Effect of severity of urinary incontinence on quality of life in women

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Aims: While the effect of different types of incontinence on the quality of life (QoL) has been clearly documented, the information about the impact of incontinence severity on QoL in women is lacking. Therefore, we investigated whether increasingly severe degrees of incontinence were linearly correlated with poorer QoL.

Methods: We included 391 continent women and 81 continent volunteers in the study and assessed them in accordance with routine clinical practice. A 24 h pad-weight test was used to objectively quantify the incontinence severity. We then stratified participants according to incontinence type and severity and assessed correlations between incontinence severity and Patient Perception of Bladder Condition (PPBC), International Consultation on Incontinence short-form questionnaire (ICIQ-SF), and King’s Health Questionnaire (KHQ) quality of life scores in the entire study population and in individual groups according to incontinence type.

Results: Minimal incontinence was associated with significant negative impact on QoL, as measured by all quality of life assessment tools. There were nonlinear correlations between scores on individual questionnaires and daily leakage volumes. Stress urinary incontinence had a weaker impact on quality of life than urge or mixed incontinence, as measured by PPBC ($P < 0.0001$), KHQ part 1 ($P < 0.0001$), and KHQ part 2 ($P < 0.001$). Stress urinary incontinence also had a weaker impact on QoL than mixed incontinence as measured by ICI-Q ($P = 0.007$).

Conclusions: This study demonstrated that even mild urinary leakage significantly reduces the QoL, while subsequent increase in the degree of incontinence has only minimal additional effect. There was no linear correlation between incontinence severity and QoL.

Keywords
Pad-weight test, quality of life, questionnaire, urinary incontinence

1 INTRODUCTION

Urinary incontinence is defined as the involuntary loss of urine. Its prevalence is relatively high in both men and women. The prevalence of any type of incontinence in adult women is 25-29%. This condition has a marked effect on quality of life (QoL). Previous studies have examined the impact of different types of incontinence on QoL and reported...
that urge urinary incontinence (UUI) has a greater impact than stress urinary incontinence (SUI). However, there is little information in the literature about the impact of the degree of incontinence on QoL. The most of previous studies used only self-reporting questionnaires to estimate the severity of incontinence. The goal of this investigation is to assess the effect of the incontinence degree on the QoL, based on objective quantification using pad-weight test. Pad-weight test is a valuable diagnostic tool for the qualitative and quantitative assessment of urinary incontinence. This test records all leaked urine during a predetermined period of time. Patient is asked to wear diapers at all time and weigh them after use. The weight gain equals the leaked volume. The 24-h PWT (24hPWT) is more reproducible than the 1-h test.\(^5\)

The present study evaluated the relationship between the severity of incontinence, as measured by the 24hPWT, and QoL, as quantified by three validated questionnaires. We hypothesized that there would be a linear relationship between severity of incontinence and its negative impact on the QoL in affected women.

2 | MATERIAL AND METHODS

Total 391 women who were seeking help for all types of urinary incontinence were enrolled at five tertiary urological and urogynaecological referral centers. The study was designed in accordance with the principles of the Declaration of Helsinki, World Medical Association, and the study protocol was approved by the ethics committee of the University Hospital, Ostrava, Czech Republic. After signing the informed consent all study participants were assessed in accordance with routine clinical practice. The assessment included history, a voiding diary for two consecutive days, 24hPWT for two consecutive days, urine analysis, and local physical examinations including cough test and postvoid residual measurements. Additional work-up, including uroflowmetry, urodynamics, and cystoscopy, were performed, if needed, to ensure correct diagnosis in unclear cases.

Based on the clinical evaluation, we stratified patients by type and degree of severity of incontinence. Types of incontinence were as follows: stress urinary incontinence (SUI), urge urinary incontinence (UUI), mixed urinary incontinence with stress predominant (MUIS), and mixed urinary incontinence with urge predominant (MIU). There are no universally accepted definitions for MUIS and MIU; therefore, patients were placed in these groups at the investigators' judgment. Severity of incontinence was determined by the average value of two 24hPWTs. To ensure precise measurements, during initial diagnostic work-up, patients received electronic balance, which was the same for all participants and has been calibrated prior to the use. Patients were instructed to weigh the diapers immediately after removal to avoid evaporation. Grades of severity of incontinence were defined as follows: continence, 0-4 g/24 h (grade 0); mild incontinence, 4-20 g/24 h (grade 1); moderate incontinence, 21-74 g/24 h (grade 2); and severe incontinence, >75 g/24 h (grade 3).\(^6\) The control group consisted of 81 healthy volunteers who reported that they were continent (age 44.61 ± 11.86 years, BMI 25.16 ± 4.33). These subjects were selected from health care providers.

