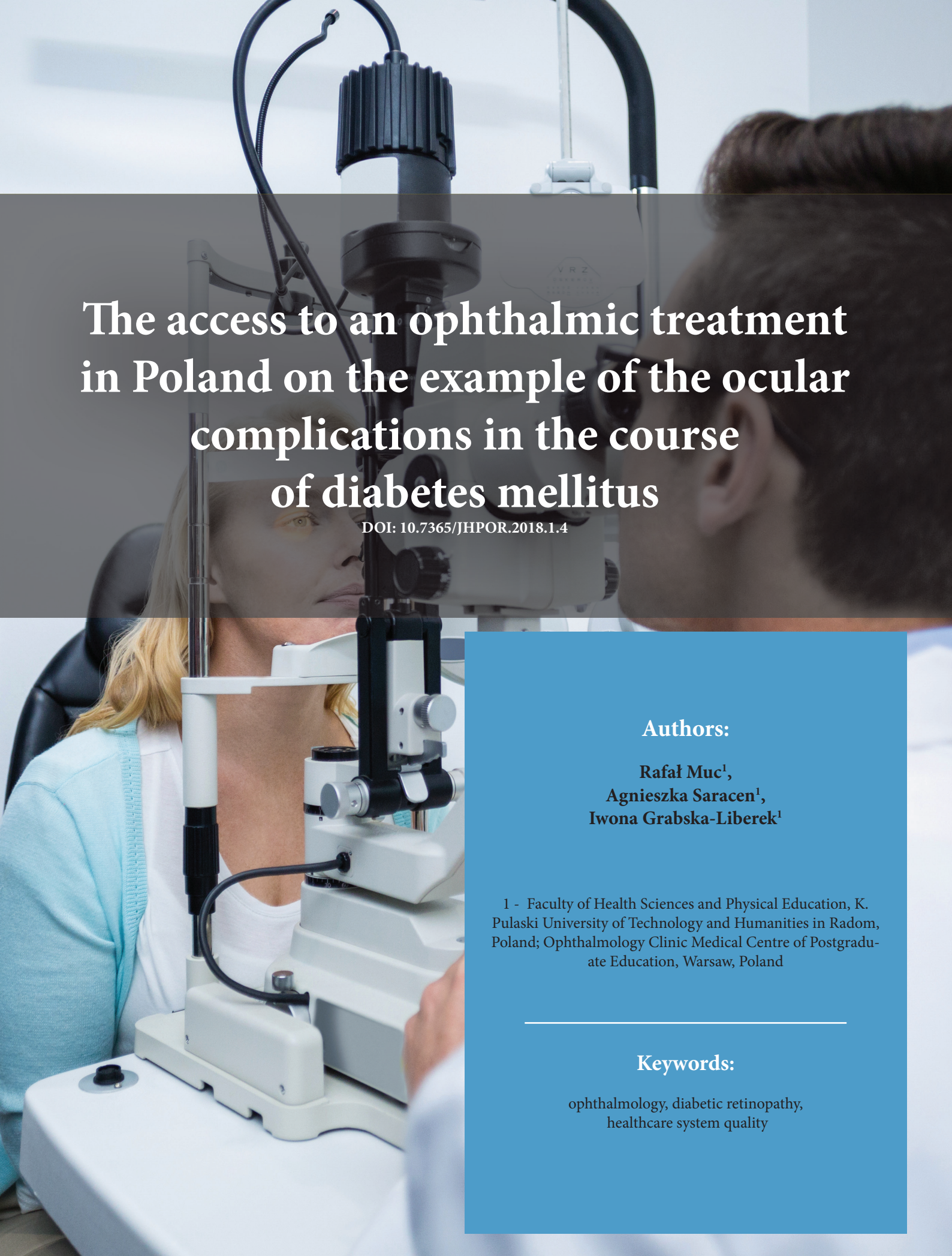

The access to an ophthalmic treatment in Poland on the example of the ocular complications in the course of diabetes mellitus

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Abstract

Background
Diabetic Retinopathy (DR) is the severe disease, that develops as a result of diabetes complication. All diabetic patients are at risk of DR development and the National Health Fund (NHF) estimates that there are 2 million people suffering from diabetes in Poland. Thus, around 692,000 Poles may exhibit DR traits, of which up to 139,000 have a severe form of it - proliferative, threatening the loss of vision in the absence or an incorrect treatment.

