ЭПИДЕМИОЛОГИЯ ДИАБЕТИЧЕСКОЙ РЕТИНОПАТИИ В РОССИЙСКОЙ ФЕДЕРАЦИИ ПО ДАННЫМ ФЕДЕРАЛЬНОГО РЕГИСТРА ПАЦИЕНТОВ С САХАРНЫМ ДИАБЕТОМ (2013–2016 ГГ.)

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ОБОСНОВАНИЕ. Диабетическая ретинопатия (ДР) является одной из наиболее частых причин развития слепоты у больных сахарным диабетом (СД), что обусловливает актуальность изучения эпидемиологических характеристик данного осложнения в Российской Федерации (РФ).

ЦЕЛЬ. Оценить эпидемиологические характеристики развития ДР и слепоты у взрослых пациентов СД 1 (СД1) и СД 2 типа (СД2) в РФ в динамике за период 2013–2016 гг.

МЕТОДЫ. Объектом исследования является база данных Федерального регистра СД – 81 региона РФ, включенных в систему онлайн-регистра. Оценивались показатели на 10 тыс. взрослых больных СД (>18 лет).

РЕЗУЛЬТАТЫ. В 2016 г. распространенность ДР в РФ составила: СД1 – 38,3%, СД2 – 15,0% с выраженными межрегиональными различиями 2,6–66,1%, 1,1–46,4% соответственно. Распространенность ДР в РФ в динамике 2013→2016 гг. составила: СД1 – 3830,9→3805,6; СД2 – 1586,0→1497,0/10 тыс. взрослых. Динамика новых случаев ДР/год имела тенденцию к повышению: СД1 – 153,2→187,8; СД2 – 99,7→114,9. Структура новых случаев ДР в 2016 г.: непролиферативная стадия СД1 – 71,4%, СД2 – 80,3% препролиферативная – 16,4%/13,8%, пролиферативная – 12,1%/5,8%, терминальная – 0,2%/0,1% при СД1/СД2 соответственно, что свидетельствует о преимущественном выявлении ДР на ранней стадии. Средний возраст развития ДР увеличился: СД1 – на 1,2 года, СД2 – на 2,6 года. Средняя длительность СД до диагностики ДР увеличилась: при СД1 – 9,6→13,1 лет, при СД2 – 6,0→9,1 лет. Распространенность слепоты имела тенденцию к снижению: СД1 – 92,3→90,8, СД2 – 15,4→15,2/10 тыс. взрослых, однако отмечено увеличение новых случаев слепоты/год: СД1 – 4,3→4,6, СД2 – 1,2→1,4/10 тыс. взрослых. Средний возраст развития слепоты увеличился: СД1 – 39,1→41,6 лет, СД2 – 64,4→67,4 лет; длительность СД до развития слепоты (от момента постановки диагноза СД) также увеличилась: СД1 – 20,2→21,2 лет, СД2 – 10,7→11,3 лет. Отмечено увеличение частоты проведения всех методов лечения ДР (лазерной коагуляции сетчатки (ЛКС), витрэктомии, ингибиторов фактора роста эндотелия сосудов VEGF), однако их использование при СД2 примерно в 2 раза реже по сравнению с СД1.

ЗАКЛЮЧЕНИЕ. В РФ отмечено снижение общей частоты развития поражения глаз при СД (ДР и слепоты) в анализируемый период. ДР и слепота развивались в более позднем возрасте и при большей длительности СД. В качестве основных направлений развития офтальмологической помощи при СД с целью профилактики развития новых случаев потери зрения требуются стандартизация оказания первичной специализированной помощи в регионах, унификация алгоритмов обследования и методов ранней диагностики, повышение преемственности и взаимодействия эндокринологов и офтальмологов при ведении пациентов с СД.

КЛЮЧЕВЫЕ СЛОВА: сахарный диабет; Федеральный регистр сахарного диабета; диабетическая ретинопатия; слепота

TRENDS IN THE EPIDEMIOLOGY OF DIABETIC RETINOPATHY IN RUSSIAN FEDERATION ACCORDING TO THE FEDERAL DIABETES REGISTER (2013–2016)

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BACKGROUND: Diabetic retinopathy (DR) is one of the most common causes of blindness in patients with diabetes mellitus (DM) that is why it's necessary to study the epidemiological characteristics of this complication.

AIMS: The aim of the study was to evaluate the epidemiological characteristics of DR and blindness in adult patients with type 1 (T1) and 2 (T2) diabetes in Russian Federation (RF) for period 2013–16years.

MATERIALS AND METHODS: Database of Federal Diabetes register, 81st regions included in the online register. Indicators were estimated per 10,000 adult DM patients (>18years).

RESULTS: In 2016 the DR prevalence in RF was T1 38,3%, T2 15,0%, with marked interregional differences: 2,6–66,1%, 1,1–46,4%, respectively. The DR prevalence within 2013→2016 years was: T1 3830,9→3805,6; T2 1586,0→1497,0. Trend of new

Received: 02.08.2018. Accepted: 18.08.2018.

DR cases/per year increased: T1 153,2→187,8; T2 99,7→114,9. The structure of new cases of DR in 2016: non-proliferative stage (T1 71,4%, T2 80,3%), pre-proliferative stage 16,4%, 13,8%, proliferative 12,1%, 5,8%, terminal 0,2%, 0,1%, respectively, these data indicated the earlier detection of DR. The mean age of DR diagnosis increased: T1 by 1,2 years, T2 by 2,6. The average DM duration of DR determine increased T1 9,6→13,1 years, T2 6,0→9,1. The prevalence of blindness tends to decrease: T1 92,3→90,8; T2 15,4→15,2/10.000 DM adults. The amount of new cases of blindness/per year increased: T1 4,3→4,6; T2 1,2→1,4. The mean age of blindness increased: T1 39,1→41,6 years, T2 64,4→67,4; the mean duration of diabetes before blindness occur (from the time of DM diagnosis) increased: T1 20,2→21,2 years, in T2 10,7→11,3. We observed growth of DR treatment (laser surgery, vitrectomy, anti-VEGF medication) but the frequency of use in T2 patients is about 2 times less than in T1.

CONCLUSIONS: There was a decrease in the overall incidence of eye damage in diabetes (DR and blindness) in the analyzed period in RF. DR and blindness develops at advanced age and with a longer duration of diabetes. As the main directions of eye care development in diabetes it is necessary to standardize primary care in the regions, to unify the examination algorithms and methods of early diagnostic, to increase the continuity and interaction of endocrinologists and ophthalmologists in managing patients with diabetes in order to prevent the development of new cases of vision loss.

KEYWORDS: diabetes mellitus; the register of diabetes mellitus; diabetic retinopathy; blindness

INTRODUCTION

Diabetic retinopathy (DR) is a microvascular complication of diabetes mellitus (DM), characterised by (i) eye lesions resulting from ischaemia, (ii) increased permeability and endothelial dysfunction of blood vessels, leading to a significant reduction or/and loss in vision [1]. Global data reports that the development of DR occurs in every third patient with DM and is a threat to vision loss develops in 1 out of 10 patients [2]. According to the International Agency for the Prevention of Blindness (IAPB), 145 million people had DR in 2015, and 45 million people were at risk of vision loss [2]. According to the Federal Register of Diabetes Mellitus (FRDM), in the Russian Federation (RF), taking into account the total number of patient with DM, the number of DR patients comes to 580,000 people [3]. Thus, in the twenty-first century, DR remains an important global healthcare problem, which makes it necessary to study its epidemiological characteristics in order to develop ophthalmic care services.

