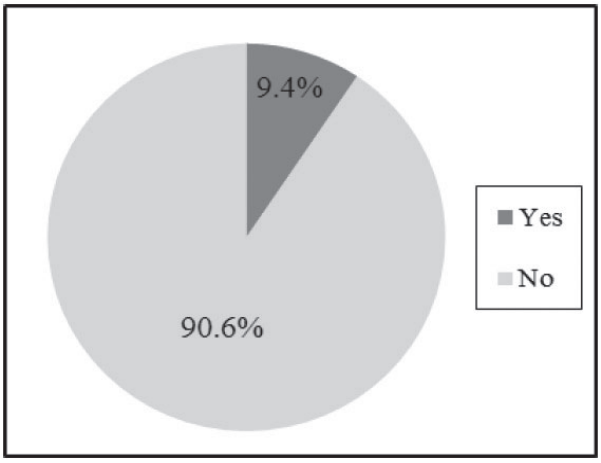

Figure 3: HbA1c <6.5 Glycemic Control in 2009 (N=192)

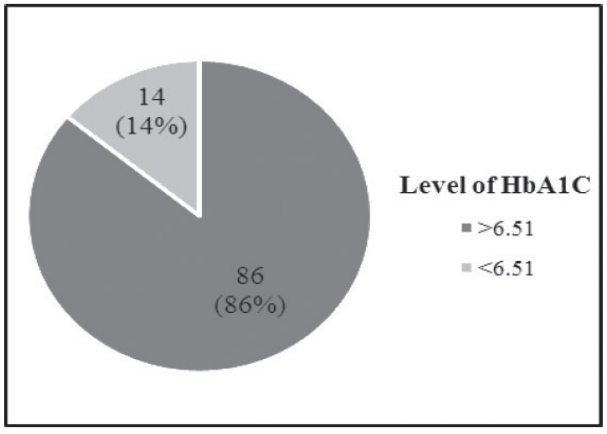

Figure 4: HbA1c <6.51 Glycemic Control in 2014 (N=100)

In 2009, 131 (68.2%) had poor glycemic control (HbA1c 7.51% or more) and 62 (62%) in 2014. In 2009, 43 (22.4%) had fair glycemic control (HbA1c 6.51% to 7.5%) and 24 (24%) in 2014. In 2009, 18 (9.4%) had good glycemic control (HbA1c 6.51% or less) and 14 (14%) in 2014, see figures 5 and 6.

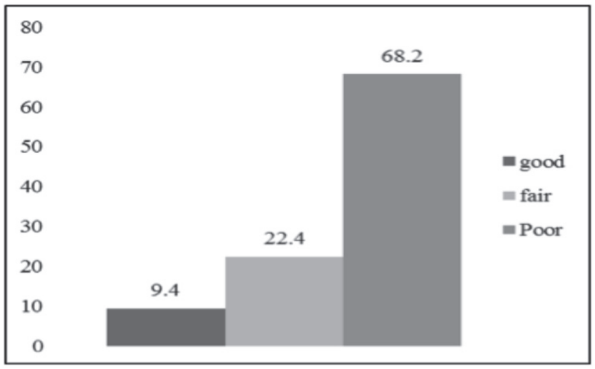

Figure 5: HBA1c Glycemic Control of Diabetes in 2009 (N=192)

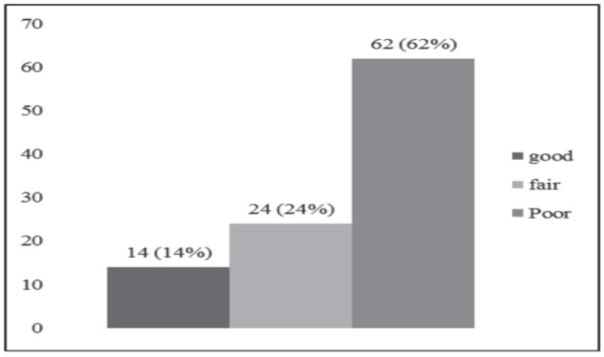

Figure 6: HbA1c Glycemic Control of Diabetes in 2014 (N=100)

If HbA1c<7 had been considered as an indicator of glycemic control, 40 (20.8%) were controlled in 2009 and 152 (79.2%) were uncontrolled; while in 2014, 28 (28%) were controlled, and 72 (72%) were uncontrolled, see figures 7 and 8.

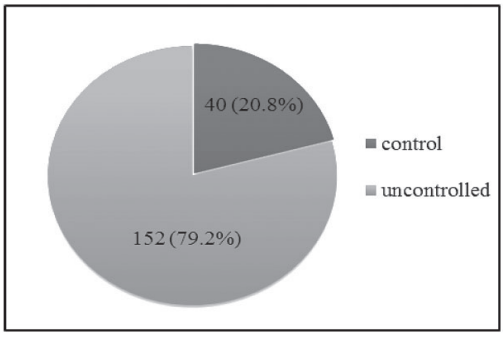

Figure 7: HbA1c<7% Glycemic Control in 2009 (N=192)

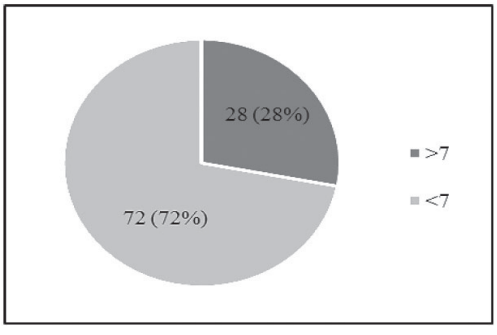

Figure 8: HbA1c < 7% Glycemic Control in 2014 (N=100)

In 2009, only 12 (6.2%) were given advice about smoking, and 189 (97.4%) were given diet advice; while in 2014, none was given advice about smoking and 76 (76%) were given diet advice. In 2009, none was given advice about foot care, while in 2014, 11 (11%) were given foot care advice, see tables 19, 20 and 21.

