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Anxiety and Depression Associated With Urinary Incontinence. A 10-year Follow-Up Study From the Norwegian HUNT study (EPINCONT)

Gunhild Felde,[1]* Marit Helen Ebbesen,[1] and Steinar Hunskaar[1,2]
[1]*Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway*
[2]*National Centre for Emergency Primary Health Care, Uni Research Health, Bergen, Norway*

Aims: Firstly, to investigate the association between depression, anxiety and urinary incontinence (UI) in a 10-year longitudinal study of women. Secondly, to investigate the association between possible differences in the stress- and urgency components of UI and different severities of depression and anxiety by age groups. **Methods:** In a longitudinal, population-based survey study, the EPINCONT part of the HUNT study in Norway, we analyzed questionnaire data on UI, depression and anxiety from 16,263 women from 20 years of age. A multivariate logistic regression model was used to predict the odds of developing anxiety and depression among the women with and without UI at baseline and the odds of developing UI among the women with and without anxiety or depression at baseline. **Results:** For women with any UI at baseline we found an association with the incidence of depression and anxiety symptoms, OR 1.45 (1.23–1.72) and 1.26 (1.8–1.47) for mild depression and anxiety respectively. For women with depression or anxiety symptoms at baseline we found an association with the incidence of any UI with OR 2.09 (1.55–2.83) and 1.65 (1.34–2.03) for moderate/severe symptom-score for depression and anxiety, respectively, for the whole sample. **Conclusions:** In this study, both depression and anxiety are shown to be risk factors for developing UI with a dose-dependent trend. UI is associated with increased incidence of depression and anxiety. *Neurourol. Urodynam. 36:322–328, 2017.*

Key words: anxiety; depression; epidemiology; EPINCONT; HADS; HUNT; urinary incontinence

INTRODUCTION

Several epidemiologic cross-sectional studies have linked depression to urinary incontinence (UI) in women. The association has been shown to be strongest for urgency and mixed incontinence and for severe incontinence.[1–7] An association between anxiety and UI has also been found.[5,8,9] Anxiety, depression and UI are all common health problems, and a possible link between them is of great interest. Studies have given conflicting answers on the question of whether it is anxiety and depression that give a higher risk of incidence of UI or UI that gives a higher risk of developing anxiety and depression.[8,10–12] In addition to the epidemiological substrate, there are also biological and neurological explanation models for both directions of the associations. Serotonergic pathways and the sympathetic nerve system are involved in both UI, anxiety, and depression.[10,13–15]

Longitudinal studies are necessary to better understand the underlying causes and sequences of the observed associations in the cross-sectional studies. With data from the large Norwegian EPINCONT study, based on the Nord-Trøndelag Health Survey 2 and 3 (HUNT2 and HUNT3), the main objective of the present study was to investigate the associations between depression, anxiety and UI in women in a prospective 10-year follow-up study.

MATERIALS AND METHODS

The Nord-Trøndelag health study (HUNT) was a large population-based survey, which all persons aged 20 years and older in the county of Nord-Trøndelag were invited to participate in. HUNT3 (2006–08) included the same questions as HUNT2 (1995–97) on the topics of UI, anxiety and depression. 47,177 women were invited to participate in HUNT2, and 47,415 in HUNT3. The invitation included questionnaire one (Q1), which the participants were asked to bring to a screening station where several clinical examinations were done and blood samples were drawn. The women who met inclusion criteria at the screening station received questionnaire two (Q2). In HUNT2, the questions about anxiety and depression were in Q1 and the questions about UI were in Q2. In HUNT3 the questions in both of these areas were in Q2. 34,653 (73.5%) answered Q1 in HUNT2. 80.8% of those who answered Q1 answered the incontinence part of the study in Q2 in HUNT2. 27,761 (58.7%) of those invited answered Q1and 21,804 answered Q2 in HUNT3. 16,253 women answered Q1 and Q2 in HUNT2 and Q2 in HUNT3, and our study was a longitudinal survey of the women in this subgroup. Figure 1 is a vizualization of the study-population of the women who were invited to the HUNT-study until they were included in the study-group. For the analyses we used three age groups: 19–39 years, 40–54 years and 55 years and older.

