Original Article

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Evaluation of nausea and vomiting in pregnancy using the Pregnancy-Unique Quantification of Emesis and Nausea scale in Korea

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Objective
Severity of nausea and vomiting of pregnancy (NVP) is associated with adverse pregnancy outcomes and poorer quality of life (QOL). The aim of this study was to evaluate the severity of NVP and maternal well-being status using the Pregnancy-Unique Quantification of Emesis and Nausea (PUQE) scale in a Korean population.

Methods
A total of 527 pregnant women who were receiving prenatal care at 4 hospitals were asked to participate in the study between January 2015 and June 2015. The severity of NVP was evaluated by the PUQE scale and maternal well-being status was evaluated using the visual analogue scale (VAS). Statistical analyses were performed to determine the risk factors associated with NVP and the associations between the severity of NVP and QOL.

Results
Among the 472 eligible pregnant women, 381 (80.7%) were suffering from NVP during pregnancy. No significant differences (P>0.05) were observed in any of the variables between the 2 study groups, with the exception of smoking, alcohol consumption, and history of NVP. NVP history was found to be the most powerful risk factor (adjusted odds ratio, 11.6; 95% confidence interval, 4.7–28.7). The correlation coefficient (r) between the VAS scores of maternal well-being status and PUQE severity was –0.25 (r^2=0.062; P-<0.001).

Conclusion
In this study, an explicit decline in maternal well-being status was observed according to severity of NVP. The PUQE scale may be of help to clinicians, healthcare providers, and researchers because of its simplicity and usefulness as a tool for NVP evaluation.

Keywords: Nausea; Vomiting; Pregnancy; Visual analog scale

Introduction

Severity of nausea and vomiting of pregnancy (NVP) is associated with poorer quality of life (QOL) and adverse effects on various aspects of social, occupational, and domestic life functioning [1-3]. In addition, NVP is related to increased stress levels and depressive symptoms [1,4]. The more severe the NVP symptoms, the greater the feelings of depression; among women with severe NVP, 39% reported feeling depressed, compared with only 4.8% of women with mild NVP [3].

Around 50%–80% of the pregnant population experi-

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ence NVP with variable severity [5]. The symptoms of NVP range from mild to severe and hyperemesis gravidarum (HG), the most severe condition, occurs in 0.5%–2% of all pregnancies. HG results in weight loss, dehydration, nutritional deficiencies, and often hospital admission [6].

It is difficult to quantify and evaluate the severity of NVP using a single method. Gideon Koren developed the Pregnancy-Unique Quantification of Emesis and Nausea (PUQE) scoring system for NVP in 2002, and it has been translated into several languages, including Norwegian [7], Spanish [8], French [9], and Italian [10], but the Korean version has not yet been used.

Thus, we aimed to evaluate of severity of NVP in the Korean population using a modified PUQE scale and to investigate whether NVP affects maternal self-perception of well-being on the most symptomatic day. We also examined the potential risk factors of NVP.

Materials and methods

1. Population

A total of 527 pregnant women who were receiving prenatal care at the Cheil General Hospital and Women's Healthcare Center in Seoul, the Miz Women's Hospital in Daejeon, the Mom's Women's Hospital in Ulsan, and the Ilsin Christian Hospital in Busan were asked to participate in the study, which was conducted from January 2015 to June 2015. People were excluded from the NVP group if they suffered from diseases unrelated to pregnancy such as gastroenteritis or pyelonephritis causing nausea and vomiting. In addition, incomplete questionnaires were excluded from this study. Demographic data included age, gravidity, marital status, current employment, education level, cigarette smoking status, alcohol consumption, prenatal multivitamin supplementation, previous NVP, and history of chronic disease.

