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Anxiety and depression in women with asthma prior to fertility treatment

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ABSTRACT

Objective: We investigate symptoms of anxiety and depression among women with asthma prior to fertility treatment.

Methods: This is a cross-sectional study of women screened for eligibility to the PRO-ART study (RCT of omalizumab versus placebo in asthmatic women undergoing fertility treatment (NCT03727971)). All participants were scheduled for in vitro fertilization (IVF) treatment at four public fertility clinics in Denmark. Data on demographics and asthma control (ACQ-5) were obtained. Symptoms of anxiety and depression were assessed using the Hospital Anxiety and Depression Scale (HADS-A and D, respectively) and defined as being present on both subscales if a score >7 was obtained. Spirometry, diagnostic asthma test, and measurement of fractional exhaled nitric oxide (FeNO) were conducted.

Results: A total of 109 women with asthma were included (mean age 31.8 ± 4.6 and BMI 25.5 ± 4.6). Most women had male factor infertility (36.4%) or unexplained infertility (35.5%). Twenty-two percent of the patients reported uncontrolled asthma (ACQ-5 score > 1.5). The mean HADS-A and HADS-D scores were 6.0 ± 3.8 (95% CI 5.3–6.7) and 2.5 ± 2.2 (95% CI 2.1–3.0), respectively. Thirty (28.0%) women reported anxiety symptoms, and four (3.7%) had concomitant depressive symptoms. Uncontrolled asthma was significantly associated with both depressive ($p = 0.04$) and anxiety symptoms ($p = 0.03$).

Conclusions: More than 25% of women with asthma prior to fertility treatment had self-reported symptoms of anxiety, and just below 5% had self-reported depressive symptoms, possibly related to uncontrolled asthma.

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Introduction

Asthma is one of the most common chronic diseases among women of reproductive age [1]. Asthma is characterised by airway inflammation [2]. Typical symptoms include wheezing, shortness of breath, and cough of variable intensity over time [2].

Previous studies have linked female asthma to impaired reproduction [3,4], and one study showed that women with asthma have a higher need for fertility treatment compared to healthy controls [5]. In Denmark, fertility treatments using assisted reproductive technology (ART) have been increasing [6]. In 2019, before the COVID-19 pandemic, 12,938 IVF/intracytoplasmic sperm injection (ICSI) treatments, and 7,449 treatments with frozen embryo replacement (FER) were initiated in fertility clinics in Denmark [7] (in the Danish population of nearly 6 million people).

Both asthma and fertility treatment have been linked with anxiety and depression. Self-reported anxiety symptoms, as well as doctors diagnosed with anxiety disorders, have been shown to be more prevalent in patients with asthma compared to non-asthma controls [8]. Immunological [9] and genetic [10] theories, among others, have been suggested as possible explanations for this association. Furthermore, in a study by Akula et al. [11], asthma was found to be linked with self-reported depressive symptoms, and the association between asthma and depression is further underlined by a significantly higher use of antidepressant medication in asthma patients compared to the general population, as reported by Håkansson et al. [12]. The mechanisms linking asthma and depression have yet to be fully understood. However, the physical burden

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of asthma, as well as immune-inflammatory pathways involving different inflammatory factors, have been suggested as possible explanations [11,13]. Additionally, patients with inadequate self-rated asthma control have been shown to have significantly higher levels of self-reported depression [14] and anxiety [15] suggesting that poor asthma control may be a driver of anxiety and depression in asthmatic patients.

The impact of fertility treatment on the psychological health of women undergoing fertility treatment has been investigated by Lakatos et al. [16], who found that ART patients had significantly more self-reported depressive symptoms compared to infertile women without a history of ART. Furthermore, Volgsten et al. [17] found depressive disorders to be more common in infertile women undergoing IVF treatment than in the general population. Additionally, one study showed significant changes in self-rated anxiety and depressive symptoms throughout IVF treatment [18], and moreover, that infertile patients report increased levels of anxiety and depression after unsuccessful fertility treatment [19]. These findings suggest that fertility treatment has an impact on the level of anxiety and depressive symptoms in women.