Objective
The aim of this study is to discuss the quality of the healthcare system in Poland, through the prism of access to highly specialized treatment for patients with ocular complications in the course of diabetes.

Material and Methods
The study in this article is based on the statistical data and reports by the Central Statistical Office in Poland, the European Statistical Office, the National Health Fund, as well as the Polish Chamber of Physicians and Dentist. Data collection and analysis concerning the period between years 2010 and 2018. All information has been reviewed thoroughly, compared and juxtaposed with each other to allow concluding.

Results
There are 4,617 ophthalmologist in Poland, which results in a 1 ophthalmologist per 8,324 inhabitants in Poland. Comparing Poland to major EU countries, access to an ophthalmic treatment just based on number of ophthalmologists is almost as poor as in the United Kingdom, especially comparing to the benchmark countries like Spain, France and Germany. In Poland, patients waiting for a treatment in an ophthalmic clinic account for 5% of all patients. 34% ophthalmology patients had to wait 3 months and more for the specialist consultation, which is contrasting with the DR guidelines, where each DR patient has to be reviewed every 3 months regularly. A one statistical ophthalmologist, in a specialist care clinic, gives 11 consultations per working day.

Conclusion
Patients with Diabetic Retinopathy in Poland have insufficient access to the specialized diagnostics and treatment. They have much lower access for quick diagnostics and treatment in comparison to the major western European countries. It might result in increased expenditures on ocular complications treatment in the course of Diabetes Mellitus. Therefore a strategic assessment of the DM and DR patients' access to the specialized diagnostics and treatment as well as development of a holistic approach and diseases comprehensive management strategy is recommended, including change of the healthcare system processes related to ocular complications in the course of diabetes mellitus.

Introduction

Diabetic Retinopathy (DR) is a serious eye disease associated with complications in the course of diabetes. All patients with diabetes are at risk of developing DR. Progression of the disease leads to a gradual deterioration of the quality of vision, including even loss of vision. Based on a meta-analysis of 35 studies from 1980-2008 involving 22.896 diabetics, the occurrence of any form of diabetic retinopathy in patients with diabetes is estimated at 34.6% (95% CI 34.5-34.8) and its proliferative form at 6.96% (95% CI 6.87-7.04).[1]

The National Health Fund (NFZ) estimates that there are 2 million people suffering from diabetes in Poland. [2] Thus, around 692,000 Poles may exhibit DR traits, of which up to 139,000 have a severe form of it - proliferative, threatening the loss of vision in the absence or incorrect treatment.[3]

The public healthcare system in Poland enables comprehensive diseases treatment, including patients with both sudden disease entity and chronic disorders. The Ministry of Health, governmental administration and local administration bodies are responsible for the design, organization and implementation of the healthcare policy. In addition the National Health Fund (NHF) is responsible for the management of the financial budget dedicated for healthcare, that is built from public health insurance contributions and governmental central subsidies.[4]

Generally, patients with ocular complications, in the course of diabetes mellitus in Poland, can be treated in primary health care, outpatient specialist care, hospital treatment and medical rehabilitation.[4]

Patients with DR require specialist treatment and most often the disease is managed in outpatient specialist care clinics (AOS) and then following hospital treatment when the treatment objectives in AOS cannot be achieved at any given time. Outpatient specialist care is provided by healthcare providers to patients who do not require treatment in 24-hour or all-day conditions. The specialist care is guaranteed and is provided in specialist clinics by a physician with appropriate qualifications.[4]

Guaranteed healthcare is defined as diagnostic and therapeutic activities to the extent necessary to provide the treatment in accordance with current medical knowledge.

Outpatient specialist care in the field of ophthalmic care is provided on the basis of a referral from any of the health insurance doctor.

