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Epidemiology of Parkinson's disease in the Southern Ukraine

Abstract. Background. Parkinson's disease (PD) is a slowly progressing neurodegenerative disease with accumulation of alpha-synuclein and the formation of Lewy bodies inside nerve cells. The prevalence of PD ranges from 100 to 200 cases per 100,000 population. However, in the Ukrainian reality, many cases of the disease remain undiagnosed, which affects the statistical indicators of incidence and prevalence. The purpose of the study is to compare PD epidemiological indices in the Southern Ukraine with all-Ukrainian rates. **Material and methods.** Statistical data of the Ministry of Health of Ukraine, public health departments of Odessa, Mykolaiv and Kherson regions for 2015–2017 were analyzed. There were used the methods of descriptive statistics and analysis of variance. **Results.** Average prevalence of PD in Ukraine is 67.5 per 100,000 population — it is close to the Eastern European rate. The highest prevalence was registered in Lviv (142.5 per 100,000), Vinnytsia (135.9 per 100,000), Cherkasy (108.6 per 100,000) and Kyiv (107.1 per 100,000) regions. The lowest rates were in Luhansk (37.9 per 100,000), Kyrovohrad (42.5 per 100,000), Chernivtsi (49.0 per 100,000) and Ternopil (49.6 per 100,000) regions. In the Southern Ukraine, the highest prevalence of PD was found in Mykolaiv region. The prevalence was higher in urban area and in the districts located closely to the regional capital city. Based on the total population and demographic characteristics of Odessa, Mykolaiv and Kherson regions, it can be concluded that at least 40–50 % of patients with PD are left outside the sphere of medical care, and in some areas, this index is 80–90 %. **Conclusions.** To optimize the diagnostic process and standardize epidemiological data, it is necessary to intensify the work of centers of extrapyramidal diseases in all regions of Ukraine, including intracenter and intercenter information databases to obtain adequate and pertinent statistical data.

Keywords: Parkinson's disease; epidemiology; surveillance; health care

Introduction

The number of reported cases of any nosology depends on many parameters: its detectability, professional competence and qualification of specialists, their motivation, organizational and methodological activities in the regions, the establishment of specialized centers for the diagnosis and treatment of extrapyramidal diseases, the economic development, life expectancy, etc. [1].

Significant dispersion of prevalence, morbidity, medical records of patients with Parkinson's disease (PD) is associ-

ated with the features of the organization of medical care at the local level, the lack of the uniform method of registration for all neuropathologists, and, therefore, with insufficient detection of these patients [2, 3].

PD is the second most frequent neurodegenerative pathology after Alzheimer's disease [2, 4, 5]. According to E. Dorsey, B. Bloem (2018), there are more than 6 million patients diagnosed with PD in the world, most of them live in Europe and North America. According to the authors, the prevalence of PD in the world has increased 2.5 times in the last 20 years [4]. The cause of

this phenomenon is not only the population ageing, but also improved diagnosis.

According to various studies, the incidence rate for PD ranges from 5 to 25 per 100,000 population per year. With age, prevalence and morbidity rates are steadily increasing: among persons over 60 years, the prevalence of PD reaches 1–2 %, and among persons over 80 years — 4 % [6].

The prevalence of PD varies from 15 cases per 100,000 population in China to 657 per 100,000 population in Argentina. In Europe and North America, this figure ranges from 100 to 250 cases per 100,000 population. In the USA, the highest values are recorded in the state of Nebraska — 329.3 cases per 100,000 population [5]. Among European countries, the high prevalence is characteristic of Albania (800/100,000) and Italy, where in the province of Brescia the rate was 407 cases of PD per 100,000 population [4, 5, 7]. The lowest prevalence of PD is characteristic of developing countries: in Ethiopia, this index is only 7 cases per 100,000 population, and in Central Africa — 20 cases per 100,000 population [7].

The incidence of PD varies greatly in different regions of the world and within individual countries. Thus, in China, the incidence of new cases of PD varies from 1.5 to 8.7 cases per 100,000 population. France has the highest incidence rates — 49.4 cases per 100,000 population, Argentina — 31.2, Taiwan — 28 and Italy — 23.1 cases per 100,000 population. The lowest incidence rates are typical for the Russian Federation — 9.0 per 100,000 population, India — 5.7, Libya — 4.5 cases per 100,000 population [7].

Given the current tendency to an increase in the prevalence associated with population ageing and improved survival of patients with PD, it is estimated that in various countries the number of patients may reach 9 million by 2030 [4, 6].

Epidemiological data on the prevalence of PD are interesting because they can potentially improve our understanding of the environmental impact on the development and course of the disease and identifying possible risk factors. Also, these data may be useful and relevant for the formation of the correct structure of on-site health care delivery [1, 8].