AIM

This study assessed the epidemiological characteristics of the development of DR and blindness in adult patients with type 1 and type 2 diabetes mellitus (DM1 and DM2) in the Russian Federation from 2013 to 2016.

METHODS

In this study, the FRDM comprised of data of DM patients from 81 regions of the Russian Federation. The prevalence and incidence rates (new cases/year) were estimated for 10,000 patients with DM (>18 years) in 2013–2016.

DR is classified in the online FRDM in the section 'Algorithms of Specialised Medical Care' as follows [1]:

1. Non-proliferative stage
2. Pre-proliferative stage
3. Proliferative stage
4. Terminal stage

The FRDM also records the presence of blindness (in one or both eyes) as complete loss of vision (visus = 0); the 10,000 patients included in the study were those for whom visus was recorded as 0. We analysed the structure of DR therapy for the patients. Laser retinal coagulation (LRC) and vitreoretinal surgery were recorded in the register since 2014 from the moment of transfer to the online format. The prescription of anti–vascular endothelial growth factors (anti-VEGFs) was registered since 2015. It is not mandatory to fill these fields in the

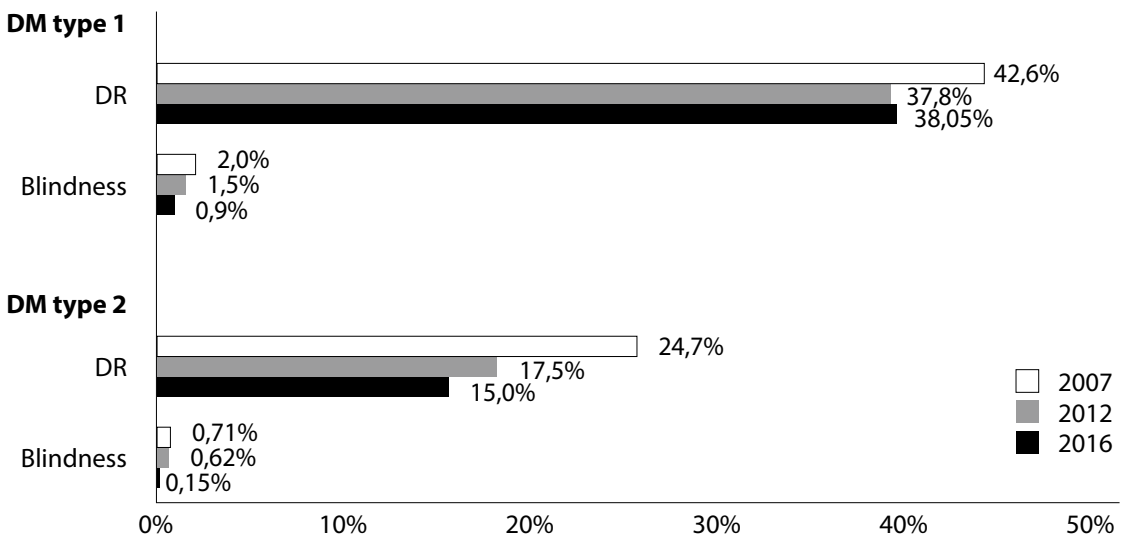

Fig. 1. Prevalence of DR and blindness in adult DM1 and DM2 patients according to the FTP in 2007 and 2012 and the FRDM in 2016 (% of patients).

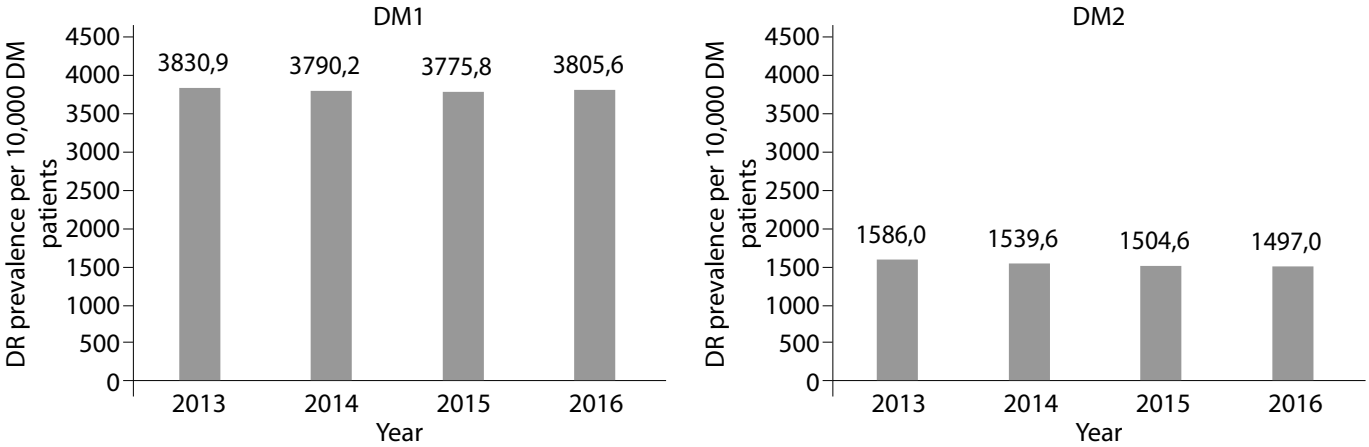

Fig. 2. Prevalence of DR per 10,000 adult DM1 and DM2 patients in 2013–2016 in 81 regions of the RF (FRDM).

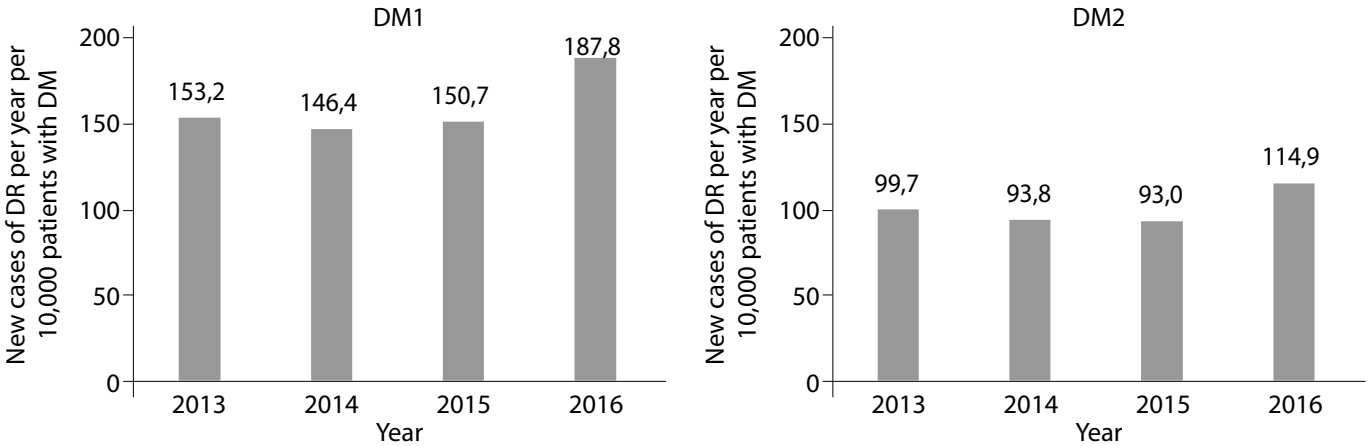

Fig. 3. Prevalence of DR (new cases per year) per 10,000 adult DM1 and DM2 patients in 2013–2016 in 81 regions of the RF FRDM).

