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Public report

Dynamics of urological morbidity of the Central Federal District population (Russian Federation) in 2013-2017

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Abstract: Based on official statistics of the Russian Federal State Statistics Service and the Ministry of Healthcare, the article analyzes the state and dynamics of urological morbidity, along with urologic cancer incidence and mortality in adult population of the Central Federal District vs. entire Russian Federation (RF). It was established that genitourinary diseases are consistently at the top in the structure of RF population morbidity and mortality, often being among leading causes of disabilities as well. The analysis results, using the case-studies of specific nosological forms, constitute an important methodological and informative base for strategic planning of developing both medical and preventive care in the patients, as well as create essential basis for further improvement of specialized outpatient and inpatient types of a health care.

Keywords: urological morbidity, urologic cancer incidence, morbidity trends, mortality from urologic diseases, improving urological care.

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Introduction

Genitourinary system (GS) diseases are among priority issues of contemporary medicine. As noted by many authors and confirmed by official statistics, there was a significant morbidity increase in this class of diseases over the past decade [1-4]. By the end of the twentieth century, the proportion of GS diseases in the structure of the total morbidity incidence was 4-5%. Currently, according to the statistics, this number in Russian Federation (RF) increased up to 7%, or still more in some RF regions and foreign countries [2, 4-6].

In 2017, the GS diseases' share in the general morbidity structure of RF population surpassed the above-mentioned cut-off value and reached 7.17% (161,776.0 and 11,594.3 cases per 100 thousand people, respectively), while the annual growth rate was 0.08%. The highest growth rates were observed for the following nosologies: diseases of prostate and bladder, urolithiasis, and male infertility [1, 3, 6]. Similar to those nosological forms, there was even more pronounced increase in urologic oncology – especially stage I or II tumors with localization of malignant neoplasms (MN) in the kidneys and prostate, which led to augmented disability and mortality rates, predominantly, in the working age population [7-10].

Analysis of urological morbidity dynamics is an important methodological and informational basis for strategic planning of specialized medical care development. It creates required prerequisites for designing a set of measures for developing residential outpatient and inpatient care. Hence, the objective of our research stated below.

Study objective involved analyzing uronephrological morbidity (including urologic cancer incidence) in adult population of the Central Federal District (CFD) over 2013-2017 in comparison with similar data for entire Russian Federation (RF) in order to evaluate morbidity levels and dynamics.

Material and Methods

Data source

Data sources for the study included official statistics, reporting forms of municipalities – such as form No. 12 "Information on the number of diseases registered in patients living in the service area of a medical institution (MI)", form No. 30 "MI annual medical report", scientific (magazines and information portals) and methodological literature.

Study design

The research design consisted of three consecutive stages: Stage 1 – analysis of literature sources, official statistics on the topic under study, development of the research program and the formulation of its objective; Stage 2 – copying data from their official sources and their statistical processing; Stage 3 – data analysis, synthesis and discussion of the results. The dynamics of morbidity indicators over 2013–2017 was analyzed for entire RF vs. entire CFD vs. particular CFD subjects, using absolute growth and growth rate indices, along with building a forecast trend graph.

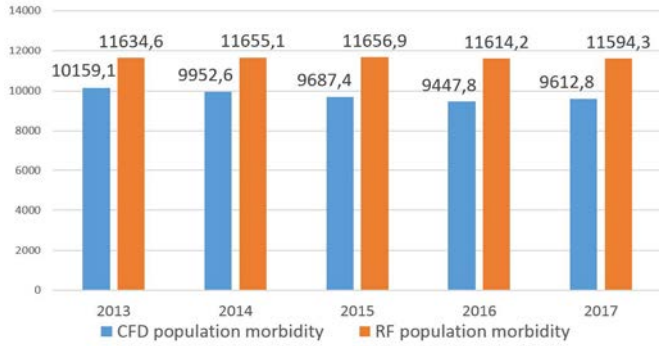

Figure 1. Comparative dynamics of the overall GS diseases morbidity of the Central Federal District population vs. entire Russian Federation population over 2013-2017 (per 100,000 residents).

