

# GEORGIAN MEDICAL NEWS

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ჩატარდა განივი კვლევა სამხრეთ ყაზახეთის თურქესტანულ რეგიონში; შესწავლილია 639 პაციენტის ზოგადკლინიკური, ლაბორატორიული მანევრებები. კოგნიტიური დისფუნქცია შეფასდა Mini Mental State Examination (MMSE) მეთოდის მეშვეობით. მეტაბოლურ სინდრომს, მის ცალკეულ კომპონენტებსა და MMSE-ს შორის კავშირის

შეფასებისათვის გამოყენებული იყო მრავალ-განზომილებიანი ლოგისტიკური რეგრესიული ანალიზი. MMSE ტესტის მეშვეობით გამოვლინდა კოგნიტიური დარღვევების ნიშნები 4,1% შემთხვევაში. დადგენილია სტატისტიკურად სარწმუნო დადებითი კორელაცია კოგნიტიური დარღვევების ნიშნებსა და მეტაბოლურ სინდრომს, სისტოლურ ჰიპერტენზიას, ჰიპერქოლისტერინემიას, ჰიპერგლიკემიას შორის. კვლევის შედეგებმა გამოავლინა, რომ მეტაბოლური სინდრომის კომპონენტები კორელაციაშია კოგნიტიურ დარღვევებთან.

## SUSPECTED ENVIRONMENTAL AND SOCIO-ECONOMIC CAUSES OF DIABETES MELLITUS AND ASSOCIATED OCULAR COMPLICATIONS IN THE SUMY REGION, UKRAINE, FOR THE PERIOD OF 2011-2016

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Diabetes mellitus (DM) is one of the most common endocrine disorders. DM affects more than 240 million people worldwide, and this number is expected to reach roughly 370 million by 2030 [30]. The prevalence of diabetes in Ukraine was 2,861.6 people per 100,000 people in 2015 and annual mortality rate was 5 per 100,000 people [31]. Complications of DM are progressive and almost always resulting by chronic exposure to high levels of blood glucose caused by impairments in insulin metabolism and of biological macromolecules such as carbohydrates, lipids, proteins and nucleic acids [7]. Ocular complications associated with DM are progressive and rapidly becoming the world's most significant cause of loss of health. They are preventable with early detection and timely treatment. This research provides an overview of two main ocular complications associated with DM - diabetic retinopathy and cataract [17].

### **Diabetic cataract. Definition and features**

Cataract is considered a major cause of visual impairment in diabetic patients. Morphologically it is cloudy opacifications of the lens of the eye which can lead to blurred vision which can be dazzled by bright lights, seeing a circle of light around lights, a yellowing of vision and finally it can also lead to a loss of vision. True diabetic cataract, which is bilateral and often develops quickly, can affect individuals at younger ages with severe diabetes. This condition is relatively rare: the development of senile cataract is a problem of more practical importance though it seems no more common in diabetics than in non-diabetics in a similar age group. This view is supported by

the findings of Waite and Beetham (1935), who found the incidence of senile cataract in 2000 diabetic patients no greater than in non-diabetics of a comparable age [22].

Cataract frequency varies between ethnic populations and geographic locations (ranges from 35% to 48%), and in these circumstances it can be found higher in diabetics when compared to non-diabetics. For example, in Chinese, Indonesian and Indian populations rate of diabetic cataract was higher than in other populations [3,5,15].

Cataract formation in diabetics maybe related to hyperglycemia or to old age [16].

Unfortunately, diabetic cataract extraction is associated with higher complication rates than nondiabetic surgery and may be accompanied by macular edema, progression of retinopathy, frank neovascularization, uveitis, and posterior capsular thickening. The precise cause of diabetic cataract is unknown [20].

