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Psychometric properties of the generalized anxiety disorder questionnaire (GAD-7) in a polish postpartum women sample

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Abstract

Objective Generalized Anxiety Disorder is an international mental health problem. Prevalence for anxiety disorders reported in perinatal period is high and related with adverse parental and child outcomes. Thus, the objective of this study was to investigate the psychometric properties and factorial validity of General Anxiety Disorder-7 questionnaire (GAD-7) in the context of postpartum mothers.

Methods In this cross-sectional study, 278 mothers (mean age 31.09; SD=4.42) were recruited at the Neonatology, Gynecology, and Obstetrics Ward. Generalized Anxiety Disorder was assessed with GAD-7, stress with Parental Stress Scale (PSS), while risk of depression with Edinburgh Postpartum Depression Scale (EPDS). Confirmatory factor analysis (CFA) was used to verify factor structure of GAD-7 and the internal consistency was evaluated using reliability coefficients: Cronbach's Alpha and McDonald's Omega.

Results The internal consistency of the GAD-7 was high (Cronbach's Alpha=0.90 and MacDonal's Omega=0.91). GAD-7 had significant correlations with the variables examined for construct validity, stress (PSS; $r=0.35, p<0.01$) and risk of depression (EPDS; $r=0.76, p<0.01$). The Confirmatory Factor Analysis results supported a good fit of the data to the model: $\chi^2(df)=14.19(14), p=0.44$; Comparative Fit Index (CFI)=0.99; Tucker-Lewis Index (TLI)=0.99; Root Mean Square Error of Approximation (RMSEA)=0.007 (90% C.I. 0.000; 0.059).

Conclusion GAD-7 has satisfactory psychometric properties. GAD-7 had significant correlations with the variables examined for construct validity with PSS and EPDS. GAD-7 is a reliable instrument for screening anxiety symptoms in perinatal period in research and clinical setting.

Keywords Anxiety, Reliability, Validity, Psychometrics, GAD-7, Generalized anxiety disorder questionnaire

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Introduction

Anxiety disorders are one of the most common mental health conditions among various population worldwide [1, 2]. Generalized Anxiety Disorder (GAD) is an independent type of anxiety disorder among others such as: panic disorder, agoraphobia, specific phobias, social anxiety disorder, separation anxiety disorders, selective mutism and substance/medication induced anxiety disorder, anxiety disorder due to another medical condition, other specified anxiety disorder, unspecified anxiety disorder [3]. According to The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), Generalized Anxiety Disorder is characterized by excessive, uncontrollable anxiety and feeling worried for at least six months [3] that can cause functional impairment in various areas of life [3–5]. Generalized Anxiety Disorder can have number of non-specific psychological and physical symptoms such as restlessness, overthinking, difficulty concentrating, irritability, tiredness, muscle tension, nausea, troubles with sleeping [3].

Centre of Perinatal Excellence (COPE) indicates general themes of perinatal worries that revolve around: a fetal/infant's wellbeing (e.g.), maternal wellbeing (constant worry about how they will cope, manage work and parenthood, how to give their other children enough attention while meeting the needs of the new infant), breastfeeding worries (e.g., if the baby had enough milk) [4, 6].

In the past decade, scientific research has paid more attention to the mental health of new parents in the perinatal period, which starts in pregnancy and continue up to a year after delivery [7–10]. According to the National Institute for Health and Care Excellence (NICE), depression, anxiety disorders, and posttraumatic stress disorder (PTSD) are the most prevalent perinatal mental health conditions [10, 11]. Recent findings have indicated that around 21% of women meet diagnostic criteria for at least one anxiety disorder in the perinatal period [12]. A systematic review and meta-analysis have demonstrated that the prevalence for a clinical diagnosis of any anxiety disorder during pregnancy was 15.2%, 4.1% for the Generalized Anxiety Disorder and 15% for overall anxiety symptoms prevalence in the postpartum period [9].

