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 Odesa, 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), Kyivohrad (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 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 %.

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
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

| Region                  | Ukraine | Absolute value |
|-------------------------|---------|----------------|
|                          | 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 region             | 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 |
| Donets region           | 49.9    | 818.0          |
| Odesa region            | 49.8    | 954.0          |
| Ternopil region         | 49.6    | 425.0          |
| Chernivtsi region       | 49.0    | 353.0          |
| Kyrovocha region        | 42.5    | 335.0          |
| Luhans region           | 37.9    | 226.0          |
(107.1 per 100,000) regions. The lowest prevalence rates are in Luhansk (37.9 per 100,000), Kyrovo-Hrad (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-Dnistrovskiy district — 160.4 per 100,000, Tatarbunar 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 Vesenyovka (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), Bilozerska (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

| Settlements and districts | Prevalence Per 100,000 | Absolute value |
|---------------------------|------------------------|----------------|
| Odesa                     | 47.3                   | 395            |
| Bilhorod-Dnistrovskiy     | 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            |

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

| Settlements and districts | Prevalence Per 100,000 | Absolute value |
|---------------------------|------------------------|----------------|
| Tatarbunary district      | 112.9                  | 34             |
| Biliaivka district        | 111.8                  | 79             |
| Ananiv district           | 109.2                  | 23             |

**More than 100 cases per 100,000**

| Settlements and districts | Prevalence Per 100,000 | Absolute value |
|---------------------------|------------------------|----------------|
| 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             |

**51–100 cases per 100,000**

| Settlements and districts | Prevalence Per 100,000 | Absolute value |
|---------------------------|------------------------|----------------|
| Lyman district            | 43.9                   | 25             |
| Kilia district            | 38.3                   | 16             |

**31–50 cases per 100,000**

| Settlements and districts | Prevalence Per 100,000 | Absolute value |
|---------------------------|------------------------|----------------|
| Shryiaieve 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              |
| Berezhivka district       | 23.1                   | 6              |
| Artsz 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 | Absolute value |
|---------------------------|------------|----------------|
|                           | Per 100,000|                |
| Mykolaiv                  | 61         | 242            |
| Yuzhnioukrainsk           | 73         | 25             |
| Voznesensk                | 37         | 10             |
| Pervomaisk                | 36         | 20             |
| All towns                 | 58         | 297            |

**More than 100 cases per 100,000**

| Settlements and districts | Prevalence | Absolute value |
|---------------------------|------------|----------------|
| Nova Kakhovka             | 149        | 85             |
| Oleshky                   | 104        | 60             |

**51–100 cases per 100,000**

| Settlements and districts | Prevalence | Absolute value |
|---------------------------|------------|----------------|
| Kazanka district          | 279        | 45             |
| Snihurivka district       | 162        | 53             |
| Bratske district          | 160        | 23             |
| Bereznitsa district       | 119        | 23             |
| Ochakiv district          | 86         | 21             |
| Novyi Buh district        | 82         | 21             |
| Vradyivka district        | 79         | 11             |
| Bereznivutsk district     | 71         | 12             |
| Kryve Ozero district      | 65         | 13             |
| Mykolaiv district         | 63         | 15             |
| Voznesensk district       | 57         | 14             |

**51–100 cases per 100,000**

| Settlements and districts | Prevalence | Absolute value |
|---------------------------|------------|----------------|
| 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**

| Settlements and districts | Prevalence | Absolute value |
|---------------------------|------------|----------------|
| 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            |

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

| Settlements and districts | Prevalence | Absolute value |
|---------------------------|------------|----------------|
|                           | Per 100,000|                |
| Nova Kakhovka             | 149        | 85             |
| Oleshky                   | 104        | 60             |

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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.
Епідеміологія хвороби Паркінсона на півдні України

Резюме. Актуальність. Хвороба Паркінсона (ХП) — повільно прогресуюче нейродегенеративне захворювання з накопиченням альфа-синуклеїну і утворенням тілець Леві всередині нейронів. Поширеність ХП становить від 100 до 200 випадків на 100 000 населення, однає в українській реальності багато випадків залишаються недіагностованими, 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, відділів охорони здоров'я міських та районних центрів, а також внутрішньоцентрові та міжцентрові інформаційні бази даних, для порівняння епідеміологічних показників Одесської, Миколаївської та Херсонської областей за 2015–2017 рр. Були використані методи описової статистики та дисперсійний аналіз. Результати. Середня поширеність ХП в Україні становить 67,5 на 100 000 населення — це близько до рівня Восточної Європи. Найбільша поширеність зареєстрована в Львівській (142,5 на 100 000), Вінницькій (135,9 на 100 000), Черкаській (108,6 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 Одесської, Миколаївської та Херсонської областей, можна зробити висновок, що принаймні 40–50 % пацієнтів із ХП залишаються поза сферою медичної допомоги. Суттєва роль в їхньому охороні здоров'я відіграє медична система, в тому числі медичні відділи здравоохоронних установ. З метою оптимізації діагностичного процесу та стандартизації епідеміологічних даних необхідно активизувати роботу центрів експертизних захворювань у всіх регіонах України, включно з функціонуванням внутрішньоцентрових та міжцентрових інформаційних базі данних, для отримання адекватних та актуальніх статистичних даних.

Висновки. С вніманьй успіху і здобутку наційних здоров'я передбачається створення в Україні відповідних структур для охорони здоров'я пацієнтів хвороби Паркінсона, що включає узагальнення даних від відділів охорони здоров'я, міських та районних медичних центрів та медичних установ, а також юридичного регулювання з етичних позицій, що стосується прав пацієнтів, їхнього здоров'я та працівників здравоохоронної системи.

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