*Pathogenesis.* The base of pathogenesis of diabetic cataracts is accumulation of glucose in the lens, following background episodes of hyperglycemia. Some part of glucose transforms into sorbitol. Glucose and sorbitol have a high osmolarity and are able to delay the fluid, which causes swelling of the lens, change of its shape and refractive properties. These changes cause degeneration of the lens and later cataract (Fig. 1).

*Diagnostic.* A comprehensive ophthalmologic examination includes:

- visual acuity measurement; evaluation of relative afferent pupil defect; slit-lamp biomicroscopy; gonioscopy; intraocular pressure measurement; dilated fundus examination.



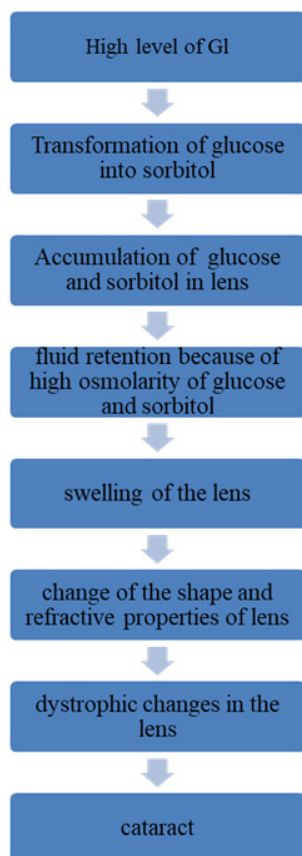


Fig. 1. Pathogenesis of cataract

In selected cases, ancillary tests such as fundus angiography and OCT may also be useful.

#### Treatment of diabetic cataracts in diabetes mellitus

Treatment of diabetic cataracts is always carried out in parallel with the treatment of the underlying disease - diabetes mellitus.

It is impossible to get results of treatment of cataract without restoration of metabolism, without stabilizing the level of blood sugar.

The following methods are used: Insulin therapy (with DM2); Diet therapy (with insulin-independent DM); Physiotherapy and lifestyle correction; Surgical treatment.

Modifications to surgical technique and intraocular lens material are thought to alter outcome. Small incision phacoemulsification surgery causes less postoperative breakdown of the blood-aqueous barrier than extracapsular extraction does, but this complication nonetheless increases with advancing retinopathy [9,24].

Anterior capsular phimosis is greater in diabetic than in nondiabetic patients and may have clinical significance if retinal laser treatment is required.

#### Diabetic retinopathy. Definition and features

Diabetic retinopathy (DR), a microangiopathy affecting all of the small retinal vessels, such as arterioles, capillaries and venules, is characterized by increased vascular permeability, ocular hemorrhages, lipid exudate, by vascular closure mediated by the development of new vessels on the retina and the posterior vitreous surface [18].

Diabetic retinopathy includes non-proliferative and proliferative retinopathy.

The overall prevalence of diabetic retinopathy varies in different populations [2]. Diabetic retinopathy is the major blinding ocular complication of diabetes.

Recent studies have also found correlations between HbA1c and other glycosylated proteins, particularly the advanced glycosylation end products (AGEs), and progression of retinopathy.

These modified proteins are markers of chronically elevated glucose levels and are indicators of overall diabetes control.

*Pathogenesis.* There is a very strong relationship between chronic hyperglycemia and the development of DR [11,23].

Hyperglycemia causes vascular endothelial dysfunction. Many inter-dependent metabolic pathways have been put forward as important connections between hyperglycemia and DR.

These implicated metabolic pathways include:

- increased polyol pathway-activity (Fig. 2), [13],
- protein kinase C (PKC) pathway activity (Fig. 3), [8],
- up-regulation of growth factors of vascular endothelial growth factor (VEGF) [8],
- generation of advanced glycation end products (AGEs) [4,20],
- chronic oxidative damage [6],
- increased activation of the renin-angiotensin system (RAS) [21],
- chronic inflammation and abnormal clumping of leukocytes (leukostasis) [21].

