Assessing physical symptoms during the postpartum period: Reliability and validity of the Primary Health Questionnaire Somatic Symptom Subscale (PHQ-15)

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Abstract

Introduction: This study aimed to establish the reliability and validity of the Primary Health Questionnaire Somatic Symptom Severity Subscale (PHQ-15) for postpartum women.

Methods: Women (*N* = 495) completed the PHQ-15 approximately six weeks postpartum during the baseline phase of a randomised controlled trial evaluating a writing intervention for postnatal health in England. Reliability was assessed using internal consistency statistics and convergent validity by comparing differences in self-reported physical health, health-related quality of life (QoL), and primary care usage by PHQ-15 symptom severity category.

Results: Cronbach's α for the PHQ-15 was 0.73 and item-total statistics met recommended guidelines. Validity analyses showed 6% of women reported severe symptoms, 17% medium, 50% low, and 27% minimal symptoms. Women with severe symptoms reported poorer overall physical health, poorer physical health-related QoL, and greater use of primary care. Women with severe symptoms also rated their baby's health as worse and used primary care more for their baby.

Discussion: This study suggests the PHQ-15 has the potential to be a useful and valid measure of physical symptoms in postpartum women in high-income countries.

Keywords: Postpartum, pregnancy, symptoms, physical health, PHQ-15

Introduction

Pregnancy, birth and the postpartum period involve huge physiological changes and women often experience normal and abnormal physical symptoms during this time [1-4] with over 90% of women reporting physical health problems after birth [2, 5]. There is substantial evidence from other populations that physical symptoms are associated with psychological symptoms [6]. Less research has been done with women during pregnancy and postpartum but the findings are consistent with the broader literature, showing physical symptoms can be associated with psychological problems such as depression, anxiety or somatic disorders [3, 4]. For example, a longitudinal study of women in pregnancy found that physical symptoms in the second trimester of pregnancy predicted symptoms of depression in the last trimester [7]. Similarly, a population study of 78,660 women in Norway found that women with a previous and recent history of sexual violence were approximately seven times more likely to suffer from eight or more physical symptoms in pregnancy [8]. High levels of physical symptoms during pregnancy and after birth are therefore associated with poor emotional and physical wellbeing in women.

Women's physical symptoms in pregnancy and after birth may also affect the baby. Women's physical wellbeing during pregnancy can affect the developing fetus [9]. Severe symptoms associated with health anxiety or somatic disorders may also heighten women's concerns about their own and/or their baby's health. It is therefore important to examine physical symptoms in pregnancy and after birth for a number of reasons. These include being able to discern normal from abnormal physical symptoms, identifying women with a high number of physical symptoms who may be at greater risk of psychological problems, or as a potential marker of sexual abuse.

The current study focused on measuring physical symptoms during the postpartum period. The way in which physical symptoms are measured at this time is important. Various measures of physical symptoms are available but few are validated for use in postpartum samples. One measure of physical symptoms is the Primary Health Questionnaire Somatic Symptom Subscale (PHQ-15) [10]. The PHQ-15 was originally designed to assess "15 somatic symptoms or symptom clusters most prevalent in somatization disorder" and was initially validated in both primary care and obstetric-gynecology clinical settings (p. 259) [10]. Initial results indicated symptom severity as measured by the PHQ-15 was linked to lower functional health and both increased healthcare usage and disability days. The PHQ-15 has a number of advantages in that it is widely used [11-13], is considered reliable and valid for general [14, 15] and clinical populations [11, 16-18], has been translated into several languages [12-15, 17, 18], and has been widely implemented in healthcare. It also includes items that assess the severity of the most common symptoms in postpartum women including tiredness and musculoskeletal problems [3, 5], as well as symptoms associated with poor self-rated health such as headache, stomach pain, nausea and musculoskeletal problems [19].

