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CHANGES IN THE DEMOGRAPHIC AND CLINICAL PROFILE OF PATIENTS AND THE STRUCTURE OF HIGH-TECH OPHTHALMOLOGICAL CARE FOR DIABETIC RETINOPATHY

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Two samples of 250 patients with diabetic retinopathy were retrospectively formed before the introduction of compulsory health insurance (2018–2019) and after it (2021–2022). For all patients, standard information was collected, which included data on gender, age, type and duration, as well as treatment options for diabetes mellitus, the stage of diabetic retinopathy (non-proliferative, preproliferative, proliferative), form (exudative, edematous, ischemic) and type (focal, diffuse, cystic and cystic with the presence of vitreoretinal fractions) maculopathy, as well as comorbid eye pathologies (secondary glaucoma, cataracts, age-related macular degeneration, vitreous diseases and others). A comparison of the treatment results in the clinic before and after the introduction of compulsory health insurance shows that the difference between them is also statistically significant ($p<0.05$). Eliminating financial restrictions for the treatment of diabetic retinopathy through the introduction of compulsory health insurance leads to a change in the clinical profile of hospitalized patients and increase in the adequacy of treatment using high-tech medical care.

Key words: diabetic retinopathy, compulsory health insurance, maculopathy, laser coagulation

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ЗМІНИ ДЕМОГРАФІЧНОГО І КЛІНІЧНОГО ПРОФІЛЮ ХВОРИХ І СТРУКТУРИ ВИСОКОТЕХНОЛОГІЧНОЇ ОФТАЛЬМОЛОГІЧНОЇ ДОПОМОГИ ПРИ ДІАБЕТИЧНІЙ РЕТИНОПАТІЇ

Ретроспективно було сформовано дві вибірки з 250 пацієнтів з діабетичною ретинопатією до введення обов'язкового медичного страхування (2018–2019 рр.) та після нього (2021–2022 рр.). За всіма пацієнтами збирали стандартну інформацію, яка включала дані про стать, вік, тип і тривалість перебігу, а також варіанти лікування цукрового діабету, стадії діабетичної ретинопатії (непроліферативна, препроліферативна, проліферативна), форми (ексудативна, набрякла, ішемічна) та типу (вогнищева), дифузна, кістозна та кістозна з наявністю вітреоретинальних фракцій) макулопатії, а також коморбідних патологіях очей (вторинна глаукома, катаракта, вікова макулодистрофія, захворювання склоподібного тіла та інші). Порівняння результатів лікування у клініці до та після введення обов'язкового медичного страхування показує, що різниця між ними також статистично значуща ($p<0,05$). Усунення фінансових обмежень на лікування діабетичної ретинопатії за рахунок введення обов'язкового медичного страхування призводить до зміни клінічного профілю госпіталізованих пацієнтів та підвищення адекватності лікування з використанням високотехнологічної медичної допомоги.

Ключові слова: діабетична ретинопатія, обов'язкове медичне страхування, макулопатія, лазерна коагуляція.

The dynamic increase in the prevalence of diabetes mellitus is associated with an increase in the medical and social burden of diabetic retinopathy, which has become one of the main causes of vision loss in the working population [6, 9]. High-tech types of surgical interventions are successfully used to treat diabetic retinopathy (DR). Positive results were obtained using YAG–laser vitreolysis, intravitreal administration of ranibizumab followed by laser coagulation of the retina, endovitreal intervention with silicone oil tamponade [1, 3]. High-tech interventions in the treatment of DR occupy leading positions among modern types of medical care provided in the clinics of the Eye Microsurgery [4] and Russian Universities [5]. The choice of options for high-tech medical care (HTMC), according to American experts, in many cases depends on the cost of treatment [10]. Health insurance increases the availability of HTMC. The choice of treatment tactics for a particular patient and strategic planning to meet the needs of the population are based on the demographic and clinical characteristics of patients with DR, which determine the priority of treatment methods. At the present stage, in many countries of the world, the profile of patients in ophthalmology clinics is comprehensively assessed [7, 11, 13].