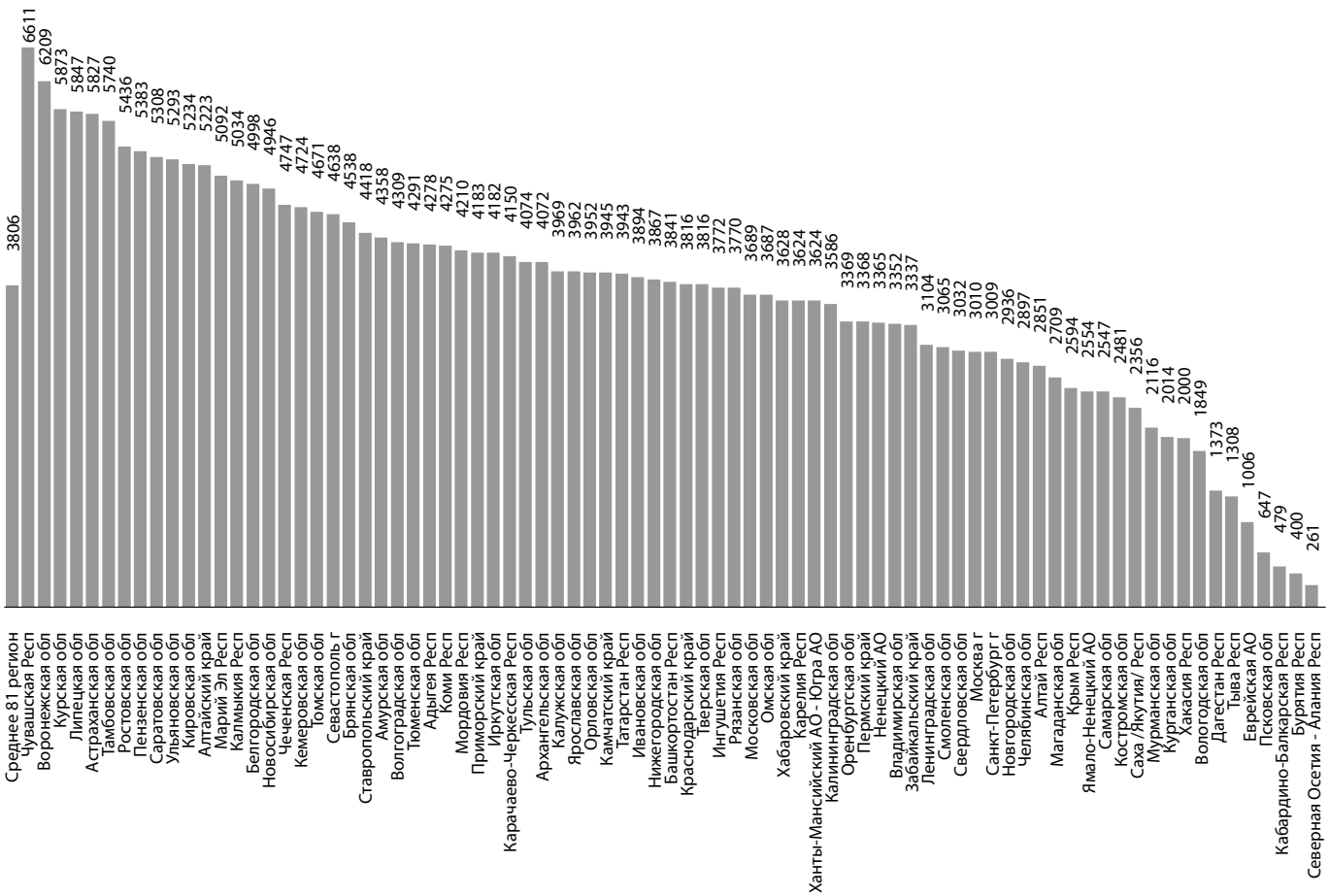

Fig. 4. Prevalence of DR per 10,000 adult DM1 patients in 2016 in 81 regions of the RF (FRDM).

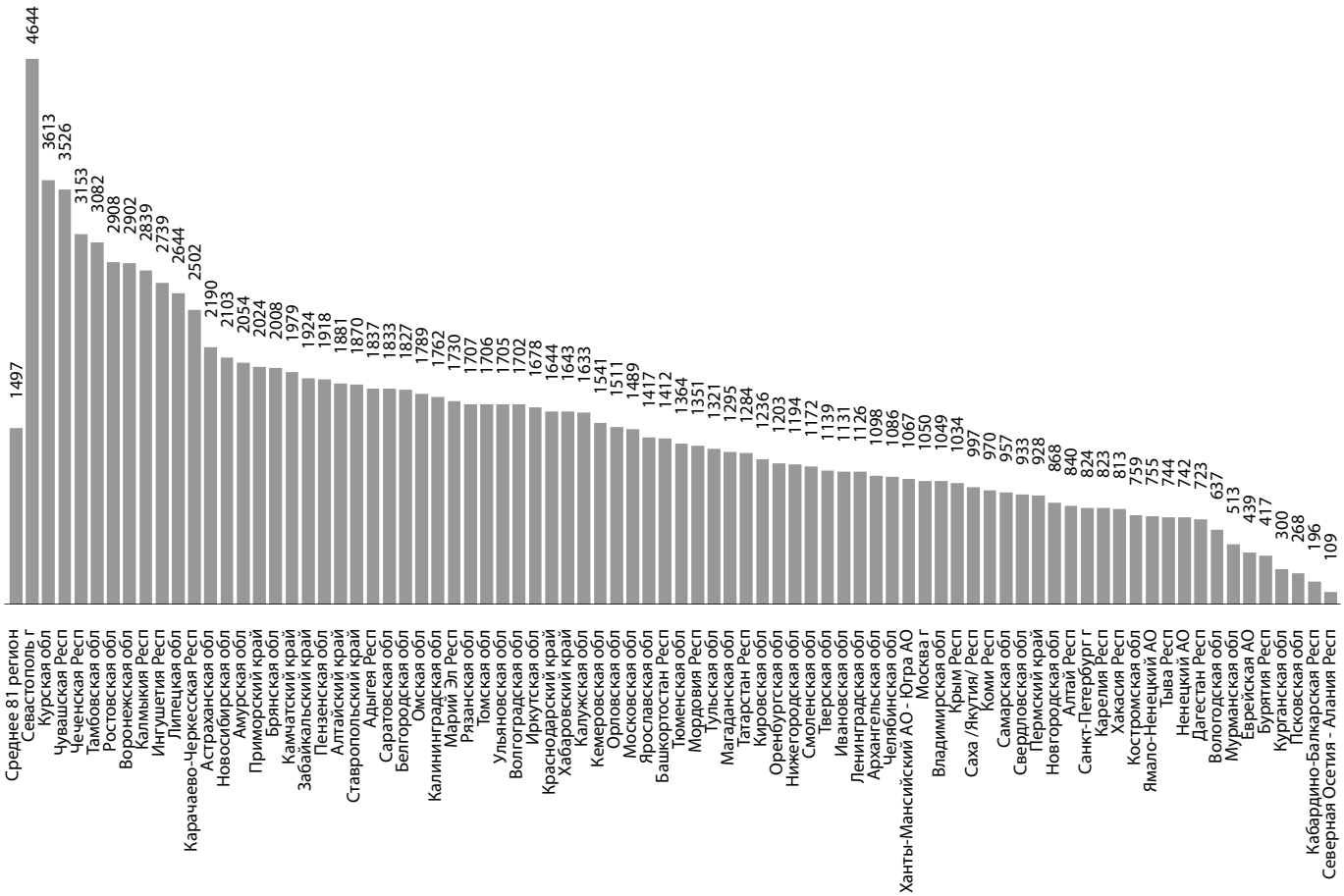

Fig. 5. Prevalence of DR per 10,000 adult DM2 patients in 2016 in 81 regions of the RF (FRDM).