Based on these findings, the aim of this study was to investigate symptoms of anxiety and depression in women with asthma who are about to start fertility treatment.

Material and methods

Study population

This cohort comprises patients screened for eligibility for a randomized, double-blinded clinical trial, PRO-ART, which investigates omalizumab (anti-IgE monoclonal antibody) versus placebo treatment in women with asthma undergoing fertility treatment. Women were recruited from four public fertility clinics in hospitals in Eastern Denmark (Copenhagen University Hospital – Hvidovre, Copenhagen University Hospital – Rigshospitalet, Copenhagen University Hospital – Herlev, and Zealand University Hospital – Køge) prior to their first cycle of IVF treatment. Potential participants for the clinical trial were given a questionnaire with 20 standardized European Academy of Allergy and Clinical Immunology (EAACI) clinical questions regarding asthma and allergy (validated as an asthma and allergy screening tool). If the women responded positively to one or more of the asthma questions, they were screened for the presence of asthma and eligibility for the RCT. Women were eligible for the RCT if they fulfilled the following inclusion criteria: (1) informed consent, (2) females aged between 18 and 40 years, inclusive, (3) diagnosis of asthma with or without allergy, (4) infertility due to male factor, tubal factor, or unexplained infertility, (5) referred to IVF treatment with or without ICSI, (6) willingness to receive treatment with biologic drugs during menstruation period, (7) controlled disease with an ACQ ≤ 1.5 (not applicable to our study). The exclusion criteria were as follows: (1) other respiratory diseases than asthma, (2) other inflammatory disease or a disease that affects fertility, (3) allergy to the investigational drugs, (4) respiratory infections requiring antibiotics or anti-viral treatment within 30 days, (5) referred to testicular sperm aspiration (TESA)/testicular sperm extraction (TESE), (6) endometriosis, (7) infertility due to other reasons than male factor, tubal factor, or unexplained infertility. In the present study, we included all women screened for eligibility for the RCT who had asthma diagnosed or confirmed during the screening visit. Further details of the recruitment process for the PRO-ART trial have been previously published by Tidemandsen et al. [20].

Questionnaires and HADS

Data on baseline characteristics were obtained with a questionnaire, and information on fertility history was obtained from the medical files of the patients. HADS is a self-assessment scale developed to identify symptoms of anxiety and depression, and it has been validated to screen for the dimensions of anxiety and depression [21,22]. The questionnaire encompasses 14 items subdivided into the HADS-anxiety (HADS-A) and HADS-depression (HADS-D) subscales, with seven items related to each subscale [23]. Each item is rated on a 4-point scale (scores between 0 and 3) with a maximum score of 21 for HADS-A and HADS-D, respectively [24]. In this study, symptoms of anxiety and depression were defined as being present in both subscales if a score >7 was obtained [22,25]. A validated Danish version of HADS was used in this study [26]. The Asthma Control Questionnaire (ACQ) is a validated questionnaire that measures the level of asthma control [27]. In this study, a shortened five-item version (ACQ-5) with questions about asthma symptoms only was used [28]. The ACQ-5 score is calculated as the mean of the five items, where a score of 0 is well-controlled asthma and 6 is extremely poorly

controlled asthma [27]. In this study, a validated cut-off of 1.50 points was used to define inadequately controlled asthma [29], and a validated Danish version of ACQ was used [30].

Spirometry

Spirometry with measurements of forced expiratory volume in 1 s (FEV_1) and forced vital capacity (FVC) was conducted with the Jaeger Spirometer, according to recommendations of the American Thoracic Society (ATS)/European Respiratory Society (ERS) [31]. Predicted values for FEV_1 and FVC were calculated according to the reference equations [32].