2. PUQE questionnaire

Participants were requested to answer a modified version of the PUQE questionnaire developed in 2002 by Koren et al. [6]. Briefly, the questionnaire consisted of 3 questions regarding NVP, including the length of time the patient felt nauseated, the number of times the patient vomited, and the number of times the patient had retching without vomiting. Responses were then grouped into 5 different categories that were scored from 1 to 5, according to the severity of the symptom. The composite sum of the PUQE category scores was used to classify the NVP as "mild" if the score was between 3–6

Choose the answer that describe the best your situation in the worst day of NVP in their current pregnancy, which could have occurred recently or several weeks before the questionnaire.

Score / Questions	1	2	3	4	5
Question 1. For how long have you felt nauseated or sick to your stomach?	Not at all	< 1 hour	1 to 3 hours	3 to 6 hours	> 6 hours
Question 2. How many times do you vomit or throw up?	Never	1 to 2	3 to 4	5 to 6	≥ 7
Question 3. How many times have you had retching or dry heaves without bringing anything up?	Never	1 to 2	3 to 4	5 to 6	≥ 7

PUQE total score; mild if the score was between 3–6 points, moderate if 7–12 points, severe if 13 points or higher.

Fig. 1. Modified Pregnancy-Unique Quantification of Emesis and Nausea (PUQE) scoring system. NVP, nausea and vomiting of pregnancy.

points, "moderate" if between 7–12 points, and "severe" if 13 points or higher. Due to its simplicity, the PUQE questionnaire was translated from English to Korean by one of the investigators of the study, and then translated back to English by the other investigator. No disagreement occurred between the investigators as to the accuracy of the translated version.

The following modifications to the original version of the PUQE questionnaire were conducted by our group. First, the duration or length of nausea was originally described as "<1 hour" for the second category, and as "from 2 to 3 hours" for the third category, leaving a 1-hour gap between the categories. In order to correct this problem, we made a slight modification such that the present study used "<1 hour" and "from 1 to 3 hours" categories to eliminate the original 1-hour gap. Second, the questionnaire was originally intended to collect information on NVP occurring in the preceding 12 hours only. Some studies also extended the time interval to include the last 24 hours for the collection of NVP data [7,9]. However, the present study used the PUQE questionnaire to retrospectively collect information about the worst day of NVP in the current pregnancy, which may have occurred recently or several weeks prior to completion of the questionnaire (Fig. 1). We aimed to achieve a broader spectrum of analysis by extending the target time period of NVP.

3. Visual analogue scale (VAS) for overall maternal well-being

The questionnaire provided to participants also contained a VAS to rate their overall well-being on their worst day of NVP. The VAS consisted of a 10-cm horizontal line with "0" written at the left end ("the worst possible") and "10" at the right end, with "the best I feel" written below each point.

4. Data analysis

A total of 472 pregnant women returned completed questionnaires and were included in the analysis. The following demographic and baseline characteristics were collected as dichotomous variables: age of participants as <35 or ≥35 years old; marital status as unmarried (single, separated, divorced, or widowed) or married; education level as up to high school or college/university or higher; and current employment status as employed or unemployed. For the following 5 variables, the response was collected and dichotomized as "yes" or "no": cigarette smoking; alcohol consumption; prenatal multivitamin supplementation; history of NVP in a previous pregnancy; and history of any chronic disease. Data on gravidity was collected categorically as 1, 2, or ≥3 pregnancies.

Since all of the demographic and baseline characteristics were collected as categorical variables, comparisons between data from participants who reported NVP in their current pregnancy and those who did not were conducted using the χ^2 test. Data with statistically significant differences were included in a logistic regression analysis.

In addition, a linear regression analysis was conducted to compare the PUQE total scores and VAS scores (cm) of maternal well-being as reported by participants. All statistical analyses were performed using SPSS software (IBM Corp., Armonk, NY, USA) and a 2-tailed *P*-value of 0.05 was adopted as the significance limit.