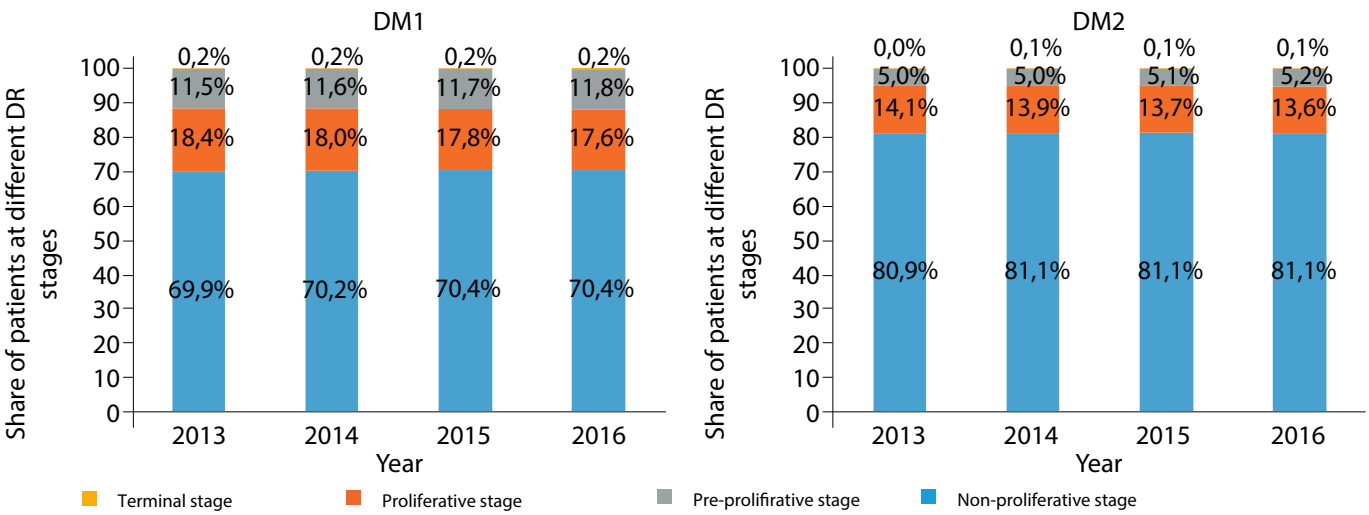

Fig. 6. Distribution by DR stage in adult DM1 and DM2 patients in 2013–2016 in 81 regions of the RF (FRDM).

FRDM; thus, the quality of the FRDM's maintenance could have an impact on the results obtained.

Ethical expertise

Study Protocol No. 20 of 14 December 2016 was reviewed and approved by the ethical committee of the Endocrinology Research Centre.

RESULTS

The incidence of complications in DM1 and DM2 patients decreased to 38.05% and 15.0%, respectively, in 2016 (Figure 1). Figure 1 also shows that the prevalence of blindness in 2016 showed decreased almost 2 times (from 2.0% to 0.9%) in DM1 and 4.7 times (from 0.71% to 0.15%) in DM2 patients.

Figure 2 depicts the latest data (from 2013 to 2016) obtained after transition of the FRDM to the online format. The data show that the prevalence of DR in DM1 patients was stable (3830/9–3805.6 per 10,000 patients) and slightly decreased in DM2 patients (1586.0–1497.0 per 10,000 patients) (Figure 2).

The morbidity rate (new cases of DR per year) in 2013–2016 showed a slight upwards trend: from 153.2 to 187.8 per 10,000 DM1 patients and from 99.7 to 114.9 per 10,000 DM2 patients (Figure 3).

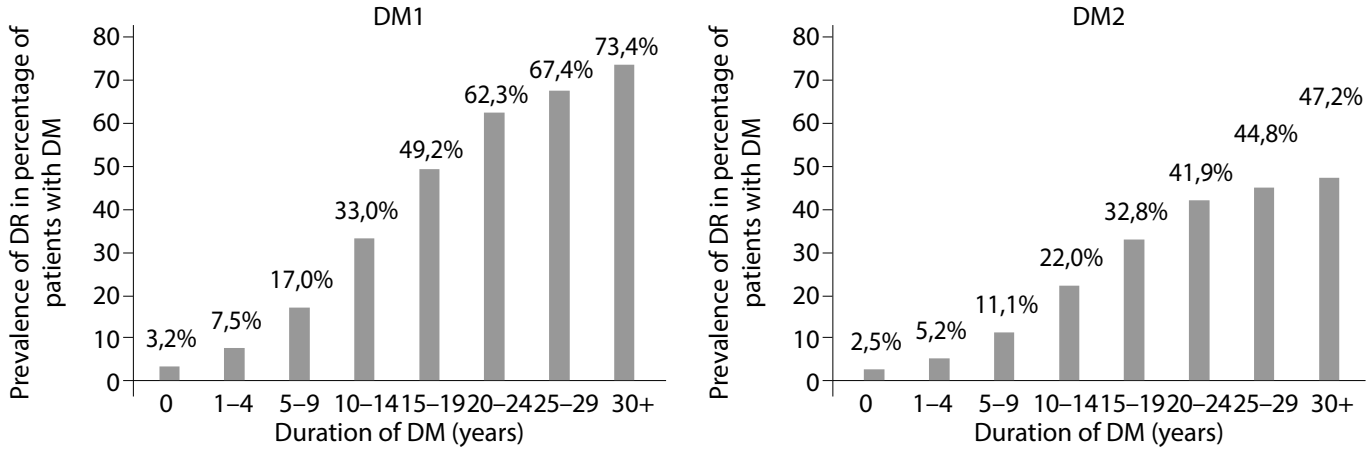

Fig. 7. DR prevalence based on DM duration in 2016 in 81 regions of the RF (] FRDM).

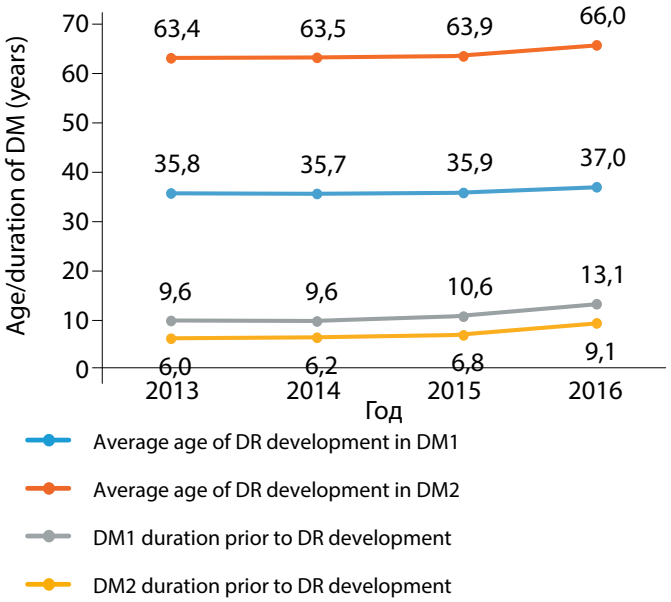

Fig. 8. Average age of patients and duration of DM prior to DR development in 2013–2016 in 81 regions of the RF (FRDM).