Fractional exhaled NO (FeNO)

FeNO was measured using a nitric oxide analyser according to the ATS/ERS guidelines [33]. Patients performed the test by exhaling from total lung capacity to residual volume at an expiratory flow rate of 50 $mL{\cdot}s^{-1}$ against a resistance of 4–5 cmH_2O under the guidance of a biofeedback monitor. The level of FeNO was calculated as the average of two measurements of the FeNO curve plateau. A FeNO level > 25 ppb was considered elevated in this study [34].

Objective tests for asthma

A number of tests including bronchial challenge tests (methacholine or mannitol) and bronchodilator reversibility testing were performed to objectively diagnose or confirm asthma. Most patients had a bronchial challenge test, and if this test was negative, further testing was done. The choice and sequence of tests were based on individual assessment.

Methacholine challenge test

Methacholine challenge testing was conducted according to the ERS standards [35] using the Vyntus APS nebulizer and the Jaeger Spirometer. After inhalation of a single dose of nebulized sodium chloride (NaCl) used as a control and subsequent spirometry, increasing doses of methacholine from 72 µg to a cumulative dose of 1483 µg was administered by the nebulizer in regular pulses, and spirometry was conducted 120 s after each dose of methacholine to track potential changes in lung function. A decline in $FEV_1 \geq 20\%$ (provocative dose, PD_{20}) compared to baseline was defined as a positive test.

Mannitol challenge test

The mannitol challenge test was performed using a standardised test kit, Osmohale. Dry powder of mannitol was inhaled in increasing doses from 0 mg to a cumulative dose of 635 mg, and each inhalation was followed by measurement of FEV_1 after 60 seconds [36]. The test was positive if a decline in FEV_1 of 15% occurred at a cumulative dose <635 mg (PD_{15}) [37].

Bronchodilator reversibility test

Following spirometry, a standard dose of a short-acting $beta_2$-agonist (SABA, 400 µg salbutamol) was administered. Spirometry was repeated after approximately 15 minutes, and a positive test was defined as an increase in FEV1 ≥ 12% and ≥200 mL [38].

Statistical analysis

Data were analysed using SPSS statistical software version 28 (IBM, North Castle, New York, USA). Demographic and clinical characteristics are described using means ± standard deviations for continuous data and number [percentage] for categorical data. Chi-square or Fisher's exact test, as appropriate, was used to analyse binary unpaired data. Two-tailed t-test was performed when comparing means. Confidence intervals (CIs) presented for mean HADS-A and HADS-D score, respectively, as well as for mean ACQ-5 score in women with self-reported symptoms of anxiety (HADS-A >7) and without (HADS-A <7) A p-value <0.05 was considered statistically significant.

Ethics approval

This study was performed in accordance with the Helsinki II declaration, and according to Danish legislation. The PRO-ART study is approved by the Research Ethics Committee of the Capital Region of Denmark (H-18016605) and the Danish Medicines Agency (EudraCT no: 2018–001137–41) and permission has also been obtained from the Danish Data Protection Agency (journal number: VD-2018486 and I-Suite number 6745).

Results

Baseline characteristics

A total of 109 women in the screening cohort of PRO-ART with a verified diagnosis of asthma were included in the present study, mean age 31.8 ± 4.6 years and BMI 25.5 ± 4.6 $kg{\cdot}m^{-2}$, respectively. Almost all patients were

nulliparous (102 [93.6]). Sixteen (15.0%) women had experienced one or more pregnancy terminations, and 20 (18.7%) had had at least one pregnancy loss. The most frequent causes of infertility were male factor infertility (39 [36.4]) and unexplained infertility (38 [35.5]). Further details on the demographics and fertility characteristics are listed in Table 1.

