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## What do repetitive thinking styles tell about hyperemesis gravidarum?\*

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### ABSTRACT

**OBJECTIVES:** Although there are studies investigating the relationship between anxiety disorders, depression, and hyperemesis gravidarum (HG), none have sufficiently clarified the link between underlying psychological processes and HG. The present study aimed to examine the relationship between rumination, worry, and HG and their possible triggering effects on HG.

**METHODS:** The study was designed as a prospective, self-reported, cohort research and the study sample consists of 350 pregnant women. Socio-demographic Form, Ruminative Thinking Style Questionnaire (RTSQ), Trait Anxiety Inventory (STAI-2), and Beck Depression Inventory (BDI) were administered to the participants at the first 6 weeks of their pregnancies (time 1). Second consultation was made to detect women with HG diagnosis between the 6 and 18 weeks' gestation (time 2). Forty participants diagnosed with HG and 40 randomly chosen participants who had healthy pregnancy process at the end of the 18th gestational week were compared by using independent-samples T-test.

**RESULTS:** While there was no significant difference between the time 1 RTSQ scores and the time 1 BDI scores of the HG and control groups, time 1 STAI-2 scores of the HG group were found to be significantly higher than the control group.

**CONCLUSIONS:** Our results show that worry process plays an active role in the development of HG rather than rumination. As a well-known mechanism of trait anxiety, worry could be a vulnerability factor for HG.

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### KEYWORDS

Hyperemesis gravidarum; pregnancy; rumination; worry

## Introduction

While there are no certain diagnostic criteria, hyperemesis gravidarum (HG) is defined as a clinical presentation that is characterized by intractable nausea, and vomiting occurs in the first trimester of pregnancy [1]. HG is empirically differentiated from the common nausea and vomiting of pregnancy which affects up to 80% of pregnancies [2] by the need for hospitalization because of fluid, electrolyte and acid–base imbalance, nutrition deficiency, dehydration, anaemia, ketonuria, and lethargy [1,3]. The incidence reported is 0.3–2% in different series [1], and it is known that HG not only affects the physical status of pregnant women but also can cause reduction in health-related quality of life [4].

The aetiology and pathogenesis of HG have not yet been clearly elucidated. Endocrine factors such as changes in human chorionic gonadotropin, oestrogens, progesterone and thyroid hormones, motility irregularities, metabolic defects, *Helicobacter pylori*, and psychosocial factors may play a role in this medical condition [1,5,6]. Many psychiatric risk factors

including psychological stress, anxiety, depression, and personality disorders are suggested within this context [7,8].

Although the data about the psychological causes for HG is relatively limited, most of the studies showed relations between psychiatric disorders and HG [9–14]. In a retrospective telephone survey, depressive symptoms in pregnant women were found to be associated with more severe nausea and vomiting [15]. This study also indicates that psychological distress, evoked by hyperemesis, has a negative effect on quality of individual's life, and this effect is independent from antiemetic medication. Another study demonstrated four times higher hospitalization rates due to HG among women with post-traumatic stress disorder history [16]. Also in a case–control study, Simpson et al. [17] reported that women with HG had more somatization, anxiety, obsessive–compulsive, and psychotic symptoms. Additionally, no significant differences were found between HG subjects and controls after pregnancy.

While a number of psychological interventions such as hypnosis [18], behaviour modification [19],

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relaxation training [20], and eye movement desensitization reprocessing [21] have been advanced for treatment of HG, data on psychological processes that accompany or contribute to HG are unclear. In considering the association between gastrointestinal system and psychiatric conditions such as depression, anxiety, panic, and post-traumatic stress disorder [22,23], effects of cognitive and emotional processes on the HG clinic should be researched. In this line, there is a growing focus on the literature regarding the relationship between perseverative thinking styles (e.g. rumination and worry) and psychopathology such as depression, anxiety, and somatization disorders [24]. The role of these cognitive processes in functional gastrointestinal disorders (FGIDs) like irritable bowel syndrome (IBS) is also demonstrated. Keefer et al. [25] suggest that worry may be an important factor in the onset and/or maintenance of IBS and predicts gastrointestinal symptom severity. Also in Chapman's study [26], IBS participants reported more pain-focused rumination compared with healthy participants.

