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Quality of diabetes care in family medicine practices in eastern Bosnia and Herzegovina

Maja Račić[a,*], *Srebrenka Kusmuk*[a], *Srđan Mašić*[a], *Siniša Ristić*[a], *Nedeljka Ivković*[a], *Ljubica Djukanović*[b], *Djordje Božović*[a]

[a] *University of East Sarajevo, Faculty of Medicine Foča, Studentska 4, Foča, Bosnia and Herzegovina*
[b] *University of Belgrade, Faculty of Medicine, Suboticeva 10, Belgrade, Serbia*

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ABSTRACT

Objectives: In the present study, the audit of medical files of patients with diabetes, followed in family medicine practices in the eastern region of Bosnia and Herzegovina (BiH), was carried out in order to investigate the frequency of the use of screening tests for early diagnosis of diabetes complications.
Methods: The audit was conducted in 32 family medicine practices from 12 primary health care centers in the eastern part of BiH over one-year period (March 2010 to March 2011). A specially established audit team randomly selected medical files of 20 patients with diabetes from the Diabetes Registry administered by each family medicine team database. Screening tests assessed are selected according to the ADA guidelines.
Results: Frequency of the individual screening test varied between 99%, found for at least one blood pressure measurement, and 3.8% for ABI measurement. When the frequency of optimal use of screening was analyzed, only 1% of patients received all recommended screening tests.
Conclusion: The frequency of the use of screening tests for chronic diabetes complications was found to be low in the eastern part of Bosnia and Herzegovina. Multivariate linear regression analysis showed that longer duration of diabetes and a larger number of diabetics per practice were associated with a smaller number of screening tests, but specialists in family medicine provided a higher number of screening tests compared to other physicians.

1. Introduction

Diabetes mellitus is a common chronic illness, which is associated with many chronic complications. Diabetes was found to be the leading cause of renal failure, the second commonest cause of lower limb amputation, and the leading cause of blindness in working age group [1,2]. Screening practices to detect the early stage of chronic complications of diabetes effective and recommended by evidence based guidelines [3–9].

The American Diabetes Association (ADA) recommends that all persons with diabetes should receive the set of screening tests in an effort of early detection of chronic complication and of reducing their impact on disease outcome.

For nephropathy screening, an annual testing of urine albumin excretion and serum creatinine measurement are recommended. Screening for microalbuminuria by measuring

* *Corresponding author at*: Studentska 4, 73300 Foca, Bosnia and Herzegovina. Tel.: +387 65 593 714; fax: +387 33 719 336.
E-mail addresses: majaracic@excite.com, majaivan@bih.net.ba (M. Račić).

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the albumin-to-creatinine ratio in a random spot urine collection was found to have sufficient accuracy and predictability and is more convenient than 24-h or timed urine collections [10–12].

Retinopathy screening should include an initial dilated and comprehensive eye examination by an ophthalmologist shortly after the diagnosis of diabetes and subsequent annual examinations. Less frequent exams (every 2–3 years) may be cost effective in patients with well-controlled type 2 diabetes and those with one or more normal eye examinations. Examinations will be required more frequently if retinopathy is progressing [13,14].

Diabetic peripheral neuropathy (DPN) should be screened annually using tests such as pinprick sensation, vibration perception 10-g monofilament pressure sensation at the distal plantar aspect of both big toes and metatarsal joints, and assessment of ankle reflexes. Combinations of more than one test have >87% sensitivity in detecting DPN. Loss of 10-g monofilament perception and reduced vibration perception predict foot ulcers. The symptoms and signs of autonomic dysfunction should be elicited carefully during the history and physical examination [15–18].

Initial screening for peripheral artery disease (PAD) should include a history for claudication, foot examination and an assessment of the pedal pulses. A diagnostic of ankle-brachial index (ABI) should be performed in any patient with symptoms of PAD. Due to the high prevalence of PAD in patients with diabetes and its asymptomatic course ADA consensus statement suggested screening of ABI in patients over 50 years of age and in younger ones who have other PAD risk factors (smoking, hypertension, hyperlipidemia, or duration of diabetes >10 years) [7,8,19].