Asthma characteristics

Before the screening visit, 64 (58.7%) patients received no asthma medication, while 26 (23.9%) patients were prescribed inhaled corticosteroid (ICS) in combination with a long-acting beta$_2$-agonist (LABA). Twenty-four (22.4%) patients were classified as having poorly controlled asthma (ACQ-5 score > 1.5). Detailed information on lung function, asthma medication, and asthma characteristics are shown in Table 2.

HADS questionnaire findings

The mean HADS-A score was 6.0 ± 3.8 (95% CI 5.3–6.7), and the mean HADS-D score was 2.5 ± 2.2 (95% CI 2.1–3.0). In total, 30 (28.0%) women had self-reported symptoms of anxiety, of these, four (3.7%) had concomitant self-reported symptoms of depression. No cases of self-reported depressive symptoms only were observed.

When comparing those who used only SABA or no asthma medication to those who used ICS or ICS + LABA before the screening visit, the mean score was higher in the first group in regard to both HADS-A (6.5 ± 3.9 vs. 4.9 ± 3.5, respectively, **p = 0.041**) and HADS-D (2.8 ± 2.3 vs. 1.9 ± 1.9, respectively, **p = 0.040**). The mean ACQ-5 score was higher in women with a HADS-A score > 7 (mean 1.3 ± 0.7 (95% CI 1.0–1.6)) than those with a lower HADS-A (0.8 ± 0.9 (95% CI 0.7–1.1), $p = 0.01$, respectively). No significant difference in mean ACQ-5 score was found between women with a HADS-D score above or below 7. See Table 3 for further details.

Table 4 shows the distribution of women with HADS-A or HADS-D scores > 7 when stratified according to demographic characteristics, level of lung function, asthma, and fertility history. Poor asthma control was significantly associated with both symptoms of depression and anxiety. Self-reported symptoms of anxiety or depression were not significantly associated with the other variables included in the analysis.

Table 1. Characteristics of demographics and reproduction characteristics in women with asthma referred to fertility treatment and evaluated for eligibility for enrolment into a randomized clinical trial ($n = 109$).

Characteristics	Value
Age, years	31.8 ± 4.6
BMI, kg·m^{-2}	25.5 ± 4.6
Civil status	
Married/Cohabiting (couple)	99 [90.8]
Single	10 [9.2]
Smoking status	
Never-smoker	69 [63.3]
Former smoker	27 [24.8]
Current smoker	13 [11.9]
Number of children	
≥1	7 [6.4]
None	102 [93.6]
Pregnancy terminations	
≥1	16 [15.0]*
Pregnancy loss	
≥1	20 [18.7]*
Biochemical	6 [5.6]*
Miscarriage	14 [13.1]*
Cause of infertility	
Male factor	39 [36.4]*
Tubal factor	7 [6.5]*
PCOS	5 [4.7]*
Single/same sex partner	14 [13.1]*
Unexplained	38 [35.5]*
Combined	4 [3.7]*/**

Notes: Values are expressed as mean ± SD and number [%]. BMI: body mass index; PCOS, polycystic ovary syndrome. *Missing values for two cases. **In all cases combined male factor infertility and PCOS.

Table 2. Level of lung function, prescribed asthma medication, FeNO, and asthma control in women with asthma referred to fertility treatment ($n = 109$).

Characteristics	Value
Lung function	
FEV_1 L	3.38 ± 0.54
FEV_1 %predicted	100.96 ± 13.52
FVC L	4.26 ± 0.66
FVC %predicted	107.90 ± 13.74
FEV_1/FVC	0.79 ± 0.06
Asthma medication before the visit	
No medication	64 [58.7]
SABA only	10 [9.2]
ICS monotherapy	9 [8.3]
ICS + LABA	26 [23.9]
FeNO, ppb	17.7 ± 17.4*
ACQ-5 score > 1.5	24 [22.4]*

Notes: Values are expressed as mean ± SD and number [%]. FEV_1, forced expiratory volume in 1 s; FVC, forced vital capacity; SABA, short-acting $beta_2$-agonist; ICS, inhaled corticosteroid; LABA, long-acting $beta_2$-agonist; FeNO, fractional exhaled nitric oxide; ACQ, asthma control questionnaire. *Missing values for two cases.

