Original Article

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Association of the 24-hour Pregnancy Unique Quantification of Emesis Index with Self-Rated Wellbeing Score: A Cross-Sectional Study

Obstetrics and Gynaecology Section

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ABSTRACT

Introduction: Nausea and Vomiting of Pregnancy (NVP) are common symptoms of pregnancy. Often, treatment is guided by subjective symptoms, leading to hospitalisation of these patients and unnecessary health costs. The 24-hour Pregnancy-Unique Quantification of Emesis (PUQE) index helps objectively quantify these symptoms and guide the management of these patients.

Aim: To assess the association of the 24-hour PUQE index with the self-rated well-being score in evaluating the severity of NVP.

Materials and Methods: In this cross-sectional study, a total of 207 women at 5 to 12 weeks of singleton pregnancy were recruited after obtaining informed consent. They were interviewed regarding their symptoms of nausea and vomiting based on a 24-hour PUQE index questionnaire, and a score was assigned to them. They were stratified as mild, moderate, or severe based on the score. The association of these symptoms with a self-rated well-being score and subjective symptoms such as the ability to take multivitamins, sleep pattern, liquid intake, and the need for hospitalisation was assessed. They were followed-up after four weeks, and a repeat score was obtained. Chi-square test was performed to compare the severity of PUQE-24.

Results: The mean well-being score at the first visit was 3.381±1.650, and at the follow-up visit, it was 7±1.763. At the first visit, 46 out of 207 had a mild 24-hour PUQE score, 140 out of 207 had a moderate score, and 21 out of 207 had a severe score. During the follow-up visit, 123 out of 207 had a mild score, 77 out of 207 had a moderate score, and seven out of 207 had a severe score. There was a significant association between the mean self-rated well-being score and the 24-hour PUQE score at the first and follow-up visits (p-value=0.0001). Among the patients hospitalised at the first visit (21 out of 28), 75% belonged to the severe PUQE category. The mean liquid intake at the first visit was 24.363±10.357 mL/kg/hr, and at the follow-up visit was 29.972±10.691, showing a significant association with the severity of the 24-hour PUQE score (p-value=0.0001). A significant association was observed between the 24-hour PUQE scores of the first and follow-up visits (p-value=0.002).

Conclusion: In this study, there was a significant association between the 24-hour PUQE score and the well-being score at both visits. Stratifying the severity of NVP objectively will guide us to choose the appropriate treatment and reduce the need for hospitalisation.

Keywords: Antenatal, Antiemetics, Score, Hospitalisation

INTRODUCTION

NVP are among the most common symptoms in early pregnancy, affecting 50-80% of pregnancies with variable severity. It can start as early as four weeks, peaks at nine weeks, and typically resolves by 16 weeks of gestation [1]. The most severe form of NVP is hyperemesis gravidarum, which may require hospitalisation [2]. The clinical features of nutritional disturbances, weight loss, dehydration, and ketonuria may lead to hospitalisation [2]. The routine practice for managing nausea and vomiting during pregnancy involves assessing subjective symptoms such as the ability to take multivitamins, liquid intake, the rate of hospitalisation or emergency room visits, and a woman's perception of her well-being [2]. Koren G and Cohen R developed a score to objectively assess the severity of NVP. The score, called the PUQE and Nausea, is found to be a promising tool for determining the burden or treatment outcome of NVP [3,4]. This score was developed for pregnant women based on the Rhodes Index of Nausea and Vomiting (INV; Rhodes et al., 1984), which focused on three symptoms: nausea, vomiting, and retching [5]. The original PUQE involved rating the daily number of vomiting episodes, the length of nausea in hours per day, and the number of retching episodes per 12 hours, and was validated by Koren G and Cohen R [3]. The Modified-PUQE (PUQE-24) was proposed by Lacasse A et al., which is scored over 24 hours with the same calculation and interpretation as the original PUQE [6]. This score is widely used as a scoring system to assess the severity of NVP in many countries [6].

The management of NVP can be decided based on the 24-hour PUQE score [7]. In the majority of women with mild to moderate PUQE scores, symptoms subside with conservative treatment involving dietary advice and multivitamins initially, followed by antiemetics such as doxylamine, metoclopramide, ondansetron, etc., based on severity. Patients with severe PUQE scores may require hospitalisation [7]. The lack of quantification of severity adds to health costs by increasing hospitalisation and the usage of antiemetic medications [7]. Therefore, this study was conducted to assess the 24-hour PUQE Index as a tool to measure the severity of NVP compared to their self-rated well-being score and subjective symptoms.