In the original PHQ-15 validation study [10], the obstetric-gynecology sample was not disaggregated so evidence of its reliability and validity for postpartum women specifically was not established. Whilst subsequent studies have confirmed the suitability of the PHQ-15 in other clinical populations [11, 16-18], evidence of the reliability and convergent validity of the PHQ-15 for use with postpartum women still needs to be confirmed as "symptoms can result from normal physiological changes in pregnancy and the early post-partum period, so therefore need to be assessed with care." (p. 384) [20]. To our knowledge, only one prior study used the PHQ-15 with a

perinatal sample and this was in a low-income country "where the burden of under-nutrition and infectious disease morbidity is high (p. 340)" [21]. In that study, a modified version of the PHQ-15 was implemented which: 1) eliminated two items regarding feeling tired/having low energy and problems sleeping based on an overlap with another study measure, and 2) modified item wording regarding menstruation to vaginal discharge. This study found the PHQ-15 predicted poorer daily functioning [21], providing initial evidence of suitability for use with perinatal women. However, the generalizability of these findings are limited to women in low-income countries when using a modified version of the PHQ-15.

The aim of the present study was therefore to examine whether evidence for the reliability and convergent validity of the standard PHQ-15 exists for a postpartum sample from a high-income country. Evidence of reliability was explored using internal consistency statistics chosen to facilitate comparison with values reported in prior studies. Evidence of convergent validity was established by examining differences between women with minimal, low, medium and high levels of physical symptoms in self-rated physical health, physical and mental health related quality of life (QoL), and primary care usage. In addition, differences in women's ratings of their babies' physical health and primary care usage were examined. The following hypotheses were tested:

HY_1: The internal consistency statistics for the PHQ-15 in this postpartum sample from a high-income country will be similar to values reported in other populations.

HY_2: Compared with women in other severity groups, women high in PHQ-15 symptom severity will:

HY_{2A}: rate their physical health lower,

HY_{2B}: report lower health-related quality of life, and

HY_{2C}: report greater primary care use.

$HY_{3:}$ Compared with women in other severity groups, women high in PHQ-15 symptom severity will:

$HY_{3A:}$ rate their baby's physical health lower and

$HY_{3B:}$ report greater primary care use for the baby.

Methods

Design

This study examines evidence for the reliability and convergent validity of the PHQ-15 with postpartum women based on a secondary analysis of data collected as part of a randomised controlled trial evaluating a writing intervention for improving women's postnatal health [REF removed for blind review]. Data presented here are from the baseline measures completed prior to intervention, at approximately six to eight weeks postpartum.

Procedure

The project was approved by an NHS Research Ethics Committee. Participants were recruited from 11 acute NHS hospital trusts in England between November 2013 and December 2014. All were aged 18 years or older and had given birth to a live infant after 26 weeks gestation. All eligible women (N = 7986) in the 11 NHS Trusts were sent a letter inviting them to take part approximately four weeks after birth. Of these, 1413 replied and 854 consented to participate. The majority of women who declined to participate reported they were too busy (n = 422). A further four women were excluded because their contact details could not be obtained. A number of women who initially consented to participate did not complete any baseline measures; the

final sample for analysis of baseline measures including the PHQ-15 was 548. Women completed baseline measures by post or online. Participants also provided socio-demographic information. Obstetric information was obtained from medical records. There were no incentives for participation. A detailed account of the design and procedure for the primary study can be found in the study protocol [REF removed for blind review].

Sample

Table 1 summarizes mothers' socio-demographic and obstetric characteristics. Most women were white European, educated to degree level or higher, employed, and married/living with partner. Approximately 19% reported having been diagnosed with or treated for psychological problems at some point before their baby was born; 36 women (7.3%) reported having been diagnosed or treated since giving birth. Gestation was 37 weeks or more for 86% of the sample. Approximately half were multiparous (52%), had normal vaginal births (55%), and experienced maternal and/or neonatal complications (53%).

Study measures

Physical health questionnaire somatic symptom subscale (PHQ-15)

The standard English version of the PHQ-15 [10] was used. Participants rated the severity of 15 symptoms experienced over the last four weeks as 0 (*not bothered at all*), 1 (*bothered a little*), or 2 (*bothered a lot*). PHQ-15 scores can range from 0–30. Symptom severity was categorized as minimal (0–4), low (5–9), medium (10-14), or high (15 +) [10].