Results

A total of 527 pregnant women receiving prenatal care were asked to fill out the PUQE questionnaire. Among them, 472 (89.6%) pregnant women were eligible and were included in the analysis. Of the 472 questionnaires included in the analysis, 171 were completed by participants from the Cheil General Hospital and Women's Healthcare Center in Seoul, 43 from the Miz Women's Hospital in Daejeon, 165 from the Mom's Women's Hospital in Ulsan, and 93 from the Ilsin Christian Hospital in Busan. The mean gestational age of the participants was 21.5±9.7 (range 12–40) weeks.

1. Demographic and baseline characteristics

Among the 472 pregnant women participants, 381 (80.7%) responded affirmatively with regard to suffering from NVP in their current pregnancy, whereas 91 (19.3%) did not (Table 1). In both groups, most of the participants were married and had an education level of college/university or higher, were non-smokers, and did not have any history of chronic disease. Over half of the participants were aged <35 years, currently employed, and were not taking any prenatal multivitamin. No significant differences (P>0.05) between any of the variables were observed between the 2 study groups, with the exception of smoking status.

In terms of alcohol consumption, it was higher in the control group than in the NVP group: 36.3% vs. 24.7% (P=0.025), respectively. In terms of the history of NVP, the proportion of participants who answered affirmatively was significantly

Table 1. Participant demographics and characteristics

Characteristics	Controls (n=91)	NVP (n=381)	*P*-value
Age (yr)			0.160
<35	61 (67.0)	225 (59.1)	
≥35	30 (33.0)	156 (40.9)	
Gravidity			<0.001
1	63 (69.2)	170 (44.6)	
2	23 (25.3)	167 (43.8)	
≥3	5 (5.5)	44 (11.5)	
Marital status			1.000
Unmarried	1 (1.1)	4 (1.0)	
Married	90 (98.9)	377 (99.0)	
Currently employed			0.270
Unemployed	43 (47.3)	156 (40.9)	
Employed	48 (52.7)	225 (59.1)	
Education level			0.067
Up to high school	14 (15.4)	34 (8.9)	
College/university or higher	77 (84.6)	347 (91.1)	
Cigarette smoking			0.010
No	83 (91.2)	370 (97.1)	
Yes	8 (8.8)	11 (2.9)	
Alcohol consumption			0.025
No	58 (63.7)	287 (75.3)	
Yes	33 (36.3)	94 (24.7)	
Prenatal multivitamin supplementation			0.750
No	53 (58.2)	215 (56.4)	
Yes	38 (41.8)	166 (43.6)	
NVP in previous pregnancy			<0.001
No	19 (67.9)	33 (16.1)	
Yes	9 (32.1)	172 (83.9)	
History of chronic disease			0.430
None	85 (93.4)	346 (90.8)	
Yes[a)]	6 (6.6)	35 (9.2)	

NVP, nausea and vomiting of pregnancy.
[a)]Chronic diseases included the following: rheumatoid arthritis, chronic rhinitis, glaucoma, systemic lupus erythematosus (SLE), hyperlipidemia, chronic hypertension, migraine, depression, and others.

greater in the NVP group than in the control group: 83.9% vs. 32.1% (*P*<0.001), respectively.

2. Characteristics of NVP

According to the 381 participants who reported NVP in their current pregnancy, symptoms started at 6.6±2.1 weeks of gestation, were worst at 9.5±2.5 weeks, and ceased at 14.7±3.8 weeks. On the worst day of NVP, 141 (37%) reported a mildly severe PUQE score, 214 (56.2%) reported a moderately severe score, and 26 (6.8%) reported a severe score.

