



# Urinary-autonomic dysfunction in Parkinson's disease

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**Background:** autonomic nervous system dysfunction affecting 70-80% of patients with Parkinson's disease (PD) causes significant morbidity and it is correlated with poor quality of life. Frequency of autonomic symptoms by means of the Scale for Outcomes for Parkinson's disease AUTonomic (SCOPA-AUT) was assessed in a consecutive series of patients with PD and correlated with results of noninvasive urological studies (nUS).



**Inclusion criteria were:**

- Diagnosis of PD according to the U.K. PD Brain Bank criteria 01/2013-12/2015 → 172 PD patients

**Exclusion criteria were:**

- PD patients with cognitive impairment (MMSE < 26);
- PD patients with major depression/psychiatric disorder;
- PD patients with other diseases known to influence urinary function, such as previous stroke, diabetes mellitus, spondylosis;
- PD patients with prostate hypertrophy (PH);
- PD patients receiving medication for urinary problems.

**Clinical assessment**

- Hoehn and Yahr staging (H&Y);
- Unified Parkinson's Disease Rating Scale (UPDRS);
- MMSE (Mini Mental State Examination);
- SCOPA-AUT (Scale for Outcomes for PARKinson's disease AUTonomic);
- BDI (Beck's Depression Inventory);
- NPI (Neuropsychiatric Inventory);
- PDQ-39 (The Parkinson's Disease Questionnaire-39);
- PDSS(the Parkinson's diseases Sleep Scale);
- ESS (Epworth Sleepiness Scale).

**Noninvasive urological studies :**

- Uroflowmetry;
- Ultrasound of the urinary tract with measurement of postvoid residual (PVR) urine volume.

|                   | All PD patients<br>45           | Females<br>19    | Males<br>26      | p           |
|-------------------|---------------------------------|------------------|------------------|-------------|
| Age at onset      | 56.5 ± 10.1                     | 57.9 ± 12.1      | 55.2 ± 8.4       | 0.4         |
| Age at interview  | 62.5 ± 10.7                     | 64.8 ± 12.1      | 61.0 ± 9.5       | 0.2         |
| Disease duration  | 6.5 ± 4.3                       | 6.8 ± 4.4        | 5.7 ± 4.2        | 0.4         |
| Onset             | Tremor 30/45<br>(66.7%)         | 12/19<br>(63.2%) | 18/26<br>(69.2%) | 0.8         |
|                   | Rigid-akinetic 15/45<br>(33.3%) | 7/19<br>(36.8%)  | 8/26<br>(30.8%)  |             |
| UPDRS-I           | 2.3 ± 2.1                       | 2.4 ± 2.1        | 2.2 ± 2.2        | 0.8         |
| UPDRS-II          | 9.9 ± 7.2                       | 9.8 ± 6.4        | 10 ± 7.8         | 0.9         |
| UPDRS-III         | 17.2 ± 11.8                     | 16.6 ± 8.7       | 17.5 ± 13.7      | 0.8         |
| UPDRS tot         | 29.5 ± 20.7                     | 29.1 ± 18.4      | 29.8 ± 22.6      | 0.9         |
| LED               | 517.5 ± 406.2                   | 488.8 ± 411.8    | 538.5 ± 408.9    | 0.7         |
| L-DOPA            | 349.7 ± 331.9                   | 340.5 ± 318      | 356.5 ± 347.7    | 0.9         |
| DA                | 174.3 ± 130.5                   | 148.3 ± 130.3    | 193.2 ± 129.8    | 0.3         |
| PDSS              | 112.7 ± 22                      | 113.2 ± 26.2     | 112.4 ± 18.9     | 0.9         |
| MMSE              | 27.9 ± 2.4                      | 28.1 ± 2.2       | 27.9 ± 2.1       | 0.8         |
| Beck              | 9.1 ± 7.1                       | 8.9 ± 7          | 8.6 ± 7.2        | 0.5         |
| NPI               | 10.6 ± 9.8                      | 11.6 ± 10.6      | 9.5 ± 9          | 0.5         |
| SCOPA- AU         | 5.1 ± 3.8                       | 4.5 ± 3.5        | 5.5 ± 4.1        | 0.4         |
| SCOPA tot         | 14.1 ± 7.1                      | 14.9 ± 6.4       | 13.3 ± 7.7       | 0.5         |
| Maximum flow rate | 17.9 ± 9.1                      | 21.6 ± 12        | 15.4 ± 6         | <b>0.03</b> |
| Postvoid residual | 33.7 ± 68.7                     | 39.8 ± 93        | 29.3 ± 45.8      | 0.6         |