In light of this literature, the aim of this study is to examine the triggering effects of perseverative cognitive response styles on HG. We hypothesized that HG can be a kind of FGID and associated with rumination and worry. For this aim, the current research was designed as a prospective cohort study instead of a retrospective one.

## Methods

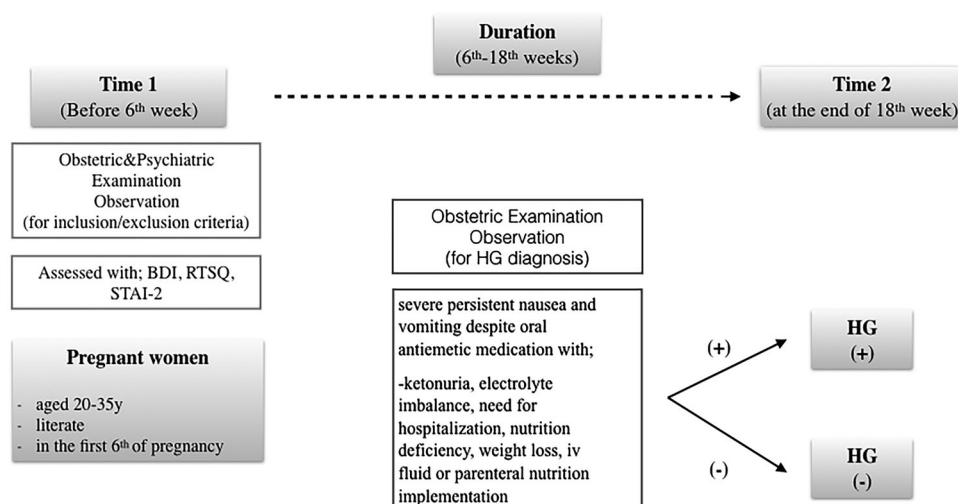
### Design

Our research was approved through the decision of Ethics Committee of the Bakirkoy Training and Research Hospital for Psychiatry, Neurology and Neurosurgery and was designed as a prospective study.

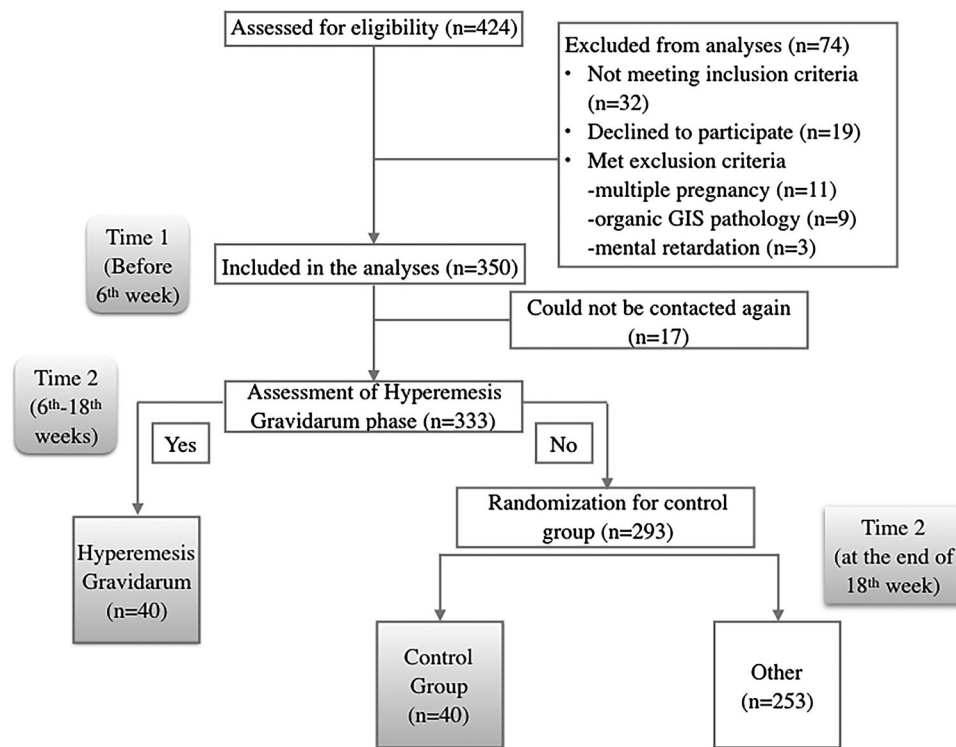
Written consent was obtained from individuals who accepted to participate voluntarily in the research after the researchers explained the requirements. HG is defined as severe persistent nausea and vomiting that causes ketonuria and electrolyte imbalance despite oral antiemetic medication between the 6 and 18 weeks' gestation, without any other underlying gastrointestinal system pathology [27]. Inclusion criteria for the study were literate women aged 20–35 years and being in the first 6 weeks of pregnancy. Having any psychotic disorder, active mood episode, mental retardation, multiple pregnancy, and organic pathology are identified as exclusion criteria. Assessment measures were administrated to all participants in the first consultation (time 1). During the second consultation, the participants were thoroughly examined clinically and laboratory tests were performed between the 6 and 18 weeks' gestation (time 2) for HG diagnosis (Figure 1). For the control group, participants were randomly chosen among the study sample who had a healthy pregnancy period at the end of the 18th gestational week (time 2). The study was conducted until the case group – participants diagnosed with HG – reached 40 participants (Figure 2), and then time 1 depression, worry, and rumination levels of both the groups were compared.