In Ukraine in recent years, there has been an increase in the prevalence of PD, with the largest one observed in Kyiv and Kyiv region, as well as in Lviv, Chernihiv, and Ivano-Frankivsk regions. The number of registered cases of PD decreased by 43.14–77.87 % in the territories of Joint Forces Operation. The highest prevalence rates of PD were noted in Vinnytsia (126.1 per 100,000), Kyiv (111.6 per 100,000), Lviv (109.5 per 100,000) and Cherkasy (90.0 per 100,000) regions [9, 10].

Currently, there are no scientifically substantiated and statistically reliable epidemiological data on the prevalence and incidence of PD and parkinsonian syndrome in the Southern Ukraine.

The purpose of the study: to compare PD epidemiological indices in the Southern Ukraine with all-Ukrainian rates.

Material and methods

Statistical data of the Ministry of Health of Ukraine, public health departments of Odesa, Mykolaiv and Kherson regions for 2015–2017 were analyzed. There were used the methods of descriptive statistics and analysis of variance.

Results and discussion

Number of registered patients with PD in Ukraine in 2017 was 214,226 (Table 1), which corresponds to the prevalence of 67.5 per 100,000 population. It should be noted that this indicator is heterogeneous in the various regions of Ukraine. The largest number of patients was registered in Lviv (142.5 per 100,000), Vinnytsia (135.9 per 100,000), Cherkasy (108.6 per 100,000) and Kyiv

Table 1. Parkinson's disease prevalence in Ukraine and its regions (2017)

Region	Prevalence	
	Per 100,000	Absolute value
Ukraine	67.5	24,226.0
More than 100 cases per 100,000		
Vinnytsia region	135.9	1,757.0
Cherkasy region	108.6	1,113.0
Kyiv	108.4	2,558.0
Kyiv region	107.1	1,499.0
51–100 cases per 100,000		
Khmelnytskyi region	86.0	480.0
Volyn region	85.1	680.0
Chernihiv region	84.8	730.0
Transcarpathian region	74.2	715.0
Poltava region	73.7	873.0
Zhytomyr region	71.3	713.0
Ivano-Frankivsk region	68.6	753.0
Mykolaiv region	65.0	612.0
Kharkiv region	64.4	1,455.0
Zaporizhzhia region	61.9	894.0
Dnipropetrovsk region	59.3	1,572.0
Kherson region	56.0	480.0
Sumy region	51.2	476.0
Rivne region	50.1	443.0
30–50 cases per 100,000		
Donetsk region	49.9	818.0
Odesa region	49.8	954.0
Ternopil region	49.6	425.0
Chernivtsi region	49.0	353.0
Kyrovohrad region	42.5	335.0
Luhansk region	37.9	226.0

(107.1 per 100,000) regions. The lowest prevalence rates are in Luhansk (37.9 per 100,000), Kyrovohrad (42.5 per 100,000), Chernivtsi (49.0 per 100,000) and Ternopil (49.6 per 100,000) regions.

The prevalence rates of PD in the south of Ukraine also differ. Thus, in Mykolaiv region, 65 cases per 100,000 population were registered, in Kherson region — 56, in Odesa region — 49.8 per 100,000.

The differences may be due to the various causes and, above all, variations in the methodology of patient examination, non-compliance with the diagnostic criteria, bad training of specialists, their poor motivation, lack of specialized offices and centers for the study and treatment of this pathology at the local level, low rates of seeking medical care by patients in a weak economy and ineffective reform of the health care system.

This can be confirmed by epidemiological indicators in selected regions of Odesa, Mykolaiv and Kherson regions, supporting the thesis that underdiagnosis is not due to environmental or geographical factors, but depends on the availability of trained specialists, their professional interests and a sufficient level of organizational and methodological work.

Thus, in Odesa region in 2017, the largest number of patients with PD was registered in Bilhorod-Dnistrovskyi district — 160.4 per 100,000, Tatarbunary district — 112.9 per 100,000, Biliaivka district — 111.8 per 100,000. At the same time, the lowest number was in Zakharivka district — 20.2 per 100,000, Kodyma district — 16.8 per 100,000, Rozdilna district — 11.1 per 100,000, Velyka Mykhailivka district — 4.3 per 100,000 (Table 2).

In Mykolaiv region, the highest prevalence was registered in Kazanka (279 per 100,000), Snihurivka (162 per 100,000), Bratske (160 per 100,000), and the lowest one — in Bashtanka (36 per 100,000), Yelanets (16 per 100,000) and Vesely-nove (11 per 100,000) districts (Table 3).

In Kherson region (2017), the highest prevalence was in Nova Kakhovka (149 per 100,000), Oleshky (104 per 100,000), Bilozerkha (88 per 100,000) and Hola Prystan (83 per 100,000) districts, and the lowest one — in Beryslav (16 per 100,000) and in Novovorontsovka (6 per 100,000) districts (Table 4).