|                   | Disease<br>Duration ≥5.7<br>n = 23 | Disease<br>Duration < 5.7<br>n = 22 | p               |
|-------------------|------------------------------------|-------------------------------------|-----------------|
| Age at onset      | 56.4 ± 10.7                        | 56.3 ± 9.8                          | 1.0             |
| Age at interview  | 66.1 ± 10.4                        | 58.9 ± 10                           | <b>0.02</b>     |
| LED               | 736.2 ± 401.9                      | 288.9 ± 263.6                       | <b>&lt;.001</b> |
| LDOPA             | 529.3 ± 317.7                      | 162 ± 229.8                         | <b>&lt;.001</b> |
| DA                | 193.8 ± 159.8                      | 153.8 ± 89.71                       | 0.3             |
| UPDRS tot         | 31.8 ± 13.5                        | 27.2 ± 26.4                         | 0.5             |
| PDSS              | 106.2 ± 19.9                       | 119.5 ± 22.6                        | <b>0.04</b>     |
| MMSE              | 27.9 ± 2.1                         | 28.1 ± 2.1                          | 0.7             |
| NPI               | 13.9 ± 7.9                         | 7.1 ± 10.4                          | <b>0.03</b>     |
| BECK              | 10.4 ± 6.2                         | 7.8 ± 10.4                          | 0.2             |
| SCOPA-AUT         | 16.7 ± 6.9                         | 11.2 ± 6.5                          | <b>0.008</b>    |
| Items SCOPA-U     | 5.8 ± 3.2                          | 4.2 ± 4.3                           | 0.1             |
| Maximum flow rate | 17.1 ± 7                           | 18.7 ± 11.1                         | 0.6             |
| Postvoid residual | 30.6 ± 53.5                        | 37.3 ± 84.3                         | 0.8             |

|                   | H&Y 1<br>n= 15 | H&Y 2<br>n= 20 | H&Y >2<br>n=10 | p                |
|-------------------|----------------|----------------|----------------|------------------|
| Age at onset      | 53.9 ± 11.1    | 56.6 ± 10.2    | 59.7 ± 8.3     | 0.4              |
| Age at interview  | 57.3 ± 10.5    | 64 ± 10.6      | 67.6 ± 8.7     | <b>0.04</b>      |
| Disease Duration  | 3.5 ± 2.8      | 7.6 ± 4.2      | 8 ± 4.7        | 0.06             |
| LED               | 217.4 ± 125.5  | 624.6 ± 420.4  | 753.7 ± 414.1  | <b>0.0007</b>    |
| LDOPA             | 86.1 ± 115.8   | 418.8 ± 330.2  | 607.2 ± 295.1  | <b>&lt;.001</b>  |
| DA                | 130.7 ± 75.7   | 190.1 ± 154    | 206.5 ± 138.9  | 0.3              |
| UPDRS tot         | 16.7 ± 6.8     | 25.6 ± 11.7    | 56.6 ± 25.3    | <b>&lt;.0001</b> |
| PDSS              | 120.7 ± 17     | 117.9 ± 18     | 90.5 ± 23      | <b>0.0005</b>    |
| MMSE              | 28.9 ± 1.5     | 28.2 ± 1.4     | 26.3 ± 3       | <b>0.04</b>      |
| BECK              | 6 ± 4.3        | 8.5 ± 5.4      | 15.2 ± 9.8     | <b>0.004</b>     |
| NPI               | 5.8 ± 5        | 8.6 ± 7.2      | 20.9 ± 11.7    | <b>0.0003</b>    |
| SCOPA-AUT         | 12.8 ± 7.9     | 13.1 ± 7.1     | 17.6 ± 5.1     | 0.2              |
| Items SCOPA-U     | 4.7 ± 5.1      | 4.2 ± 2.8      | 7.4 ± 2.4      | 0.08             |
| Maximum flow rate | 17.8 ± 8.5     | 18.6 ± 10.9    | 16 ± 5.7       | 0.8              |
| Postvoid residual | 59 ± 103       | 16.8 ± 34.2    | 26.1 ± 40.5    | 0.2              |