At arrival to the clinic and prior to meeting the physician, all patients and controls were asked to fill out several questionnaires to evaluate the impact of urinary incontinence on their QoL. The King's Health questionnaire (KHQ) on QoL is a two-part, 20-question questionnaire. Part 1 asks about general health and the impact of incontinence, while part 2 asks about role limitations, physical/social limitations, personal relationships, emotions, sleep/energy, and estimates of severity. We separately calculated the scores for parts 1 and 2. Higher score indicated greater impairment of QoL.\(^7\) The Patient Perception of Bladder Condition (PPBC) scale ranges from 1 (my bladder condition does not cause me any problems at all) to 6 (my bladder condition causes me many severe problems).\(^8\) The International Consultation on Incontinence short-form questionnaire (ICIQ-SF) provides a brief and robust measurement of both the impact of symptoms of incontinence on QoL and the outcome following treatment. The total score ranges from 0 to 21; higher values indicate increased severity and impact on QoL. A self-diagnostic item was not included in the total score calculation.\(^9\)

We first assessed the correlation between incontinence severity grades (as measured by the 24hPWT) and PPBC, ICIQ-SF, KHQ part 1, and KHQ part 2 total scores in the entire study population. We subsequently investigated correlations in individual incontinence-type groups.

2.1 | Statistical analysis

We used NCSS to process data and perform statistical analyses.\(^10\) Data are expressed as means ± standard error of the mean. We used nonparametric analysis of variance (Kruskal-Wallis) to assess differences in the total scores of individual questionnaires (PPBC, ICIQ-SF, and KHQ) between groups. In cases of rejection of the null hypothesis, we used the Dunn test (Kruskal-Wallis z-test) to search for significant differences between pairs of groups. We used the Bonferroni test to assess significance, and a \(P\) value of <0.05 was considered statistically significant. We used nonlinear regression to evaluate correlations between questionnaire total scores and 24hPWT values.

3 | RESULTS

We analyzed data from the total patient population, which comprised 391 incontinent women. The mean age was
53.92 ± 15.72 years, and the mean body mass index (BMI) was 28.02 ± 5.73. As measured by the 24hPWT, the average daily leakage in the entire population was 74.8 mL ± 219.72 mL, the mean PPBC score was 3.7 ± 1.55, the mean ICI-Q total score was 11.4 ± 6.37, the mean KHQ part 1 score was 100.7 ± 50.17, and the mean KHQ part 2 score was 316.4 ± 167.24.

We used history, a voiding diary, 24hPWT, urine analysis, local physical examinations including cough test, postvoid residual measurement, uroflowmetry, urodynamics, and cystoscopy to divide patients in the following incontinence-type groups: SU1, n = 182; UUI, n = 68; MUIS, n = 78; and MUIU, n = 63. Based on 24 hPWT results, we classified 114 patients as having mild incontinence (grade I), 79 patients as having moderate incontinence (grade II), and 84 patients as having severe incontinence (grade III). A total of 114 patients reported that they were incontinent but had only minimal leakage of urine (up to 4 mL) or did not experience any leakage at all during the 24hPWT. These patients were classified as having incontinence grade 0. The mean leakage/24 h was 0.33 ± 0.89 mL in Group A (control group, continent women), 1.53 ± 1.44 mL in Group B (grade 0), 10.46 ± 4.46 mL in Group C (grade I), 40.56 ± 15.89 mL in Group D (grade II), and 365.39 ± 410.66 mL in Group E (grade III).

Table 1 lists the scores for the PPBC, ICI-Q, KHQ part 1, and KHQ part 2. Tables 2 and 3 show correlations between scores on the PPBC, ICIQ-SF, KHQ part 1, and KHQ part 2 and incontinence severity grade and incontinence type.