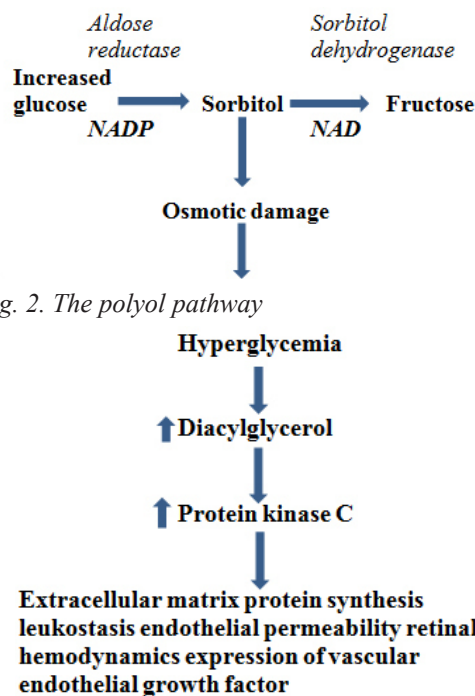


Fig. 2. The polyol pathway

Fig.3. The protein kinase C pathway

*Diagnostic.* The comprehensive dilated eye examination includes dilation, tonometry, visual field test and a visual acuity test.



During examinations it is possible to detect: Abnormal blood vessels; Swelling, blood or fatty deposits in the retina; Growth of new blood vessels and scar tissue; Bleeding in the clear, jelly-like substance that fills the center of the eye (vitreous); Retinal detachment; Abnormalities in the optic nerve [32].

Optical coherence tomography (OCT) is another way to look closely at the retina. A machine scans the retina and provides detailed images of its thickness. This helps your doctor find and measure swelling of your macula [33].

Fluorescein angiography is a medical procedure in which a fluorescent dye is injected into the bloodstream. The dye highlights the blood vessels in the back of the eye so they can be photographed [34].

*Treatment:* increased metabolic control; Glycemic control; Control of blood pressure; Control of serum lipids; laser treatment; intravitreal medication; surgery.

In this paper we aim to compare and research:

- The prevalence of DM in the Sumy region during the years 2011-2016 compared with that of the whole of Ukraine.
- The prevalence of ocular complications of diabetes and their tendency to progress in Ukraine and Sumy region over the years 2011 – 2016.
- Various demographical traits of the prevalence of ocular complications of diabetes.
- The dependence of prevalence of ocular complications of diabetes upon various socio-economic factors.

**Material and methods.** We conducted a statistical analysis of the data concerning diabetes and its complications in Sumy region compared with the prevalence of DM in the whole of Ukraine. The materials that were analyzed were collected over the last 6 years from the Department of Endocrine diseases of the Regional Hospital of Sumy. In addition materials were collected from the Global Burden of Disease Study (GBD) presented by the Institute of Health Metrics and Evaluation (University of Washington, Seattle) [31]. Environmental reports were collected from the website of the government of Sumy region [35].

#### Results and their discussion. Epidemiology of DM

The prevalence of diabetes in Sumy region in the year 2011 was 3418.6 per 100,000 people compared with 2773.1 people in Ukraine. In 2012 the prevalence of DM in Sumy region grew to 3527.34 compared to 2885 in whole of Ukraine. In 2013 there was additional growth to 3673.06 per 100,000 people in Sumy region compared to 2780.5 in Ukraine. In 2014 prevalence of diabetes in the Sumy region continued to grow to 3804.68 compared to 2730.7 in the whole of Ukraine, and in 2015 it grew even more to 3877.1 compared with 2861.6 in Ukraine (Fig. 4). The prevalence of DM in Sumy region grew even more in the year 2016 to the value of 4018.3 per 100,000 people. The absolute total number of people sick with DM in Ukraine at the beginning of 2017 were 537 641 people [25-29].