Despite high prevalence of anxiety disorders, perinatal anxiety has received little attention from researchers in comparison with depression examined in the perinatal period [13]. On the other hand, comorbidity of depression and anxiety disorder is also well established in the literature [4]. However, not many patients with anxiety disorders are adequately screened, diagnosed and able to receive proper treatment [14]. People with anxiety disorders are often not screened or under-diagnosed, as the Generalized Anxiety Disorder is clinically distinct from feelings of anxiety associated with Postpartum

Depression [4]. Diagnosing anxiety in perinatal period and differentiating them from pathological worry may be difficult [4, 15]. Problems with diagnosis may be related with some symptoms such as fatigue, irritability, tension, insomnia, which may be perceived as a hormonal aspect related with pregnancy and the postpartum period. For example, Weisberg et al. have shown that nearly half (47.3%) of patients in primary care with anxiety disorder were not treated [16].

Perinatal period is a vulnerable time for parents, thus proper diagnosis of perinatal anxiety disorders, adequate care and treatment is needed. Research has shown that anxiety disorders are associated with negative consequences related to birth such as increased preterm birth rate [17], lower Apgar scores [18], increased caesarean section delivery rate [19] as well as negative outcome for child development [8, 20]. Anxiety disorders may also impact maternal health and well-being [7], parenting behaviors and skills [21] and process of bonding with a child [7, 22, 23]. Hence, more studies are needed to evaluate the prevalence of anxiety disorders among parents in perinatal period, using reliable and validated tool for assessment and then adequate treatment with positive patients' outcomes [7, 24].

The Generalized Anxiety Disorder-7 (GAD-7), developed by Spitzer et al. [25] is one of the recommended screening measures for perinatal anxiety by National Institute for Health and Care Excellence in London, England (NICE) [26]. Initially, GAD-7 was designed to screen Generalized Anxiety Disorder in primary care setting in the United States [27]. Currently, GAD-7 is a commonly used, brief self-report measure for screening general anxiety symptoms across different settings and among various adult populations [24, 28, 29]. GAD-7 has been translated into many languages with satisfactory psychometric properties obtained in the perinatal period samples e.g., in Canada [30], Peru [31], Spain [32], China [33] or Cypriot women [24].

Validity and reliability of GAD-7 on a polish postpartum cohort has not been yet examined despite of existence of GAD-7 in a polish language and its use in scientific research. It is also important to mention that anxiety screening in perinatal period is not common practice in Poland.

It is essential to recognize that validating established tools in specific populations, particularly in understudied groups such as postpartum mothers, can provide valuable insights into their applicability and reliability in different cultural and clinical contexts. Ensuring that the GAD-7 is psychometrically sound for postpartum Polish mothers is crucial for clinical practice, as it enables healthcare providers to accurately assess anxiety symptoms in this specific sample, which supports mental health care and early intervention strategies for postpartum women. Through

the validation process, we also aim to encourage perinatal health settings in Poland to use the GAD-7 as a screening tool for anxiety disorders, alongside with the Edinburgh Postnatal Depression Scale (EPDS), a widely used tool for screening postpartum depression in mothers.

Thus, the main purpose of the current study is to assess the internal consistency (Cronbach's Alpha and MacDonal's Omega) and factorial validity of the Polish version of GAD-7 among mothers in the early postpartum period. The secondary aims of the study are as follows: (a) determine the prevalence of generalized anxiety disorder in this sample, (b) conduct the analysis of correlations between GAD-7 scores and maternal stress (PSS) and postpartum depression symptoms scores (EPDS).

Methods and measures

Study design

This study is a part of a longitudinal project evaluating parental mental health after premature birth (ClinicalTrials.gov ID: NCT04118751). Dataset in this paper was obtained in the first stage of the study in the early postpartum period (1–3 days after delivery). The study took place at the Neonatology, Gynecology, and Obstetrics Ward of the Medical University of Gdańsk (Poland). Study protocol has been approved by the Research Ethics Board at the University of Gdansk (No 7/2019, approved: 29th of April 2019) and the procedures were conducted in accordance with 1975 Helsinki Declaration as revised in 2008. In this paper, only mothers' data set were included. Results of the fathers and parents' dataset were published separately [23, 34, 35].