Unfortunately, there are no reliable statistical data on the age-weighted prevalence of PD in Ukraine. Nevertheless, it seems that the epidemiological patterns in the Southern Ukraine are close to the European ones.

Conclusions

Based on the total population and demographic characteristics in Odesa, Mykolaiv and Kherson regions, it can be concluded that at least 40–50 % of patients with PD are left outside the sphere of medical care, and in some areas, this index is 80–90 %.

The revealed variability in the prevalence and incidence of Parkinson's disease in the Southern region of Ukraine indicates not so much about the territorial

Table 2. Prevalence of Parkinson's disease in Odesa region (2017)

Settlements and districts	Prevalence	
	Per 100,000	Absolute value
Odesa	47.3	395
Bilhorod-Dnistrovskyi	160.4	72
Podilsk	97.1	32
Teplodar	95.8	8
Izmail	92.4	54
Chornomorsk	32.1	19
Yuzhne	31.4	8
Balta	23.4	6
All towns of Odesa region	55.7	575
More than 100 cases per 100,000		
Tatarbunary district	112.9	34
Biliaivka district	111.8	79
Ananiv district	109.2	23
51–100 cases per 100,000		
Savran district	78.3	12
Ivanivka district	68.7	14
Okny district	65.9	10
Bolhrad district	65.0	36
Izmail district	55.3	22
31–50 cases per 100,000		
Lyman district	43.9	25
Kiliia district	38.3	16
1–30 cases per 100,000		
Shyriaieve district	29.2	6
Podilsk district	28.1	6
Sarata district	26.4	9
Tarutyne district	25.9	8
Ovidiopol district	25.0	16
Mykolaivka district	24.7	3
Berezivka district	23.1	6
Artsyz district	22.3	8
Zakharivka district	20.2	3
Kodyma district	16.8	4
Reni district	16.7	5
Rozdilna district	11.1	5
Velyka Mykhailivka district	4.3	1
Liubashivka district	4.2	1
Totally by the rural area	43.6	360
Totally by the Odesa region	49.8	954

differences of these indicators, but rather the fact of non-compliance with standards of epidemiological surveillance, untimely submission of information to statistical centers, bad training of specialists, as well as wrong summarization of the results of the studies by the total population.

Epidemiological studies in Odesa, Mykolaiv and Kherson regions have shown a large dispersion of data but comparatively low prevalence of PD compared to other regions of Ukraine. It could be a consequence of insufficient detection of PD by the specialists.

Table 3. Prevalence of Parkinson's disease in Mykolaiv region (2017)

Settlements and districts	Prevalence	
	Per 100,000	Absolute value
Mykolaiv	61	242
Yuzhnoukrainsk	73	25
Voznesensk	37	10
Pervomaisk	36	20
All towns	58	297
More than 100 cases per 100,000		
Kazanka district	279	45
Snihurivka district	162	53
Bratske district	160	23
Berezanka district	119	23
Ochakiv district	86	21
Novyi Buh district	82	21
Vradiivka district	79	11
Berezhnivate district	71	12
Kryve Ozero district	65	13
Mykolaiv district	63	15
Voznesensk district	57	14
51–100 cases per 100,000		
Nova Odesa district	48	13
Domanivka district	43	9
Arbuzynka district	43	7
Vitovka district	41	17
Bashtanka district	36	11
1–30 cases per 100,000		
Veselynove district	11	2
Yelanets district	16	2
Pervomaisk district	12	3
Totally by the rural area	75	345
Totally by Mykolaiv region	65	612

In order to optimize the diagnostic process and standardize epidemiological data, it is necessary to intensify the work of centers of extrapyramidal diseases in all regions of Ukraine, including intracenter and intercenter information databases to obtain adequate and pertinent statistical data.

Conflicts of interests. Author declares the absence of any conflicts of interests and their own financial interest that might be construed to influence the results or interpretation of their manuscript.

Table 4. Prevalence of Parkinson's disease in Kherson region (2017)

Settlements and districts	Prevalence	
	Per 100,000	Absolute value
More than 100 cases per 100,000		
Nova Kakhovka	149	85
Oleshky	104	60
51–100 cases per 100,000		
Novotroitske district	96	28
Bilozerka district	88	47
Hola Prystan district	83	40
Chaplynka district	73	20
Nyzhni Sirohozy district	69	9
Velyka Lepetykha district	67	9
Dnipro district of Kherson	61	44
Velyka Oleksandrivka district	59	12
Ivanivka district	53	6
31–50 cases per 100,000		
Henichesk district	50	24
Kakhovka district	42	25
Hornostaivka district	39	6
Vysokopillia district	34	4
Verkhni Rohachyk district	31	3
Skadovsk district	31	12
Kalanchak district		
1–30 cases per 100,000		
Kherson	31	83
Korabelnyi district of Kherson	21	21
Suvorov district of Kherson	18	18
Beryslav district	16	6
Novovorontsovka district	06	1
Totally by the rural area	59	312
Totally by Kherson region	56	480