MATERIALS AND METHODS

The present cross-sectional study was conducted at the Apollo Institute of Medical Sciences and Research in Hyderabad from July 2019 to December 2022. The study was approved by the institutional review board (AIMSR/IRB/RC/2018/07/050).

Inclusion criteria: All antenatal women with 5 to 12 weeks of singleton gestation presenting with NVP who were willing for a follow-up visit after four weeks were recruited in the study after providing informed consent.

Exclusion criteria: Pregnant women with multiple pregnancies, known cases of hyperthyroidism, liver disorders, or gastrointestinal disorders were excluded from the study.

Sample size: The sample size was calculated as 207 using a prevalence of 75% [8], a 95% confidence interval, and a 5% margin of error using the formula

$$n=Z^2P(1-P)/d^2$$

where n=Sample size, Z=Z statistic for a level of confidence (1.645 for a 95% confidence level), P= Expected prevalence or proportion, and d= Precision.

Study Procedure

The study subjects were interviewed regarding their symptoms of nausea and vomiting based on a questionnaire. The questionnaire was validated by two subject experts. A pilot study was conducted with 10 antenatal mothers, who found all the questions easy and understandable. The questionnaire consisted of two parts to record two visits. In the first visit, the socio-demographic profile of the patient was recorded, such as age, gravidity, marital status, employment, socio-economic status, use of prenatal vitamins, and history of nausea and vomiting during pregnancy. Part A of the questionnaire measured the 24-hour PUQE index. A score was assigned to them, and they were stratified as mild, moderate, or severe based on the score: mild NVP≤6; moderate NVP 7-12; severe NVP≥13 [1].

Part B of the questionnaire included information regarding subjective symptoms of patients, such as the ability to take multivitamins, liquid intake/kg/day, quality of sleep, and a well-being score that was self-rated by the patient. The well-being score was taken on a scale of 1-10 based on a visual analog scale to rate their overall well-being on their worst day of NVP. The VAS consisted of a 10-cm horizontal line with "0" at one end ("the worst possible") and "10" at the other end ("the best I feel"). This scale was based on a study done by Choi HJ et al., [9]. Treatment given, such as multivitamins, antiemetics, or hospitalisation, was also recorded in the questionnaire. This was followed by a follow-up visit after four weeks where Part A and Part B of the questionnaire were filled out again, and a change in the PUQE score and other subjective symptoms were noted.

STATISTICAL ANALYSIS

Chi-square analysis was performed to compare the severity of PUQE-24 (mild, moderate, severe) at presentation and the use of multivitamin supplements, as well as rates of hospitalisation, quality of sleep, and liquid intake. All statistical analyses were performed using Statistical Package for Social Sciences (SPSS) software version 24.0 (IBM Corp., Armonk, NY, USA), and a 2-tailed p-value of 0.05 was considered significant.

RESULTS

A total of 207 antenatal women with NVP were included in the study. The mean age of presentation for nausea and vomiting in pregnancy was 8.8±1.270 weeks.

In the present study, 180 out of 207 (87%) women presenting with NVP were less than 30 years of age. Additionally, 146 out of 207 (70.5%) women were primigravida. Approximately, two-thirds were unemployed and had received only primary education. During the first visit, 46 out of 207 had mild, 140 out of 207 had moderate, and 21 out of 207 had severe 24-hour PUQE scores. There was a statistically significant association between parity, married life, education, employment status, consumption of prenatal vitamins, past history of NVP, and the severity of the 24-hour PUQE score (p-value <0.05) [Table/Fig-1].