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*Correspondence to: Gunhild Felde, Department of Global Public Health and Primary Care, University of Bergen, PB 7804, 5020 Bergen, Hordaland, Norway.
E-mail:: gunhild.felde@uib.no
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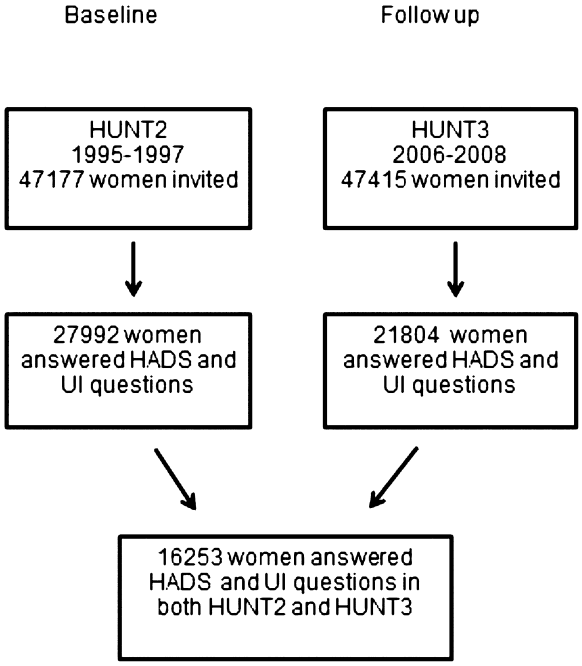

Fig. 1. Visualization of the study-population of women who were invited to the HUNT-study until they were included in the study-group.

Urinary Incontinence Variables (EPINCONT Study)

The incontinence part of the questionnaire is known as the EPINCONT study (Epidemiology of Urinary Incontinence in Nord-Trøndelag).[16] For analyses UI was defined as any leakage of urine.[17] If the answer to the entry question of whether she had experienced leakage was yes, the woman was asked to answer more specific questions about the leakage of urine; how often (four levels), how much (three levels) and in which situations she experienced the leakage. A stress UI component was defined when the woman experienced loss of urine when coughing, laughing, sneezing, or making an effort. An urgency UI component was defined when she experienced urgency to void. The incontinence was classified as stress incontinence if she answered "yes" on the stress component question and urgency incontinence if she answered "yes" on the urgency component question. Mixed UI was defined if she answered "yes" on both these questions. Only stress and urgency UI components were used in the analyses.

Anxiety and Depression Variables

Anxiety and depression was measured by the Hospital Anxiety and Depression Scale (HADS).[18,19] This is a self-administered questionnaire consisting of 14 items, seven for anxiety (HADS-A) and seven for depression (HADS-D). Each item has four possible answers and is scored on a Likert scale from 0 to 3. The item scores are added, giving subscales from 0 (minimum symptom level) to 21 (maximum symptom level).

The developers of the scale have recommended three cut-off scores: mild (8–10), moderate (11–14), or severe (15–21) anxiety or depression.[18,20] Here the moderate and severe groups (scores >11) are combined into a common " moderate/severe" group. Data on the validity of HADS have been published.[20–22]

Statistical Analyses

All statistical analyses were performed using SPSS version 22.0. Statistical significance was accepted at a 5% level. Logistic regression analyses were performed to investigate the associations between anxiety and depression and UI. Associations are shown as odds ratios (ORs) with 95% confidence intervals (CIs). In the regression model we adjusted for age, body mass index, parity, myocardial infarction, cerebral stroke, asthma, and diabetes. Age was used as a continuous variable, the other adjustment variables were used as categorical variables.

To see if anxiety and depression could predict the onset of UI during follow-up we first excluded women who had UI at baseline. Then we made two groups of cases; those with HADS-score 8–10 and those with HADS-score ≥ 11 at baseline. Women with HADS < 8 were controls. Conversely, to see if UI could predict the onset of anxiety and depression during follow-up, we first excluded those women who had anxiety or depression at baseline. Women with UI at baseline were now the cases and the women without UI at baseline were the controls.

Ethics

Approvals for the HUNT study were obtained from the Regional and National ethics review board and from the Norwegian Data Inspectorate.