Functioning of outpatient specialist care clinics are financed from public funds managed by the National Health Fund, which signs agreements in the field of outpatient specialist care with individual and group medical practices.[4]

Hospital care in Poland is financed within the system of homogeneous groups of patients (eng. Diagnosis Related Group - DRG). The homogeneous group system is used to settle the costs of completed hospitalization as part of hospital treatment. The DRG system consists of qualifying for a specific homogeneous group of patients with the same health problem, who were covered by a similar treatment method. A homogeneous group is the average cost of the diagnostic and therapeutic procedure performed in a patient with a given diagnosis. In simplified terms, this means that the homogeneous group includes cases of hospitalization of patients with a diagnosis of a similar disease whose treatment was similar.[4]

Along with the development of therapeutic options in ophthalmology, the diversity of medical procedures and services contracted by the Polish National Health Fund with healthcare providers is increasing. In this article the authors rises concerns, if the access to the ophthalmic treatment in Poland is sufficient, optimized and balanced, especially for the DR patients? Does financing follow demographic and epidemiological processes in Poland?

Material and Methods

The study in this article is based on the statistical straight extrapolation methods. Data and reports in this study concern years between 2010 - 2018 and are provided and/or published by the National Health Fund, the Central Statistical Office in Poland, the European Statistical Office, the National Health Fund, as well as the Polish Chamber of Physicians and Dentists. The article uses epidemiological information such as the number of ophthalmologists, ophthalmic clinics and hospitals as well as financial reports like the number of Diagnosis Related Groups concerning diagnosis Diabetic Retinopathy ICD - 10 H36.0. All data has been reviewed thoroughly, compared and juxtaposed with each other to allow concluding.

Results

1. Ophthalmologists in Poland

One of the key elements affecting the quality of the system and access to eye care is undoubtedly the number of practicing ophthalmologists.

The Polish Chamber of Physicians and Dentists reports that in year 2018 (data report out as of 30 June 2018) the profession of an ophthalmologist is performed by 4,617 physicians, which results in a 1 ophthalmologist per 8,324 inhabitants in Poland.

By comparing the data of the Polish Central Statistical Office together with the data of the Polish Chamber of Physicians and Dentist we obtain information on the availability of ophthalmological treatment in Poland per one inhabitant.[5,6] Data by province are presented in the Table 1.

Table 1. The distribution of ophthalmologists in Poland

Province	# of Inhabitants	# of Ophthalmologists	# of Inhabitants per 1 Ophthalmologist
Dolnośląskie	2 902 547	428	6 782
Kujawsko-Pomorskie	2 082 944	206	10 111
Lubelskie	2 126 317	265	8 024
Lubuskie	1 016 832	81	12 553
Łódzkie	2 476 315	381	6 500
Małopolskie	3 391 380	391	8 674
Mazowieckie	5 384 617	821	6 559
Opolskie	990 069	86	11 512
Podkarpackie	2 129 138	159	13 391
Podlaskie	1 184 548	132	8 974
Pomorskie	2 324 251	252	9 223
Śląskie	4 548 180	626	7 265
Świętokrzyskie	1 247 732	126	9 903
Warmińsko-Mazurskie	1 433 945	116	12 362
Wielkopolskie	3 489 210	341	10 232
Zachodniopomorskie	1 705 533	206	8 279
SUM	38 433 558	4 617	8 324

The above data shows the highest accessibility to the treatment (taking into account the number of ophthalmologists per capita) in provinces: Mazowieckie, Łódzkie and Dolnośląskie, while the lowest accessibility to treatment occurs in the Opolskie, Podkarpackie, Lubuskie and Warmia and Mazury provinces. The European statistical office (Eurostat) collects data, inter alia, on the number of specialist doctors in individual European countries. The definitions used in Eurostat have been agreed with the OECD and WHO, and the medical specialties correspond to the International Standard Classification of Occupations (ISCO).[9]

In the area of ophthalmology, Eurostat provides statistics on ophthalmologists 'ophthalmologists' according to the ISCO classification. This results to a degree of discrepancy between the data of the Primary Medical Number and Eurostat on the number of ophthalmologists in Poland, but assuming consistency in the methodology and definitions of European statistical agency officials, we may be tempted to compare access to specialist doctors in major European countries.[10] This data is presented in the Table 2 and Chart 1.