We also found that there were marked inter-regional differences in the frequency of DR registration: from 2.6% (Republic of North Ossetia-Alania) to 66.1% (Chuvash Republic) in DM1 patients (Figure 4) and from 1.1% (Republic of North Ossetia-Alania) to 46.4% (Sevastopol) in DM2 patients (Figure 5). These data indicates the presence of under- or over-diagnosis of eye lesions in certain regions, as well as the effect of the quality of FRDM maintenance on the assessment of DR prevalence.

Analysis of DR distribution by stage indicated early diagnosis of DR at stage 1 (non-proliferative DR) in most patients, followed by stages 2, 3 and 4: stage 1 DR: 70.4% DM1 and 81.1% DM2 patients; stage 2 DR: 17.6% DM1 and 13.6% DM2 patients; stage 3 DR: 11.8% DM1 and 5.2% DM2 patients; and stage 4 DR: 0.2% DM1 and 0.1% DM2 patients (Figure 6).

With DM duration of <5 years, DR was noted in 7.5% DM1 patients and in 5.2% DM2 patients. With DM duration >30 years, DR was noted in 73.4% DM1 patients and in 47.2% DM2 patients (Figure 7).

The average age of patients diagnosed with DR increased by 1.2 years in DM1 patients (from 35.8 years in 2013 to 37 years in 2016) and by 2.6 years in DM2 patients (from 63.4 years in 2013 to 66 years in 2016) (Figure 8). The average duration of DM prior to detection of DR increased from 9.6 to 13.1 years in DM1 patients and from 6.0 to 9.1 years in DM2 patients (Figure 8).

The increase in DM duration prior to DR development and the average age at DR diagnosis can be considered positive because they reflect (i) an improvement in the quality of control of the primary disease and (ii) success of preventive measures against general complications of DM as well as specific ones such as DR.

We observed a decrease in the prevalence of blindness per 10,000 patients in both DM1 and DM2: from 92.3 to 90.8 in DM1 patients and from 15.4 to 15.2 in DM2 patients (Figure 9). However, when analysing the new cases of blindness per year per 10,000 patients, unfortunately, we found an increase in the prevalence of blindness (Figure 10): from 4.3 to 4.6 in DM1 patients and

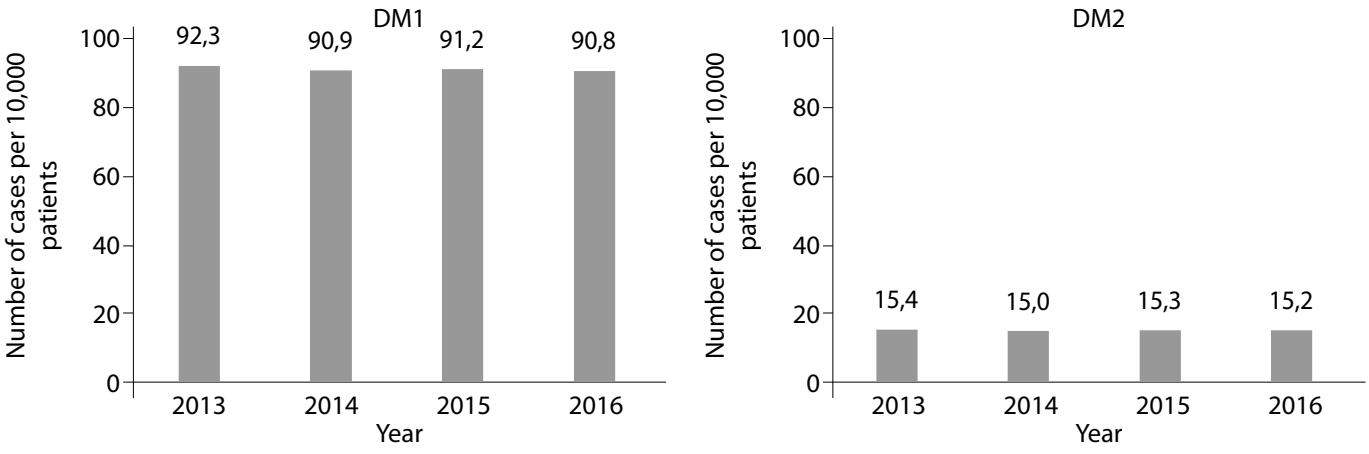

Fig. 9. Prevalence of blindness per 10,000 adult DM1 and DM2 patients in 2013–2016 in 81 regions of the RF (FRDM).

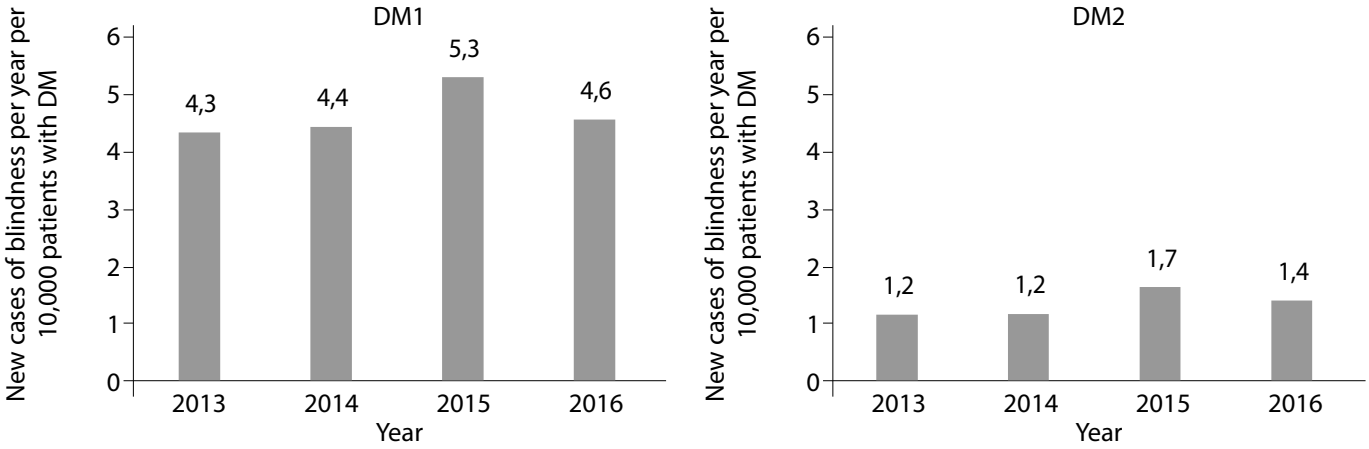

Fig. 10. Incidence rates of blindness (new cases/year) per 10,000 adult DM1 and DM2 patients in 2013–2016 in 81 regions of the RF (FRDM).