Participants and procedures

Individuals were recruited according to the eligibility criteria between 2019 and 2020. Trained assistants identified females after birth through medical records at the at the Neonatology, Gynecology, and Obstetrics Ward of the Medical University of Gdańsk (Poland). The authors had no access to information that could identify individual participants during or after data collection. Participants could take part in the study when gave informed oral and written consent. All women invited to the study had right to not take part in the research study or resign without giving any reason, at any time. Participation was voluntarily and anonymous. Inclusion criteria were as follows: [1] women who gave birth to a child; [2] age between 18 and 49 years and 11 months; [3] oral and written consent to participate in the research study after having all research project information. In this study participants were excluded if they self-reported current mental illness diagnosis, a history of schizophrenia, other psychotic disorders, bipolar disorder, recurrent major depressive disorder or has limited knowledge of the Polish language to fill paper questionnaires.

For this study both woman after preterm birth (children born below the 37th week of pregnancy) and full-term birth (defined as above 37 weeks of gestation) were included. Majority of newborns in our sample were late preterm (N=47; 65.4%) moderate preterm (N=15; 20.8%), very preterm (N=7; 9.7%) and extremely preterm (N=3; 4.1%). Most of the infants in this study sample were healthy based on the APGAR score, for the full-term birth mean 9.65 (SD=0.85) and for the pre-term birth mean 8.19 (SD=1.79). Based on the age' role in reproductive and mental health [36–38], we applied the cut-off age limit.

Measures

Generalized anxiety disorder (GAD-7)

The Generalized Anxiety Disorder was measured using the Polish 7-item Generalized Anxiety Disorder Questionnaire – a self-report measure (GAD-7). Polish translation of GAD-7 is freely available at the MAPI Research Institute: www.phqscreeners.com, translated and prepared by: Dr. Robert L. Spitzer, Dr. Janet B.W. Williams, Dr. Kurt Kroenke and colleagues, supported by an educational grant from Pfizer Inc. Permission to reproduce, translate, display or distribute GAD-7 is not required [39].

Each item asks the individual to rate the severity of symptoms over the past two weeks. Response options include 0 = 'not at all', 1 = 'several days', 2 = 'more than half the days', and 3 = 'nearly every day'. The sum of the results ranges from 0 to 21. Scores of 0, 5, 10, and 15 are taken as the cut-off points for low, mild, moderate and severe anxiety, respectively [25, 40]. GAD-7 well differentiates between generalized anxiety disorder and often comorbid depression as two separate dimensions. In a previous study, the Cronbach α coefficient of reliability was calculated as 0.92, with intraclass correlation calculated as 0.83 [25]. Other research also showed that GAD-7 is a reliable and valid measure to capture anxiety symptoms [30, 41–43]. For the current study the Cronbach's alpha reliability coefficient was 0.90 for the full scale.

Parental stress scale (PSS)

Maternal stress was measured using the Polish version of the Parental Stress Scale (PSS). PSS consists of 18 items (e.g., 'I sometimes worry whether I am doing enough for my child(ren)', 'The major source of stress in my life is my child(ren)') evaluated on a 5-point Likert scale from 1=Strongly disagree to 5=Strongly agree. Overall possible scores on the scale range from 18 to 90, higher the score, the higher the severe parental stress. The scale is designed to assess the level of stress related to parenthood. The PSS considers positive (e.g., emotional benefits, personal development) and negative (demands on

resources, restrictions) aspects of parenting [44]. The Cronbach α coefficient of reliability was calculated as 0.83 with inter-item correlation as 0.23 [45]. In this study the Cronbach α coefficient of reliability was 0.82 for the full scale.

Edinburgh postpartum depression scale (EPDS)

Maternal postpartum depressive symptoms were measured using the Edinburgh Postpartum Depression Scale [46, 47]. This screening tool consists of 10 items evaluated on a 4-point Likert scale from 0 to 3. The sum of the results ranges from 0 to 30, with high results indicating more severe depressive symptoms [46]. EPDS is a measure used around the world [48] with good psychometric properties. The Cronbach α coefficients of reliability in the Polish version of EPDS were calculated as 0.91. Intraclass correlation equaled to 0.95 with the scales' sensitivity of 96% and the specificity was calculated as 93% for the cut-off of 13 points [47]. EPDS is well accepted in Poland as a screening measure for postpartum depression symptoms [13]. In this study, the Cronbach's alpha reliability coefficient was 0.78 for the full scale.