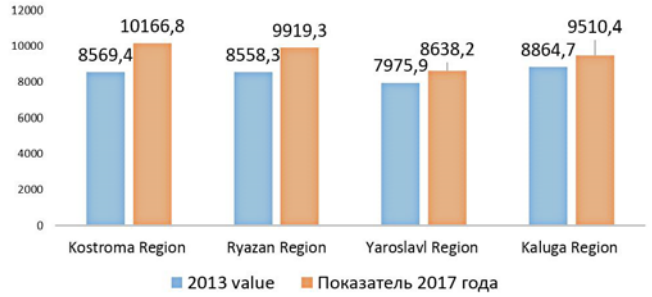

Figure 2. Central Federal District regions with highest growth rates of GS diseases morbidity over 2013-2017 (per 100,000 residents).

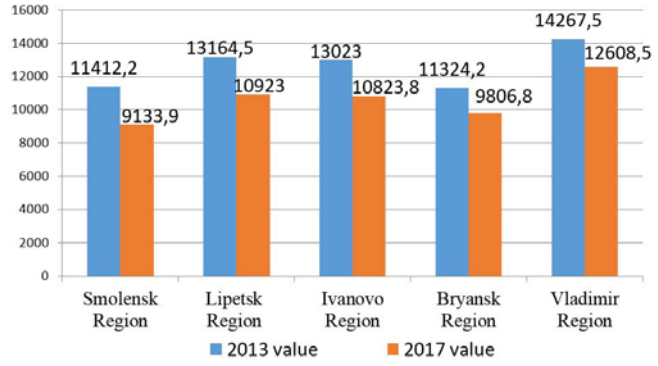

Figure 3. Central Federal District regions with the highest rate of decline in the overall incidence of GS diseases (per 100,000 residents).

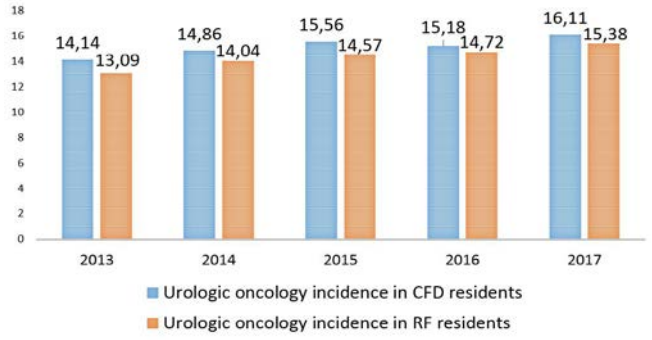

Figure 4. Dynamics of urologic oncology incidence in the population of the Central Federal District and entire Russian Federation over 2013-2017 (per 100,000 residents).

Statistical analysis

Analyzing our results involved calculating relative indicators and assessing statistical significance of the differences in population means (Student's t-test). Computed t-criterion values were compared with tabular values, while the differences in the indicators were considered statistically significant at significance level of $p<0.05$. The confidence intervals for the means were calculated at a confidence level of at least 0.95 [11]. Statistical data processing was performed using the PASW (Predictive Analytics SoftWare) Statistics 22 software.

Results

Incidence of GS diseases in the population

The total registered incidence of GS diseases in RF in 2017 was 17,025,367(absolute number), or 11,594.3 (per 100,000 of the population), which was lower than in 2013 (absolute number of 16,821,274 people, or 11,634.6 per 100 thousand residents). The growth rate of this indicator (per 100,000 population) amounted to -0.4% over the specified period of time. The incidence rate of GS diseases in CFD population had lower values: 10,159.1 in 2013 and 9612.8 in 2017 (per 100 thousand people). However, the growth rate of this indicator in CFD significantly exceeded its values for the entire RF and amounted to -5.4% over the analyzed period of time (*Appendix* 1, *Figure* 1).