Convergent validity measures

As evidence of convergent validity of the PHQ-15, three outcomes were expected to vary based on symptom severity. These were women's self-rated overall physical

health, health-related quality of life (QoL), and primary care usage. In addition, women's ratings of their baby's health and primary care usage were also expected to differ. Convergent validity outcomes were operationally defined as follows:

Overall physical health was rated by participants on a single item covering the most recent four weeks using a 10-point Likert scale (1 = *extremely bad*; 10 = *best possible health*). An identical single item was used to obtain the mother's perception of their baby's physical health.

Health-related quality of life was measured using the SF-12v2 health survey, a reliable and valid 12-item self-report measure of QoL over the prior four weeks [22]. Response options varied across items. Women rated their overall general health with a 5-point Likert scale (1 = *excellent*; 5 = *poor*). Five items were rated using Likert scales with lower values indicating poorer outcomes. For example, the impact of bodily pain was measured by: '*During the past four weeks, how much did pain interfere with your normal work including both outside the home and housework?'* (1 = *extremely*; 5 = *not at all*). Two items assessed the ability to conduct moderate activities (vacuuming, climbing stairs) using a 3-point scale (1 = *yes, limited a lot*; 3 = *No, not limited at all*). Four items had yes/no response options to further assess limitations due to physical health and emotional problems (*During the past four weeks, did you accomplish less than you would like as a result of an emotional problem, such as feeling depressed or anxious?*). Quality Metric Incorporated calculated physical and mental component scores based on weighted, combined item scores using its proprietary SF-12v2 software. Component scores range from 0 to 100 with higher values indicating better QoL. The normative mean for both components is 50 (*SD* =10).

Primary care usage was measured as the number of visits for themselves to primary care or other healthcare professionals in a primary care setting for any reason with routine maternity care appointments excluded. A similar item was used to measure primary care usage for their baby.

Statistical analysis

Full PHQ-15 data were obtained from 482 women; 66 women had missing data. Of these 66 participants, 13 had only a single missing value that varied across items. Median imputation was used for these values and the women were included in the final analysis (N = 495). The remaining 53 had missing data percentages considered inappropriate for statistical imputation [23]. Descriptive statistics were calculated for participants' socio-demographic and obstetric characteristics, PHQ-15 items, and convergent validity outcomes. PHQ-15 reliability was assessed using internal consistency statistics (Cronbach's α, α if item deleted, corrected item-total correlations). These internal-consistency statistics were chosen to facilitate comparison of the evidence from the current study with prior studies. One-way analyses of variance compared convergent validity outcomes by PHQ-15 symptom severity category with Bonferroni adjustment implemented for post-hoc analyses. SPSS version 23.0 was used for all analyses.

Results

Evidence of reliability

Internal consistency statistics are presented in Table 2. Cronbach's α for the PHQ-15 was 0.73; a value of 0.70 is considered satisfactory for group comparison [24]. Values for women reported in other studies ranged from 0.73 in a general sample of women [15, 18], 0.77 with young women [11], and 0.80 in the original obstetric-gynecology sample [10]. Removing items did not improve Cronbach's alpha. The

average item-total correlation (0.33) and corrected item-total correlations (0.21 – 0.46) were within the recommended guidelines of a minimum of 0.15 – 0.20 and 0.15 – 0.50 respectively [25, 26].

Evidence of convergent validity

Table 3 provides the correlations between the PHQ-15 and the outcomes for mother and baby. Table 4 shows the differences in overall physical health, health-related QoL, and primary care usage for mother and baby by PHQ-15 symptom severity category. In this sample, 136 women (27%) were categorized as minimal, 247 (50%) as low, 83 (17%) as medium, and 29 (6%) as high in symptom severity.