Table 3. Comparison of demographics, level of lung function, FeNO, and asthma symptom control between women with asthma referred to fertility treatment with and without self-reported symptoms of anxiety or depression based on the Hospital Anxiety and Depression Scale (HADS). A cutoff score > 7 was used in both the HADS-anxiety and HADS-depression subscales.

	HADS-A ≤7 $N = 77$	HADS-A >7 $N = 30$	*p-value*	HADS-D ≤ 7 $N = 104$	HADS-D > 7 $N = 4$	*p-value*
Age	32.12 ± 4.36	30.80 ± 5.10	0.18	31.73 ± 4.52	32.75 ± 6.65	0.66
BMI	25.48 ± 4.71	25.98 ± 4.40	0.62	25.43 ± 4.55	29.92 ± 3.97	0.06
FEV_1 %pred	100.40 ± 13.23	103.03 ± 14.32	0.37	101.07 ± 13.60	98.25 ± 14.89	0.69
FeNO	17.49 ± 17.56	18.00 ± 17.84	0.90	17.75 ± 17.81	16.35 ± 3.93	0.88
ACQ-5 score	0.84 ± 0.87	1.29 ± 0.72	**0.01**	0.93 ± 0.86	1.65 ± 0.47	0.10

Notes: Values are expressed as mean ± SD. HADS, Hospital Anxiety, and Depression Scale; HADS-A, HADS subscale for anxiety; HADS-D, HADS subscale for depression; BMI: body mass index; FEV_1, forced expiratory volume in 1 s; FeNO, fractional exhaled nitric oxide; ACQ, asthma control questionnaire. Values of $p < 0.05$ were considered significant and are written in bold. Values missing for HADS-A two cases and HADS-D one cases in all analyses.

Table 4. Women with asthma referred to fertility treatment who had self-reported symptoms of anxiety or depression based on the Hospital Anxiety and Depression Scale (HADS) stratified according to case history and clinical characteristics. A cutoff score > 7 was used in both the HADS-anxiety and HADS-depression subscales.

	Age			BMI		
	<35	≥35	p-value	<25	≥25	p-value
HADS-A >7	21 [70.00]	9 [30.00]	0.62	13 [43.30]	17 [56.70]	0.50
HADS-D > 7	2 [50.00]	2 [50.00]	0.60#	1 [25.00]	3 [75.00]	0.62#
	Relationship status			History of smoking		
	Couple	Single	p-value	Yes	No	p-value
HADS-A >7	27 [90.00]	3 [10.00]	1.00#	12 [46.70]	16 [53.30]	0.22
HADS-D > 7	4 [100.00]	0 [0]	1.00#	3 [75.00]	1 [25.00]	0.14#
	FEV_1 %pred			ACQ-5		
	<80	≥80	p-value	<1.5	>1.5	p-value
HADS-A >7	2 [6.70]	28 [93.30]	0.62#	19 [63.30]	11 [36.70]	**0.03**
HADS-D > 7	0 [0]	4 [100.00]	1.00#	1 [25.00]	3 [75.00]	**0.04#**
	History of pregnancy loss			Cause of infertility		
	Yes	No	p-value	Known	Unknown	p-value
HADS-A >7	6 [20.70]*	23 [79.30]*	0.79	21 [72.40]*	8 [27.60]*	0.37
HADS-D > 7	1 [25.00]**	3 [75.00]**	0.57#	4 [100]**	0 [0]**	0.30#

Notes: Values are expressed as number (%). HADS, Hospital Anxiety, and Depression Scale; HADS-A, HADS subscale for anxiety; HADS-D, HADS subscale for depression; BMI, body mass index; FEV_1, forced expiratory volume in 1 second; ACQ, asthma control questionnaire. Pregnancy loss includes miscarriage and biochemical pregnancy loss. Values of $p < 0.05$ were considered significant and written in bold. #p-value determined from analysis with Fisher's exact test. Values missing for HADS-A two cases and HADS-D one cases in all analyses except values missing for × 4 and **3 cases.