Table 2. ‚Surgery' ophthalmologists in selected European countries (2010-2015)

Countries/ Years	2010	2011	2012	2013	2014	2015
Germany	6 568	6 652	6 716	6 799	6 879	7 010
Spain	3 504	3 546	3 571	3 589	3 605	3 619
France	5 767	5 808	5 849	5 855	5 907	5 927
Poland	2 483	2 426	2 550	2 495	2 648	2 683
Great Britain	3 326	3 378	3 382	3 407	3 405	3 445

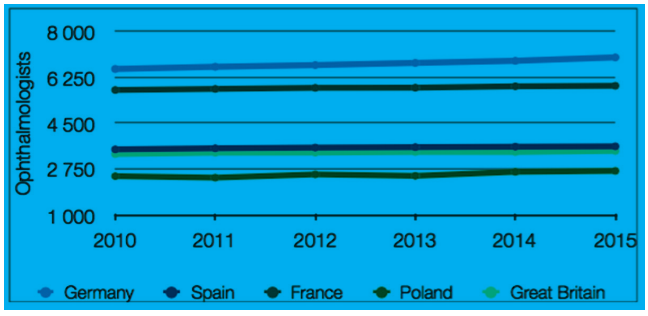

Chart 1. Ophthalmologists in selected European countries (2010-2015)

Based on the above data, we can observe that countries such as Germany and France systematically increase the number of specialist doctors in the field of eye diseases, thus responding to the trend of aging populations and the growing number of diabetics. In Poland, there was a relatively significant increase (by 153 more) of ophthalmologists in 2014, compared to 2013.[10,11]

So what is the availability of ophthalmologists, treatment doctors per 1 inhabitant?

This data is presented in the Table 3.

Table 3. „Surgery' ophthalmologists in selected European countries (2015)

Countries	# of Ophthalmologists (2015)	# of Inhabitants (k, 1st JAN 2016)	# of Inhabitants per / 1 Ophthalmologist
Germany	7 010	82 176	11 722
Spain	3 619	46 440	12 832
France	5 927	66 730	11 258
Poland	2 683	37 967	14 150
Great Britain	3 445	65 382	18 978

Analyzing the data from Eurostat, it appears that the most limited access to highly specialized ophthalmological treatment occurs in Poland and the United Kingdom. On the other hand we have countries such as Germany, Spain and France, in which patients have significantly better access to ocular care.

Therefore, regardless of whether we are using the data of the Polish Central Statistical Office or the European Statistical Office, taking into account the availability of treatment by the amount and distribution of ophthalmologists or the number of specialist clinics, we can conclude that patients with diabetic retinopathy in Poland not only have much lower chances for quick diagnostics and treatment within the public healthcare system in comparison to the largest European countries (except Great Britain), but also in the country itself, where there is a vast variation in the access to a treatment between the provinces.

2. Specialist outpatient care treatment for ophthalmics' patients

Another criterion affecting the quality of access to the treatment of patients with ophthalmic complications in the course of diabetes is the number and distribution of specialist clinics, where patients can be diagnosed and monitored regularly.[6,12] Detailed information is presented in the Table 4.

Table 4. # of Ophthalmic outpatient clinics in Poland

Province	# of Inhabitants	# of Ophthalmic Clinics	# of Inhabitants / 1 Clinic
Dolnośląskie	2 904 207	192	15 126
Kujawsko-Pomorskie	2 086 210	86	24 258
Lubelskie	2 139 726	87	24 595
Lubuskie	1 018 075	49	20 777
Łódzkie	2 493 603	141	17 685
Małopolskie	3 372 618	124	27 199
Mazowieckie	5 349 114	211	25 351
Opolskie	996 011	58	17 173
Podkarpackie	2 127 657	102	20 859
Podlaskie	1 188 800	46	25 843
Pomorskie	2 307 710	77	29 970
Śląskie	4 570 849	312	14 650
Świętokrzyskie	1 257 179	58	21 676
Warmińsko-Mazurskie	1 439 675	61	23 601
Wielkopolskie	3 475 323	158	21 996
Zachodniopomorskie	1 710 482	67	25 530
SUM	38 437 239	1 829	21 015

Taking into account the number of ophthalmic clinics in Poland, patients from Śląskie, Dolnośląskie, Opolskie and Łódzkie provinces are in the best situation, whereas in the worst situation are inhabitants of Małopolskie and Pomorskie provinces.