#### Epidemiology of diabetic cataract

The annual loss of health from cataract is 57 per 100,000 people in the whole of Ukraine. In Eastern Eu-

rope Ukraine reserved the 6<sup>th</sup> place for loss of healthy life after Russia, Latvia, Lithuania and Croatia. The number of years of loss of health, caused by cataract, in Ukraine is lower relative to the region of Eastern Europe but higher relative to the world [31].

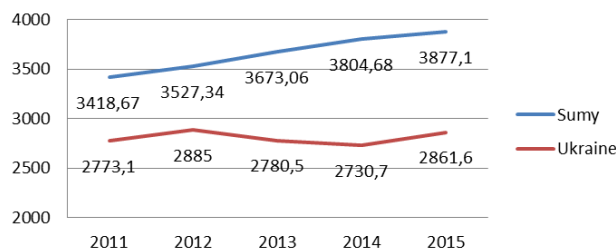


Fig.4. Prevalence of DM in Ukraine compared with Sumy region during the years 2011-2015

The data analyzed from hospitals in the Sumy region and other regions in Ukraine [25] shows that in the year 2011, diabetic cataract counts for 6% among all complications of diabetes ( $n = 195.35$  persons per 100,000). In 2012 it was also 6% ( $n = 198.51$ ), in 2013 – 5% ( $n=196.74$ ), in 2014 – 5% ( $n=203.72$ ) and in 2015 – 5% ( $n = 196.5$ ) (Fig.7), [25-29].

Diabetic cataract prevalence varies amongst various age-groups (Fig. 5). In the year 2011, amongst teenagers (15-17 years) the prevalence of diabetic cataract was almost zero ( $n=2$ ) whereas amongst adults (18-54 years) it was 59% ( $n=1908$ ), and amongst elderly (55 and over) – 41% ( $n=1310$ ) [25].

In the year 2015 there weren't any cases with diabetic cataract among teenagers. However, amongst adults the prevalence of diabetic cataract was 60% ( $n=1923$ ) and among the elderly – 40% ( $n=1395$ ) [29].

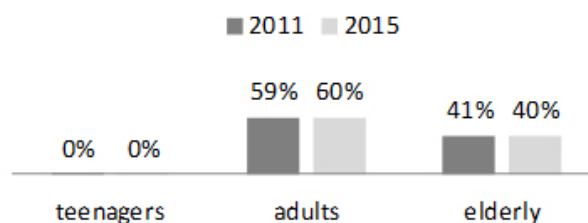


Fig. 5. Prevalence of diabetic cataract in different age categories

*Epidemiology of diabetic retinopathy.* The prevalence of diabetic DR was higher in Ukraine than in Sumy region. So, in 2011 it was 16% of total diabetic complications ( $n=542.95$ ), in 2012 – 15% ( $n=540.07$ ), in 2013 – 17% ( $n=626.61$ ), in 2014 – 14% ( $n=531.52$ ), and in 2015 – 14% ( $n=541.52$ ) [25-29].

Diabetic retinopathy prevalence varies amongst various age-groups (Fig. 6). In the year 2011 were 9129 cases of diabetic retinopathy: 0,6% of the cases ( $n=15$ ) were amongst teenagers (15 – 17 years old), 58% ( $n=5,303$ ) amongst adults (18 – 55 years old women, 60 years old men) and 42% ( $n=3,811$ ) amongst the elderly (from 55 years old women, 60 years old men) [25].

Then in 2015 the total level of DR cases declined from 9129 cases to 8857 cases. The prevalence amongst teenagers 0.2% (n = 5), 60% (n = 5,316) amongst adults and 40% (n=3,536) amongst elderly group [29].