Discussion

In this study of 109 patients, we found that 30 (28.0%) women had self-reported symptoms of anxiety prior to fertility treatment and furthermore, four (3.7%) patients had concomitant symptoms of depression, whereas none of the patients had depressive symptoms only. Furthermore, we found that there may be a correlation between poor asthma control and self-reported symptoms of anxiety and depression.

According to a study by Kolte et al. [39], the prevalence of self-reported moderate or severe depression is 2.2% in a cohort of 1,813 Danish women who are trying to conceive naturally. We found a slightly higher prevalence of self-reported symptoms of depression (3.74%) in our study population. Likewise, the prevalence of self-rated anxiety symptoms in our study population (27.5%) is higher than the prevalence of self-reported high stress level in women trying to conceive naturally (23.3%). However, it is important to note that the results by Kolte et al. are not directly comparable to our results, as they investigated the prevalence of self-reported moderate or severe depression and stress level in women who were trying to conceive naturally, whereas our study examines the prevalence of self-reported depressive and anxiety symptoms, respectively, in women with asthma prior to fertility treatment. Furthermore, they used other questionnaires than HADS to assess the psychological state of the women. Still, both study groups consist of Danish women trying to conceive, which makes the results from Kolte et al. a relevant standard of reference for our study population.

The relatively high prevalence of self-report anxiety and depressive symptoms in our study population suggests that asthma and fertility treatment are affecting the psychological health of the women in our study. Still, it is difficult to determine whether it is asthma or fertility treatment or perhaps both being the main driver of anxiety and depression. The link between anxiety and asthma has been described by Ye et al. [8] who reported a significant association between asthma and self-report symptoms of anxiety, as well as clinically diagnosed anxiety disorders. In terms of anxiety and fertility treatment, a study by Massarotti et al. [40] found higher levels of anxiety before treatment than during treatment, possibly because the women had already spent a long time trying to conceive without success, and due to fear of the unknown treatment ahead. Additionally, Liu et al. [18] observed that in couples undergoing IVF treatment, the women reported higher levels of both anxiety and depressive symptoms in the early stages of treatment prior to embryo transfer compared to after embryo transfer, perhaps due to the uncertainty of treatment success combined with high expectations concerning ovarian growth and fear of the egg retrieval procedure. Although we did not repeat HADS during fertility treatment in the present study, our results support the finding of a generally high prevalence of anxiety symptoms in women prior to fertility treatment.

We found a significant difference in distribution of women with anxiety and depressive symptoms stratified according to the level of asthma control. Furthermore, the mean ACQ-5 score was found to be higher in women with a HADS-A score > 7 than those with a lower HADS-A, which suggests that anxiety and depressive symptoms may be associated with uncontrolled asthma. Still, the clinical implication of the latter result needs to be addressed. The difference in ACQ-5 score between the two groups is 0.45 and therefore lower than the minimal clinically important difference (MCID) for ACQ-5 which is close to 0.5 [41]. As the MCID represents the threshold value of change in ACQ-5 score that has an implication in clinical management [42], the difference in mean ACQ-5 score between the two groups of women is perhaps not noticeable in a clinical setting.