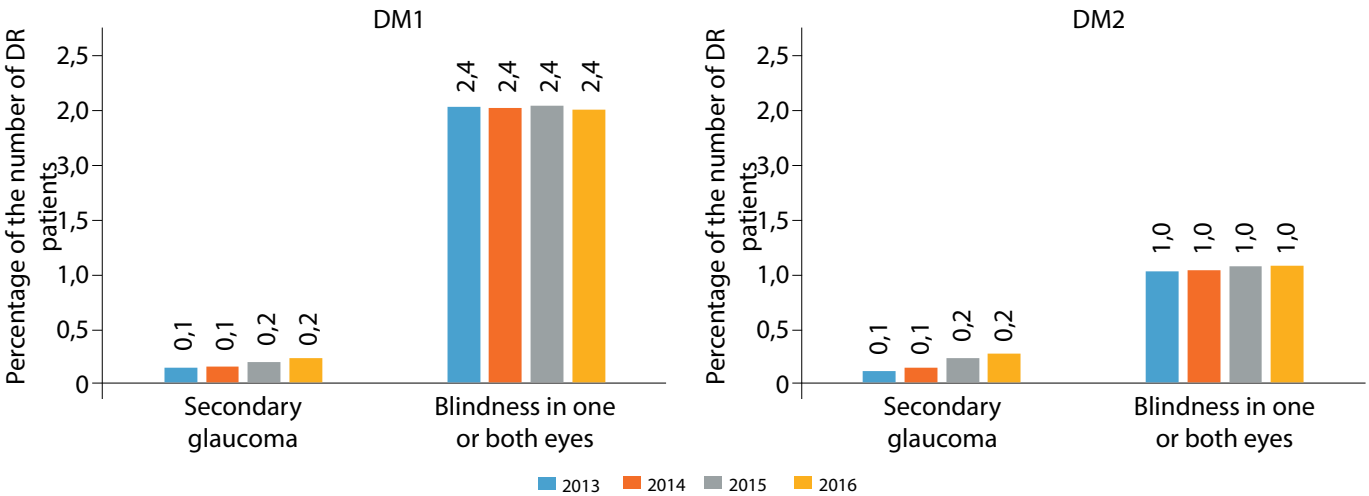

Fig. 11. Frequency of secondary complications in DR patients (% DR patients) in 2013–2016 in 81 regions of the RF (FRDM).

Fig. 12. Frequency of secondary complications (blindness and glaucoma) in DR patients, depending on the DR stage, in 81 regions of the RF (according to the FRDM).

from 1.2 to 1.4 in DM2 patients. Analysis of secondary complications of DR (secondary glaucoma and blindness in one or both eyes) indicated a stable situation and the absence of an increase in blindness development in both DM1 and DM2 patients during the analysis period (2.4% in DM1 and 1.0% in DM2 patients) (Figure 11).

The results also showed a relationship between an increase in the frequency of secondary complications and progression of DR. Thus, the rate of blindness in DM1 patients was 73.1% at stage 4 DR, 5.4% at stage 3 DR and 0.5% at stage 2 DR and that in DM2 patients was 60.9% at stage 4 DR, 4.7% at stage 3 DR and 0.6% at stage 2 DR. A similar tendency was observed in secondary glaucoma (Figure 12).

The positive findings were (i) an increase in the DM duration from the time of DR diagnosis to blindness development, namely by 1 year in DM1 patients (from 20.2 to 21.2 years) and by 6 months in DM2 patients (from 10.7 to 11.3 years) and (ii) an increase in the average age of blindness development, namely by 2.5 years in DM1

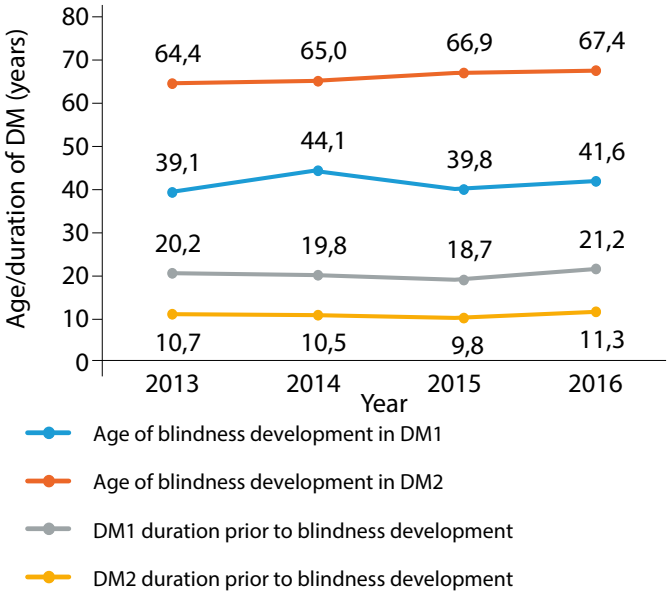

Fig. 13. Average age and duration of DM prior to blindness development in 2013–2016 in 81 regions of the RF (FRDM).

patients (from 39.1 to 41.6 years) and by 3 years in DM2 patients (from 64.4 to 67.4 years) (Figure 13).

Analysis of DR treatment data showed a sharp, almost twofold increase in LRC performed in 2015–2016 compared to 2013 (Figure 14), which may be due to the improvement in the quality of FRDM maintenance in recent years.

We noted an increase in the use of different DR treatments (LRC, vitreoretinal surgery and anti-VEGFs) with progression of the severity of complications (Figure 15). Thus, LRC was performed in 27.6% of DM1 patients with stage 4 DR compared to 0.6% of DM1 patients with stage 1 DR and in 11.7% of DM2 patients with stage 4 DR compared to 0.3% of DM2 patients with stage 1 DR. The frequency of the use of any DR treatment in DM2 patients was 2 times less than that of DM1 patients.

DISCUSSION

Recently, due to the introduction of new methods of diagnostics and treatment of DR in clinical practice, the epidemiological situation has significantly improved in terms of the frequency of DR, which is evidenced by both global and Russian data [2, 4, 5, 6]. Nevertheless, to prevent its progression to severe stages and blindness development in patients with DM, early diagnosis and timely treatment of DR remains an important public healthcare concern throughout the world.

T. Y. Wong et al. (YYYY) meta-analysis of more than 27,000 patients with DM showed that DR progressed to stage 3 in 19.5% of patients with DM in 1975–1985 and in

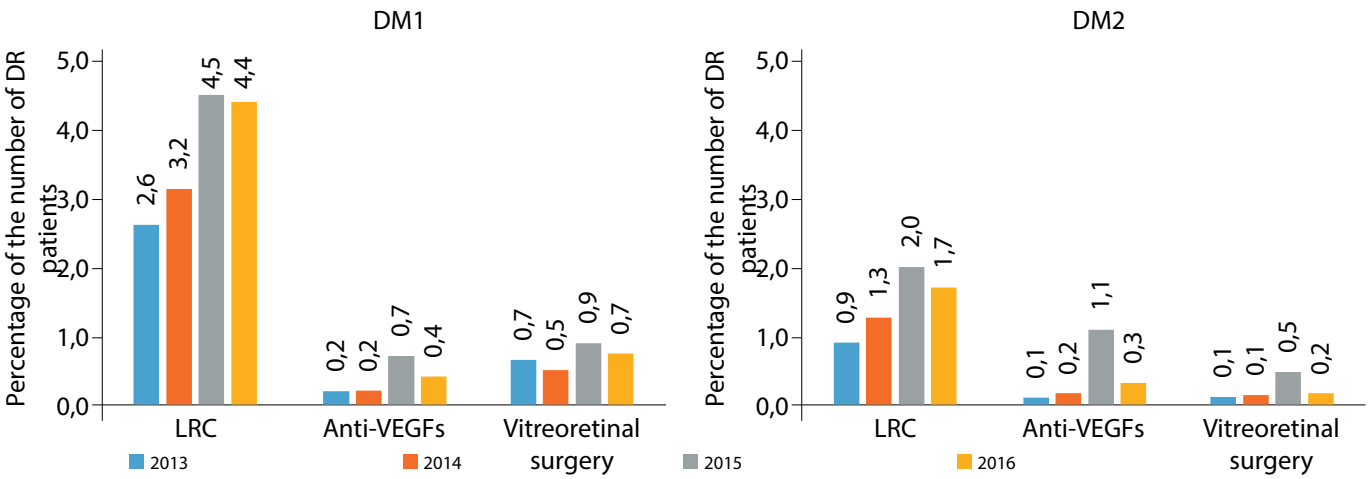

Fig. 14. Frequency of the use of different methods of DR treatment (% of the number of DR patients) in 2013–2016 in 81 regions of the RF (FRDM).