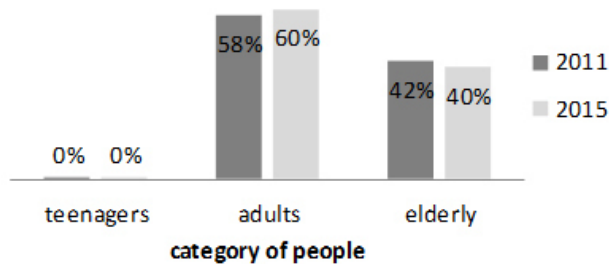


Fig. 6. Prevalence of diabetic retinopathy in different age categories

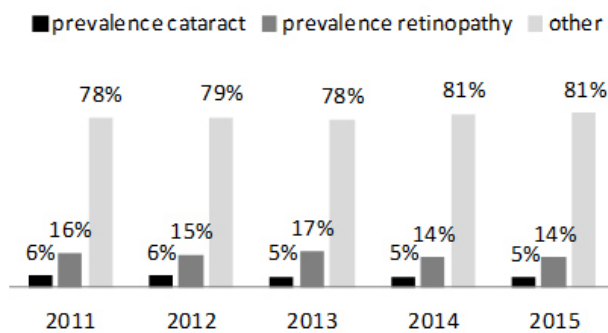


Fig. 7. Prevalence of DM ophthalmic complications

The prevalence of DM in Sumy region grew between the years 2011-2016 by 17.5%. During that period there was no significant change in the prevalence of DM in the whole of Ukraine. This difference between Sumy and the whole of Ukraine will be discussed later in this discussion.

The prevalence of ocular complications of DM are approximately 22% of which 6% are for DC and 16% are for DR. The prevalence of ocular complications did not change over the years. At the time point of writing this article there are 88 ophthalmologists in Sumy region, of which 47 serve in the town of Sumy. Out of 88 ophthalmologists, 14 doctors treat the juvenile sector. This adequate number of eye-doctors, work on the prevention and treatment of ocular complication of DM and are capable of keeping the prevalence of ocular complications of DM constant.

It can be seen that these ocular disorders do not almost occur within the juvenile group, are highly prevalent with adults (60%) and decrease a little within the elderly group (40%). This is due to the low life expectancy of adults that are sick with DM with ocular complications who will not reach the age of the elderly group.

The absolute number of endocrinologists in the whole of Sumy region is 36 and stands on the 6<sup>th</sup> place from the bottom of the list of occurrence of endocrinologist per region (0.32 per 10 000 people). Compared to Kyiv that has 201 endocrinologists (0.7 per 10 000 people) only for

the town, this number is extremely low. During the years 2011-2016 this number did not change. In addition, according to our investigation there was no significant anti-diabetes campaign during these years, not in the Sumy region and neither in the whole of Ukraine. Therefore, the increase in prevalence of DM must be explained not merely by hyperdiagnostic but by real new causes of sickness.

Since the Sumy region is well known as an industrial area, we suspect environmental hazardous materials to be the causes of the increase in DM prevalence. We therefore investigated the last environmental report for the Sumy region in the year 2017 [35]. The findings indicated that there is a strong case for 'accusing' environmental factors with the increase of DM prevalence. Findings of the report show that during the five-year observation period (2012-2016), there was a significant increase in the observed level of atmospheric air pollution. In 2016 there was an increase of 13.2% in emissions of pollutants into the air from stationary sources compared to 2015 (in absolute numbers there was an increase of 2.3 thousand tons of pollutants). The main pollutants were: nitrogen compounds (by 1.0 thousand tons or by 53.2%); carbon monoxide (by 0.8 thousand tons or by 17.6%); methane (by 0.1 thousand tons or by 4.8%); sulfur dioxide (by 0.1 thousand tons or by 4.1%); sulfuric acid (by 36.7 tons or by 43.3%); POP (benzopyrene) (by 0.006 tons or 7 times); bromine and its compounds (by 0.031 tons or 2.7 times) [35].