### Sample and eligibility criteria

The volunteered pregnant participants were recruited from an outpatient clinic of a hospital, specializing in the field of obstetrics and gynaecology in Istanbul. Of the 424 women, 333 applied to the outpatient clinic in the first 6 weeks of their pregnancy considered eligible for the study and completed the second consultation. Among the 333 participants, 40 subjects met the HG criteria and 40 healthy subjects were randomly selected for the control group (Figure 2).



**Figure 1.** Study design.



**Figure 2.** Flow diagram of the participants.

## Measures

### Socio-demographic form

It is a study-oriented form, which includes questions about socio-demographic properties, medical history, date of last menstrual period, gestational week at ultrasound, and pregnancy history (gravidity, parity) of the participants. The form was developed and applied by the researchers.

### Ruminative thinking style questionnaire

Ruminative thinking style questionnaire (RTSQ), developed to evaluate ruminative response styles by Brinker and Dozois [28], is a 7 point Likert-type scale consisting of 20 items. In contrast to previous rumination-oriented scales, RTSQ assesses a general ruminative response style, independently from the person's present mood especially from depression. Reliability and validity study of the RTSQ Turkish version was conducted in 2013 by Karatepe et al. [29].

### Beck depression inventory

Beck depression inventory (BDI) is a self-report inventory developed to measure the severity of depression by Beck et al. [30]. The Turkish version of BDI was conducted by Hisli [31]. The inventory consists of 21 items, each item is scored between 0 (least) and 3 (most) and the highest possible total score for the whole test would be 63. Higher total scores represent higher levels of depressive symptoms.

### State-trait anxiety inventory-2

It was developed by Spielberger et al. to measure levels of trait anxiety and worry [32]. In the present study, only the Trait Anxiety part (State-trait anxiety inventory-2, STAI-2) of the inventory was used. STAI-2 comprises 20 self-report items, scored on a 4-point Likert-type scale. The inventory was adapted into Turkish by Oner in 1985 [33]. Scores range from 20 to 80, with higher scores suggesting greater levels of trait anxiety.

### Statistical analysis

Statistical analyses were performed with SPSS-13 (Statistical Package for Social Sciences) package software. Descriptive statistics were calculated for the sample population. The intergroup differences were evaluated with chi-square test for categorical variables and independent-samples T-test for continuous variables conforming to normal distribution.  $p < .05$  was accepted for significant differences.

## Results

While the mean age of the HG group ( $n = 40$ ) was  $25.5 \pm 4.1$  and the control group ( $n = 40$ ) was  $24.8 \pm 3.9$ , no significant difference was found between both the groups in terms of age. All of the participants were married. No significant difference was found between the HG and control groups for gravida (HG group:  $M = 2.17 \pm 0.6$ ; control group:  $M = 2.34 \pm 0.8$ ), parity

**Table 1.** Between-group comparison of BDI total scores at the beginning (Time 1).

	HG M ± SD	Control M ± SD	<i>t</i>	<i>df</i>	<i>p</i>
BDI	6.4 ± 2.1	6.1 ± 1.8	0.35	78	.91

\**p* < .017.**Table 2.** Between-group comparison of RTSQ and STAI-2 total scores at the beginning (Time 1).