Mother's perceived physical health, health-related quality of life and primary care usage

Somatic symptom severity as measured by the PHQ-15 total score was significantly, negatively correlated with overall physical health rating and physical health-related QoL; and was significantly, positively associated with primary care usage by the mother. The relationship between somatic symptom severity and mental health-related QoL was not significant ($p = .16$).

Physical health ratings differed by PHQ-15 symptom severity category. Women categorized as minimal or low severity rated their own physical health higher than either medium or high severity groups (Welch's F (3, 105.61) = 19.09, $p < .001$, $\eta^2_p = .13$). Physical health-related QoL also differed significantly by symptom severity category (Welch's F (3, 105.04) = 31.93, $p < .001$, $\eta^2_p = .17$). Women categorized as either medium or high severity rated their physical health-related QoL lower than those with minimal or low symptoms. The mean rating by participants from the medium/high severity categories was approximately equal to the normed mean (50); those in the minimal/low severity category had mean ratings above the

normed mean (+1.0 *SD* and +0.6 *SD* respectively). Mental health-related QoL did not differ by symptom severity category (Welch's F (3, 105.68) = 0.04, p = .99, η^2_p = .00).

Primary care usage differed significantly by PHQ symptom severity category (Welch's F (3, 102.01) = 6.79, $p < .001$, η^2_p = .04). Women with high severity reported more primary care visits for themselves than the minimal and low groups; visits by those in the medium severity category did not differ statistically from any other group.

Mother's ratings of baby's physical health and primary care usage

Mother's PHQ-15 total score was significantly, negatively correlated with ratings of the baby's overall physical health and positively associated with primary care usage for the baby. The entire sample rated their baby's overall physical health highly; but a main effect of symptom severity category indicated women with high symptom severity rated their baby's health lower than women in all other categories (Welch's F (3, 105.90) = 2.80, $p < .05$, η^2_p = .03). Participants with high symptom severity also reported more primary care usage for their baby than participants in all other categories (Welch's F (3, 99.31) = 3.11, $p < .05$, η^2_p = .04).

Discussion

This study aimed to determine the reliability and convergent validity of the PHQ-15 in postpartum women from a high-income country. The results provide evidence of the reliability and validity of the PHQ-15 for use with postpartum women. Internal consistency of the PHQ-15 was 0.73, a value consistent with those previously reported for women [15, 18]. Corrected item-total correlations also indicated that all items exceeded established minimum criterion [25, 26]. Based on PHQ-15 scores, approximately 6% of women were classified as having high symptom severity. This is

a similar percentage to that reported in 18-34 year old women in Sweden [15] but less than the 9% reported in the obstetrics/gynecology validity study [10] or 14% in a gynecological cohort [27], suggesting that using the PHQ-15 in a high-income postpartum sample does not over-identify women as high in symptom severity. Additional research should further explore the PHQ-15's sensitivity and specificity with postpartum women.

There was evidence for good convergent validity of PHQ-15. Women with high levels of symptoms reported significantly worse overall physical health, poorer physical health-related QoL, and increased primary care usage. This is consistent with earlier studies indicating an association between the PHQ-15 and physical health-related QoL and increased healthcare usage [10, 14, 16, 18]. A new finding was that high symptom severity was also associated with overall physical health ratings. However, we found no difference in mental health-related QoL based on symptom severity, which is inconsistent with previous studies [14, 16, 18]. This may be because mental health-related QoL (as measured by the SF-12v2) includes questions on current energy level, time for social activity, and feelings of calmness/peacefulness, all of which are likely to be affected in any women caring for a new infant.

Exploration of the impact of women's physical symptoms on their perception of their baby's health and primary care usage showed interesting results. Although women generally rated their baby's health as good (with a mean of ~9 out of 10), women with severe symptoms rated their baby's physical health as poorer than women in all other categories and reported more primary care visits for their baby. This may be due to anxiety about physical symptoms and/or health generally, which is transferred onto the baby. These types of anxiety also can be present in individuals with somatic symptom disorder [28]. It would therefore be interesting to see whether

symptom severity on the PHQ-15 predicts the clinical diagnosis of somatic symptom disorder in a postpartum sample.