Socio-demographical variables

Socio-demographical variables (maternal age in years, marital status, educational level, work status, history of anxiety or depression (yes, no) were assessed through self-report form. Information about the child (biological sex, birth weight, delivery route, number of children in the household and APGAR score: A-appearance (skin color), P-pulse (heart rate), G-grimace (reflex irritability), A-activity (muscle tone), R-respiration were obtained from the hospital records. All collected data were received in paper datasets and were extracted into Microsoft Excel.

Statistical analyses

The statistical analysis included item analysis, confirmatory factor analysis, reliability analysis, comparison of Generalized Anxiety Disorder severity between two groups of pre-term and full-term mothers (gave birth before and after the 37th week of pregnancy), and finally, the analysis of correlations between anxiety with GAD-7 scores with parental stress with PSS scores and risk of postpartum depression with EPDS scores.

Item analysis included computing descriptive statistics (means, standard deviations, skewness and kurtosis) as well as item-total correlations. In line with Curran, West and Finch (1996) suggestions, normality was assessed for each of items based on skewness and kurtosis that skewness and kurtoses values >2 were considerate as problematic in the analyses [49, 50]. Next, item-total correlations were assessed by calculating *r.drop* that

computes item-total correlation for each item against the scale without this item.

To confirm the single-factor structure of the Polish version of GAD-7, we conducted a confirmatory factor analysis using the Maximum Likelihood (ML) estimator, as we did not observe problematic deviations of the results from the normal distribution. In our study, a confirmatory factor analysis (CFA) model fit was evaluated with the commonly used criteria (Comparative Fit Index (CFI) >0.95 , Tucker-Lewis Index (TLI) >0.95 , and Root Mean Square Error of Approximation (RMSEA) <0.08 ; [51]. Next, reliability was assessed by calculating Cronbach's alpha [49] for each of the multi-item scales (≥ 0.80 for good reliability, ≥ 0.70 for acceptable reliability [52]).

Finally, using the chi-square test we tested the differences in the occurrence of three levels of GAD severity between two groups of mothers who gave birth before and after the 37th week of pregnancy. We also calculated correlation coefficients between GAD-7 scores and the other variables measured in the study (maternal stress and postpartum depressive symptoms).

Results

The characteristics of the study group

The total study sample consisted of 278 mothers. There were 184 women who gave birth to a child above the 37th week of pregnancy and 94 women, who delivered the baby below the 37th week of pregnancy. The mean age of mothers was 31.09 (SD=4.42). The majority of mothers were in a romantic relationship ($N=271$, 97%). In terms of education, more than half of mothers were graduates ($N=163$, 59%). The majority of mothers ($N=243$, 88%) reported that they do not struggle with maternal depression or anxiety disorders. Most of the children born in this study group were healthy, the mean APGAR score for the whole sample was 9.17 (SD=14.2), mean 9.65 (SD=0.85) for birth at full term and mean 8.19 (SD=1.79) for the pre term birth. A summary of the socio-demographic variables are presented in Table 1.

Item analysis

Item analysis was conducted on the GAD-7 questionnaire to evaluate the performance of each item in study among Polish mothers after birth. Descriptive statistics were computed for each item, including mean, standard deviation, skewness, and kurtosis. The mean represents the average response for each item, providing an indication of the item's central tendency. The standard deviation measures the dispersion or variability of responses around the mean. As can be seen in Table 2, study participants responded moderately on average to all the questions, but these responses varied within the group (relatively high SD). Skewness assesses the symmetry of the item's response distribution. Kurtosis, on the other