RESULTS

Sixteen thousand two hundred and fifty-three women answered the UI-questions and the questions concerning anxiety and depression in both HUNT2 and HUNT3 and could thus be included in the follow-up study.

Table I shows the characteristics of the included women at baseline regarding UI, anxiety, depression, and the adjustment variables used, in total and by the three age groups. Mean age was 47 years, and mean number of children was 2.1. Prevalence of UI was 23.7%, highest among the middle-aged, and lowest among the youngest. One in five reported a stress UI component, again highest among the middle-aged, and least in the youngest group. One in ten reported an urgency UI component, this was highest among the eldest.

About one in ten had mild and about one in twenty had moderate/severe levels of anxiety, with small differences between age groups. Depression, however, showed increasing prevalence by increasing age. The incidence of UI during the 10-year follow-up period was 18.7%, highest for the stress UI component and for the youngest age group. The 10-year incidence was 7.6% and 2.5% for mild and moderate/severe levels of anxiety, respectively, and 5.2% and 1.2% for mild and moderate/severe levels of depression, respectively (Table I). The incidences of anxiety and depression showed less variance by age groups than for UI.

UI and Depression

Table II presents adjusted analyses from logistic regression for the associations (ORs) between depression and the incidence of any UI, a urgency UI component and a stress UI component. We found a highly significant association between developing UI and high depression score at baseline. The associations are present in all three age groups and for both urgency UI and stress UI components, but the associations did not always reach statistical significance.

TABLE I. Characteristics of the Included Women at Baseline, Shown in Total and by Three Age Groups

Age at inclusion (years)	19–39 N = 5,147		40–54 N = 6,330		55 + N = 4,780		All N = 16,263	
Number of women (N)	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Urinary incontinence (UI)								
Any UI	889	17.3	1753	27.7	1213	25.4	3856	23.7
Stress UI component	744	14.5	1567	24.8	1022	21.4	3334	20.5
Urgency UI component	334	6.5	645	10.2	617	12.9	1596	9.8
Mixed UI	252	4.9	533	8.5	533	11.2	1321	8.1
Other/unclassified	153	3.0	229	3.6	280	5.9	662	4.1
Anxiety								
HADS-A 8–11	546	10.6	749	11.8	524	11.0	1821	11.2
HADS-A ≥ 11	265	5.1	388	6.1	252	5.3	905	5.6
Depression								
HADS-D 8–11	202	3.9	434	6.9	421	8.8	1057	6.5
HADS-D ≥ 11	72	1.4	167	2.6	144	3.0	383	2.4
Parity								
None	1037	20.1	301	4.8	321	6.7	1661	10.2
1	880	17.1	499	7.9	312	6.5	1691	10.4
2	1900	36.9	2626	41.5	1169	24.5	5695	35.0
≥ 3	1303	25.3	2880	45.5	2929	61.3	7114	44.0
Body mass index								
< 18.5	79	1.5	28	0.4	18	0.4	125	0.8
18.5–24.9	2978	57.9	2925	46.2	1434	30.0	7337	45.1
25.0–29.9	1523	29.6	2426	38.3	2208	46.2	6157	37.9
> 29.9	544	10.6	948	15.0	1106	23.1	2598	16.0
Incidence of UI								
Any UI	895	22.2	665	15.9	492	17.9	2054	18.7
Stress UI component	753	19.4	528	13.0	358	13.7	1641	15.5
Urgency UI component	369	10.5	333	8.6	294	11.5	997	10.1
Incidence of anxiety								
HADS-A 8–10	330	7.9	363	7.3	272	7.6	965	7.6
HADS-A ≥ 11	119	3.0	125	2.7	57	1.7	301	2.5
Incidence of depression								
HADS-D 8–10	191	4.0	248	4.5	309	7.8	749	5.2
HADS-D ≥ 11	51	1.1	57	1.1	49	1.3	158	1.2
Asthma	403	7.8	453	7.2	374	7.8	1232	7.6
Myocardial infarction	2	0	11	0.2	76	1.6	89	0.5
Cerebral stroke	9	0.2	25	0.4	77	1.6	111	0.7
Diabetes	22	0.4	65	1.0	130	2.7	217	1.3

Results are given as N and percentages.