It is documented that perinatal mental health problems impact both the mother and child [29-31]. However, to date, perinatal mental health research has focused on depression and anxiety [20], with somatic disorders receiving less attention. One explanation for this may be due to the comorbidity of depression and/or anxiety with somatic symptom disorder or to the classification of these three conditions in the same group of common mental disorders [32-34]. While these disorders share similarities, there are also distinctions in presentation [35] and functional outcomes [32]. Screening of physical symptom severity and possible somatic symptom disorder during the perinatal period may be important because women are more likely to be classified as high symptom severity than men [10, 15, 18]. Similarly, mothers may report more child somatic symptoms than fathers [36], and parental somatization can lead to the development of somatization in children [37]. The PHQ-15 potentially provides a useful measure of somatic symptoms in perinatal samples based on the current findings with postpartum women.

The current study has a few limitations. The sample was comprised predominantly of white European women who were highly educated and therefore not representative of the general population of postpartum women. The self-reported rate of postpartum psychological problems in the current sample appears low at 7.3% compared to 15 - 20% usually reported [38]. This may have been due to the item wording for self-reports of psychological diagnosis or treatment pre and post-birth. Women were asked to indicate the presence of psychological problems ever prior to birth and, in a separate item, those since birth. It may be women who reported pre-birth psychological problems did not then also indicate a problem since birth;

therefore, it is difficult to ascertain the true postpartum rate in this sample. These study limitations may affect the generalizability of the current findings. Prior research has also indicated the PHQ-15 might perform differently across ethnic groups [11], so future research needs to examine the validity of the PHQ-15 in different ethnic groups. Finally, the current study focused on postpartum women so similar research is needed to examine the validity of the PHQ-15 with pregnant women.

Conclusion

Women often present with a range of physical symptoms during the perinatal period, making a brief, reliable and valid assessment tool to screen for somatic symptom severity useful in maternity care settings. The PHQ-15 has been widely used in other healthcare contexts and the current study supports the reliability and validity of the PHQ-15 for postpartum women. Women with severe symptoms reported poorer overall physical health of themselves and their baby, poorer physical health-related QoL, and greater use of primary care for themselves and their baby. The PHQ-15 therefore has the potential to be a useful and valid measure of physical symptoms in postpartum women in high-income countries.

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Current knowledge on the subject

- Physical symptoms are common during pregnancy and after birth.
- Measures of physical symptoms are needed that are reliable and valid for use with perinatal women.
- The PHQ-15 is a measure of physical symptoms that has been widely used in other populations.

What this study adds

- This study determines the reliability and convergent validity of the PHQ-15 for postpartum women in high-income countries.
- Women with a high level of symptoms (6%) reported poorer physical health and greater use of primary care for themselves and their babies.
- Women with a high level of symptoms also reported poorer physical health-related quality of life.

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Table 1 Mother's Socio-demographic and Obstetric Characteristics

Mothers' Socio-demographic Characteristics			Obstetric Characteristics		
	n	%		*n*	%
Age [M (SD)]	32.77	(5.33)	*Labour duration in hours [M (SD)]*	5.53	(7.68)
Ethnicity			*Type of birth*		
White European	342	69.1	Normal vaginal birth	274	55.4
Other	20	4.0	Assisted*	181	36.6
Education			*Gestation*		
None	4	0.8	Less than 32 weeks	9	1.8
GCSE/O-level	45	9.1	32 - 36 weeks	22	4.4
A-level/Diploma	84	17.0	37 - 40 weeks	206	41.6
Degree	222	44.8	40 + weeks	219	44.2
Employed			*Parity*		
Yes	301	60.8	Primiparous	224	45.3
No	61	12.3	Multiparous	255	51.5
Marital status			*Complications*		
Married	231	46.7	None	187	37.8
Living with partner	106	21.4	Maternal	131	26.5
Other	19	3.8	Neonatal	76	15.4
Psychological problems (diagnosed/treated)			Both	57	11.5
Prior to birth	95	19.2			
Since giving birth	36	7.3			

Note: *N* varied across analyses due to missing data. Therefore, *n* and % will not sum to the study *N* or 100%.