Considering particular CFD subjects, four of those had the highest growth rate of GS diseases per 100,000 residents: Kostroma Region (+18.6%), Ryazan Region (+15.9%), Yaroslavl Region (+8.3%) and Kaluga Region (+7.3%) ($p<0.05$) (*Appendix* 1, *Figure* 2).

Over the analyzed period of time, the highest rate of decline in this indicator (per 100 thousand people) was recorded in the following CFD subjects: Smolensk Region (-20.0%), Lipetsk Region (-17.1%), Ivanovo Region (-16.9%), Bryansk Region (-13.4%), Vladimir Region (-11.6%) (differences were significant, $p<0.05$) (*Appendix* 1, *Figure* 3).

Urologic cancer incidence

Urologic oncology, as well as overall morbidity related to malignant neoplasms of various localizations, demonstrated a distinct upward trend in all CFD regions, as well as in the entire RF. For the period from 2013-2017, the growth rate of this pathology was 13.93% in the CFD vs. 17.49% in the RF (per 100,000 residents), the annual growth rate was 2.8% vs. 3.5%, respectively (*Appendix* 2, *Figure* 4).

Mortality from GS MN in RF for the period of time from 2013-2017 increased by 6.7%, vs. 5.7% in CFD. Detailed data on residential mortality from MN in general, and MN of GS, for both entire RF and CFD are given in *Table* 1.

The proportion of deaths from GS MN in the structure of mortality from all malignant neoplasms annually was over 17%. In the entire RF, the proportion of the patients, who died during their first year after the MN diagnosis and registration in the previous year, declined from 25.3% in 2013 to 22.5% in 2017. Residential mortality rates from major nosological categories of GS MN are compiled in *Table* 2. The following diagnoses sensu ICD-10 are assigned to MN of other GS organs: C65 (MN of the renal pelvis); C66 (MN of ureter) and C68 (MN of other and unspecified urinary organs).

Table 1. Residential mortality in the Russian Federation and Central Federal District from malignant neoplasms over 2013-2017

Indicators	*Years*									
	2013		2014		2015		2016		2017	
	RF	CFD	RF	CFD	RF	CFD	RF	CFD	RF	CFD
Total died from MN, absolute numbers	288,636	85,320	286,900	84,311	296,476	83,973	295,729	84,487	290,662	81,256
Total died from MN, absolute numbers	288,636	14,997	49,,527	14,679	50,281	14,699	51,371	14,894	50,813	14,408
GS MN, per 100,000 people	32.7	33.3	34.3	33.7	34.5	33.3	34.0	34.5	34.9	35.2
Died from GS MN,%	16.3	17.6	17.3	17.4	17.0	17.5	17.4	17.6	17.5	17.7
Growth rate, %	-	-	4.9	1.2	0.6	-1.2	-1.4	3.6	2.7	2.1

Table 2. Comparative characteristics of genitourinary system malignant neoplasm-caused mortality rates

Subject	*Prostate*		*Kidney*		*Urinary bladder*		*Other GS organs*	
	Malignant neoplasm localtion in 2013							
	Abs. no.	Rel. no. per 100,000 residents	Abs. no.	Rel. no. per 100,000 residents	Abs. no.	Rel. no. per 100,000 residents	Abs. no.	Rel. no. per 100,000 residents
RF	11111	16.72	8 459	5.89	6 561	4.57	445	0.42
CFD	3 364	18.95	2 409	6.22	1 993	5.14	171	0.44
	Malignant neoplasm location in 2017							
	Abs. no.	Rel. no. per 100,000 residents	Abs. no.	Rel. no. per 100,000 residents	Abs. no.	Rel. no. per 100,000 residents	Abs. no.	Rel. no. per 100,000 residents
RF	12 565	18.46	8 386	5.71	6 094	4.15	558	0.40
CFD	3 607	20.01	2 271	5.78	1 744	4.44	131	0.33
	Growth rate, absolute and relative, per 100,000 residents							
	Abs. no.	Rel. no.	Abs. no.	Rel. no.	Abs. no.	Rel. no.	Abs. no.	Rel. no.
RF	1 454	10.4*	- 73	- 3.1	- 467	- 9.2*	113	-4.8
CFD	243	5.6	- 138	- 7.1	- 249	-13.4*	- 40	-25.0

* differences are significant at $p<0.05$; Abs. no. – absolute numbers; Rel. no. – relative numbers.