As per the Polish Central Statistical Office (GUS) in year 2016 there were over 11 million ophthalmic consultations in specialist care clinics.[6] Between 2010 to 2014 the number of consultations was systematically increasing, however in the years between 2014 and 2016 we observe a flattening of the trend. Details are presented in Chart 2.

Doing simple calculations, a one statistical ophthalmologist, in a specialist care clinic that signed a contract with the Polish NHF, gives around 11 consultations every day (assumed 230 working days in a year).

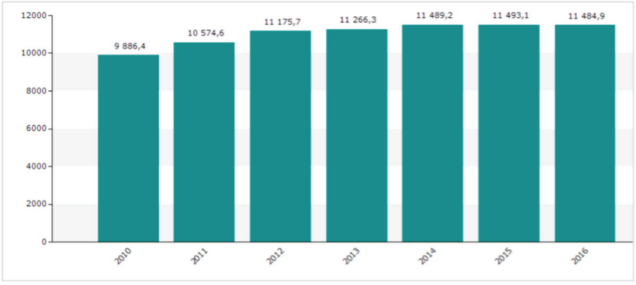

Chart 2. Number of ophthalmic consultations in the outpatient specialty care clinics (AOS)

According to a report of the National Health Fund for the fourth quarter of year 2017, patients waited for a treatment in ophthalmic clinics accounted for 5% of all patients waiting for any specialist clinic consultation (183,992 versus 3,651,169) of which as many as 64% of them expected an ophthalmologic consultation for more than 1 month and 34% for 3 months and more. Detailed information is presented in the Table 5.

Irrespectively of consulted ophthalmology patients in year 2017, another 269,943 patients have been waiting for the medical care. Calculated median for waiting time for an urgent cases is 0 days, however for stable patients it is 67 days. Moreover 25% of the patients have had scheduled visits in 138 days and more. Only in 12% of the clinics waiting time - for stable patients - equaled to 0 days. Details are presented in the tables 6 and 7.

In general, in 65% outpatient ophthalmic clinics waiting time equaled 0 days for patients requiring an urgent consultation. Still for 25% of these patients waiting time amounted to generally 6 days. The worst situation was in such provinces as Opolskie, Warmińsko - Mazurskie, Kujawsko -Pomorskie, Mazowieckie, Podlaskie and Małopolskie where waiting time for an urgent treatment lasted between 10 up to 21 days.

The situation looks much different for stable ophthalmic patients. In only 12% of the outpatient ophthalmic clinics waiting time was 0 days. Median equaled 67 days and the third quartile 138 days. The worst situation was observed in provinces Kujawsko-Pomorskie and Mazowieckie provinces where 50% of the patients had to wait over 100 days for a consultation and 25% of the patients 186 and 196 days respectively.

In 2016, the National Health Fund recorded over 42,000 patients with diabetic retinopathy (ICD 10 H36.0) treated in specialist care clinics (AOS), of whom over 16 thousand patients were former patients diagnosed with DR for the first time.[16] Detailed data is presented in the Table 8.

Based on the above findings, we can observe that in 5 years Diabetic Retinopathy is treated only at 2% in the population of patients with diabetes, therefore more than three times less than it would result from international research indicating the need to treat severe DR forms in Poland (2% vs 6.96%).[3] In addition, according to NHF data, almost 19,000 new cases from the DR are newly diagnosed each year. Referring to the DR guidelines, where patients with severe or moderate DR require regular consultation and monitoring of disease progression from 1 to 3 months[17], this indicates a significant limitation in access to proper medical care for patients diagnosed with Diabetic Retinopathy.