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Епідеміологія хвороби Паркінсона на півдні України

Резюме. *Актуальність.* Хвороба Паркінсона (ХП) — повільно прогресуюче нейродегенеративне захворювання з накопиченням альфа-синуклеїну і утворенням тілець Леви всередині нейронів. Поширеність ХП становить від 100 до 200 випадків на 100 000 населення, однак в українській реальності багато випадків залишаються недиагностованими, що впливає на статистичні показники захворюваності та поширеності. *Мета дослідження:* порівняти епідеміологічні показники ХП на півдні України із загальноукраїнськими даними. *Матеріали та методи.* Проаналізовано статистичні дані Міністерства охорони здоров'я України, відділів охорони здоров'я Одеської, Миколаївської та Херсонської областей за 2015–2017 рр. Були використані методи описової статистики та дисперсійного аналізу. *Результати.* Середня поширеність ХП в Україні становить 67,5 на 100 000 населення — це близько до рівня Східної Європи. Найбільша поширеність зареєстрована у Львівській (142,5 на 100 000), Вінницькій (135,9 на 100 000), Черкаській (108,6 на 100 000) і Київській (107,1 на 100 000) областях. Най-

нижчими показники були в Луганській (37,9 на 100 000), Кіровоградській (42,5 на 100 000), Чернівецькій (49,0 на 100 000) і Тернопільській (49,6 на 100 000) областях. На півдні України найбільшу поширеність ХП зареєстровано в Миколаївській області. Поширеність була вищою в містах та районах, розташованих близько до обласного центру. Виходячи із загальної чисельності населення та демографічних показників Одеської, Миколаївської та Херсонської областей, можна зробити висновок, що принаймні 40–50 % пацієнтів із ХП залишаються поза сферою медичної допомоги, а в деяких районах цей показник становить 80–90 %. *Висновки.* З метою оптимізації діагностичного процесу та стандартизації епідеміологічних даних необхідно активізувати роботу центрів екстрапірамідних захворювань у всіх регіонах України, включаючи внутрішньоцентрові та міжцентрові інформаційні бази даних, для отримання адекватних та актуальних статистичних даних.

Ключові слова: хвороба Паркінсона; епідеміологія; нагляд; охорона здоров'я

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Епідеміологія хвороби Паркінсона на юге України

Резюме. *Актуальность.* Болезнь Паркинсона (БП) — медленно прогрессирующее нейродегенеративное заболевание с накоплением альфа-синуклеина и образованием телец Леви внутри нейронов. Распространенность БП составляет от 100 до 200 случаев на 100 000 населения, однако в украинской реальности много случаев остаются недиагностированными, что влияет на статистические показатели заболеваемости и распространенности. *Цель исследования:* сравнить эпидемиологические показатели БП на юге Украины со всеукраинскими данными. *Материалы и методы.* Проанализированы статистические данные Министерства здравоохранения Украины, отделов здравоохранения Одесской, Николаевской и Херсонской областей за 2015–2017 гг. Были использованы методы описательной статистики и дисперсионный анализ. *Результаты.* Средняя распространенность БП в Украине составляет 67,5 на 100 000 населения — это близко к уровню Восточной Европы. Наибольшая распространенность зарегистрирована во Львовской (142,5 на 100 000), Винницкой (135,9 на 100 000), Черкасской (108,6 на 100 000) и Киевской (107,1 на 100 000) об-

ластях. Самыми низкими показателями были в Луганской (37,9 на 100 000), Кировоградской (42,5 на 100 000), Черновицкой (49,0 на 100 000) и Тернопольской (49,6 на 100 000) областях. На юге Украины наибольшая распространенность БП зарегистрирована в Николаевской области. Распространенность была выше в городах и районах, расположенных близко к областному центру. Исходя из общей численности населения и демографических показателей Одесской, Николаевской и Херсонской областей, можно сделать вывод, что по меньшей мере 40–50 % пациентов с БП остаются вне сферы медицинской помощи, а в некоторых районах этот показатель составляет 80–90 %. *Выводы.* С целью оптимизации диагностического процесса и стандартизации эпидемиологических данных необходимо активизировать работу центров экстрапирамидных заболеваний во всех регионах Украины, включая внутрицентровые и межцентровые информационные базы данных, для получения адекватных и актуальных статистических данных.

Ключевые слова: болезнь Паркинсона; эпидемиология; надзор; здравоохранение