Although the recommendations of the guidelines are based on clinical evidence and accepted by the medical community, it has been reported that few patients obtained all recommended screening tests [4,20]. In the present study, the audits of medical files of patients with diabetes, followed in family medicine practices in the eastern region of the Republic of Srpska, Bosnia and Herzegovina, was carried out in order to investigate the frequency of the use of screening tests for early diagnosis of diabetes complications.

2. Methods

The audit was conducted in 32 family medicine practices from 12 primary health care centers in the eastern part of the Republic of Srpska, BiH. The sample size for the audit population of 6032 patients with diabetes included in regional Diabetes Registry, with the confidence interval of 3.7% and confidence level of 95% was calculated to be 629.

An especially established audit team randomly selected medical files of 20 patients with diabetes from the Diabetes Registry administered by each family medicine team database. Patients were registered as patients with diabetes mellitus if they had two fasting plasma glucose levels above 7.8 mmol/l or two random plasma glucose levels above 11.1 mmol/l. and/or were treated with insulin and/or oral hypoglycemic agents. Patients with an established cardiovascular disease and renal failure were excluded from the audit.

In the analytical database, patient records were pseudonymised so individuals cannot be identified and access to the database was controlled by the Committee for Science and Research of Medical Faculty Foča, University of East Sarajevo. The study was approved by the Ethics Committee of the Medical Faculty Foča.

In addition to the data on the patient characteristics (age, gender, years of diabetes, type of diabetes, type of treatment and level of education), and their average serum levels of glucose, Hb1Ac, total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides, the physician characteristics (gender, age, years of practice, specialty) and their practice characteristics (number of registered patients, number of patients with diabetes, environment of practice) were registered. Screening tests assessed were selected according to the ADA guidelines 2010 [7] and included: blood pressure, body mass index (BMI), urine protein analysis, serum creatinine, dilated eye examination, foot examination, screening for distal symmetric polyneuropathy (DPN) and ankle-brachial index (ABI).

According to ADA recommendations [7,8], A1C <7%, BP <140/80 mmHg (previously BP < 130/80 mmHg), total cholesterol level <4 mmol/l, HDL > 1.0 mmol/l in men and 1.3 mmol/l in women, LDL < 2.6 mmol/l, triglycerides <1.7 mmol/l and BMI $\leq$25 kg/m^2 were defined as target values.

To evaluate the barriers to high-quality diabetes care, the Delphi technique with three iterative questionnaires was used. Thirty-two physicians and 62 nurses were asked to fill the first questionnaire on barriers to achieving better quality of diabetes care and to the implementation of the recommended screening tests for chronic diabetes complications in their practice. The answers to the first questionnaire were summarized and analyzed individually and the second, more structured questionnaire was designed. In the second questionnaire, the study participants were asked to rank the importance of each response from the previous survey by using Likert scale. In the third questionnaire, the participants were asked to express their agreement or disagreement with the group assessment and to provide their comments. During all three phases, the participants were individually informed about the objectives and principles of Delphi technique.

2.1. *Statistical analysis*

The analysis considered screening from two perspectives: the use of individual screening and screening practices at the optimal level. According to the ADA guidelines, patients who received all eight screening tests in the last year were considered as patients obtaining appropriate and optimal screening.

Data are expressed as mean values and standard deviations or as frequencies. Frequencies of the use of individual screening tests and screening practice at the optimal level are presented. Variables were compared among the groups by a two-way analysis of variance (ANOVA), *t*-tests, Tukey's multiple comparisons test, Wilcoxon test, Kolmogorov–Smirnov test and a chi-square test, as appropriate. The association between the frequency of screening test and the patient, the physician and practice characteristics was analyzed by using ANOVA and a multivariate linear regression analysis in addition. The variables that were included in the model were as follows: patient age, gender, education and type, duration,

Table 1 – Mean values of tested variables and number and percent of patients with recommended target levels.