In the first visit, two-thirds of patients with a well-being score of 5 or less had a moderate 24-hour PUQE score. Additionally, 25 out of 31 (80.6%) patients with a well-being score higher than five had a mild 24-hour PUQE score. There was a significant statistical association between the mean self-rated well-being score and the severity of the 24-hour PUQE score at the first visit (p-value=0.0001). Among the hospitalised patients, seven out of 28 (25%) had a moderate 24-hour PUQE score, while 21 out of 28 (75%) had a severe 24-hour PUQE score. There was a statistically significant association between the treatment given at the first visit and the severity of the PUQE score (p-value 0.0001). Furthermore, there was a significant association between the type of sleep pattern and the severity of the 24-hour PUQE score at the first visit (p-value=0.002). The mean liquid intake value was almost half (17.2 mL/kg/24hr) in patients presenting with a severe PUQE score in the initial visit [Table/Fig-2].

Variables		PUQE score, n (%)			p-value
		Mild	Moderate	Severe	
Age (years)	<30	46 (25.5)	113 (62.8)	21 (11.7)	0.19
	>30	0	27 (100)	0	
Parity	Primigravida	26 (17.8)	106 (72.6)	14 (9.6)	0.04
	Multigravida	20 (32.8)	34 (55.7)	7 (11.5)	
Married life	<2 years	19 (17.9)	73 (68.9)	14 (13.2)	0.0001
	>2 years	27 (26.7)	67 (66.3)	7 (6.9)	
Employment	Employed	6 (9)	54 (80.6)	7 (10.4)	0.006
	Unemployed	40 (28.6)	86 (61.4)	14 (10.0)	
Education	Illiterate	0	13 (100)	0	0.0001
	Up to 10th	46 (31.5)	86 (58.9)	14 (9.6)	
	Graduate	0	41 (85.4)	7 (14.6)	
Smoking	Yes	0	12 (100)	0	0.04
	No	46 (23.6)	128 (65.6)	21 (10.8)	
Alcohol	Yes	0	7 (100)	0	0.177
	No	46 (23.0)	133 (66.5)	21 (10.5)	
Prenatal vitamins	Yes	0	28 (100)	0	0.0001
	No	46 (25.7)	112 (62.6)	21 (11.7)	
Previous NVP	Yes	14 (34.1)	20 (48.8)	7 (17.1)	0.025
	No	6 (30)	14 (70)	0	
	NA	26 (17.8)	106 (72.6)	14 (9.6)	

[Table/Fig-1]: Various factors associated with different degrees of Nausea and Vomiting of Pregnancy (NVP) as per the PUQE index.

In the follow-up visit, 123 out of 207 had a mild, 77 out of 207 had a moderate, and seven out of 207 had a severe 24-hour PUQE score. A statistically significant association was found between the mean well-being score and the severity of nausea and vomiting as per the 24-hour PUQE score in the follow-up visit (p-value=0.0001). Mean well-being score improved in the follow-up visit. During the follow-up visit, among the patients taking multivitamins, 39 out of 67 (58.3%) had a mild 24-hour PUQE score, while only seven out of 67 (10.4%) had a severe 24-hour PUQE score. There was a significant association between the treatment and the follow-up PUQE scores (p-value=0.02) [Table/Fig-3].

Thirty nine out of 46 patients (84.8%) with a mild 24-hour PUQE score had mild symptoms at the follow-up visit. More than half of the patients with a moderate 24-hour PUQE score at the first visit had regressed to a mild 24-hour PUQE score at the follow-up visit, while only seven out of 140 (5%) progressed to a severe 24-hour PUQE score. Among patients presenting with a severe 24-hour PUQE score at the first visit, 14 out of 21 (66.7%) had regressed to moderate symptoms. Regression analysis showed that there was a statistically significant association between the 24-hour PUQE scores of the first and follow-up visits (p-value=0.002) [Table/Fig-4].

Variables		Mild	Moderate	Severe	p-value
Well-being score	≤5	21/176 (11.9%)	134/176 (76.1%)	21/176 (11.9%)	0.0001
	>5	25/31 (80.6%)	6/31 (19.4%)	0/31 (0)	
Mean well-being score	3.381±1.650	5.20±1.500	2.99±1.295	2.00±0.837	0.0001
Treatment given	MV	32/67 (47.8%)	35/67 (52.2%)	0/67 (0)	0.0001
	MV+ Antiemetic	14/112 (12.5%)	98/112 (87.5%)	0/112(0)	
	Hospitalisation	0/28 (0)	7/28 (25%)	21/28 (75%)	
Sleep pattern	Continuous	31/139 (22.3%)	101/139 (72.7%)	7/139 (0.05%)	0.002
	Disturbed	15/68 (22.1%)	39/68 (57.4%)	14/68 (20.5%)	
Liquid intake (mL/kg body weight/24 hours) Mean	24.363±10.357	31.765± 10.524	23.005±9.615	17.205±4.511	0.0001
Multivitamin intake	Yes	27/131 (20.6%)	102/131 (77.9%)	2/131 (1.5%)	0.0001
	No	15/42 (35.8%)	23/42 (54.7%)	4/42 (9.5%)	
	Stopped	4/34 (11.8%)	15/34 (44.1%)	15/34 (44.1%)	