Table 1 Sample composition

Variable	Gestational age				Total (N=278)	
	Over 37 weeks (N=184)		Under 37 weeks (N=94)		M	SD
	M	SD	M	SD		
Mother's age	30.87	4.08	31.51	5.03	31.09	4.42
Birth weight	3464.77	441.51	2137.54	661.59	3014.38	819.99
Apgar score	9.65	0.85	8.19	1.79	9.17	1.42
Number of children	1.72	0.85	2.04	1.04	1.82	0.93
	N	%	N	%	N	%
Gender of the child						
boy	93	51	47	50	140	50
girl	90	49	47	50	137	49
missing date	1	1	–	–	1	<1
Method of childbirth						
caesarean section	87	47	64	68	151	54
vaginal delivery	96	52	30	32	126	45
missing date	1	1	–	–	1	<1
Single mother						
yes	4	2	1	1	5	2
no	179	97	92	98	271	97
missing date	1	1	1	1	2	1
Mother's education						
below secondary	5	3	6	6	11	4
secondary	38	21	16	17	54	19
undergraduate	30	16	17	18	47	17
graduate	109	59	54	57	163	59
missing date	2	1	1	1	3	1
Mother's employment						
yes	151	82	76	81	227	82
no	31	17	18	19	49	18
missing date	2	1	–	–	1	<1
History of maternal depression or anxiety disorders						
yes	20	11	13	14	33	12
no	163	89	80	85	243	88
missing date	1	1	1	1	1	<1

Table 2 Descriptive statistics, normality indices, factor loadings, and corrected item-total correlations for the GAD-7 scale items

Item [Polish version]	M	SD	Skew.	Kurt.	λ	r.drop
Feeling nervous, anxious or on Edge [Czuł(a) się Pan(i) podenerwowany(a), niespokojny(a), mocno spięty(a)]	1.02	0.83	0.95	0.72	0.80	0.75
Not being able to stop or control worrying [Nie mógł(a) Pan(i) przestać się martwić albo zapanować nad tym]	0.88	0.89	0.91	0.17	0.80	0.75
Worrying too much about different things [Za bardzo się Pan(i) martwił(a) różnymi rzeczami]	1.08	0.86	0.73	0.10	0.83	0.78
Trouble relaxing [Miał(a) Pan(i) trudności z relaksowaniem się]	0.88	0.88	0.91	0.23	0.78	0.73
Being so restless that it is hard to sit still [Był(a) Pan(i) tak niespokojny(a), że nie mógł(a) usiedzieć na miejscu]	0.46	0.77	1.67	2.16	0.71	0.68
Becoming easily annoyed or irritable [Łatwo stawał(a) się Pan(i) rozdrażniony(a) lub poirytowany(a)]	0.80	0.80	0.83	0.24	0.66	0.62
Feeling afraid as if something awful might happen [Obawiał(a) się Pan(i), tak jakby miało się stać coś strasznego]	0.63	0.88	1.36	1.00	0.74	0.70

Notes. N=278; λ =standardized loading estimate; r.drop=item-total correlation for this item against the scale without this item

hand, measures the flatness of the distribution. As can be seen, the results for both measures indicate a lack of clear deviations from the normal distribution. Furthermore, item-total correlations were examined to assess the strength of the relationship between each item and the

overall scale score. Obtained in the study high item-total correlations indicate a strong association between the items and the Generalised Anxiety Disorder construct, suggesting good item discrimination.

Table 3 Prevalence of generalized anxiety disorder among postpartum mothers

Grouping variable	Anxiety Level			
	Low (0–4)	Mild (5–9)	Moderate (10–14)	Severe (15–21)
<i>Gestational Age</i>				
Under 37th Week	32 (34%)	38 (40%)	12 (13%)	12 (13%)
Over 37th Week	97 (53%)	64 (35%)	15 (8%)	8 (4%)
<i>Way of Delivery</i>				
Vaginal Delivery	70 (56%)	41 (33%)	7 (6%)	8 (6%)
Caesarean Section	59 (39%)	60 (40%)	20 (13%)	12 (8%)
Total	129 (46%)	102 (37%)	27 (10%)	20 (7%)

Table 4 Descriptive statistics and intercorrelations for the variables measured in the study