In addition to the increase of air pollution during the years 2012-2016, there was also significant increase in contamination of surface water by sewage which might have reached ground water. This water is used in the Sumy region as drinking water. In 2016, the total discharge of sewage into surface water was 48.38 million m<sup>3</sup> in comparison with 2015 when it was 45.59 million m<sup>3</sup>. The absolute increase in contamination was by 2.79 million m<sup>3</sup> [35].

Environmental pollution is a well-known cause of DM and has been reported in the works of David Spero [36] and Jacquelyn K. Beals [33]. Spero claims that chemicals in food, water, plastic packaging, and cleaning and beauty care products have all been found to increase insulin resistance and diabetes [36]. In her study, Beals looked for significant association between factors such as levels of heavy metals or pesticides in blood or urine and cases of T2D [1].

In addition to environmental pollution as a cause of increase of DM prevalence, in the last years another significant cause has been found – moving from rural style of life to an urban style of life. In India, it was found that the prevalence of DM was two and half times higher in urban areas than in rural areas [12].

We now know that this process of urbanization changes the daily life style of people in the form of increase in fat consumption, physical inactivity, and substance abuse with associated risk of development of

chronic diseases like hypertension and DM [10]. Nirmala et al. [14] also reported higher level of diabetes in urban areas compared with tribal areas. These findings are in accordance with the similar process that is occurring in the Sumy region, mainly since the dissolving of USSR in 1991. We know that since 1980 the number of agricultural settlements of Sumy region has decreased from 1629 to 1491 (138 villages were liquidated). Most of the villagers have migrated to the towns and have changed their life style [37].

**Conclusion.** In this work we have shown a clear increase in the prevalence of diabetes mellitus in Sumy region during the period 2011 – 2016. We have found that this increase is in accordance with severe increase in environmental pollution. In addition we have shown that there is a process of the population moving from the villages to the towns – a process which invites negative change in life style leading to higher prevalence of DM. We plan in the future to look in detail into the question of ground water pollution and research whether the drinking water is polluted in a way that it may affect the increase prevalence of DM.