TABLE II. Adjusted Analyses From Logistic Regression for the Associations Between Depression and the Incidence of Any UI, a Urgency UI Component and a Stress UI Component

Age at inclusion (years)	19–39 N = 5,147		40–54 N = 6,330		55 + N = 4,780		All N = 16,263	
Number of women (N)	**OR**	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**
Incident any UI (N = 2,054)								
HADS-D < 8 (N = 14,613)	Ref.		Ref.		Ref.		Ref.	
HADS-D 8–10 (N = 1,057	1.62	1.11–2.36	1.30	0.92–1.83	1.33	0.93–1.89	1.38	1.13–1.69
HADS-D ≥ 11(N = 383)	1.84	0.99–3.40	2.07	1.28–3.34	2.54	1.51–4.27	2.09	1.55–2.84
Incident urgency UI component (N = 997)								
HADS-D < 8 (N = 14,613)	Ref.		Ref.		Ref.		Ref.	
HADS-D 8–10 (N = 1,057	1.60	0.95–2.69	1.27	0.80–2.02	1.66	1.11–2.50	1.50	1.15–1.94
HADS-D ≥ 11 (N = 383)	1.99	0.86–4.57	1.98	1.05–3.73	3.10	1.71–5.60	2.30	1.57–3.36
Incident stress UI component (N = 1,641)								
HADS-D < 8 (N = 4,613)	Ref.		Ref.		Ref.		Ref.	
HADS-D 8–10 (N = 1,057)	1.64	1.11–2.44	1.27	0.86–1.86	1.60	1.10–2.33	1.46	1.17–1.83
HADS-D ≥ 11 (N = 383)	1.83	0.95–3.52	2.56	1.57–4.18	2.21	1.21–4.03	2.22	1.60–3.08

Results are given as odds ratios (OR) with 95% confidence intervals (CI). The analyses are adjusted for age, body mass index, parity, myocardial infarction, cerebral stroke, asthma, and diabetes.

TABLE III. Adjusted Analyses From Logistic Regression for the Associations Between Any UI, Urgency and Stress UI Components and the Incidence of Mild and Moderate/Severe Depression

Age at inclusion (years)	19–39 N = 5,147		40–54 N = 6,330		55 + N = 4,780		All N = 16,263	
Number of women (N)	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Incident HADS-D 8–10 (N = 749)								
Continence (N = 11,683)	Ref.		Ref.		Ref.		Ref.	
Any UI (N = 3,856)	1.66	1.17–2.35	1.46	1.11–1.92	1.44	1.10–1.89	1.45	1.23–1.72
Urgency UI component (N = 1,596)	1.84	1.11–3.03	1.63	1.11–2.40	1.69	1.20–2.36	1.65	1.32–2.07
Stress UI component (N = 3,334)	1.66	1.15–2.41	1.45	1.09–1.94	1.45	1.08–1.93	1.45	1.21–1.73
Incident HADS-D ≥ 11 (N = 158)								
Continence (N = 11,683)	Ref.		Ref.					
Any UI (N = 3,856)	1.37	0.69–2.73	1.70	1.98–2.95	1.15	0.58–2.29	1.43	1.00-2.06
Urgency UI component (N = 1,596)	2.21	0.92–5.33	0.85	0.30–2.41	1.85	0.85–4.03	1.52	0.92–2.50
Stress UI component (N = 3,334)	1.19	0.54–2.60	1.85	1.05–3.26	1.03	0.48–2.22	1.40	0.95–2.06

Results are given as odds ratios (OR) with 95% confidence intervals (CI). The analyses are adjusted for age, body mass index, parity, myocardial infarction, cerebral stroke, asthma and diabetes.

The ORs were higher for HADS-D score 11 and over than for HADS-D scores 8–10 for all age groups and for both types of UI, thus indicating a "dose-dependent" trend. The highest OR (3.07) was found for urgency UI and moderate/severe depression in the oldest age group.