The majority of patients with DR in central clinics are people aged 50–60 years. Among diabetic patients in Oman attending a tertiary hospital, DR was detected in 31 % of cases. Moreover, in 15.4 and 13.3 % of cases, DR and maculopathy are associated with severe visual impairment [6]. Indian scientists note an increase in the risk of developing DR by 2.4 times in the age range of 30–50 years [8]. Attention is drawn to antihyperglycemic medicines, which may increase the risk of developing retinopathy [14]. It has been shown that the demographic and clinical profile of patients with DR is diverse and its monitoring is necessary for planning measures to improve the efficacy of treatment [2, 9].

The purpose of the study was to evaluate the relationship between changes in the demographic and clinical profile of patients and high-tech eye care staff for diabetic retinopathy in the university hospital before and after the implementation of compulsory health insurance.

Materials and methods. The study was carried out at the ophthalmology clinic of the Azerbaijan Medical University (AMU). By random selection (according to the serial number of the medical history), two samples of patients with DR out of 250 patients were retrospectively formed before the introduction of compulsory health insurance (2018–2019) and after it (2021–2022). For all patients, standard information was collected, which included data on gender, age, type and duration, as well as treatment options for diabetes mellitus, the stage of DR (non-proliferative, preproliferative, proliferative), form (exudative, edematous, ischemic) and type (focal, diffuse, cystic and cystic with the presence of vitreoretinal fractions) maculopathy, as well as comorbid eye pathologies (secondary glaucoma, cataracts, age-related macular degeneration, vitreous diseases and others). According to the methods of treatment in the clinic, the following groups were distinguished: para and retrobulbar injection: injection of air or drugs into the chambers of the eyes: subconjunctival injection: intravitral injection of drugs (angiogenesis inhibitors, corticosteroids); focal laser coagulation of the fundus; panretinal laser coagulation. The results of treatment were assessed by the dynamics of visual acuity, which was measured in the clinic before the start of treatment and 10 days after treatment. Statistical processing of materials was carried out using methods of analysis of qualitative characteristics (calculation of proportions and standard error), the statistical significance of changes in the profile of patients, the structure of treatment methods and their results was assessed by the χ^2 criterion; the critical value of statistical significance was accepted as $p \leq 0.05$.

Results of the study and their discussion. The demographic and clinical characteristics of patients with DR before and after the introduction of compulsory health insurance are shown in Table 1.

Table 1

Demographic and clinical characteristics of patients with diabetic retinopathy in the AMU clinic before and after the introduction of compulsory health insurance in Azerbaijan

Indices	Index options	%±	
		Before	After
Gender	Men	35.2±3.0	41.2±3.1
	Women	64.8±3.0	58.8±3.1
Age	30–40	8.0±1.7	9.6±1.8
	40–50	23.2±2.6	33.6±2.9
	50–60	36.0±3.0	35.6±3.0
	60–70	18.0±2.4	14.0±2.1
	70 and more	14.8±2.2	7.2±1.6
Type	Diabetes mellitus 1	19.6±2.5	20.8±2.5
	Diabetes mellitus 2	26.4±2.8	28.4±2.9
Retinopathy stage	Non-proliferative	26.4±2.8	28.4±2.9
	Preproliferative	48.4±3.2	39.6±3.1
	Proliferative	25.2±2.7	32.0±2.9
Form of maculopathy	Exudative	6.4±1.5	7.2±1.6
	Edema	3.2±1.1	5.2±1.4
	Ischemic	1.6±0.8	2.8±1.0
Type of maculopathy	Focal	4.0±1.2	6.4±1.5
	Diffuse	4.4±1.3	5.2±1.4
	Cystic	2.0±0.9	2.4±1.0
	Cystic with the presence of vitreoretinal tractions	0.8±0.6	1.2±0.7
Comorbidity	Secondary glaucoma	4.0±1.2	6.0±1.5
	Vitreous diseases	18.4±2.4	19.2±2.5
	Cataract	20.4±2.5	28.0±2.8
	Condition after lens removal	10.0±1.8	8.0±1.7
	Age-related macular degeneration	9.6±1.8	12.8±2.1
Duration of diabetes, years	5 and less	12.8±2.1	16.4±2.3
	6–10	42.4±3.1	45.6±3.1
	11 and more	44.8±3.1	38.0±3.1
Treatment of diabetes	Oral medicines	46.8±3.1	42.4±3.1
	Insulin	35.2±3.0	36.8±3.1
	Insulin+oral medicines	20.8±2.4	19.4±2.5