Variable	N	M	SD	GAD-7	PSS	EDPS
Generalised Anxiety Disorder (GAD-7)	278	5.74	4.72	(0.90)		
Parental Stress (PSS)	260	32.88	8.11	0.35**	(0.82)	
Risk of Postpartum Depression (EDPS)	264	7.69	4.66	0.76**	0.38**	(0.84)

Notes. N=278, ** $p < 0.01$. Cronbach's alpha internal consistency coefficients are given diagonally in parentheses

Confirmatory factor analysis and reliability

The CFA results supported the hypothesized single-factor structure of the Polish version of GAD-7. The model fit indices indicated an excellent fit of the data to the model: $\chi^2(df)=14.19$ [14], $p=0.44$; CMIN/df=1.04; CFI=0.99; TLI=0.99; RMSEA=0.007 (90% C.I. 0.000; 0.059); SRMR=0.017; GFI=0.99; AGFI=0.97; NFI=0.99; PNFI=0.66; RFI=0.98; IFI=0.99. The items' factor loadings are presented in Table 2. These indices suggest that the observed data were consistent with the underlying factor structure of GAD-7 in the Polish sample. Moreover, reliability analysis demonstrated high internal consistency of the Polish version of the GAD-7 scale, with a Cronbach's alpha coefficient of 0.90 and MacDonal's omega of 0.91. This indicates a strong reliability of the scale in measuring Generalized Anxiety Disorder symptoms among Polish mothers after birth.

Prevalence of generalized anxiety disorder among mothers in the early postpartum period

In our study, almost half of all women ($N=278$) presented low level of anxiety (46%), mild anxiety occurred among 37% and only 7% of postpartum women declared severe anxiety level (see Table 3). The comparison of anxiety scores between full term and pre-term mothers, based on the gestational age showed that low level of anxiety occurred in more than half of full-term women (53%) (gave birth over 37 week), while among pre-term women (gave birth under 37 week) it was 34%. Among pre-term mothers 40% of pre-term mothers reported mild anxiety level (40%) and 13% of women reported severe level of anxiety.

In this study by using the chi-square test we tested the differences in the occurrence of four levels of Generalised Anxiety Disorder severity between two groups of pre-term and full-term mothers (gave birth before and

after the 37th week of pregnancy). The results of the chi-square test revealed a significant association between GAD severity levels and maternal group ($\chi^2 = 12.71$, $df=3$, $p < 0.01$). The distribution of GAD severity levels differed significantly between the pre-term and full-term mothers (see Table 3). The percentage of pre-term mothers with moderate (13%) and severe (13%) GAD severity was higher than in a group of full-term mothers (8% and 4% respectively, $p < 0.01$). Conversely, the percentage of full-term mothers with low GAD severity (53%) was higher than in the group of pre-term mothers (34%).

Moreover, the results of the chi-square test also revealed a significant association between GAD severity levels and way of delivery ($\chi^2 = 9.39$, $df=3$, $p < 0.05$). The distribution of GAD severity levels differed significantly between the vaginal delivery group and Caesarean section group (see Table 3). The percentage of mothers giving birth through Caesarean section with mild (40%) and moderate (13%) GAD severity was significantly higher than in the group of mothers giving birth naturally (33% and 6% respectively). Conversely, the percentage of mothers' vaginal delivery group with low GAD severity (56%) was significantly higher than in the group of mothers giving birth through Caesarean Sect. (39%).

Correlation with parental stress and postpartum depression

Correlations between GAD-7 scores with PSS scores and EPDS scores were examined. The results revealed a moderate positive correlation between anxiety scores and parental stress.

($r=0.35$, see Table 4), while a strong positive correlation was found between anxiety scores and risk of postpartum depression scores ($r=0.76$, see Table 4). These findings suggest that higher levels of Generalised Anxiety Disorder symptoms are associated with increased levels of

parental stress and risk of postpartum depression among mothers after birth.