* Ventouse, forceps or caesarian section births.

Table 2 PHQ-15 Item and Item Total Statistics (*N* = 495)

Item	*M*	*SD*	Cronbach's alpha	Cronbach's alpha if item deleted	Corrected r_{IT}
Total PHQ score	7.02	3.99	*0.73*		*0.33*
Stomach pain	0.46	0.60		0.71	0.34
Back pain	0.96	0.74		0.72	0.30
Pain in your arms, legs, or joints	0.56	0.68		0.72	0.30
Menstrual problems	0.31	0.57		0.70	0.41
Pain or problems during intercourse	0.37	0.62		0.73	0.21
Headaches	0.58	0.65		0.71	0.34
Chest pain	0.06	0.28		0.72	0.27
Dizziness	0.39	0.58		0.71	0.38
Fainting spells	0.06	0.29		0.72	0.26
Feeling your heart pound or race	0.15	0.40		0.71	0.39
Shortness of breath	0.16	0.42		0.71	0.41
Diarrhea/constipation	0.68	0.73		0.72	0.28
Nausea/gas/indigestion	0.43	0.63		0.70	0.46
Feeling tired or having low energy	1.29	0.62		0.70	0.40
Trouble sleeping	0.57	0.70		0.71	0.35

Table 3: Correlation Coefficients between PHQ-15 and Outcomes for Mother and Baby

Outcome	1		2		3		4		5		6		7
1. PHQ-15 total score	1.0												
2. SF12 v2 physical health related quality of life	-0.42	***	1.0										
3. SF12 v2 mental health related quality of life	-0.05		-0.50	***	1.0								
4. Overall physical health rating (mother)	-0.37	***	0.59	***	-0.09	*	1.0						
5. Overall physical health rating (baby)	-0.17	***	0.20	***	0.03		0.22	***	1.0				
6. Primary care visits (non-routine, mother)	0.23	***	-0.26	***	0.04		-0.25	***	-0.09	*	1.0		
7. Primary care visits (non-routine, baby)	0.20	***	-0.19	***	0.00		-0.15	***	-0.51	***	0.22	***	1.0

Note: *N* varied across analyses due to missing data on outcomes. * $p < .05$, *** $p < .001$.

Table 4 Differences in Mothers' Physical and Mental Health Related Quality of Life, Overall Physical Health Ratings for Mother and Baby, and Primary Care Visits for Mother and Baby by PHQ-15 Symptom Severity Category

			PHQ-15 symptom severity category											
			Minimal		Low		Medium		High					
	Overall		*n* = 136		*n* = 247		*n* = 83		*n* = 29					
Outcome	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*		η^2_p	Post-hoc
SF12 v2 Health related quality of life														
Physical health	55.99	8.82	60.69	6.10	55.80	7.96	51.71	9.62	47.88	11.59	31.93	***	0.17	Mi > L > Me = H
Mental health	41.32	5.85	41.33	4.54	41.38	5.83	41.27	7.04	40.86	7.82	0.04	NS	0.00	
Overall physical health rating														
Mother	7.81	1.43	8.38	1.14	7.86	1.31	7.21	1.43	6.48	2.01	19.09	***	0.13	Mi > L > Me = H
Baby	9.09	1.16	9.29	1.04	9.07	1.11	9.07	1.12	8.41	1.84	2.80	*	0.03	Mi = L = Me > H
Primary care visits (non-routine)														
Mother	0.86	1.26	0.54	0.94	0.87	1.22	1.10	1.58	1.54	1.45	6.79	***	0.04	Mi & Low < H Mi = L = Me
Baby	0.92	1.32	0.71	1.15	0.88	1.22	1.01	1.31	1.89	2.18	3.11	*	0.04	Mi = L = Me > H

Note: *N* varied across analyses due to missing data on outcomes. Maximum n for each symptom severity category is provided. * $p < .05$, *** $p < .001$.