Distribution of the severity of NVP according to items assessed by the PUQE questionnaire is summarized in Table 2. Most participants experienced the cardinal symptom of nausea that lasted for ≥1 hour. In fact, on their worst day of NVP, 24.4%

Table 2. Distribution of the severity of nausea and vomiting of pregnancy according to factors assessed by the Pregnancy-Unique Quantification of Emesis and Nausea questionnaire

Nausea and vomiting of pregnancy	Categories				
Length of nausea					
Hours	Not at all	<1	1–3	4–6	>6
Participants (%)	18 (4.7)	92 (24.2)	109 (28.6)	69 (18.1)	93 (24.4)
Vomiting					
Times	Never	1–2	3–4	5–6	≥7
Participants (%)	175 (45.9)	108 (28.4)	63 (16.5)	25 (6.6)	10 (2.6)
Retching but not vomiting					
Times	Never	1–2	3–4	5–6	≥7
Participants (%)	79 (20.7)	98 (25.7)	95 (24.9)	49 (12.9)	60 (15.8)

The scores for each item increase from 1 to 5 as either the duration of the nausea or the severity of vomiting or retching increases. The Pregnancy-Unique Quantification of Emesis and Nausea (PUQE) score categories for the duration of nausea were slightly modified from those established by Koren et al. [6] in order to avoid time gaps between the categories.

Table 3. Evaluation of risk factors associated with nausea and vomiting of pregnancy by logistic regression analysis

Variables	aOR (95% CI)	*P*-value
Gravida		0.920
1	1.00	
≥2	0.94 (0.29–3.01)	
Alcohol		0.035
Non-drinker	1.00	
Drinker	0.36 (0.14–0.93)	
Cigarette smoking		0.410
Non-smoker	1.00	
Smoker	2.69 (0.26–28.01)	
NVP of previous pregnancy		<0.001
No	1.00	
Yes	11.62 (4.70–28.72)	

aOR, adjusted odds ratio; CI, confidence interval; NVP, nausea and vomiting of pregnancy.

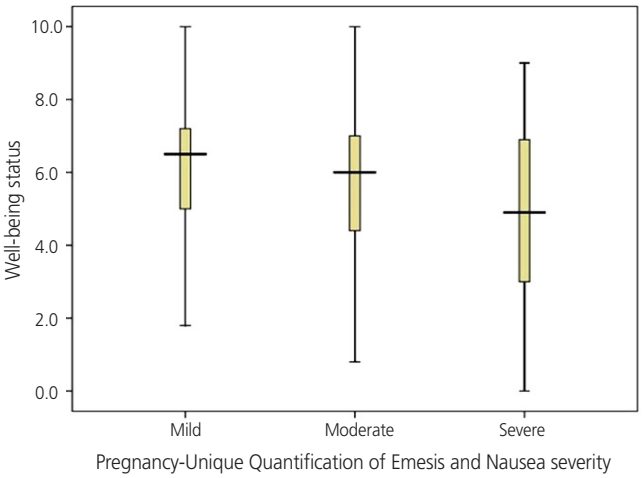

Fig. 2. Maternal well-being status by Pregnancy-Unique Quantification of Emesis and Nausea severity.

of participants had nausea episodes that lasted >6 hours. In terms of vomiting, 45.9% of participants never vomited, and 28.4% vomited only 1–2 times/day. In terms of retching, 20.7% of participants did not experience any episodes, 25.7% reported 1–2 episodes, and 24.9% experienced 3–4 episodes.

In the logistic regression analysis, the independent associated risk factors for the NVP were NVP in previous pregnancy (adjusted odds ratio [aOR], 11.6; 95% confidence interval [CI], 4.7–28.7) and alcohol consumption (aOR, 0.36; 95% CI, 0.14–0.93) (Table 3). Among the risk factors associated with NVP, a history of NVP was the most powerful.

3. Self-perception of maternal well-being

Although the VAS scores of self-perception of well-being on the worst day of NVP exhibited wide variability, they tended to decline (i.e., get worse) as the severity of NVP increased (Fig. 2). The correlation coefficient (r) between the VAS scores of maternal well-being and the PUQE total scores was –0.25 (r^2=0.062; P<0.001). This study showed an association between maternal well-being according to severity of symptoms as reflected by VAS and PUQE scores, revealing the degree to which NVP can disturb QOL in pregnancy.