However, previous studies support our findings, therefore, it is relevant to address the possible association between anxiety and depression and uncontrolled asthma. Di Marco et al. [15] found self-rated poor asthma control to be closely correlated with self-reported symptoms of anxiety and depression, and Trzcinka et al. [14] reported self-rated, inadequate asthma control to be significantly associated with any grade of self-reported depression. Considering that the women in our study population have asthma and are aiming to become pregnant, it is interesting to see that Grzeskowiak et al. [43] found that a history of maternal depression or anxiety significantly increases the risk of poor asthma control in women with asthma during pregnancy. To add to this, Powell et al. [44] reported that women's self-rated asthma control and self-report anxiety symptoms are associated with future asthma exacerbation risk and preterm birth. Since we found poor asthma control to be associated with both anxiety and depressive symptoms in our study population of women with asthma trying to obtain pregnancy, early detection of anxiety and depression in women with asthma who are about to start fertility treatment could have an important positive impact on asthma control and exacerbation risk during pregnancy.

The association between asthma and anxiety is further complicated when considering the question about causality. The nature of the interplay between

asthma and anxiety symptoms is complex due to the similarity of symptoms. Consequently, the possibilities of asthma causing anxiety or anxiety causing asthma both seem likely. Our results do not address this matter of direction of causality; however, it can be hypothesized that difficulty in breathing due to bronchial constriction in asthma could induce anxiety symptoms and a feeling of panic due to the fear of not being able to breathe properly. Conversely, anxiety symptoms might induce respiratory symptoms as shown by Leander et al. [45], who found that HADS score is a strong determinant for attacks of breathlessness at rest in asthma patients, suggesting that anxiety symptoms might exacerbate asthma symptoms. This hypothesis of a bidirectional relationship between asthma and anxiety is supported by the findings of Del Giacco et al. [46].

The clinical overlap between asthma, anxiety, and depression is also worth considering. Anxiety and depression have some shared symptoms, including fatigue and sleep difficulties [47]. Previous studies have found that fatigue is also highly prevalent in patients with asthma [48,49]. To add to this, Günaydın et al. showed that self-reported fatigue in patients with asthma was significantly correlated with self-reported symptoms of depression and anxiety [50]. Sleep difficulties such as sleep initiation problems, sleep maintenance, and early morning awakening are also common among patients with asthma [51]. From a clinical point of view, it is important to be aware of these complex interplays and diagnostic overlaps between asthma, anxiety, and depression as they may pose a differential diagnosis problem.

Strengths and limitations

A strength of this study is that all participants had an objectively verified asthma diagnosis. Another strength is that women were recruited from four different public fertility clinics in Denmark and not just one clinic, increasing the representativeness of the study population.

However, there are also limitations to this study. First, using questionnaires to assess symptoms of mood disorders might be questioned due to concerns about somatic illness affecting or being mistaken as symptoms of a mood disorder, as well as the risk of insufficient distinction between different mood disorders because of symptom overlap [23,47]. However, in the development of HADS, Zigmond and Snaith have attempted to prevent this matter by excluding all symptoms of anxiety or depression which also relates to physical disorder and omitting terms that overlap with physical symptoms such as 'headache' or 'dizziness' [23], and validation studies generally agree on HADS performing well in screening for the separate dimensions of anxiety and depression [21,52]. Second, participants in our study only completed HADS before the first cycle of treatment, thereby omitting the impact of later stages of fertility treatment on symptoms of anxiety and depression. Optimally, HADS should be repeated, for instance, after embryo transfer, as conducted by Liu et al. [18], and after the human chorionic gonadotropin (hCG) result, as increased self-rated symptoms of depression and anxiety after fertility treatment failure was observed by Maroufizadeh et al. [19].

Conclusion

This study brings forward a new perspective on anxiety and depressive symptoms in a study population of women with asthma prior to fertility treatment. We showed that more than 25% and just below 5% of women with asthma who are about to start fertility treatment had self-reported symptoms of anxiety and depression, respectively, and our findings are consistent with those of previous studies reporting an association between asthma control and symptoms of anxiety and depression. Our findings suggest that early detection of anxiety and depressive symptoms as well as mental health interventions for women who are both dealing with asthma and are about to start fertility treatment are needed.

Disclosure statement

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