Table III shows adjusted analyses from logistic regression for the associations (ORs) between any UI, a urgency UI component, and a stress UI component, and the incidence of mild and moderate/severe levels of depression. We found that any UI, a urgency UI component, and a stress UI component at baseline, were all statistically significantly associated with the incidence of MILD depression (HADS 8–10) in all age groups with the highest ORs in the youngest age group. We also saw an association with moderate/severe depression score, but these results were mostly not significant. There were generally higher ORs for a urgency UI component than for a stress UI component.

UI and Anxiety

Table IV shows adjusted analyses from logistic regression for the associations (ORs) between anxiety and the incidence of any UI, and urgency UI and stress UI components. As for depression, we found a highly statistically significant association between developing any UI and the two UI components and having a high anxiety score at baseline. However, the associations were not statistically significant in the oldest age group for any UI category. The ORs were higher for HADS-A score 11 and over than for HADS-A scores 8–10 for all age groups and for both types of UI, thus indicating a "dose-dependent" trend. The highest OR (2.25) was found for a urgency UI component and moderate/severe anxiety in the middle age group.

Table V shows adjusted analyses from logistic regression for the associations (ORs) between any UI, a urgency UI component, and a stress UI component, and the incidence of mild and moderate/severe levels of anxiety.

We found statistically significant associations between the incidence of MILD anxiety (HADS-A 81–10) in the total sample for women with any UI and stress and urgency UI components at baseline. For the different age subgroups the ORs for anxiety were generally lower than for depression. The incidence of moderate/severe levels of anxiety was statistically significant only for a urgency UI component in the older age group.

TABLE IV. Adjusted Analyses From Logistic Regression for the Associations Between Anxiety and the Incidence of Any UI, a Urgency UI Component and a Stress UI Component

Age at inclusion (years)	19–39 N = 5,147		40–54 N = 6,330		55 + N = 4,780		All N = 16,263	
Number of women (N)	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Incident any UI (N = 2,054)								
HADS-A < 8 (N = 13,161)	Ref.		Ref.		Ref.		Ref.	
HADS-A 8–10 (N = 1,821)	1.43	1.12–1.88	1.73	1.13–1.99	1.17	0.84–1.61	1.45	1.25–1.68
HADS-A ≥ 11(N = 905)	1.78	1.28–2.47	1.79	1.28–3.33	1.36	0.86–2.15	1.65	1.34–2.03
Incident urgency UI component (N = 997)								
HADS-A < 8 (N = 13,161)	Ref.		Ref.		Ref.			
HADS-A 8–10 (N = 1,821)	1.53	1.10–2.14	1.81	1.31–2.51	1.30	0.88–1.92	1.54	1.26–1.88
HADS-A ≥ 11 (N = 905)	2.11	1.37–3.23	2.24	1.49–3.37	1.58	0.92–2.72	1.98	1.53–2.57
Incident stress UI component (N = 1,641)								
HADS-A < 8 (N = 13,161)	Ref.		Ref.		Ref.		Ref.	
HADS-A 8–10 (N = 1,821)	1.43	1.12–1.81	1.73	1.32–2.27	1.21	0.84–1.75	1.50	1.27–1.76
HADS-A ≥ 11 (N = 905)	1.78	1.28–2.49	1.96	1.38–2.79	1.47	0.89–2.44	1.75	1.41–2.19

Results are given as odds ratios (OR) with 95% confidence intervals (CI). The analyses are adjusted for age, body mass index, parity, myocardial infarction, cerebral stroke, asthma and diabetes.

TABLE V. Adjusted Analyses From Logistic Regression for the Associations Between Any UI, Urgency and Stress UI Components and the Incidence of Mild and Moderate/Severe Anxiety