Repetitive thinking styles	HG M ± SD	Control M ± SD	<i>t</i>	<i>df</i>	<i>p</i>
RTSQ	55 ± 6.1	53 ± 4.7	2.2	78	.12
STAI-2	48 ± 6.1	38 ± 4.2	7.8	78	.01

\**p* < .017.

(HG group:  $M = 1.05 \pm 0.2$ ; control group:  $M = 1.23 \pm 0.3$ ), and BMI (HG group:  $M = 22.2 \pm 2.8$ ; control group  $M = 21.7 \pm 3.1$ ).

There were no significant differences with regard to education levels except higher rates of high school graduates in the control group (HG: 12.5%, control: 27.5%;  $t = -2.35$ ,  $p = .041$ ). While any alcohol/substance use and suicide attempt were not detected in both the groups, smoking rates were significantly higher in the HG group (HG: 17.5%, control: 15%;  $p = .03$ ).

When both the groups were compared for beginning depression levels, independent-samples T-test analyses showed that there was no significant difference between the time 1 BDI scores of the HG and control groups ( $p = .91$ ) (Table 1).

RTSQ and STAI-2 scores at first consultation (time 1) were analysed to assess the possible relationship between HG and repetitive thinking styles. While there was no significant difference between the time 1 RTSQ scores of the HG and control groups ( $p = .12$ ), time 1 STAI-2 scores of the HG group were found to be significantly higher than the control group ( $p = .01$ ) (Table 2).

## Discussion

Existing researches investigating psychiatric morbidity in HG focused mainly on the association between axis I disorders (depression, anxiety, etc.) and HG severity [15,34–36]. Although an association was found in many previous studies [12,36], the causal direction of these relationships remains controversial [34,35,37–40]. Removing the research focus from diagnoses and investigating the transdiagnostic processes could be useful to overcome this causal complexity, and there have been no studies about the relationship of these processes and HG reported in the literature yet. In our study, we found higher worry levels in the HG group at time 1 while there were no significant differences between the HG and the control group in terms of rumination and depression levels.

Despite the lack of data in HG, several studies have been conducted on aforementioned processes in physical illness, especially FGIDs. IBS, as one of the FGIDs, was found to be associated with higher trait anxiety, worry, and experiential avoidance in many studies [41,42]. Considering the studies emphasize the role of altered autonomic neuro-systemic function – affecting gut motility – in primary symptoms of HG like nausea and vomiting [3,43], findings about FGIDs that have a similar relation with autonomic nervous system function become important.

In the literature, many studies demonstrated that there is a possible relationship between anxiety disorders and HG [17,34,35], but there is no prospective case-control study specific to underlying anxiety-related cognitive processes like worry in these individuals. Although some cross-sectional studies show that pregnant women usually have worries about the baby's health, giving birth and miscarriage [44,45], none of them includes a HG sample. Psychiatric disorders, including anxiety disorders, were reported to be related to HG in several studies. Tan et al. analysed 209 hospitalized patients with HG in their prospective study and reported that depression and anxiety disorders were common in women affected by HG [35]. Uguz et al. analysed 52 patients with HG and 90 control pregnant women and found higher rates of major depression, generalized anxiety disorder, and personality disturbances among women with HG and suggested that there was a potential relationship between these psychiatric disorders and HG during pregnancy [12]. Similarly, Koken et al. performed a prospective analysis of 230 women with nausea and vomiting in pregnancy (NVP) and found a significant correlation between severity of NVP and anxiety-depression scores [34]. As is seen, most of the literature about anxiety and HG presents only the relationship between these but they do not provide any idea about causality. Only in the McCarthy et al.'s study, in which women were assessed at  $15 \pm 1$  weeks' and  $20 \pm 1$  weeks' gestation, higher state anxiety scores (assessed by STAI-6) were detected in women with HG compared to women without HG, but it does not provide data about HG cases that occur earlier in the pregnancy and also worry levels [46]. Within this context, one move ahead of the previous study, the most important finding of our study is higher worry levels in the HG group according to the control group in time 1. In consideration of this result, it can be said that HG is more frequent in women who use worry as a response style, and worry can be interpreted as an etiologic factor that plays an active role in the development of HG.