What is common among patients at the clinic regardless of health insurance is the predominance of women, people aged 50–60 years, patients diagnosed with type 2 diabetes mellitus with a duration of more than 5 years taking oral antihyperglycemic drugs. The commonality of characteristics numbers of DR before and after the use of health insurance is noteworthy: the predominance of DR at the preproliferative stage, the similarity of the structure of maculopathy in forms and types, as well as the similar structure of comorbid eye pathologies.

A statistically significant difference ($p \leq 0.05$) in the groups of patients before and after the introduction of compulsory health insurance is revealed when they are compared by the age structure of

patients (after the introduction of compulsory health insurance, the proportion of people aged 40–50 years increased), and by the proportion of proliferative DR. Data on treatment options are shown in Table 2.

Table 2

Treatment options and visual acuity (before and after surgery) of patients with diabetic retinopathy in the AMU clinic before and after the introduction of health insurance

Indices		Index options	%±	
			Before	After
Methods of treatment		Para and retrobulbar injection	4.4±1.3	3.6±1.2
		Injecting air or medication into the chambers of the eyes	16.0±2.3	8.4±1.8
		Subconjunctival injection	1.2±0.7	0.8±0.5
		Intravitreal medicine administration	32.0±2.9	19.6±2.5
		Focal laser coagulation of the fundus	24.0±2.7	33.2±3.0
		Panretinal laser coagulation	12.0±2.1	19.2±2.5
		Vitreoretinal surgery	10.4±1.9	15.2±2.3
Visual acuity	>0.3	Before surgery	26.8±2.8	18.0±2.4
		On 10th day of surgery	34.8±3.0	43.2±3.1
	0.1–0.3	Before surgery	60.0±3.1	67.2±3.0
		On 10th day of surgery	57.6±3.1	44.4±3.1
	0.05–0.1	Before surgery	4.8±1.4	9.6±1.5
		On 10th day of surgery	5.6±1.5	10.8±2.0
	0.02–0.05	Before surgery	5.2±1.4	3.6±1.2
		On 10th day of surgery	2.0±0.9	1.6±0.8
	Less than 0.02	Before surgery	3.2±1.1	1.6±0.8
		On 10th day of surgery	–	–

The data obtained indicate the statistical significance of changes in their structure after the introduction of compulsory health insurance: the share of vitreoretinal surgery, panretinal laser coagulation and focal laser coagulation of the fundus increased up to 1.5 times. At the same time, the proportion of cases of using para- and retrobulbar injection, introducing air and drugs into the chambers of the eyes and intravitral administration of drugs significantly decreased.

Compared to the preoperative period, 10 days after treatment the proportion of patients with visual acuity of more than 0.3 significantly increased statistically.

A comparison of the treatment results in the clinic before and after the introduction of compulsory health insurance shows that the difference between them is also statistically significant ($p<0.05$). It is obvious that the change in the structure of treatment methods for DR after the introduction of health insurance (increasing the share of laser coagulation and vitreoretinal surgery) is not due to a commercial approach (making more profit using high-tech interventions through compulsory insurance), but is associated with a change in the clinical profile of patients (this does not exclude the role of health insurance) and the use of more adequate treatment methods.