Age at inclusion (years)	19–39 N = 5147		40–54 N = 6,330		55 + N = 4,780		All N = 16,263	
Number of women (N)	**OR**	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**
Incident HADS-A 8–10 (N = 965)								
Continence (N = 11,683)	Ref.		Ref.				Ref.	
Any UI (N = 3,856)	1.24	0.92–1.67	1.33	1.05–1.69	1.24	0.93–1.66	1.26	1.08–1.47
Urgency UI component (N = 1,596)	1.23	0.77–1.96	1.38	0.97–1.95	1.61	1.13–2.30	1.42	1.14–1.77
Stress UI component (N = 3,334)	1.25	0.90–1.72	1.30	1.01–1.67	1.25	0.92–1.71	1.25	1.06–1.47
Incident HADS-A ≥ 11 (N = 158)								
Continence (N = 11,683)	Ref.							
Any UI (N = 3,856)	1.37	0.85–2.20	0.93	0.61–1.42	1.30	0.71–2.41	1.12	0.84–1.48
Urgency UI component (N = 1,596)	1.84	0.96–3.53	0.64	0.29–1.39	2.55	1.32–4.94	1.33	0.90–1.96
Stress UI component (N = 3,334)	1.41	0.85–2.33	0.90	0.57–1.42	1.57	0.85–2.91	1.15	0.86–1.55

Results are given as odds ratios (OR) with 95% confidence intervals (CI). The analyses are adjusted for age, body mass index, parity, myocardial infarction, cerebral stroke, asthma and diabetes.

Unadjusted results from logistic regression analyses for Tables I–V are not shown due to very similar results and trends.

DISCUSSION

This study indicates that both depression and anxiety are predictors for the onset of UI and that UI is a predictor for the onset of both anxiety and depression in women from 20 years of age. We investigated the association between the degree of depression and anxiety score, the UI component, and age group. With both depression and anxiety at baseline, the association with the onset of UI is stronger with a higher HADS-score. The highest ORs are found in the groups with HADS-D and HADS-A ≥ 11 at baseline developing a urgency UI component, in the eldest group for depression score and in the middle-aged group for anxiety. The association between urinary incontinence at baseline and the incidence of anxiety and depression is strongest with HADS 8–10 in the total sample, and we see the highest ORs for a urgency UI component.

In a large prospective study like ours the design indicates more certain evidence than can be found in a cross-sectional study, but the associations found are not proof of causality.

The strengths of the study include a population-based design with a large sample size and a good response rate; as far as we know one of the largest studies investigating this topic. All adult women 20 years and older were invited to participate, and results from the study give representative knowledge about the entire adult female population. Most other studies focus on elderly women only, or a more narrow age-group. However, in our study we experienced problems with low statistical power for small subgroups. We used validated scales for UI, anxiety and depression and the HADS and UI questions were part of a larger survey, which reduces the possibility of both under- and over-reporting. The questionnaire with symptom-based questions about UI is based on the definition of the International Continence Society.[17] The incidence of urinary incontinence in the EPINCONT study is in the lower range compared with incidences reported in other longitudinal studies. This is discussed in another study from HUNT.[23] The HADS is widely used in population-based studies. A cut-off score of eight on each subscale has been found to screen adequately for case-level depression and anxiety according to DSM-III/IV and ICD-8/9 diagnostic criteria.[22] A cut-off of 11 is also used to classify severity level.

Another strength of the study the ability to investigate the associations between the two different components of UI, the two severities of depression- and anxiety scores and the three groups of age.

The limitations of the study include the potentially lower participation in a mail-survey of the persons with the most symptoms, especially very depressed women. 73.5% and 58.5% of the invited persons met the inclusion criteria at the screening station in HUNT2 and HUNT3, respectively, and almost 80% of those who received the questionnaire answered the EPINCONT part. Even though the answering percentage is high, the lower percentage of persons meeting inclusion criteria at the screening station represents a possible selection bias. HADS is not a diagnostic instrument even if it is a good tool to assess symptom load.[21] We know that there are possible shared biological underliers for depression, anxiety and UI, and the lack of information about psychiatric medication and medical treatment of UI, represents a limitation. Lack of information about functional loss could also be a limitation as we know that this is important in both UI and anxiety and depression. One study found that only UI with functional loss was a predictor of anxiety after adjustments.[24] The broad definition of UI used in our study will include many women with no bother or only low bother due to their UI.