Discussion

The main aim of the study was to validate the Polish version of GAD-7 and assess the internal consistency of this scale. Statistical analysis demonstrated high internal consistency of GAD-7 scale, with a Cronbach's alpha coefficient of 0.90 and MacDonal's omega of 0.91. Obtained results provide support for the hypothesis that GAD-7 has good reliability and validity among postpartum women. Our results are in line with original research conducted on the primary care patients, where Cronbach's alpha coefficient was 0.92 [25]. GAD-7 has been found to have an excellent psychometric property among other populations in the perinatal period such as Spain [32], Canada [30], Peruvian women [31], and China [33]. Based on the CFA results, our study confirmed single-factor structure of the Polish version of GAD-7. The factor loadings of the GAD-7 items ranged from 0.66 to 0.83. Obtained findings support and strengthen the evidence that GAD-7 is a reliable screening tool for detection of anxiety in the perinatal period [30–32, 53].

The prevalence of Generalized Anxiety Disorder in this study showed that almost half of all women that participated, presented a low level of anxiety (46%). In our study sample 7% of postpartum women declared a severe generalized anxiety level. Obtained results are partially in line with other studies. For example, the systematic review and meta-analysis showed that the prevalence of a Generalised Anxiety Disorder in 4 studies was 4.2% at >24 weeks postpartum period, with increasing tendency 5.7% at 5–12 weeks postpartum (among 6 studies) [9, 20]. On the other hand, Fawcett et al. (2019) showed that 1 in 5 women meet diagnostic criteria for at least one anxiety disorder in perinatal period [12]. In the pre-term mother group, the anxiety scores were higher, 13% of women reported a severe level of anxiety, which shows that around 1 in 8 women struggle with anxiety who experienced preterm birth. These results are consistent with previous research reporting that mothers of very preterm infants may be more concerned and worried about their babies' survival as compared to those of preterm babies [54, 55]. Trumello et al. (2018) suggested that a premature birth and the child's hospitalization might strengthen a negative effect on maternal anxiety and depressive symptoms [53, 56].

The final goal of this study was to conduct the analysis between GAD-7 scores with maternal stress and risk of postpartum depressive symptoms scores. Literature has shown that Generalized Anxiety Disorder is often related with major depressive disorder with high comorbidity [30, 57, 58]. On the other hand, it is suggested that comorbidity between Generalized Anxiety Disorder and

Major Depressive Disorder is strongly influenced by diagnostic overlap, raising concerns about potential errors in diagnostic criteria [58]. Thus, the presence of physical and somatic symptoms makes differentiation between major depressive disorder and anxiety disorders is more challenging during the perinatal period [59]. This study revealed a strong positive correlation between GAD-7 and EPDS scores. Obtained findings suggest that higher levels of generalized anxiety disorder symptoms are associated with increased levels of postpartum depressive symptoms in postpartum women. These findings are in line with other studies, where Generalized Anxiety Disorder has been recognized as a predictor of mood disorders [59]. Parental stress has been associated with a range of negative outcomes, including less sensitive interaction between parent and a child, aversive and coercive disciplinary strategies, and long-term negative outcomes on child development [60, 61]. Research examining anxiety disorders with maternal stress is limited. In our study the correlation between Generalized Anxiety Disorder and parental stress scores was moderate positive, which suggest that higher levels of generalized anxiety disorder symptoms are associated with increased levels of maternal stress in postpartum mothers. Our findings are consistent with existing research that associates perinatal stress with anxiety [62] and depressive symptoms [63]. However, further studies are needed to better understand relationship between stress and anxiety, using reliable and validated tools for the precise and separate assessment of anxiety and depression.

GAD-7 is a widely used tool for assessing anxiety disorder symptoms across various populations [24, 28]. Clinical application of GAD-7 has expanded beyond primary care settings, demonstrating versatility of this tool [27, 28, 42]. Given the high prevalence of anxiety disorders, it is crucial to have a reliable and validated tool like the GAD-7 for screening anxiety symptoms, particularly among women in the perinatal period [12, 64]. Thus, implementing validated tools in clinical practice can enhance early identification and intervention for anxiety disorders in this vulnerable population, ultimately improving maternal and infant health outcomes. Therefore, further research on the use of the GAD-7 in perinatal care settings is essential [12, 27, 64].