Variable	Mean ± SD	Threshold	*n*	%
Serum glucose	9.3 ± 3.45	≤7 mmol/l	620	29.5
HbA1c	8.3 ± 1.15	≤7%	459	25
Blood pressure, Systolic	136 ± 18.63	140/80 mmHg	616	63
Blood pressure, Diastolic	82.4 ± 8.94			
Total cholesterol	5.98 ± 1.51	<4 mmol/l	547	8.2
HDL-cholesterol	0.85 ± 0.5	>1.0 mmol/l in men, 1.3 in women	209	48
LDL-cholesterol	4.63 ± 1.52	<2.6 mmol/l	209	35
Triglycerides	3.64 ± 1.52	<1.7 mmol/l	402	14
BMI	28.44 ± 4.78	<25 kg/m^2	546	25.3

treatment of diabetes as well as physician's age, gender, education, years of experience, size of practice, number of patients with diabetes per practice, practice environment. The variables that had a significant relationship with the number of screening tests in a univariate analysis ($P < 0.10$) were included in the multivariate regression analysis to determine independent determinants. The P values of less than 0.05 were considered as statistically significant.

Statistical analyses were carried out using SPSS 20 (SPSS Inc., Chicago, IL, USA).

3. Results

The audit included medical files of 624 adult patients with diabetes, selected in 32 family medicine practices. Sixteen patients were excluded from the study due to the presence of either CAD or chronic kidney disease.

In the analyzed year, the target level of glucose was found in 183 (29.5%) patients, while the mean glucose level in audited group was 9.30 mmol/l. HbA1C was measured in 459 (74%) patients and the target level of HbA1c ≤ 7% was found in 115 (25%) patients. The outcome score of blood pressure of ≤140/80 was reached in 393 (63%) patients. Total cholesterol was measured in 547 (88%) with the mean value of 5.98 mmol/l and outcome score of <4 mmol/l reached by 45 (8.2%) of the tested patients. The target HDL value was found in 101 (48%), LDL value in 73 (35%) and triglycerides value in 56 (14%) of patients. The mean BMI was 28.4 kg/m^2 and outcome score of BMI ≤ 25 kg/m^2 was achieved by 158 (25.3%) patients (Table 1).

When the frequency of optimal use of screening was analyzed, only 1% of patients received all recommended screening tests (Fig. 1). Frequency of the individual recommended laboratory and screening test varied between 99%, found for at least one blood pressure measurement, and 3.8% for ABI measurement (Table 2). In Table 2, the level of evidence that supports recommendation of each of the recommended tests are also presented showing that the B level of evidence was given for the majority of tests, but the frequency of the tests performed varied between 25% and 99%. Nevertheless, the screening of smoking status (the A level of evidence) was done in all patients, and ABI (the C level of evidence) was the test with the lowest frequency.

The mean number of patients registered with an individual family medicine practice was 2023, and the mean number of patients with diabetes was 214. The mean age of the selected patients was 59.9 years, with a slight majority of the patients being females 359 (58%). All patients visited their family physician in the previous year for regular check-ups.

Table 3 presents the relation between the frequency of screening tests performed and the patient, physician and practice characteristics. No statistically significant difference

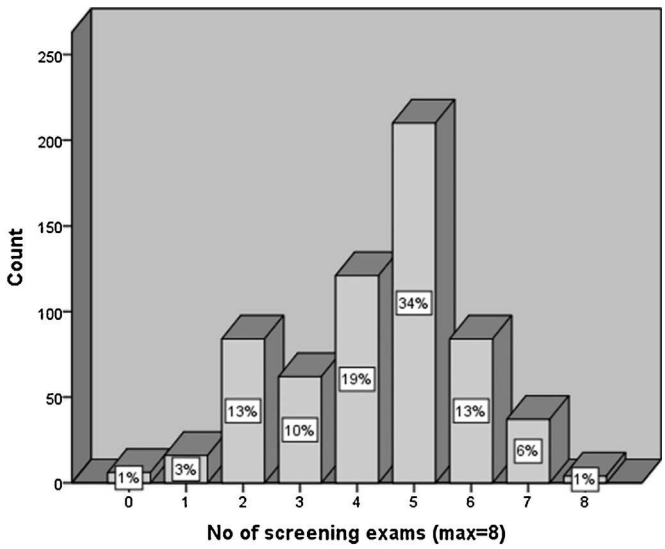

Fig. 1 – Distribution of patients according to the number of screening tests received.