## REFERENCES

1. Beals J.K.: 5 Environmental Factors Linked to Type 2 Diabetes Using Novel Approach - Medscape - May 21, 2010.
2. Browning D.: Diabetic Retinopathy: Evidence-Based Management. Springer: New York, Heidelberg, London 2010; 63.
3. Chen S.J., et al. Prevalence and associated factors of lens opacities among Chinese type 2 diabetics in Kinmen, Taiwan // *Acta Diabetol.* 2008; 45:7–13.
4. Chu J., et al. Diabetic Retinopathy: A Review // *Drug Dev Res.* 2008; 69:1–14.
5. Husain R., et al. Prevalence of cataract in rural Indonesia // *Ophthalmology.* 2005; 112:1255–1262.
6. Kowluru R.A., et al. Abnormalities of retinal metabolism in diabetes and experimental galactosemia. VII. Effect of long-term administration of antioxidants on the development of retinopathy // *Diabetes.* 2001; 50:1938–1942.
7. Kowluru RA, et al. Oxidative stress and diabetic retinopathy // *Exp Diabetes Res.* 2007;2007: 43603
8. Kowluru RA. Diabetic retinopathy: mitochondrial dysfunction and retinal capillary cell death // *Antioxid Redox Signal.* 2005; 7:1581–1587.
9. Laurell CG, et al.: Randomized study of the bloodaqueous barrier reaction after phacoemulsification and extracapsular cataractextraction//*Acta Ophthalmol Scand* 1998, 76:573–578.
10. Leon B.M.: Diabetes and cardiovascular disease: Epidemiology, biological mechanisms, treatment recommendations and future research // *World J Diabetes.* 2015 Oct 10; 6(13): 1246–1258.
11. Matthews DR, et al. Risks of progression of retinopathy and vision loss related to tight blood pressure control in type 2 diabetes mellitus: UKPDS 69 // *Arch Ophthalmol.* 2004; 122:1631–1640.
12. Mohan V., et al. Urban rural differences in prevalence of self-reported diabetes in India—the WHO-ICMR Indian NCD risk factor surveillance // *Diabetes Research and Clinical Practice,* 2008, 80/1: 159–168.
13. Naruse K, et al. Aldose reductase inhibition prevents glucose-induced apoptosis in cultured bovine retinal microvascular pericytes // *Exp Eye Res.* 2000; 71:309–315.
14. Nirmala P.V.et al., Comparative Study of the Prevalence of Type-2 Diabetes Mellitus in Various Demographic Regions of Andhra Pradesh, India: a Population based Study // *Int J MCH AIDS.* 2016; 5(2): 103–111.
15. Nirmalan PK, et al. Risk factors for age related cataract in a rural population of southern India: the Aravind Comprehensive Eye Study // *Br J Ophthalmol.* 2004; 88:989–994.
16. Pollreis A., et al. Diabetic Cataract—Pathogenesis, Epidemiology and Treatment // *Journal of Ophthalmology* 2010; 2010: 8.
17. Sayin N. et al. Ocular complications of diabetes mellitus. *World J Diabetes.* 2015 Feb 15; 6(1): 92–108
18. Singh PP, et al. Reactive oxygen species, reactive nitrogen species and antioxidants in etiopathogenesis of diabetes mellitus type-2 // *Indian J Clin Biochem.* 2009; 24:324–342.
19. Stanga P et al. Ocular manifestations of diabetes mellitus // *Current Opinion in Ophthalmology:* Dec 1999; 10:483-489
20. Stitt AW. The role of advanced glycation in the pathogenesis of diabetic retinopathy // *Exp Mol Pathol.* 2003; 75:95–108.
21. Tarr JM, et al. Pathophysiology of diabetic retinopathy // *ISRN Ophthalmol.* 2013; 2013:343560.
22. Waite J. H., et al. *New Engi. J. Med.*, 1935; 212, 367
23. White N.H, et al. Beneficial effects of intensive therapy of diabetes during adolescence: outcomes after the conclusion of the Diabetes Control and Complications Trial (DCCT) // *J Pediatr.* 2001; 139:804–812.
24. Zaczek A, et al.: Aqueous flare intensity after phacoemulsification in patients with diabetes mellitus // *J Cataract Refract Surg* 1998, 24:1099–1104.
25. Довідни основних показників діяльності ендокринологічної служби України за 2011 рік // *Ендокринологія.* - 2012. - Т. 17, №1. - Додаток 2. - 19-20.
26. Довідник основних показників діяльності ендокринологічної служби України за 2012 рік // *Ендокринологія.* - 2013. - Т. 18, №1. - Додаток 1.- 19-20.
27. Довідник основних показників діяльності ендокринологічної служби України за 2013 рік // *Ендокринологія.* - 2014. - Т. 19, №1. - Додаток 1. - 22-23.
28. Довідник основних показників діяльності ендокринологічної служби України за 2014 рік // *Ендокринологія.* - 2015. - Т. 20, №1. - Додаток 1. - 19-20.
29. Довідник основних показників діяльності ендокринологічної служби України за 2015 рік // *Ендокринологія.* - 2016. - Т. 21., №1 - Додаток 1.- 24-25.
30. <http://www.idf.org/sites/default/files/Diabetes-Atlas-3rd-edition.pdf>. as seen on 07.02.18
31. <http://global-disease-burden.healthgrove.com/1/66512/Diabetes-Mellitus-in-Ukraine> as seen on 07.02.18
32. <https://www.mayoclinic.org/diseases-conditions/diabeticretinopathy/diagnosis-treatment/drc-20371617> as seen on 07.02.18
33. <https://www.aao.org/eye-health/diseases/diabetic-retinopathy-diagnosis> as seen on 07.02.18
34. <https://www.healthline.com/health/fluorescein-angiography> as seen on 07.02.18
35. <https://menr.gov.ua/files/docs/Reg.report.pdf> as seen on 07.02.18
36. <https://www.diabetesselfmanagement.com> as seen on 07.02.18
37. <http://www.dancor.sumy.ua/articles58293> as seen on 07.02.18