On the other hand, taking into consideration that nausea in HG is a consequence of gastrointestinal dysrhythmia that is related with vagal tone abnormality [47], it can be thought that worry process could be



one of the mediators of nausea and vomiting in HG. This explanation of the current data based on the Lyonfields and Borkovec's theory, which suggests that worry causes an autonomic inflexibility presenting with reduced variation in a vagal tone due to chronic parasympathetic deficiency [48]. Additionally, considering the literature on FGIDs, worry is referred as an underlying psychological process for these disorders [41,49]. In the study of Hazlett-Stevens et al. on 1021 university students, participants with IBS reported higher levels of trait worry and anxiety, which is specific to visceral sensations than their asymptomatic counterparts [50]. Also Drews et al. analysed 391 university students and reported higher trait anxiety, worry, and experiential avoidance levels in students with IBS [41]. Although these studies do not give information to us about causality, when their findings were interpreted together with ours, it can be said that worry could be a shared psychological process as a vulnerability factor for both HG and IBS.

Another repetitive thinking style we hypothesized to be higher in the HG group was rumination. However, no significant difference was found between the rumination levels of the HG and control groups. Contrary to our hypothesis, it can be said that ruminative thinking pattern does not take place in the aetiology of HG. Additionally, pregnancy may be a triggering factor for ruminative thinking pattern, and there is a need for further researches to focus on rumination levels at second consultation.

As in many organic diseases, depression may emerge as a comorbidity in HG and most of the studies demonstrated higher levels of depressive symptoms in patients with HG than those in the control group [14,51]. While Koken et al. found a significant correlation between severity of NVP and depression scores in their prospective study on 230 women [34], no association was found in the study of Bozzo et al. in which 57 pregnant women were analysed prospectively at 8, 11, 18, and 30 weeks gestation [38]. Although both of these studies were designed as prospective, the causal direction of depression and HG relation still remains controversial. In the current study, no difference was found between the depression levels of the HG and control groups on time 1. Although there was no measurement of depression levels at 6–18 weeks' gestation, considering this result with previous studies, it can be said that HG could be a stressor causing depressive symptoms per se and provide insight about depressive symptoms can be a comorbid condition rather than a reason of the illness. In line with our finding, Tan et al. [35] and Aksoy et al. [51] reported that depression was common in women affected by HG and the psychological distress associated with HG was a direct consequence rather than a cause of HG in their study that hospitalized patients with HG were analysed. Likewise, Kjeldgaard et al.'s

study conducted on 731 pregnancies with HG and assessed the association between previous depression and HG showed that depression was a main driver in the aetiology of HG [39].

Also Simpson et al. provide a similar explanation that the psychological symptoms associated with HG may be due to the stress of illness courses with severe and debilitating physical symptoms and suggested that any normal pregnant woman experiencing severe nausea and vomiting, but not diagnosed with HG, can also be vulnerable to symptoms of stress and depression [17]. Taking into account all of these, it can be said that there is no causal relationship between depressive symptoms and development of HG.

There are some limitations to our study. Absence of the measurements of depression, rumination and worry levels during second consultation – between the 6 and 18 weeks' gestation – was the main limitation of our study. Because we did not assess time 2 scores, we could not show the possible time-related differences on depression, worry and rumination scores were due to normal pregnancy process or HG. The data collection from only one outpatient clinic specializing in the field of obstetrics and gynaecology and patients who live in the same district and have similar socio-cultural levels are the potential limitations of the study and therefore, the sample may not represent all pregnant women in the community. Another weak point is the small sample size because of lower incidence of HG in the population and time limitation for collecting data. Also, our data were derived from self-report measures, which may lend themselves to biases in reporting, and this might influence the objectivity of the data. Absence of the discrimination about how the pregnancy occurred (natural or by assisted reproductive techniques), miscarriage history and number of pregnancies are other limitations of the study.

Until now, only the possible relationship between psychiatric diagnoses and HG has been investigated in a few prospective case–control studies. This study represents a departure from previous studies in that it is the first to investigate possible associations between cognitive processes like rumination, worry and HG prospectively as from early gestational weeks. In conclusion, our results suggest that worry plays an active role in the development of HG, while rumination does not take part in the aetiology of HG. Considering all the results collectively, investigation of existence of the perseverative cognitive response styles would be useful for an integrative approach to HG. Conducting empirical intervention studies in the direction of our findings may be helpful for preventing HG and improving quality of life in a risky population.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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