Depression and Anxiety at Baseline and Incident UI

We found a significant association between depression at baseline and development of UI. The association was strongest for the women with the highest HADS-score. This corresponds well with the results of a 6-year longitudinal study[10] where they found an OR of 1.46 (1.08–1.97) of developing UI in the group with major depression at baseline. That study was limited by only including patients with a major depression score and a population of only older women. Our results are also supported by an earlier study[25] which found that women with depression at baseline had a relative risk (RR) of 1.6 (1.2–2.0) of being diagnosed with UI over a 9-year follow-up. That study was limited to individuals with medical record diagnoses. In a recent prospective study among young women, the women with depressive symptoms or a history of depression were more likely to develop UI symptoms during follow-up.[26] A one-year longitudinal study found that the incidence of cases of urgency UI were predicted by anxiety at baseline, but not depression.[8] In a 5 year follow-up study investigating 475

women with UI at baseline, the persistence of UI was associated with depression symptoms. They also found that treatment of UI did not affect the association.[11] In a 18-year follow-up study with a median follow-up of 12 years depressive symptoms were associated with incidence of UI with a hazard ratio of 1.31 (1.09–1.56).[12]

There are fewer studies on anxiety as a risk factor for UI. In one longitudinal study anxiety was both a risk factor and a consequence of urgency incontinence.[8] A longitudinal study found a strong association between anxiety at baseline and UI with incontinence-related functional loss. They did not find any significant association with UI without function loss.[25] A later longitudinal study investigating the relationship between anxiety disorder and UI, also found that persons with anxiety at baseline had a significantly higher incidence of UI, but this was only significant with condition-specific functional loss.[27]

In the present study, among those with anxiety at baseline and an incidence of UI, there were higher ORs for developing a urgency UI component compared to a stress UI component in all age groups. This is similar to the strong association between urgency UI and anxiety found in a cross-sectional study[5] and a longitudinal study.[8]

UI at Baseline and Incident Anxiety and Depression

We found an association between UI at baseline and the incidence of depression, only significant with a mild depression score (HADS 8–10), with the highest ORs for a urgency UI component at baseline. One earlier study did not find this association,[10] but that study only investigated major depression, and thus might not catch the association with mild depression. In another one year longitudinal study using HADS and data on both stress and urgency UI at baseline, depression was found to predict urgency UI, but not stress UI.[8]

Our study found an association between UI at baseline and the onset of anxiety, also most significant for a mild HADS-score and with highest ORs for a urgency UI component in most age groups. This corresponds with two other studies,[8,27] but in the latter the association was only significant when the UI was accompanied with a condition-specific functional loss.[27]

No other study we know of has been able to differentiate between severities of depression and anxiety in association with UI. Our study indicates a "dose-response" effect in the association between depression or anxiety at baseline and the development UI. With UI at baseline the association with the incidence of depression and anxiety is only significant with a mild symptom score, but this could be a result of low statistical power in the small subgroup.

Possible Mechanisms

Leakage represents loss of control, and the less predictable the UI, the more disturbing it is for the person, which could lead to helplessness, anxiety and depression.[28] Dysfunctional beliefs and automatic negative thoughts about social stigma could lead to increased functional loss with increased anxiety symptoms and sadness. Cognitive barriers may also decrease a person's benefit from treatment for UI.[28] In one longitudinal study depression at baseline was associated with persistence of UI.[11] UI also often remains underdiagnosed because many patients never consult a doctor for their problem.[29] Depression and anxiety could also contribute to a delay in help-seeking. Having a chronic illness also in itself represents a burden that could lead to sadness and depression. In addition, UI can lead to social isolation and fewer outside activities, which may contribute to depression.[10,13]

Serotonergic pathways are linked to both the regulation of voiding function and depression. Serotonin inhibits the micturition reflex pathway and facilitates the closure of the urethral sphincter. The level of serotonin is low in clinically depressed persons. Duloxetine is a serotonin and noradrenalin reuptake inhibitor and has been shown to improve incontinence and quality of life in patients with stress UI.[15,30,31]

CONCLUSIONS

In this large 10-year follow-up study of 16,253 women aged 20 years and older we found that women with depression or anxiety at baseline were about 50% more likely to develop UI during follow-up than other women, increasing with a high HADS-score. UI at baseline was associated with developing both anxiety and depression, with highest ORs for a mild to moderate depression-score. We know that women with comorbid depression or anxiety and UI have an increased symptom burden from their conditions compared to women with only one of the conditions, therefore it is important to be aware of the association between the conditions, both as a public-health priority and for physicians in their management of such patients.

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