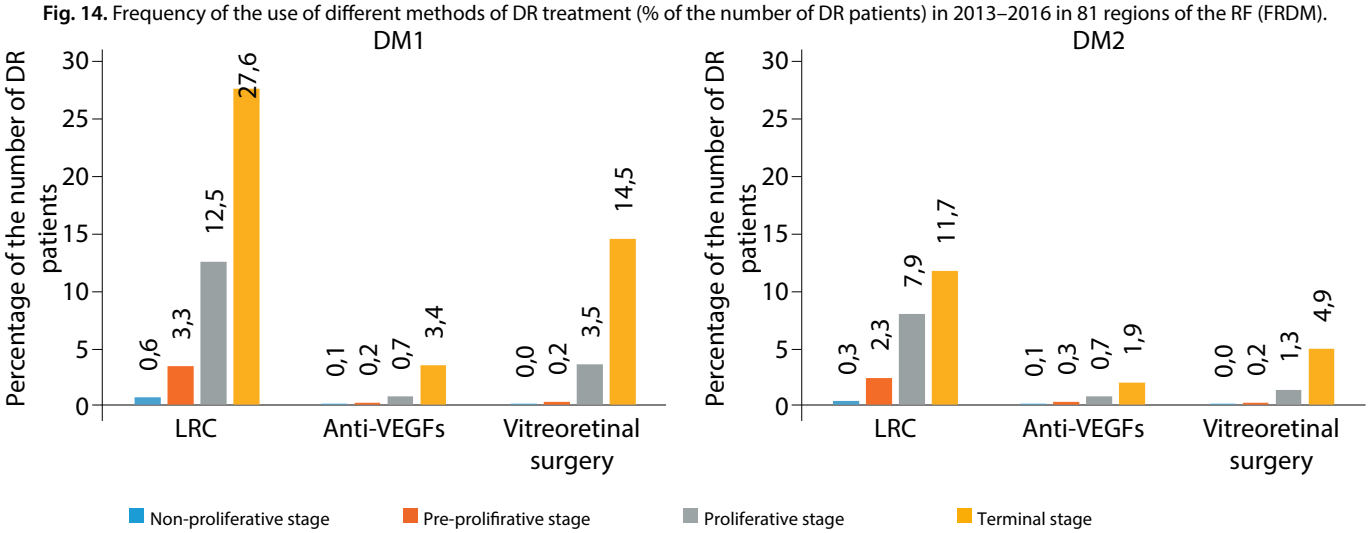

Fig. 15. Частота использования различных методов лечения в зависимости от стадии диабетической ретинопатии у взрослых больных (по данным Федерального регистра сахарного диабета).

2.6% of patients with DM in 1986–2008 [7]. A similar trend was observed with regard to blindness development: 9.7% of patients with DM in 1975–1985 and 3.2% of patients with DM in 1986–2008 [7]. According to the authors, such prevalence of later stages of DR indicates a significant improvement in the quality of medical care for DR patients over the last 30 years, which has led to a significant reduction in the frequency of blindness. In addition, the positive findings of the meta-analysis were attributed to more active control of important risk factors for the development of all DM complications, such as hypertension and hyperlipidemia. According to the Danish register, the prevalence of DR has decreased from 26% to 22% in the analysis of the periods 2014–2015 and 2013–2014 [6].

Analysis of the DR prevalence in our study enabled us to state the stabilisation of the overall frequency (all stages) of DR in both DM1 and DM2 and a significant decrease (2 times with DM1 and 4 times with DM2) in blindness compared to 2007, at the time of the launch of the FTP 'Diabetes Mellitus' [4].

Despite the implicit achievements in the field of DR control, one of the main problems is 'non-revealing' of the complication. The FTP data with the use of the mobile diagnostic and treatment module 'Diabetes Centre' showed that the actual prevalence of DR with active screening is 1.5–2 times higher than that registered in admitted patients, especially among DM2 patients [8, 9]. The actual number of patients with DM with eye lesions is significantly higher than what the FRDM data shows, which requires more active detection.

In our opinion, the general methodology of patient observation (i.e. improvement of early diagnosis methods and implementation of standards and examination algorithms) plays the most important role in the prevention of later stages of DR and blindness. According to recommendations for specialised care for patients with DM [1], all patients with DM should undergo an ophthalmological examination every year, with obligatory examination of the fundus with mydriasis, even in the absence of changes in the fundus. It is important that this recommendation be executed not only by endocrinologists but also by primary-care physicians (therapists) who monitor the majority of DM2 patients.

The pronounced inter-regional differences in the frequency of DR registration, noted in our study, appear to be mostly due to the lack of clear standards, as well as the absence of unified approaches to performing diagnosis [10, 11]. Unfortunately, in routine practice, it is not always possible to examine the retina with a wide pupil using special fundus lenses to inspect the periphery of the fundus. Often, ophthalmologists perform only visual acuity biomicroscopy of the anterior part of the eye and examine the fundus by means of an indirect ophthalmoscope. In addition, not all health institutions have an ability to archive the retina condition with a fundus camera. According to international data, the standardisation of methods significantly improved the quality of DR diagnostics [12]. Thus, in the United Kingdom, screening for DR is organised in such a way that digital fundus photographs of patients with DM are taken regularly (once a year), which are then evaluated on the basis of standard algorithms by a point system, and then a decision is taken about the need to refer the patients to ophthalmologists [13].

In our country, programmes for early diagnosis of DR with the possibility of fundus photography are possible only in specific medical centres. The creation of an electronic database with material archivation should be the next step in the development of care for DR patients. This will expand the possibility for assessing the patients' data on dynamics, including for the purpose of consultation by correspondence, remote monitoring and communication to assess treatment effectiveness.

Another determining factor in improving the diagnosis of DR is the standardisation of approaches to formulate the diagnosis of this complication. Currently, errors in the correct diagnosis of DR are related not only to the use of various diagnostic methods but also to the use of different variants of DR classification.

In the RF, there are no clearly accepted standards for a unified classification of DM complications. The classification by E. Konner and V. Porta, adopted by the World Health Organisation (WHO) in 1991 is obsolete and inconvenient to use because……?. The classification of the Early Treatment Diabetic Retinopathy Study requires a fundus camera [14]. Currently, in the RF, the classification according to the 'Algorithms for Specialised Care for patients with DM' is used, which identifies four stages of DR development: non-proliferative, pre-proliferative, proliferative and terminal stages [1]; this classification is given in the clinical recommendations of the Association of Ophthalmologists, which were adopted in 2013 and revised in 2016 [16]. The classification of DR is provided in accordance with the recommendations of the International Council of Ophthalmology and the American Diabetes Association [17, 18].