Table 2 – Number (%) of patients receiving recommended laboratory and screening test and level of evidence that supports the recommendation of each test according to ADA guidelines [7].

Screening test	No. (%) of tested patients	Level of evidence
A1c	459 (74)	B
S-total cholesterol	547 (88)	B
S-HDL cholesterol	209 (34)	B
LDL cholesterol	209 (34)	B
Triglycerides	402 (64)	B
Blood pressure	616 (99)	B
BMI	546 (88)	B
Spot urine test	243 (39)	B
S-creatinine	299 (48)	E
Eye examination	362 (58)	B
Foot examination	436 (70)	B
Distal symmetric polyneuropathy	158 (25)	B
Ankle-brachial index	24 (3.8)	C
Smoking	634 (100)	A

in the average number of screening tests per different age was found. The receipt of screening tests was not strongly associated with patient's level of education, type of treatment and years of diabetes. Women and the patients with type 2 diabetes were more likely to receive screening tests compared to men and the patients with type 1 diabetes.

The average number of screening tests was not strongly associated with physician's gender. The physicians with completed vocational training in family medicine, belonging to the age group of 36–40 years and with the years of experience in the range between 11 and 15 were more likely to provide larger number of screening test for their patients compared to the other groups. The relationship was not observed between the size, the environment of the practice and the frequency of the use of screening tests. However, the physicians with the less than 100 diabetes patients, registered with their practice, provided more screening tests compared to the physicians with the larger number of diabetes patients (Table 3).

The univariate/multivariate linear regression analysis was used to find independent factors associated with the frequency of screening tests performed. The results of the multivariate regression analysis presented in Table 4 show that the duration of diabetes, physician's level of education and the number of diabetic patients per practice are associated with the number of screening tests performed. Longer duration of diabetes and a larger number of diabetics per practice were associated with a smaller number of screening tests, but specialists in family medicine provided a higher number of screening tests compared to other physicians.

Barriers to achieving better quality of care for diabetic patients experienced by physicians and nurses employed in the audited family practices are presented in Table 5. All physicians (100%) and 46 (74%) nurses declared that the main barrier was the under-funding of health services, but a high percentage of physicians also considered the lack of time that could be dedicated to the patient to be a significant barrier.

4. Discussion

The audit of medical files of 624 patients with diabetes presented here showed that the use of screening measures varies widely. While a large percentage of diabetes patients received an assessment of BMI (88%) and BP (99%), smaller percentage received spot urine tests (39%) and screening for DPN (25%). Less than 1% of the study population received all recommended screening tests. Target HbA1c, LDL, HDL, triglycerides and BMI values were reached in only small percentage of patients.

Discrepancies between guidelines recommendations and clinical practice in our region was evident and similar was found by other authors. Thus, blood pressure was measured on each visit to the family physician in 67.2% of the diabetes patients in western parts of BiH [21], 93.5% in the USA [22] and 83% in the UK [23]. The percentage of patients with BMI measurement (88%) was higher and the percentage of foot examination was similar to the findings of the relevant international studies [22–25], but still higher compared to 53.4% in western parts of BiH [21]. On the other side, despite to the high percentage of our patients with measured BP, BMI and cholesterol, the percentage of patients that reached target levels of these parameters was much lower. Hb1Ac $\leq$ 7 mmol/l was achieved in 25% of patients what is similar to the findings of other studies conducted in BiH [26,27]. Recently published data from eight European countries showed positive trends in Europe in relation to meeting targets for the management of people with diabetes, but the level achieved is still not satisfactory and requires further improvement [28]. No association between the reached target levels, the age of patients and the use of screening tests was found. Hjelm and colleagues [29] found female diabetes patients to be more active in self-care and preventive care. A bivariate analysis in the present study showed that women are significantly more likely to receive recommended tests, but in a multivariate analysis gender was not appeared as significant independent factors associated with frequency of screening tests performed.