We found nonlinear correlations when we used nonlinear regression analysis to investigate correlations between PPBC, ICIQ-SF, KHQ part 1, and KHQ part 2 scores and daily leakage as measured by the 24hPWT in the entire population (including the control group) without discriminating among subjects according to the severity of their incontinence (Figures 1–4). When we assessed the impact of incontinence on QoL according to the type of incontinence, we found that SUI had less effect on QoL than UI or mixed incontinence (both MUIU and MUIS), as measured by the PPBC (P < 0.0001), KHQ part 1 (P < 0.0001), and KHQ part 2 (P = 0.001). Moreover, SUI had less of an effect on QoL than mixed incontinence, as measured by the ICI-Q (P = 0.007) (Table 3).

4 | DISCUSSION

Our study revealed that even very small quantities of urinary leakage are associated with significant worsening of QoL. Our findings did not support hypothesis of a linear correlation between the severity of incontinence and poorer QoL.

Several large-scale studies have assessed the impact of urinary incontinence on QoL, but from an epidemiological rather than a clinical perspective. It is difficult to objectively assess the type and severity of incontinence in these studies. Most of them used self-reporting questionnaires to estimate the severity of incontinence. The severity index of female urinary incontinence is a valuable tool that is currently used in many epidemiological studies.11

Karantasis et al found a positive correlation between the PWT and the ICIQ-SF total score in women with primary SUI. However, this study did not focus on the impact of incontinence on QoL. Rather, the researchers were investigating the feasibility and accuracy of the ICIQ-SF in self evaluations of the severity of urinary incontinence.12

Aslan et al compared the Symptom Severity Index (SSI) and Symptom Impact Index (SII) versus the 1-h PWT as a means of identifying correlations between degree of incontinence and its impact on QoL.13 Although there was a significant correlation between 1-hour PWT values and the SSI score, the authors were unable to demonstrate a significant correlation between 1-h PWT values and the SII score. The difference between this and our study could be attributed to limited sensitivity of 1-h PWT.

To the best of our knowledge, this is the first clinical study to use the 24-h PWT to determine the severity of incontinence and its impact on QoL. We did not find a linear correlation between PWT values and QoL. However, compared to continent subjects, we observed a dramatic reduction in the QoL of patients with 24hPWT values of approximately 20 g. In patients with daily leakage of ≥20 g, the negative impact on QoL increased only slightly with increasing leakage. The cutoff value was very similar among the different questionnaires.

| TABLE 1 | PPBC, ICIQ-SF, KHQ part 1, and KHQ part 2 scores in individual incontinence-severity groups |
|-----------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Group A | Group B | Group C | Group D | Group E |

| PPBC | 1.15 ± 0.48 | 3.57 ± 1.13 | 4.37 ± 1.02 | 4.44 ± 0.75 | 4.74 ± 1.08 |
| ICIQ-SF | 0.60 ± 2.31 | 10.44 ± 4.36 | 14.00 ± 3.52 | 14.86 ± 3.45 | 16.14 ± 3.61 |
| KHQ part 1 | 18.72 ± 21.27 | 93.27 ± 34.11 | 120.69 ± 34.46 | 128.38 ± 24.77 | 136.61 ± 29.21 |
| KHQ part 2 | 71.33 ± 35.90 | 300.74 ± 123.76 | 385.31 ± 126.69 | 409.52 ± 109.48 | 434.68 ± 111.98 |

Group A: control group, continent women; group B: grade 0, 0-4 mL/24 h; group C: grade I, 4-20 mL/24 h; group D: grade II, 21-74 mL/24 h; group E: grade III > 75 mL/24 h.
TABLE 2 Correlations between PPBC, ICI-Q, KHQ part 1, and KHQ part 2 scores and incontinence groups

<table>
<thead>
<tr>
<th>Questionnaires</th>
<th>Chi-square test</th>
<th>P value</th>
<th>Multiple-comparison Kruskal-Wallis test</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPBC</td>
<td>241.3</td>
<td>&lt;0.0001</td>
<td>A &lt; B, C, D, E</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B &lt; C, D, E</td>
</tr>
<tr>
<td>ICIQ</td>
<td>253.4</td>
<td>&lt;0.0001</td>
<td>A &lt; B, C, D, E</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B &lt; C, D, E</td>
</tr>
<tr>
<td>KHQ part 1</td>
<td>249.1</td>
<td>&lt;0.0001</td>
<td>A &lt; B, C, D, E</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B &lt; C, D, E</td>
</tr>
<tr>
<td>KHQ part 2</td>
<td>227.8</td>
<td>&lt;0.0001</td>
<td>A &lt; B, C, D, E</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B &lt; C, D, E</td>
</tr>
</tbody>
</table>