The pathognomonic signs of DR are micro-aneurysms and petechiation. If these signs appear in at least one quadrant of the fundus, it can be said that the changes correspond to the non-proliferative stage (stage 1) of DR. If only signs of arterial hypertension are present in the fundus (arteriostenosis, varicose veins, Salus' symptom, etc.), this is not a manifestation of DR. It should be said that the inclusion of hypertonic changes in the retina in the diagnosis of retinopathy is the most common mistake. In this regard, there are diagnoses inconsistent with algorithms, such as retinal angiopathy, diabetic angiopathy, stage 1 DR, stage 2 DR and stage 3 DR, which can lead to over-estimation of the number of patients in the retinopathy group.

On the other hand, the indices of DR prevalence, according to the FRDM and primary screening, can vary significantly for objective reasons. Thus, according to the survey in the mobile diagnostic module 'Diabetes Centre' of the endocrinology research centre, when a proper examination standard is implemented for all patients, the frequency of DR is higher for both DM1 and DM2. Particularly pronounced dissociation is typical in the diagnosis of DR with DM2 (26.23% in the FRDM against 38.4% in the module) [9]. In the last trips to the regions of the RF in 2017, the diagnosis of DR was first established by examination in the module in 23% of DM1

patients and in 26% of DM2 patients. In 2% and 5% of DM1 and DM2 patients, respectively, on the contrary, the diagnosis of DR was ruled out, which again underscores the need for standardising the methods of examination and unifying the diagnosis of this complication.

Our results reveal that there is a direct correlation between the frequency of complications and the duration of DM. Thus, according to the FRDM, with DM1 duration <5 years, DR develops in 7.5% of patients, while with DM1 duration >30 years, DR develops in 73.4% of patients. On the other hand, with DM2 duration <5 years, DR develops in 5.2% of patients, while with DM2 duration >30 years, DR develops in 47.2% of patients. Data from the Wisconsin Epidemiological Study of Diabetic Retinopathy showed a significantly higher incidence of DR with a long duration of DM2 (77.8% of patients had DR with DM2 duration >15 years [18]), which may indirectly indicate an inadequate detection of DR, specifically in DM2 patients, who are less mobile and less likely to visit relevant specialists.

In the structure of new cases of DR according to the FRDM, stage 1 DR prevails in both DM1 and DM2, which is considered as, undoubtedly, a positive tendency indicative of early diagnosis of DR. Unfortunately, there was a relative increase in the number of new cases of blindness per 10,000 adult patients with DM in the period analysed: In DM1, the number of cases increased from 4.3 to 4.6, and in DM2, it increased from 1.2 to 1.4. The obtained tendencies require additional analysis.

However, global statistics also indicate an increase in the number of patients with DM who have lost their vision despite improved diagnostic and treatment methods. According to the National Eye Institute, in the United States, the number of blind patients in 2000 was 936,000; in 2010, this figure increased to ~1.3 million. This number is projected to increase to ~2.2 million by 2030 and to ~4.1 million patients by 2050 (an increase of >3 times) [19]. One of the significant factors in the rapid growth of blindness in the world is the increase in life expectancy and the global tendency of ageing of the population, including populations of patients with DM, which leads to more frequent blindness not caused by DM. In DM onset at a young age, blindness is a consequence of DR in 86% of cases, and in DM onset in adulthood, when there are other eye diseases typical of the older age group, the frequency of blindness due to DR is only one-third [12]. According to WHO, the vast majority of blind patients (81%) are >50 years old, accounting for 20% of the world's population [20]. With the growing elderly population, an increasing number of people will be at risk of visual impairment as a result of chronic eye diseases and ageing.

Blindness development at a later age and with a longer DM duration are positive facts and indicates correct efforts by medical professionals of various specialties in managing DR patients.

The basic direction DR treatment should take is (i) training patients; (ii) achieving target values of glycemia, blood pressure and lipid profile throughout the patients' lives; (iii) performing mandatory and timely screening and monitoring of patients and (iv) ensuring continuity in management of patients in diagnosing complications.

Nevertheless, in the prevention of blindness development, the issue of succession in management of patients with different stages of DR and the interaction between ophthalmologists and endocrinologists for the purpose of early diagnosis and treatment of the patients remains the most difficult to resolve. At rather early diagnosis of DR according to FRDM data, the monitoring gap at the present stage can include the absence of dynamic monitoring of the eye fundus and the timely prescription of treatment to prevent marked stages. Perhaps, the lack of a timely decision to conduct laser coagulation of the retina and anti-angiogenic therapy may have an effect. Therefore, it is necessary to achive a cross-disciplinary consensus of endocrinologists and ophthalmologists on diagnosis, treatment and prevention of eye lesions in patients with DM.

CONCLUSION

The analysis of FRDM data enabled us to assess the dynamics of the epidemiological characteristics of DR in the RF in 2013–2016. In the RF, there was a decrease in the overall incidence of eye lesions in DM (DR and blindness) in the period analysed. DR and blindness developed at a later age and with a longer duration of DM. The primary fields of development of eye care in DM in order to prevent the development of new cases of vision loss, standardisation of primary specialised care in the regions, unification of examination algorithms and methods of early diagnosis, and promotion of succession and interaction of endocrinologists and ophthalmologists in the management of patients with DM are required.

ADDITIONAL INFORMATION

Source of financing. The work was performed within the State task of the Ministry of Health of the RF No AAAA-A18-118051590061-9.

Conflict of interest. M.A. Isakov is an employee of the company Aston Consulting, which provides technical support for the FRDM in an online format (the company Aston Consulting was not a sponsor of the study, did not participate in analysis or interpretation of the data and preparation of the article and it did not have financial relations with other members of the authoring team). Other authors declare no obvious and potential conflicts of interest related to the publication of this article.

Participation of authors. D.V. Lipatov, O.K. Vikulova, A.V. Zheleznyakova, M.A. Isakov–analysis and interpretation of the study results, writing an article; E.G. Bessmertnaya, A.A. Tolkacheva, T.A. Chistyakov–data analysis; M.V. Shestakova, I.I. Dedov–final analysis of the results and editing of the manuscript text. All authors made a significant contribution to the research and preparation of the article, read and approved the final version before publication.

Acknowledgement. We appreciate the company Aston Consulting for technical support of the DM register in online format, and also all medical specialists (doctors, nurses, data recorders) engaged in active work on filling the database of the DM register.

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ЦИТИРОВАТЬ:

Липатов Д.В., Викулова О.К., Железнякова А.В., Исаков М.А., Бессмертная Е.Г., Толкачева А.А., Чистяков Т.А., Шестакова М.В., Дедов И.И. Эпидемиология диабетической ретинопатии в Российской Федерации по данным Федерального регистра пациентов с сахарным диабетом (2013–2016 гг.) // *Сахарный диабет*. — 2018. — Т. 21. — №4. — С. 230-240. doi: 10.14341/DM9797

TO CITE THIS ARTICLE:

Lipatov DV, Vikulova OK, Zheleznyakova AV, Isakov MA, Bessmertnaya EG, Tolkacheva AA, Chistyakov TA, Shestakova MV, Dedov II. Trends in the epidemiology of diabetic retinopathy in Russian Federation according to the Federal Diabetes Register (2013–2016). *Diabetes Mellitus*. 2018;21(4):230-240. doi: 10.14341/DM9797