Discussion

The present study provides solid evidence that the modification of PUQE questionnaire, originally intended to collect information on NVP experienced in the preceding 12 hours [6], can successfully be used to retrospectively collect data pertaining to the worst day of NVP in the current pregnancy, which may have occurred recently or several weeks prior to completion of the questionnaire. Moreover, we did not limit the gestational phase time period to the first trimester, since in some severe cases, around 10%–45% of women, the nausea and vomiting do not resolve until after birth, although they resolve by 20 weeks gestation in the majority of women [11]. Due to the simplicity of the questionnaire, our findings establish the potential for its use in the clinical setting to more extensively monitor the progress of NVP.

The second major finding was related to the QOL of the participants with NVP. Well-being is representative of the extent of distress and was quantified via the VAS. A lower VAS score indicates a lower level of distress. The VAS is a very simple tool to collect such information and has been used to evaluate a large variety of health outcomes in clinico-epidemiological studies. In the present study, QOL as indicated by VAS scores strongly correlated with increased severity levels on the modified PUQE scale. Therefore, our modified PUQE scale may be effectively applied to measure the extent of distress in pregnancy.

The third finding was that among the risk factors of NVP, which is characterized as a multifactorial condition, the most powerful factor was the history of NVP. In contrast, alcohol consumption was associated with decreased odds of NVP. Many other studies have reported on the risk factors of HG such as ethnicity, youth, parity, and persons of color [12], and their findings with regard to alcohol consumption and history of NVP were consistent with our results [13]. Although the pathogenesis of NVP and HG remain unclear, maternal genetics, endocrine and gastrointestinal factors are likely to be risk factors for NVP. History of NVP is very meaningful among the risk factors of NVP, because women who experienced HG in their first pregnancy have a significant risk of recurrence when compared to women with no previous HG [14]. The mechanisms of the association between alcohol consumption and decreased odds of NVP are unknown. However, we could assume that women who experienced alcohol consumption compared to those no experienced it would be resistant to nausea or vomiting.

Further studies should be performed to know the pathogenesis of NVP and HG. Some studies have reported that pregnant women with NVP have more favorable outcomes than symptom-free women, including lower rates of miscarriages, prematurity, low birth weight, small for gestational age, and congenital malformations, as well as better developmental outcomes in their offspring [15,16]. However, pregnant women with NVP are more likely to develop complications during pregnancy such as pelvic girdle pain, proteinuria, high blood pressure and preeclampsia, placental abruption, and spontaneous preterm birth [15,17]. The relevance of these complications should be carefully considered when treating pregnant women with NVP since even relatively minor conditions such as backache, dizziness, heartburn, and regurgitation may significantly impact day-to-day life [18].

Pregnant women with HG, a severe form of NVP, also appear to assign major relevance to physical symptoms and psychosocial factors other than nausea and vomiting. For example, a study found that these patients considered depression and marital status to be of equal or greater importance than having HG in terms of the negative impact on their health-related QOL [19].

Many studies have sought to investigate optimal strategies in the management of HG. For example, individualized health education and supportive phone calls may effectively decrease the severity of symptoms and perceived level of distress while improving the QOL of women with NVP [20]. In contrast, tailoring a care plan to address a woman's individual needs based on hyperemesis symptoms was not found to be associated with any significant improvement in the QOL in this group of patients [21].

A major strength of this study is that the population of patients with NVP was well distributed with regional diversity due to multi-organizational involvement in the study. The main limitation of this study is its cross-sectional design; accordingly, its data should be further strengthened by a future study with a longitudinal design and a larger study population. Furthermore, this study might cause a recall bias because some of the NVP groups that participated in the study had done the questionnaire after relatively long time from the peak time of suffering, even

though we wanted to acquire a broader spectrum of analysis by extending the target time period of NVP.

In conclusion, our study provides evidence that the modified PUQE questionnaire is useful to retrospectively assess and monitor the severity of NVP over periods of time greater than 12 hours. Moreover, it may be of help to clinicians, healthcare providers, and researchers because of its simplicity and usefulness as a tool for HG diagnostics and evaluation.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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