3. Hospitalizations of DR patients

The specifics of eye diseases, related to diabetes mellitus, require extensive diagnosis and treatment either in outpatient specialist clinics (AOS) or in a hospitals. However selected procedures require hospitalization, because the purpose of treatment in a given case might not be achieved by outpatient care treatment (i.a administration and costs settlement of a-VEGF therapy).[14]

Diagnosis Related Groups (DRGs) are a way of accounting for treatment procedures between healthcare providers and the National Health Fund. DRG system allows patients to be qualified for proper therapeutic treatment from a well-defined list. Assignment to a given group of DRG is carried out on the basis of the diagnosis defined by the international classification of diseases and health problems of ICD-10, while the course of treatment is monitored on the basis of the international classification of ICD-9 treatment procedures.[4]

The NHF publishes official DRGs' statistics, and joint medical baskets regarding eye diseases are DRG B1 to B98. ICD-10 H36.0 diabetic retinopathy with ICD-9 (E10-E14) is settled in the DRG shown in the Table 9.

During the treatment of Diabetic Retinopathy in Poland, DRG groups B16, B17, B83, B84 and B98 are used to account for hospital ophthalmic treatment costs. 1 DRG point during hospital treatment is valued by the National Health Fund for 52 zlotys, therefore DR treatment can be settled in the budget from minimum 260 PLN to 8.476 PLN, depending on the list of ICD-9 medical procedures in the DRG group and type of hospitalization (" full "hospitalization or 1-day hospitalization).[7]

The National Health Fund regularly publishes data on hospitalization of patients under the DRG system. These data enable a synthetic analysis and evaluation of the availability

Table 5. Patients consulted in ophthalmic clinics in year 2017

	Queue	< 1 mth	1-2 mths	2-3 mths	3-6 mths	6-12 mths	12-24 mths	> 24 mths
Total patients /all outpatient clinics	3 651 169	1 562 924	592 922	346 544	574 037	488 579	82 619	3 544
Patients in ophthalmic clinics only	183 992	65 990	34 898	20 081	34 981	24 309	3 340	393
% Total	5%	4%	6%	6%	6%	5%	4%	11%
% Cumulatively Ophthalmology		100%	64%	45%	34%	15%	2%	0%

Table 6. Ophthalmic patients required an urgent treatment waiting for an ophthalmic consultation in quarter 4, year 2017

Province	Number of waiting patients	Median (waiting days)	Third quartile (waiting days)	% of ophthalmic clinics with 0 days waiting time
Dolnośląskie	302	0	6	63%
Kujawsko-Pomorskie	247	0	11	58%
Lubelskie	20	0	0	77%
Lubuskie	144	0	0	77%
Łódzkie	111	0	3	67%
Małopolskie	723	0	10	65%
Mazowieckie	857	4	21	45%
Opolskie	60	0	10	63%
Podkarpackie	52	0	0	88%
Podlaskie	51	3	12	46%
Pomorskie	240	0	1	75%
Śląskie	1304	0	5	68%
Świętokrzyskie	350	0	0	77%
Warmińsko-Mazurskie	100	0	11	67%
Wielkopolskie	234	0	4	63%
Zachodniopomorskie	143	0	5	65%
SUM	4 938	0	6	65%

of specialist treatment.[13] For Diabetic Retinopathy, data for 2010-2016 are presented in the Table 10.

When analyzing the number of hospitalizations in the diagnosis of Diabetic Retinopathy (as shown in Table 10), we can see that the number of patients treated for DR in DRG groups is significantly small. The annual number of patients hospitalized for DR was in 2010 # 2081, while in 2015 only # 699. There are about 2 million patients with diabetes in Poland. Referring to data from the meta-analysis of Joanne W.Y. Yau, where the presence of any form of diabetic retinopathy in patients with diabetes is estimated at 34.6% (95% CI 34.5-34.8) of the population, and its proliferative form at 6.96% (95% CI 6.87-7.04)[1], this gives for Poland, the result of 692 thousand Poles with a potential diagnosis of DR, of which up to 139,000 patients require particularly intensive t reatment of severe DR, which threatens loss of vision in the absence or incorrect treatment.[3,8]

As in other diseases in Poland there may be budget restrictions that reduce the level of access to treatment from public funds due to high costs of therapy in the healthcare system. To answer this question, the authors calculated the cost of treating patients with DR based on the DRG's system.[13] These data are presented in the Table 11.