Data in *Table* 2 imply that, over the analyzed period, solely mortality from prostate cancer had a steady upward trend: +10.4% (RF) vs. +5.6% (CFD). As for MN of other locations (kidney, urinary bladder, and other GS organs), there was a tendency to decrease in these indicators.

Discussion

Our study confirmed high significance of conducting a systematic analysis of the dynamics related to urological morbidity and urologic cancer incidence of the population, along with monitoring the mortality caused by GS MN. Such analysis could serve a methodological basis for implementing strategic planning methods aimed at specialized medical care.

When analyzing statistical resources on residential morbidity incidence in the RF vs. CFD subjects, we obtained the following data. The absolute number of registered adult patients diagnosed with GS vs. relative index (per 100,000 residents) in the Russian Federation in 2013 was 16,821,274.0 vs. 11,634.6. In 2017, this indicator decreased by 0.4% and amounted to 17,025,367 vs. 11,594.3, respectively.

A comparative analysis of the relative incidence of GS diseases in CFD regions vs. entire RF (per 100 thousand residents) showed declining trends for both CFD and RF. However, in a number of CFD subjects, during 2013-2017, there has been a steady upward trend, confirmed by the studies of domestic and foreign scientists [2-4]. Moreover, the dynamics of declining morbidity rate in this nosological category was developing unevenly over five years. In RF, between 2013-2015, its decline was obvious due to improvements in diagnosing and detecting GS diseases in the primary health care sector; while since 2016, there has been a slight drawback, which, apparently, can be explained by a higher detection rate of this pathology. As for CFD, a different picture was observed: from 2013-2016, there was a significant GS morbidity decline, which can be explained by successful implementation of comprehensive preventive programs, additional medical examinations, and implementation of a three-level system of provisioning medical care to the population [7, 9].

The increased attention to the problems of oncological morbidity is due to a steady tendency towards an increase in its incidence rate worldwide. The latter is projected to continually increase in virtually all countries in the years to come, which could be explained by a number of objective and subjective reasons, including population aging, along with environmental, economic and other factors [3, 4, 9, 10, 12]. During the analyzed period, the indicators of active detection of the patients with GS MN at the early stages significantly improved for both entire Russian Federation and CFD. This progress was caused by multiple factors, such as changing demographic situation (a steady increase in the elderly people share in the general structure of the country population); ongoing organizational changes in the healthcare sector of the RF (increased coverage of medical examinations of the residents belonging to the various age groups); expansion of oncological institutions' network; and emergence of new and improvement of existing diagnostic methods.

As for specialized medical institutions, there were 96 oncological dispensaries in the RF in 2017, 92 of those had hospitals, and 2 had specialized oncological hospitals. The greatest number of the patients with tumors of various localizations is detected at the early stages (I-II), which may also indicate an increase in the vigilance of the doctors of various specialties, especially in the primary care units. The analysis of the incidence structure in malignant neoplastic diseases by nosological categories showed that the leading localizations in the general

structure of residential GS oncological morbidity were prostate, uterine corpus, kidney, urinary bladder, and ovary [6, 9, 10].

The analysis of mortality from GS MN revealed that this indicator had a steady upward trend both in the RF and all regions of the CFD, as well as in other countries [1, 4, 8-10, 12]. An average annual mortality growth rate was stably high and ranged from 0.42% (CFD) to 0.54% (entire RF), which corresponded to the data for most European countries. In the structure of mortality for this nosological class, the first three places are taken by prostate cancer (4.3% in the RF vs. 4.4% in CFD), kidney MN (2.9% in the RF vs. 2.8% in CFD), and MN of ovaries (2.6% in RF vs. 2.8% in CFD).