## SUMMARY

### SUSPECTED ENVIRONMENTAL AND SOCIO-ECONOMIC CAUSES OF DIABETES MELLITUS AND ASSOCIATED OCULAR COMPLICATIONS IN THE SUMY REGION, UKRAINE, FOR THE PERIOD OF 2011-2016

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The aim of the study was to compare and research: the general prevalence of DM in the Sumy region compared with the prevalence of DM in the whole of Ukraine during the years 2011-2016; the prevalence of ocular complications of diabetes and their tendency to progress in Ukraine and Sumy region over this period; various demographical traits of the prevalence of ocular complications of diabetes and the dependence of prevalence of ocular complications of diabetes upon environmental causes and various socio-economic factors.

We conducted a statistical analysis of data on diabetes and its complications in the whole of Ukraine and the Sumy region. The materials that were analyzed were collected over the last 6 years from the Department of Endocrine diseases of the Regional Hospital of Sumy. In addition materials were collected from the Global Burden of Disease Study (GBD) presented by the Institute of Health Metrics and Evaluation (University of Washington, Seattle).

In this work we have shown an increase of 17.5% in the prevalence of diabetes mellitus in the Sumy region

during the period 2011 – 2016. During that period there was no significant change in the prevalence of DM in the whole of Ukraine. The prevalence of ocular complications of DM are approximately 22% of which 6% for DC and 16% for DR. The prevalence of ocular complications did not change over the years. We have shown that the increase of DM prevalence is in accordance with severe increase in environmental pollution. In addition we have shown that there is a process of the population moving from the villages to the towns – a process which invites negative change in life style leading to higher prevalence of DM.

We plan in the future to look in detail into the question of ground water pollution and research whether the drinking water is polluted in a way that it may affect the increased prevalence of DM.

**Keywords:** diabetes mellitus, ocular complications of diabetes, diabetic retinopathy, diabetic cataract, environmental pollution, Sumy region, Ukraine.

## РЕЗЮМЕ

### ОПРЕДЕЛЕНИЕ ЭКОЛОГИЧЕСКИХ И СОЦИАЛЬНО-ЭКОНОМИЧЕСКИХ ПРИЧИН САХАРНОГО ДИАБЕТА И ЕГО ОФТАЛЬМОЛОГИЧЕСКИХ ОСЛОЖНЕНИЙ В СУМСКОЙ ОБЛАСТИ И УКРАИНЕ ЗА ПЕРИОД 2011-2016 ГГ.

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Целью исследования явилось определение экологических и социально-экономических причин развития сахарного диабета и его офтальмологических осложнений в Украине и Сумской области в течение 2011-2016 гг., анализ их зависимости от социально-экономических факторов, разработка мер для предотвращения офтальмологических осложнений сахарного диабета.

Проведен статистический анализ данных по сахарному диабету (СД) и его осложнениям в Украине в целом и в ее Сумской области. Проанализированы материалы из отделения эндокринологии Областной больницы г. Сумы за 6 лет. Некоторые данные заимствованы из Global Burden of Disease Study (GBD), Institute of Health Metrics and Evaluation (University of Washington, Seattle). Проведен срав-

нительный анализ результатов исследований с данными других авторов.

Показано достоверное увеличение распространенности СД в Сумской области за период с 2011 по 2016 гг. Существенных изменений в распространенности СД по Украине, в целом, не отмечено. За последние годы показатели распространенности офтальмологических осложнений стабилизировались.

Установлено, что распространенность СД обусловлена ростом загрязнения окружающей среды. В будущем планируется детальное изучение вопроса о загрязнении грунтовых вод и проведение исследований на предмет выявления роли степени загрязнения питьевой воды на распространение СД.