Group A: control group, continent women; group B: grade 0, 0-4 mL/24 h; group C: grade I, 4-20 mL/24 h; group D: grade II, 21-74 mL/24 h; group E: grade III, >75 mL/24 h. Note that the total score of questionnaires assessing the impact of urinary incontinence on the quality of life is significantly lower in groups A, B than in patients with higher degree of incontinence (C-E), while no significant difference was recorded between groups C, D, and E.

Our results indicate that in women, the impact of incontinence on QoL is more qualitative (ie, continent vs incontinent) than quantitative (ie, more severe incontinence is not linearly correlated with a higher negative impact on QoL). To our knowledge, this phenomenon has not been previously documented. It signifies that even a very small urine leakage causes a severe alteration in QoL. That means that a close attention should be paid to any urine leak reported by the patient. Adequate diagnostic work-up and treatment should be offered to all patients suffering from UI with a goal of achieving full continence.

When assessing the correlation between type of incontinence and impact on quality of life, we found that UUI had an extremely negative impact on QoL, while the impact of SUI is significantly lower. This finding is in concordance with that of epidemiological studies.14 This could be due to the fact that

TABLE 3 Correlations between PPBC, ICI-Q, KHQ part 1, and KHQ part 2 scores and incontinence types

<table>
<thead>
<tr>
<th>Questionnaires</th>
<th>Chi-square test</th>
<th>P value</th>
<th>Multiple-comparison Kruskal-Wallis Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPBC</td>
<td>26.2</td>
<td>&lt;0.0001</td>
<td>SUI &lt; UUI, MUIS, MUIU</td>
</tr>
<tr>
<td>ICIQ</td>
<td>16.9</td>
<td>0.0007</td>
<td>SUI &lt; MUIS, MUIU</td>
</tr>
<tr>
<td>KHQ part 1</td>
<td>36.0</td>
<td>&lt;0.0001</td>
<td>SUI &lt; UUI, MUIS, MUIU</td>
</tr>
<tr>
<td>KHQ part 2</td>
<td>20.7</td>
<td>0.0001</td>
<td>SUI &lt; UUI, MUIS, MUIU</td>
</tr>
</tbody>
</table>

Note that SUI is associated with significantly lower scores on questionnaires assessing the impact of urinary incontinence on the quality of life compared to other types of incontinence.

FIGURE 1 Correlation between severity of incontinence and Patient Perception of Bladder Condition (PPBC) total score in entire study population (n = 472)

in UI, the urge to urinate is not predictable and therefore more distressing and limiting for patients.15,16

Our study has some limitations that should be considered. First, there are no standardized protocols for the 24hPWT. The results of the 24hPWT vary according to the patient’s physical activity. We instructed the subjects to follow their normal daily routine during the 24hPWT. Second, the sensitivity and specificity of the 24hPWT are unknown.

FIGURE 2 Correlation between severity of incontinence and International Consultation on Incontinence short-form questionnaire (ICIQ-SF) total score in entire study population (n = 472)
Some of the study patients did not experience any leakage during the 24PWT, even though they had reported that they were incontinent. This was more common with women who reported mild and occasional urine leakage. Another limitation of this study is represented by the fact that the volunteers included in the control group were not age-matched. Finally, it can be challenging to discriminate objectively between overactive bladder (OAB) dry and OAB wet (UUI). In patients with OAB, the diagnosis is based mainly on subjective reporting, with very poor objective findings during clinical assessment. Urodynamics may be inadequate in discriminating between OAB dry and wet, and it is possible that some of the patients in our study who reported that they were incontinent actually had OAB dry. Thus, we can not exclude the possibility that we included patients with OAB dry in the UUI (OAB wet) group. Despite these limitations, we believe that our study provides new insight into the impact of urinary incontinence on QoL.

5 | CONCLUSIONS

We did not find linear correlation between the degree of incontinence and its impact on the QoL. Our results document that the impact of incontinence is more qualitative (presence or absence of urinary leakage) than quantitative. This study highlights the need for adequate examination and treatment of women with any degree of urinary incontinence.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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