An analysis of the mortality trends in RF population from GS cancer, with calculation of its forecast levels, showed that in 2020, the mortality rate in entire RF would increase up to 35.5±1.2 cases per 100 thousand residents vs. 36.1±1.3 in CFD.

Conclusion

Thus, the data obtained from our study, convincingly confirmed that residential GS morbidity, prevalence of GS MN and mortality rate from those are high and tend to increase. The noted trends are associated with increase in coverage of various residential age groups by clinical examination, implementation of a three-level system of provisioning residential medical care, improvement in the detection of GS MN, especially at early stages, via new effective diagnostic methods and expansion of the oncological institutions' network. It should be also noted that domestic urological care still has a number of shortcomings, such as lack of continuity in the work among the clinic and the hospital, insufficient staffing by primary health care specialists, insufficient effectiveness of disease prevention system, poor quality and low efficiency of medical diagnostic and rehabilitation measures and health education of the population.

Ethical Issues

The article does not contain studies involving humans or animals performed by any of the authors.

Conflict of Interest

No conflict of interest is stated.

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Appendix 1. Population morbidity based on genitourinary system diseases in the RF and Central Federal District territories

Federal subjects of Russia	*2013*		*2014*		*2015*		*2016*		*2017*		*Growth rate**
	Absolute	Relative (per 100 thousand residents)	Absolute	Relative (per 100 thousand residents)	Absolute	Relative (per 100 thousand residents)	Absolute	Relative (per 100 thousand residents)	Absolute	Relative (per 100 thousand residents)	Per 100 thousand residents. 2017 to 2013. %
RUSSIA	16,821,274	11,634.6	17,047,406	11,655.1	17,050,217	11,656.9	17,019,933	11,614.2	17,025,367	11,594.3	-0.4
CENTRAL FEDERAL DISTRICT	3,929,448	10,159.1	3876703	9,952.6	3,773,378	9,687.4	3,694,486	9,447.8	3,774,020	9,612.8	-5.4
Belgorod Region	185,274	12,023.1	176,400	11,395.8	177,314	11,454.9	183,868	11,861.4	169,446	10,922.3	-9.2
Bryansk Region	141,968	11,324.2	137,251	11,132.0	128,193	10,397.3	120,995	9,871.2	119,227	9,806.8	-13.4
Vladimir Region	202,847	14,267.5	188,281	13,394.9	183,590	13,061.2	183,411	13,127.3	174,498	12,608.5	-11.6
Voronezh Region	242,458	10,404.2	249,427	10,699.8	255,644	10,966.4	272,750	11,688.6	248,426	10,641.1	+2.3
Ivanovo Region	136,606	13,023.0	121,760	11,742.6	107,352	10,353.1	27,726	2,692.3	110,285	10,823.8	-16.9
Kaluga Region	89,142	8,864.7	91,767	9,081.5	97,335	9,632.5	104,809	10,379.5	96,375	9,510.4	+7.3
Kostroma Region	56,464	8,569.4	60,464	9,239.8	58,609	8,956.3	51,785	7,949.2	65,651	10,166.8	+18.6
Kursk Region	90,141	8,053.6	84,945	7,602.2	81,991	7,337.8	84,566	7,550.4	83,174	7,432.5	-7.7
Lipetsk Region	153,003	13,164.5	142,200	12,281.2	127,106	10,977.6	125,858	10,886.5	125,965	10,923.0	-17.1
Moscow Region	557,365	7,908.0	580,358	8,025.9	578,427	7,999.2	569,937	7,787.5	570,166	7,639.5	-3.4
Orel Region	111,269	14,342.0	107,871	14,096.5	102,111	13,343.8	106,307	13,992.9	107,970	14,376.2	+0.2
Ryazan Region	97,963	8,558.3	101,172	8,910.4	114,054	10,044.9	107,151	9,481.5	111,503	9,919.3	+15.9
Smolensk Region	111,290	11,412.2	92,685	9,606.7	92,267	9,563.4	85,865	8,957.1	86,888	9,133.9	-20.0
Tambov Region	109,798	10,206.7	112,309	10,571.0	103,818	9,771.8	103,012	9,807.9	99,770	9,621.6	-5.7
Tver Region	124,508	9,333.0	124,213	9,445.3	122,040	9,280.1	123,348	9,453.8	125,771	9,747.2	+4.4
Tula Region	175,390	11,445.2	173,311	11,450.5	171,693	11,343.6	163,075	10,825.1	166,018	11,100.2	-3.1
Yaroslavl Region	101,427	7,975.9	95,623	7,519.7	99,330	7,811.2	102,556	8,063.1	109,550	8,638.2	+8.3
Moscow	1,242,535	10,372.2	1,236,666	10,138.6	1,172,504	9,612.6	1,177,467	9,549.5	1,203,337	9,670.4	-6.8