The results indicate that a large proportion of persons with type 1 diabetes are not screened at the optimal level, and that the frequency of the screening tests used in this subpopulation of diabetes patients was lower compared to type 2, what is in accordance with other studies [21]. Different had demonstrated the difference in service provision by specialist compared to generalist physicians, with higher use of preventive services and poorer glycemic control found in patients who receive their diabetes care from primary care providers [30–32]. However, many of type 1 diabetes patients in BiH rely on endocrinologist, not on their family physician, for majority of their care. Both bivariate and multivariate analysis presented here demonstrate that the vocational training in family medicine (compared to GPs without vocational training or the specialists, such as internists, occupational health specialists, gynecologists, pulmonologists, with additional professional training in family medicine) was significantly associated with the higher frequency of screening test used. All five family medicine departments in BiH put a lot of efforts aimed at disseminating evidence-based clinical care guidelines through problem-based learning models and academic detailing

Table 3 – Association between frequency of screening and patient, physician and practice characteristics.

Characteristic	Subdivision	Number of screening tests			P-value
		0–2	3–5	6–8	
Patient's age	<40	10[a]	47	0	0.1709
	40–49	7	43	5	
	50–59	24	105	71	
	60–69	42	54	60	
	>70	24	142	20	
Patient's gender	Female	24	224	108	0.0001
	Male	82	169	17	
Diabetes years	1–5	44	38	5	0.3053
	6–10	10	88	25	
	11–20	25	200	94	
	>20	27	66	2	
Diabetes Type	Type 1	32	41	2	0.0402
	Type 2	74	352	123	
Diabetes Treatment	Insulin only	32	41	2	0.1504
	Oral agents only	50	241	55	
	Oral agents + insulin	24	111	70	
Patient's education	Primary school	79	131	15	0.1934
	High school	17	99	26	
	University education	10	163	84	
Physician's education	GP	49	98	23	0.0403
	FM specialist	0	195	90	
	Other specialist	57	100	12	
Physician's age	<30	15	68	6	0.0001
	31–35	15	61	48	
	36–40	22	137	42	
	41–50	9	82	24	
	>51	45	45	5	
Physician's years of experience	1–5	15	68	6	0.0001
	6–10	15	61	48	
	11–15	22	137	42	
	16–20	9	82	24	
	>21	45	45	5	
Size of practice	1000–1500	5	109	83	0.3657
	1500–2000	13	125	28	
	2001–2500	24	66	4	
	>2500	64	93	0	
Environment	RURAL	51	267	107	0.14
	URBAN	55	126	18	
Physician's gender	Female	22	134	106	0.65
	Male	84	259	19	
Number of patients with diabetes per practice	<100	12	251	108	0.0340
	101–200	10	67	13	
	201–300	16	41	4	
	>300	68	34	0	

[a] Number of tested patients are presented.

(one-on-one physician education) to residents on a regular basis, what probably yielded better frequency of screening for the patients treated by the specialists in family medicine [33,34]. These dates particularly highlight the need to center diabetes care and complications screening in primary care setting, empowered by good education in a field of diabetes.

The level of patient's education, type of treatment, physician' gender, size of practice and practice environment were not associated with the frequency of screening tests use. Bivariate analysis revealed an inverse relationship between the number of years that a physician has been in practice and the quality of provided care but multivariate analysis did not select this variable as the factor significantly associated with frequency of screening tests. Nonetheless this particular result underlines the necessity for a comprehensive analysis to determine the relevant factors that lead to deterioration of medical services provided by experienced and older physicians, and find the way and the means through additional

Table 4 – Factors associated with number of screening tests performed.