[Table/Fig-2]: Association of various clinical variables with the severity of Nausea and Vomiting of Pregnancy (NVP) as per the PUQE index for visit 1.

Variables		Mild	Moderate	Severe	p-value
Well-being score	≤5	8/44 (18.2%)	36/44 (81.8%)	0/44 (0)	0.0001
	>5	115/163 (70.6%)	41/163 (25.2%)	7/163 (4.3%)	
Mean well-being score	7±1.763	7.85±1.486	5.62±1.328	7.14±0.378	0.0001
Treatment given	MV	39/67 (58.3%)	21/67 (31.3%)	7/67 (10.4%)	0.02
	MV+ Antiemetic	70/112 (62.5%)	42/112 (37.5%)	0/112 (0)	
	Hospitalisation	14/28 (50%)	14/28 (50%)	0/28 (0)	
Sleep pattern	Continuous	88/167 (52.7%)	72/167 (43.1%)	7/167 (4.2%)	0.0001
	Disturbed	35/40 (87.5%)	5/40 (12.5%)	0/40 (0)	
Liquid intake (mL/kg body weight/hour) Mean	29.972±10.691	38.826± 7.353	27.891±10.538	24.448± 6.421	0.0001
Multivitamin Intake	Yes	72/131 (54.9%)	54/131 (41.2%)	5/131 (3.9%)	0.008
	No	35/42 (83.3%)	7/42 (16.7%)	0/42 (0)	
	Stopped	16/34 (47.1%)	16/34 (47.1%)	2/34 (5.8%)	

[Table/Fig-3]: Association of various clinical variables with the severity of Nausea and Vomiting of Pregnancy (NVP) as per the PUQE index for visit 2.

		PUQE follow-up visit			
		Mild	Moderate	Severe	p-value
PUQE first visit	Mild	39 (84.8%)	7 (15.2%)	0	0.002
	Moderate	77 (55.0%)	56 (40.0%)	7 (5.0%)	
	Severe	7 (33.3%)	14 (66.7%)	0	
		123	77	7	

[Table/Fig-4]: Association of 24-hour PUQE score at the first visit and the follow-up visit.

DISCUSSION

The NVP are the most common symptoms with which women present in the first trimester of pregnancy [9]. In the present study, most of the women who presented with NVP were under the age of 30, primigravida, unemployed, and belonged to a low socio-economic class. This socio-demographic profile was similar to a study conducted by Latifah L et al., [10]. The mean gestational age of presentation with nausea and vomiting in the present study was 8.8 weeks ±1.27. A similar presentation was seen in a study conducted by Lacroix R et al., where patients presented with NVP at around eight weeks, and symptoms peaked at 11 weeks [11]. Similar weeks of gestation of presentation with nausea and vomiting have been reported in studies done by Kugahara T and Ohashi K [12].