Table 8. Patients with Diabetic Retinopathy (DR, H36.0) treated in Ophthalmic Outpatient Clinics in Poland

Year	Patients with DR	DR patients newly diagnosed	% new DR patients vs total
2011	32 960	19 919	60%
2012	39 750	20 734	52%
2013	42 864	19 670	46%
2014	45 258	18 349	41%
2015	45 154	16 262	36%
2016	42 142	16 704	39%
AVERAGE	41 355	18 606	45%

Table 7. Stable ophthalmic patients waiting for an ophthalmic consultation in quarter 4, year 2017

Province	Number of waiting patients	Median (waiting days)	Third quartile (waiting days)	% of ophthalmic clinics with 0 days waiting time
Dolnośląskie	23 140	46	102	8%
Kujawsko-Pomorskie	15 394	100	186	7%
Lubelskie	8 191	20	63	17%
Lubuskie	6 525	84	145	15%
Łódzkie	15 700	40	99	6%
Małopolskie	22 023	125	196	8%
Mazowieckie	40 045	91	178	11%
Opolskie	5 150	71	125	21%
Podkarpackie	11 110	49	126	14%
Podlaskie	7 484	58	124	16%
Pomorskie	21 079	84	168	8%
Śląskie	36 982	59	136	16%
Świętokrzyskie	5 155	41	138	32%
Warmińsko-Mazurskie	13 931	89	198	19%
Wielkopolskie	19 467	73	121	7%
Zachodniopomorskie	13 629	72	114	8%
SUM	265 005	67	138	12%

Table 9. Settlement of Diabetic Retinopathy ICD-10 H 36.0, in the DRG system in Poland

DRG procedure	Details	Max # of DRG points	Min # of DRG points
B16	Treatments with vitrectomy with the use of silicone oil or decalin, including multi-procedural	163	147
B17	Treatments with vitrectomy, including multi-procedural	140	126
B83	Medium vitreoretinal treatments	29	26
B84	Small vitreoretinal treatments	16	13
B98	Ophthalmologic conservative treatment	42	5

Taking into account the data from Table 11, the authors identify a significant reduction in the number of DR patients treated in public hospitals, while maintaining constant expenditure on treatment per patient in 2013-2016. This is mainly caused by the trend of movement DR patients from a hospital treatment to that one, which can be successfully managed in outpatient clinics (AOS). At the same time, it can be seen that hospitals in which the treatment of diabetic retinopathy is carried out have transferred the settlement of DR treatment costs from low-paid to high-paid procedures, while not increasing the number of patients undergoing treatment despite the low number of patients treated with diabetic retinopathy in relation to the estimated population.

Discussion:

The analysis of the data presented in the article was aimed to discuss the access to highly specialized treatment of patients with diabetic retinopathy in Poland. The distribution of ophthalmologists and outpatient specialist care clinics is not equal, which diversifies the possibility to have the proper treatment in underinvested provinces. The number of outpatient clinics and ophthalmologists in Poland do not ensure regular and adequately frequent specialist consultations in the field of DR management.

In year 2017, 34% ophthalmology patients had to wait 3 months and more for the specialist consultation, which

Table 10. Hospitalizations of patients with diabetic retinopathy with DRG system details

	Year	Diabetic Retinopathy (H36.0)	DRG B16	DRG B17	DRG B83	DRG B84	DRG B98
Hospitalization days	2010	3 295	171	191	56	2 877	0
	2011	1 555	123	188	110	1 134	0
	2012	1 370	125	235	145	865	0
	2013	1 349	125	288	106	426	404
	2014	1 247	122	194	2	356	573
	2015	849	119	215	0	200	315
	2016	779	101	242	0	0	436
Number of Patients	2010	2 081	149	180	30	1 723	0
	2011	1 019	106	177	72	663	0
	2012	958	106	220	85	547	0
	2013	715	104	267	65	278	0
	2014	508	103	181	2	221	0
	2015	699	100	201	0	131	267
	2016	661	85	226	0	0	350