Strength and limitations

This study contributes to the growing body of the literature by adding results for usefulness of GAD-7 in screening symptoms of anxiety disorders in postpartum women sample. Our study supports current international evidence, which revealed high internal consistency and one-factor structure of GAD-7 [30–32]. This study contributes further to the validation of GAD-7 in the vulnerable group such as postpartum women. However,

more research is needed to assess the diagnostic validity among women, not only in the early postpartum period but also in other time points of postpartum year. Psychometric properties of GAD-7 should also be examined in the pregnancy, so the reliability of GAD-7 is obtained in the whole perinatal period among both parents. Early diagnosis is crucial for timely interventions, professional care, adequate treatment, and positive outcomes.

Few limitations of this study need to be acknowledged, while interpreting this study results. First, the study lacks the assessment for test-retest reliability, thus the representativeness of this sample requires careful consideration. Data collection was conducted in the early postpartum period 1–3 days after birth and does not include the other time points in the postpartum period. Thus, we cannot determine whether GAD-7 remains consistent over time. Therefore, further longitudinal research is needed to establish the reliability and stability of GAD-7, ensuring that the results are robust and replicable in various settings, over extended periods. Also, researching only 1–3 days postpartum women limits the scope of our findings to this specific period, so the results may not fully represent the experiences of women at other stages of the postpartum period, such as those in the mid, or late postpartum phases.

Second limitation is the lack of other anxiety measure and diagnosis-specific measures; therefore, our study did not address diagnostic specificity or establish cut off values for the Polish version of the GAD-7. While our research aimed to provide initial evidence of the tool's reliability and validity, we recognize that detailed analysis of diagnostic specificity and appropriate cutoff values are crucial for identifying clinically significant levels of anxiety. Future studies should focus on assessing the diagnostic specificity of the GAD-7 by comparing it with established diagnostic criteria and validated tools for anxiety disorders to improve the tool's usage in primary health settings.

Nevertheless, the study results support the evidence that GAD-7 can be used as a first screening measure of perinatal anxiety by health care professionals in primary health units and hospitals.

Conclusion

This study aimed to examine psychometric properties (reliability and validity) of the Polish version of GAD-7 in a postpartum Polish mothers' sample. The GAD-7 has established satisfactory psychometric properties for screening generalized anxiety disorders symptoms in woman after delivery. Examining psychometric properties of GAD-7 on different countries and using different samples is crucial, as reliable, and valid measure is needed to assess anxiety in perinatal period [24, 28, 32]. GAD-7 had significant correlations with all the variables

examined for construct validity with EPDS and PSS. However, more research is needed to assess the diagnostic validity among other groups in population, especially more vulnerable groups.

Abbreviations

GAD	Generalized Anxiety Disorder
DSM-5	The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
COPE	Centre of Perinatal Excellence
NICE	The National Institute for Health and Care Excellence
PTSD	Posttraumatic Stress Disorder
GAD-7	The Generalized Anxiety Disorder-7
NICE	National Institute for Health and Care Excellence
PSS	Parental Stress Scale
EPDS	Edinburgh Postpartum Depression Scale
CFA	Confirmatory Factor Analysis

Author contributions

All authors had full access to the data in the study and take responsibility for the integrity of the data and accuracy of data analysis. Conceptualization, Ł.B., M.B., K.L.; Formal analysis, P.J.; Investigation, Ł.B., M.B.; Methodology, P.J., Ł.B., M.B., K.L.; Project administration, Ł.B. and M.B.; Supervision, Ł.B. and M.B.; Writing - original draft preparation, K.L., P.J. All authors reviewed and approved the final version of the manuscript.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial and not-for-profit sectors.

Data availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

Declarations

Ethics approval and consent to participate

All procedures involving human subjects has been approved by the Research Ethics Board at the University of Gdansk (No 7/2019, approved: 29th of April 2019). All methods were carried out in accordance with relevant guidelines and regulations in accordance with 1975 Helsinki Declaration as revised in 2008. Participation in the study was voluntary, and informed consent was obtained from all subjects in written.

Consent for publication

Not applicable.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Received: 11 March 2024 / Accepted: 25 September 2024

Published online: 04 October 2024

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