The evaluation of nausea and vomiting in pregnancy using the 24-hour PUQE score has been conducted in various studies in the literature, but there are very few Indian studies that have compared the 24-hour PUQE score with well-being scores and subjective symptoms. In a study by Choi HJ et al., in Korea, on the worst day of NVP, 37% reported a mildly severe PUQE score, 56.2% reported a moderately severe score, and 6.8% reported a severe score [9]. Similarly, in the present study, most of the women presenting with NVP had a moderate 24-hour PUQE score (140 out of 207). This was similar to a study done by Jha SK and Shrivastava VR [13]. The 24-hour PUQE score was significantly associated with the well-being score at the first visit. The lower the PUQE score, the higher the well-being score, which was similar to the study conducted by Ebrahimi N et al., and Lacasse A et al., where PUQE-24 scores correlated strongly with the self-rated well-being scores [1,6]. In a PUQE validation study by Koren G and Cohen R the original PUQE was studied along with well-being scores, and they found that a lower value in the well-being score correlated with higher PUQE scores in the first visit [3]. In order to validate the modified PUQE scale, external parameters were used that reflect clinically the severity of the woman's symptoms. One of these parameters, multivitamin use, is indicative of the severity of NVP, since women tend to discontinue the use of multivitamin supplements when experiencing severe nausea or gastrointestinal symptoms. Continuation of multivitamins was significantly associated with the severity of the 24-hour PUQE score in both the first and follow-up visits. A similar observation was noted by Ebrahami N et al., and Birkeland E et al., [1,14]. The 24-hour PUQE scoring has helped in guiding treatment in patients with NVP [14]. In a recent study by Laitinen L et al., quantifying the severity of NVP by the 24-hour PUQE score reduced the rate of hospitalisation and objectively indicated alleviation of symptoms [15]. This was also observed in the present study where 24-hour PUQE scores showed a statistically significant improvement in the follow-up visit. Hada A et al., also concluded that the 24-hour PUQE score is a promising tool in diagnosing and assessing the severity of NVP [2].

According to the American College of Obstetricians and Gynecologists (ACOG) 2018 bulletin on NVP, a woman's perception of the severity of her symptoms plays a critical role in the decision of whether, when, and how to treat NVP [16]. The correlation of

24-hour PUQE scores with subjective symptoms has been studied in a few previous works [17,18]. Sleep pattern and liquid intake were the two subjective symptoms evaluated in the present study. In a study by Ebrahami N et al., no correlation was found between the 24-hour PUQE score and the sleep and hydration status of the patient [1]. However, in the present study, a statistically significant association between sleep pattern and the severity of the PUQE score in the first and follow-up visits was noted. Regarding liquid intake, in the present study, a significant association was found between reduced liquid intake and the severity of the PUQE score in both the first and follow-up visits. This observation has also been noted as a severity of disease determinant by Koot MH et al., [7].

The most significant factor evaluated in the present study was the need for hospitalisation. In the present study, all patients with a severe PUQE score in the initial visit required hospitalisation, while most of the patients with a moderate PUQE score subsided with outpatient treatment. Therefore, distinguishing the severity of NVP will help in the early identification of moderate PUQE score cases, and timely treatment may prevent their hospitalisation. This increases the power of this new tool not only to predict severity but also to identify the more vulnerable group of women who are at risk of developing Hyperemesis, thereby providing women and their health-care providers with an opportunity to reduce healthcare costs that arise due to hospitalisation. This observation was similar to the study done by Ebrahami N et al., [1].

In a recent study by Dochez V et al., the 24-hour PUQE score found a significant correlation with the rate of hospitalisation well-being score, and the need for intravenous antiemetics [17]. This finding was similar to the present study, where the 24-hour PUQE score has shown a significant association with the type of treatment offered and the severity of the 24-hour PUQE score in both the first and follow-up visits.

As a prognostic tool, the PUQE score also helped in objectively confirming the improvement of symptoms. Since, the PUQE score correlated with the subjective symptoms, it promises to have a significant use in research to evaluate treatment options in an objective manner [18].

Limitation(s)

As a follow-up study, only 207 patients could be recruited. Most of the observations are self-reported. Further concordance of information could have been obtained by interviewing the family. Recall bias could also affect the results. Patients who were hospitalised in the follow-up visit based on subjective symptoms had mild or moderate PUQE scores; hence, admission could have been avoided.

CONCLUSION(S)

The 24-hour PUQE score is associated well with the self-rated well-being score in the first antenatal visit and subjective symptoms such as liquid intake sleep pattern, and continuation of multivitamins in patients with NVP. It is also a promising objective tool for research in NVP, as it significantly correlates with subjective symptoms in follow-up visits. The 24-hour PUQE score helps stratify patients into mild, moderate, and severe categories, thereby aiding in the selection of the appropriate mode of treatment for the patient and reducing the rate of hospitalisation. Admissions for NVP can be avoided if the 24-hour PUQE score is strictly followed as the standard criteria for hospitalisation. Further studies are required to evaluate the role of the 24-hour PUQE score in assessing the severity of NVP and its effect on reducing the rate of hospitalisation.

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