The most important characteristics of patients in the AMU clinic were the following: the predominance of women, people aged 50–60 years, patients with diabetes mellitus type 2, preproliferative stage of DR and severe comorbidity of ocular pathologies. Our data on the gender composition of patients with DR is consistent with the data of a number of authors [1, 2, 6]. It is known that diabetes mellitus type 2 is many times more common than diabetes mellitus type 1. Therefore, the predominance of patients with diabetes mellitus type 2 in the group with DR is natural and confirmed both in our observation and in the works of other researchers. The relatively high proportion of people aged 50–60 years among those hospitalized with a diagnosis of DR, noted in our work, corresponds to that of Indian authors [7, 8].

Das AV et al. (2021) performed a cross-sectional hospital-based study that included 263,419 individuals with diabetes mellitus (between 2012–2021, a 9-year period). They collected data from patients with a clinical diagnosis of DR within at least one eye. The authors revealed that every fourth person with DM was found to have DR, and every second person with DR had sight-threatening DR [8].

Among Indians, the onset of type 2 diabetes occurs at a younger age making them more vulnerable to all its complications owing to longer duration of disease. According to Chetan TL et al (2022), Indian patients having diabetic nephropathy are also more commonly associated with diabetic retinopathy [7].

In Taiwan women with type 2 diabetes mellitus had a higher prevalence of diabetic retinopathy than men, but men suffered from more severe retinopathy, poor vision, or blindness [9].

The structure of DR according to its stages during treatment in ophthalmological centers [6, 8, 11] is similar to our data.

Zakharov VD, et al (2018) studied results of treatment of patients with diabetic retinopathy. The patients included in the study had type 2 diabetes mellitus with tractional retinal detachment and cataracts, and were divided into two groups depending on treatment tactics. Preliminary results of the study showed equal efficacy of combined surgical treatment of DR and cataracts in patients of the first group and delayed

removal of complicated cataracts after endovitreal treatment of DR in patients of the second group. The development of neovascularization of the iris in the long-term postoperative period was observed in both groups. The authors concluded that treatment tactics in patients with diabetic retinopathy should be more preventive. They noted the need for further study of the progression of diabetic retinopathy and to determine the relationship between the development of complications and the timing of cataract removal [3].

Modern diagnostics, including the determination of such ophthalmological indices as visual acuity, central retinal thickness, light sensitivity of the macula, as well as the determination and stabilization of the most important biochemical blood index of glycosylated hemoglobin (HbA1C) will permit to prevent the development of more severe stages of DR. Vorobyeva IV, et al (2017) revealed that the patients with type 2 diabetes without signs of diabetic retinopathy, while maintaining high visual acuity and normal retinal thickness, had a reliable and significant decrease in the light sensitivity of the macula, which dictate the early preventive treatment [3].

According to modern recommendations, for type 2 diabetes patients, the first eye examination should be initiated once a diagnosis of diabetes is confirmed, as for type 1 diabetes, the timing being extended to 5 years after the onset of diabetes. Minimum screening, on the other hand, includes visual acuity examination and retinal examination [9].

Majority of clinicians emphasize that it is necessary to further develop ophthalmological care for patients and improve the organization of medical institutions activities providing high-tech ophthalmological care of this profile. There is a need to solve pressing issues related to increasing the efficiency and ensuring the availability and quality of ophthalmological high-tech medical care to the population through the introduction of innovative technologies and organizational measures.

Our data show that the morning financial restrictions for admission to the AMU clinic due to the introduction of compulsory health insurance led to a change in the clinical profile of those hospitalized with a diagnosis of DR, which increased the indication for the use of high-tech ophthalmological care and led to relatively better treatment results.

Conclusion

A comparison of the treatment results in the clinic before and after the introduction of compulsory health insurance shows that the difference between them is also statistically significant ($p<0.05$). Eliminating financial restrictions for the treatment of diabetic retinopathy through the introduction of compulsory health insurance leads to a change in the clinical profile of hospitalized patients and increase in the adequacy of treatment using high-tech medical care.

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