Table 19: Smoking Advice

Smoking Advice	2009	2014
All visits	12 (6.2%)	0
Some visits	3 (1.5%)	4 (4%)
Not given	169 (87.1%)	4 (4%)
Not applicable	10 (5.2%)	92 (92%)
Total	**194 (100%)**	**100 (100%)**

Table 20: Diet Advice

		2009	2014
Diet Advice	Yes	189 (97.4%)	76 (76%)
	No	5 (2.6%)	24 (24%)
	Total	**194 (100%)**	**100 (100%)**

Table 21: Foot Care Advice

		2009	2014
Foot Care Advice	Yes	0	89 (89%)
	No	194 (100%)	11 (11%)
	Total	**194 (100%)**	**100 (100%)**

DISCUSSION

It was found that the diabetic patients had two visits to PHC clinic annually, and probably that was not sufficient for physicians to assess what is required in the guidelines.

Documenting history of drugs intake, diet control and exercises were 80.4%, 86.8% and 82.5%, respectively in 2009; there was good compliance in taking the history of hypoglycemic episodes, but poor compliance in taking smoking history. Unfortunately, there was poor physician compliance in documenting the history of drug, diet control and exercise of diabetic patients in 2014.

Physician's compliance with physical assessment is 90.4%. There was excellent physician's compliance in assessing weight or BMI in 2009 and 2014. Another study in Bahrain revealed that 4.7% weight or BMI was performed in the initial visit of newly diagnosed diabetic patients[13]. Another study revealed 71.8% of weight or BMI was performed[14]. Blood pressure assessment was 96.4% in 2009 and 95% in 2014. Other studies revealed compliance of 49.2%, 67.2% and 83%[13-15].

Fundus examination was 89.2% in 2009 and 78% in 2014 compared to 9.1% in the previous study in Bahrain in 2005 and 53% in Bosnia and Herzegovina and 64.6% in England[13,14,15]. Feet examination was 95.4% in 2009 and 47% in 2014 compared to 0.2% in a previous study in Bahrain, 53.4% in Bosnia and Herzegovina and 64.6% in England[13-15]. Neurological assessment was 80.9% in 2009 and 44% in 2014 compared to 35% in Bosnia and Herzegovina[14]. It was noticed that 100% of patients are having good peripheral pulsations of feet although 80% of them have uncontrolled blood sugar, and none of them was referred to vascular surgery.

Physician's compliance in doing full investigations of the patients was 92.5% in 2009 and 100% in 2014. Creatinine was requested for 95.3% of patients, but only 91.2% did the test in 2009 and 100% in 2014 compared to 60.4% in Bosnia and Herzegovina[14]. One hundred percent of patients were given request for lipid assessment, but only 94% did the test in 2009 compared to 75% in Bosnia and Herzegovina[14]. In 2009, 93% of patients were given request for microalbuminuria, but only 85.6% did the test, while in 2014, 100% did the test compared to 48.1% in Bosnia and Herzegovina[14]. HbA1c was assessed in 99% compared to 26% in Bosnia and Herzegovina[14].

Glycemic control was 9.4% in 2009 and 14% in 2014 if HbA1c $\leq$ 6.5% according to the PHC diabetic guideline. The majority of the studies considered HbA1c $\leq$ 7% as an indicator of glycemic control. The glycemic control of HbA1c $\leq$ 7% was 20.8% in 2009 and 28% in 2014 which is similar to 24.7% in Saudi Arabia, 34.9% in Jordan and 29% in Malay Singapore[16-18]. The Mean ± SD of HbA1c was 8.39±1.67 compared to Saudi Arabia mean ± SD of HbA1c was 8.97±2.2[16].

The study is limited because it is retrospective; the data were collected from medical records of diabetic patients, in which, the accuracy depends on the written record or recall of individuals, it is difficult to control the bias in such study.

The study had revealed that type 2 diabetes knowledge guidelines improve the clinical care of patients and provide better glycemic control, thus, lower the number of chronic complications; therefore, it has an important impact on the cost of healthcare. However, continuous education of physicians to adhere to the guidelines should be recognized as a necessity rather than an individual optional behavior.

CONCLUSION

Overall physician's compliance with PHC diabetic guideline was 73.2% in 2009 and 47% in 2014. Physicians were fairly compliant with history of drugs intake, diet control, hypoglycemic episodes, physical assessment and laboratory investigations, but poorly compliant with foot care, history of smoking and quitting advice. Glycemic control of the studied group was inadequate.

We recommend that the diabetic patient have 4-5 visits per year, diabetic nurse to educate patients, establish a checklist for history, general assessment, investigations and prepares educational materials.

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Competing Interest: None. **Sponsorship**: None.

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