Table 2: variables according to mean duration of the disease and H&Y

Table 1: demographic and clinical data (means ± SD) of the PD patients

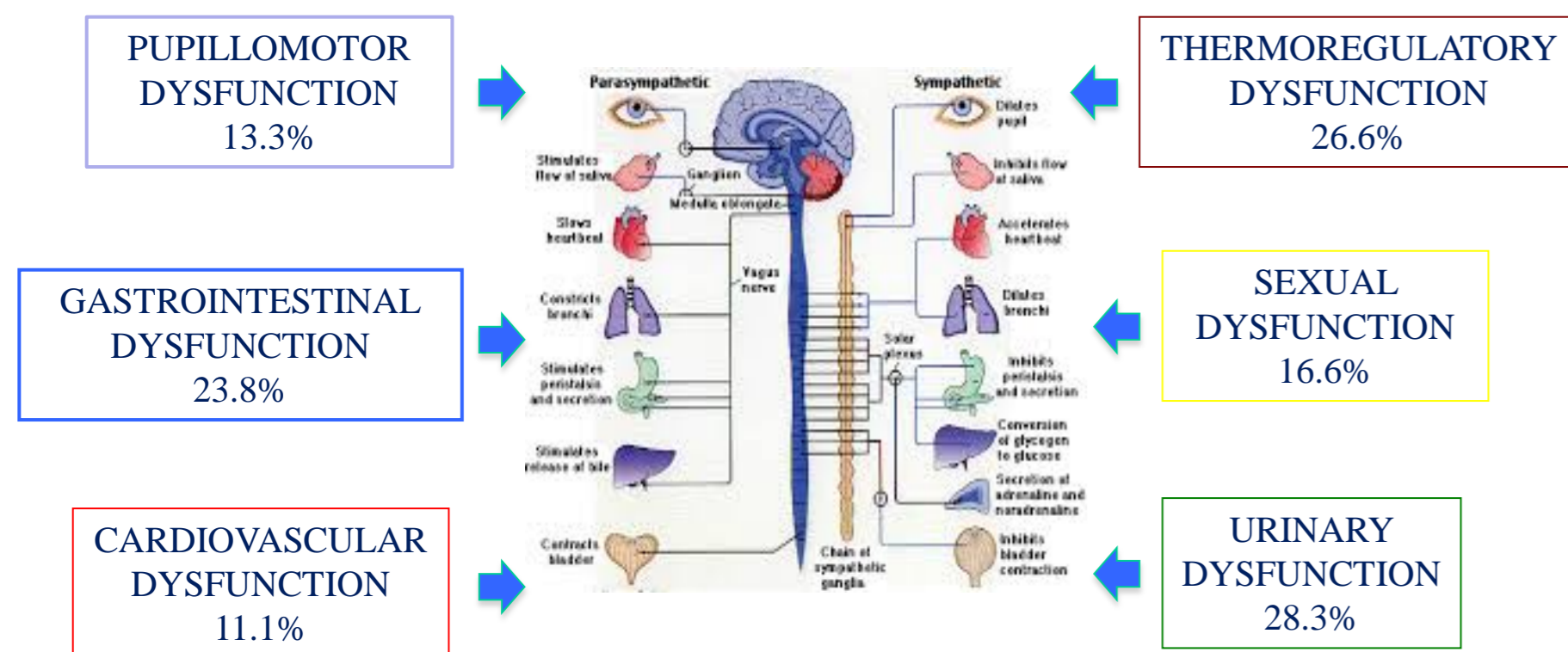


Figure 1: SCOPA-AUT scale scores

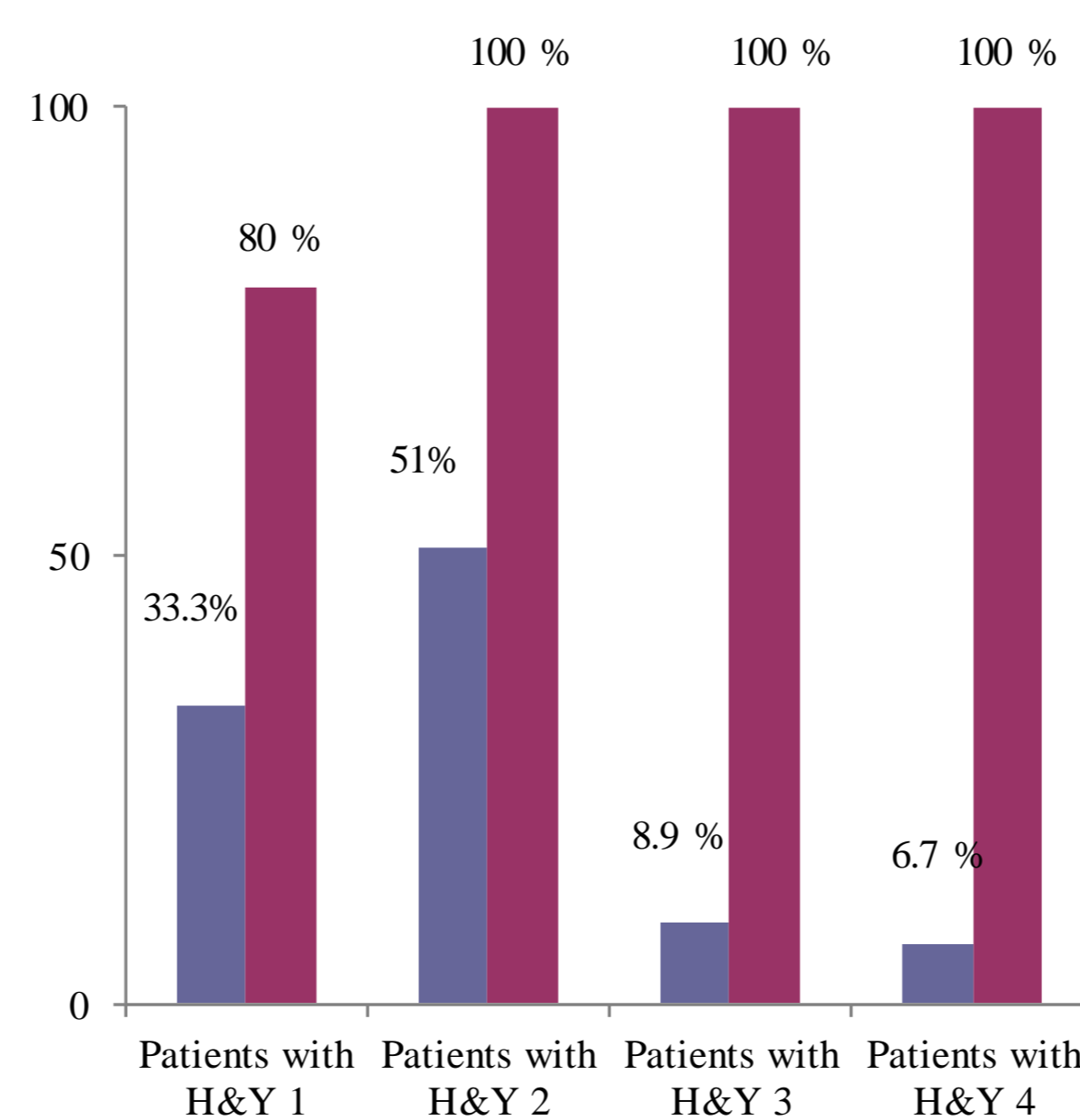


Figure 2: urinary symptoms and H&Y

|                   | Patients with PH<br>n=11 | Patients without PH<br>n=15 | p   |
|-------------------|--------------------------|-----------------------------|-----|
| Age at onset      | 57.7 ± 8.8               | 53.8 ± 8.4                  | 0.3 |
| Age at interview  | 63.3 ± 10.4              | 59.5 ± 8.8                  | 0.4 |
| Disease duration  | 5.5 ± 4.0                | 5.7 ± 4.4                   | 0.9 |
| UPDRS-I           | 3.1 ± 2.6                | 1.6 ± 1.8                   | 0.1 |
| UPDRS-II          | 10.5 ± 6.4               | 10.1 ± 9.3                  | 0.9 |
| UPDRS-III         | 16.8 ± 12.6              | 18.1 ± 15.3                 | 0.8 |
| UPDRS tot         | 30.4 ± 20.6              | 29.9 ± 25.5                 | 0.9 |
| LED               | 599.3 ± 461.3            | 499.8 ± 394.7               | 0.5 |
| L-DOPA            | 369.0 ± 389.3            | 346.3 ± 326.8               | 0.9 |
| DA                | 200.3 ± 155.2            | 195.7 ± 120.9               | 0.9 |