* Growth rate is over 5 yr time span is given in relative extensive indicators (%) per 100 thousand residents.

Appendix 2. Population morbidity based on urological cancer incidence in the RF and Central Federal District territories

Federal subjects of Russia	*2013*		*2014*		*2015*		*2016*		*2017*		*Growth rate**
	Absolute	Relative (per 100 thousand residents)	Absolute	Relative (per 100 thousand residents)	Absolute	Relative (per 100 thousand residents)	Absolute	Relative (per 100 thousand residents)	Absolute	Relative (per 100 thousand residents)	Per 100 thousand residents. 2017 to 2013. %
RUSSIA	110,874	13.09	120,092	14.04	124,979	14.57	127,056	14.72	132,709	15.38	17.49
CENTRAL FEDERAL DISTRICT	31,938	14.14	33,495	14.86	35,217	15.56	34,704	15.18	36,794	16.11	13.93
Belgorod Region	1,243	13.52	1,340	14.53	1,410	15.18	1,432	14.72	1,456	15.58	15.24
Bryansk Region	1,112	15.52	1,127	15.77	1,054	14.62	1,072	14.61	1,178	16.04	3.35
Vladimir Region	1,042	12.56	1,275	15.42	1,367	16.66	1,351	16.32	1,330	16.48	31.21
Voronezh Region	1,854	13.72	2,124	15.68	2,153	15.88	2,099	15.39	2,202	16.14	17.64
Ivanovo Region	1,015	16.31	964	15.76	1,105	18.24	1,181	19.78	1,214	20.17	23.67
Kaluga Region	1,112	14.12	1,227	15.89	1,259	16.59	1,306	16.93	1,303	17.28	22.38
Kostroma Region	967	16.66	988	17.15	1,050	18.09	1,048	18.24	977	16.71	0.30
Kursk Region	575	14.49	637	15.86	560	14.34	571	14.38	589	14.60	0.76
Lipetsk Region	968	14.07	1,071	16.14	1,131	16.95	1,226	18.11	1,134	16.52	17.41
Moscow Region	1,086	15.62	1,038	14.92	1,122	16.44	1,109	16.15	1,073	15.71	0.58
Orel Region	5,404	13.00	5,863	14.15	6,180	14.64	5,838	13.59	6,232	14.37	10.54
Ryazan Region	769	16.35	790	17.33	839	18.49	829	18.26	815	18.10	10.70
Smolensk Region	1,095	16.25	1,149	17.12	1,273	19.26	1,147	17.17	1,175	17.78	9.42
Tambov Region	748	12.82	848	14.74	810	14.02	805	14.16	856	15.10	17.79
Tver Region	878	13.63	1,035	16.38	1,020	16.00	970	15.56	972	15.75	15.56
Tula Region	1,421	15.64	1,543	17.33	1,580	17.81	1,507	16.83	1,637	18.75	19.89
Yaroslavl Region	1,185	15.67	1,256	17.12	1,271	17.12	1,263	16.89	1,360	18.21	16.21
City of Moscow	9,456	13.88	9,227	13.39	10,023	14.47	9,983	14.23	11,298	16.03	15.49

* Growth rate is over 5 yr time span is given in relative extensive indicators (%) per 100 thousand residents.