	Unstandardized coefficients		Standardized coefficients	t	p	95.0% Confidence interval for B	
	B	Std. error	Beta			Lower	Upper
Duration of DM, years	−0.024	0.012	−0.076	−1.985	0.048	−0.047	0.000
Physician education, GP	−0.135	0.143	−0.045	−0.940	0.348	−0.416	0.147
Physician education, FM	0.435	0.127	0.160	3.435	0.001	0.186	0.684
No of DM patients per practice	−0.164	0.049	−0.145	−3.328	−0.001	−0.261	−0.067
Constant	5.133	0.161		31.803	<0.000	4.816	5.450

training and quality improvement interventions in order to eradicate or at least minimize the effects of these factors [35].

The level of optimal use of screening in this report of 1%, was much lower than that noted in other studies [36–38]. The difference seen in the frequency of optimal screening practices in this report and the literature may be explained by the difference in definition of the optimal level of screening used in the reports. Despite these differences, the present and previous reports all indicate that large proportions of the diabetes population are not receiving optimal level of screening. The results presented indicated that guidelines alone are not sufficient to improve the screening rate of chronic complications and that there might be different external barriers to care that impact preventive service utilization and outcomes in patients with diabetes. The quality of care may be less an issue of individual physician or patient characteristics rather than a function of the settings in which they practice.

A majority of physicians and nurses included in this research stated that the under-funding of health services barriers were main barriers to the implementation of the screening program. Very often, family physicians, as the gatekeepers of health care systems, are forced to manage the payment contract carefully, which requires a cost-effective planning of medical services. The part of contract concerning laboratory services is, as experienced by family physicians, far too insufficient to cover the costs of all recommended screening testing, especially where the number of diabetes patients registered with family practice is oversized.

Primary care physicians in particular are faced with sicker, more demanding patients, increased costs and regulatory requirements, and are constantly pressured to see more patients. Multivariate analysis revealed that the larger number of diabetics per practice was significantly associated with a smaller number of screening tests. In the absence of sufficient consultation time and the absence of good record keeping, which has a recall system that can remind the physician about the status and timing of patients' referral, physicians easily miss referring the patients for the screening testing. As the lack of time is one of significant factors affecting the use of recommended screening tests, it could be proposed that physicians focus their attention on those tests with the highest level of evidence. The results presented really showed that the screening of smoking status with the A level of evidence was done in all patients, and ABI with the low level of evidence (C) was the test with the lowest frequency. However, the measurement of serum creatinine level, the test available in the majority of primary care services, has the lowest level of evidence but it was done in 48% of the patients. In addition, the majority of the tests recommended have the B level of evidence and their frequency varied between 25% and 99%. It seems that the availability of the tests has a greater influence on their use than the level of evidence.

Sixty-one percent of physicians and nurses included in the audit find that patients' lack of acceptance of diabetes as a chronic illness represents a significant barrier to the quality of care. Although current data are sparse and not without limitations, the general consensus is that patient awareness of diabetes chronic complications is unacceptably low.

The findings in this report indicate a need for an improved screening awareness among primary care providers and a focus on enhancing screening practices among males and persons with other cardiovascular factors present. Measurement and evaluation of screening practices for diabetes patients, the fundamental purpose of this research, provide important information that can be used to develop further diabetes management strategies

Table 5 – Barriers to achieving better quality of care as experienced by physicians and nurses employed in audited family practices.

Statement	Physicians, *n* (%)	Nurses, *n* (%)	Total, *n* (%)
Lack of time	27 (84)	28 (45)	55 (58)
Lack of patient's acceptance	12 (38)	45 (69)	57 (61)
Poor way to 'recall' or track the patients	26 (81)	45 (73)	71 (76)
Under-funding of health services	32 (100)	46 (74)	78 (83)

Conflict of interest statement

The authors declare that there is no conflict of interest.

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