| PDSS              | 108.4 ± 21.9             | 114.6 ± 17.9                | 0.5 |
| MMSE              | 28 ± 2.0                 | 27.7 ± 2.2                  | 0.7 |
| Beck              | 9.7 ± 8.8                | 7.9 ± 6.8                   | 0.6 |
| NPI               | 13.4 ± 15.9              | 7.4 ± 4.6                   | 0.3 |
| SCOPA-tot         | 12.7 ± 8                 | 13.4 ± 7.3                  | 0.8 |
| SCOPA- AU         | 5.0 ± 3.7                | 6.1 ± 4.4                   | 0.5 |
| Maximum flow rate | 14.9 ± 7.2               | 15.5 ± 5.4                  | 0.8 |
| Postvoid residual | 31.1 ± 47.7              | 31.8 ± 48.7                 | 0.9 |

Table 3: male patients with/without prostate hypertrophy (PH)

## DISCUSSION AND CONCLUSION

- In our study, the 92.8 % of patients complained of urinary symptoms and ultrasound documented possible causes of urinary disorders in 44% of the patients (prostate hypertrophy was observed in 11 of 26 males).
- Our findings suggest that urinary symptoms are common in PD patients in the early stage of the disease.
- The autonomic dysfunction might be related to nigrostriatal degeneration, though urinary dysfunctions in male patients with PD could be attributed to prostate hypertrophy.