Table 11. DR patients treatment costs under DRG system, with details

	Year	Average cost of a one DR patient treatment	SUM DRG (H36.0)	DRG B16 (147-163 points)	DRG B17 (126-140 points)	DRG B83 (26-29 points)	DRG B84 (13-16 points)	DRG B98 (5-42 points)
# of Patients	2010		2 081	149	180	30	1 723	0
	2011		1 019	106	177	72	663	0
	2012		958	106	220	85	547	0
	2013		715	104	267	65	278	0
	2014		508	103	181	2	221	0
	2015		699	100	201	0	131	267
	2016		779	101	242	0	0	436
Treatment costs within the DRG system (PLN)	2010	1 947	4 052 100	1 262 924	1 310 400	45 240	1 433 536	0
	2011	2 794	2 847 208	898 456	1 288 560	108 576	551 616	0
	2012	3 219	3 083 340	898 456	1 601 600	128 180	455 104	0
	2013	4 412	3 154 580	881 504	1 943 760	98 020	231 296	0
	2014	4 680	2 377 596	873 028	1 317 680	3 016	183 872	0
	2015	4 296	3 003 000	847 600	1 463 280	0	108 992	583 128
	2016	4 583	3 570 060	856 076	1 761 760	0	0	952 224

is contrasting to the DR guidelines, where each DR patient has to be reviewed every 3 months.

Insufficient increase of ophthalmologists in Poland with its significant underinvestment on contracting the treatment deepening of proves the insufficiency of proper state policy in this area. Also the negative signal is coming from the fact, that a statistical ophthalmologist is giving consultations within the public healthcare system to around 11 patients per day. The consequence of such situation is the transfer of the payer's (NHF) costs to patients, who are forced to pay for an ophthalmic treatment in a private clinic.

The diagnosis related groups system in hospital care allows advanced treatment of patients with DR in DRG groups B16, B17, B83, B84 and B98, but in fact limits in the budgeting level under contracts with NHF edges the wide and necessary access to diagnosis and treatment of the patients, especially when it is necessary to use the most advanced treatment options for the DR patients. Decreasing number of DR patients treated in hospitals is a positive trend from a payor perspective (NHF), however today in hospitals only the most advanced methods of treating the disease are used.

The results presented in the article indicate the insufficient, irregular access of DR patients to specialist health care within outpatient specialist care and hospitals. These results are in contradiction to the demographic trends of an aging population, where the population of diabetics is estimated at around 2 million, and patients with a potential diagnosis of diabetic retinopathy at 692,000, including 139,000 having a severe form of DR - proliferative, threatening the loss of vision in the absence or an incorrect treatment.

All these circumstances significantly narrows access to high-quality healthcare for DR patients, thereby increasing the risk of complications that can lead to poor vision or even loss of vision.

Current expenditures from the National Health Fund budget for DR treatment in public outpatient ophthalmic clinics and hospitals are either too low or utilization of current available resources are not optimized. So there is definitely room for improvement, the DR treatment process have to be enhanced, thus the indirect costs of ineffective treatment of diabetic retinopathy, including social security costs due to worsening of vision among diabetic patients can significantly exceed medical treatment costs related to high quality medical procedures.

Limitations:

This study is another one, consisting of a series of publications related to the ocular complications in the course of Diabetes Mellitus, Diabetic Retinopathy and Diabetic Macular Edema. Some of the information is recurring and/or updated, especially these one concerning epidemiological data or related to treatment statistics. It is necessary to continue building and awareness of the treatment boundaries, provides background to the analysis and concluding in the article as well as allows observation of changes in the diseases treatment trends.

The study does not include social security data and information in the scope of Diabetic Retinopathy, due to lack of possibility to select sufficient granularity in the ICD 10 system reporting (H 36.0) in the Polish Social Security Fund (ZUS).

It is recommended changing reporting to the Polish Social Security Fund to more granular as per ICD-10 codes, that would allow more detailed analysis not only for the DR, but for other main diseases.

Also, all information provided by the Central Statistical Office in Poland, the European Statistical Office and the National Health Fund is the reported data, which might not be fully consistent with the epidemiological data related to the Diabetic Retinopathy, due to reporting limits and irregularity by the healthcare providers.

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