


Validity and Reliability of the Chinese Version of the Edinburgh Postnatal Depression Scale for Fathers of Newborns

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Wei-Hsuan Jen¹ , Tai-Ho Hung^{2,3,4}, Ching-Yen Chen^{4,5},
and Yun-Fang Tsai^{5,6,7} 

Abstract

Studies often use the Edinburgh Postnatal Depression Scale (EPDS) or the Beck Depression Inventory–II (BDI-II) as a screening tool for depression in new mothers or fathers following the birth of an infant, but no studies have evaluated EPDS as a predictor of postnatal depression for new fathers in a Chinese population. This study aimed to test the validity and reliability of a Chinese version of the EPDS for fathers of newborns in Taiwan. The study included 368 parents with newborns ≤ 2 months of age and without any health problems. Construct and criterion-related validities were assessed and Cronbach's alpha was used for measuring internal consistency reliability. The receiver operating characteristic (ROC) curve analyzed the optimal cutoff score for the EPDS. Scores for the Chinese EPDS were significantly higher for fathers who were > 34 years of age, employed in a professional occupation, and participated in feeding their infant ($p < .05$). Mean scores among the fathers for the EPDS and BDI-II were significantly correlated ($r = .64, p < .001$). The Cronbach's alpha was .83 for the EPDS; ROC curve analysis revealed the optimal cutoff of the EPDS was ≥ 8 points and the area under the ROC curve was 0.91. The EPDS had good validity and reliability and should therefore be considered suitable for the evaluation of postnatal depression in fathers of newborn infants in Taiwan.

Keywords

perinatal period, father, Postnatal Depression Scale, infant, feeding

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Introduction

Postnatal depression is an affective disorder, which occurs following the birth of a child and involves symptoms of extreme sadness, anxiety, and fatigue. These symptoms of postnatal depression may cause difficulty in taking caring of oneself and others and performing everyday caregiving for the child (National Institute of Mental Health, 2022), including food preparation, feeding, diaper changes, bathing, and putting a child to bed (McHale & Huston, 1984). The *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; American Psychiatric Association [APA], 2013) now defines postnatal depression as the occurrence of a major depressive episode beginning during the perinatal period of pregnancy or up to 12 months postpartum. It is recommended that parents should undergo evaluation for depression as soon as possible after the birth of their child (APA, 2013).

¹Graduate Institute of Clinical Medical Sciences, College of Medicine, Chang Gung University, Tao-Yuan, Taiwan

²Department of Obstetrics and Gynecology, Taipei Chang Gung Memorial Hospital, Taipei, Taiwan

³Department of Obstetrics and Gynecology, Keelung Chang Gung Memorial Hospital, Keelung, Taiwan

⁴College of Medicine, Chang Gung University, Taoyuan, Taiwan

⁵Department of Psychiatry, Chang Gung Memorial Hospital at Keelung, Keelung, Taiwan

⁶School of Nursing, College of Medicine, Chang Gung University, Tao-Yuan, Taiwan

⁷Department of Nursing, Chang Gung University of Science and Technology, Tao-Yuan, Taiwan

Corresponding Author:

Yun-Fang Tsai, RN, PhD, FAAN, School of Nursing, College of Medicine, Chang Gung University, 259, Wen-Hwa 1st Road Tao-Yuan, 333, Taiwan.
Email: yftsai@mail.cgu.edu.tw



The primary caregiver for infants and toddlers has traditionally been the mother and/or nonparental caregivers such as grandparents or other household members. As more women began to work outside the home, this shared employment brought about changes in childrearing, which has resulted in more shared childrearing with both mothers and fathers (Kahan & Adesman, 2019; Ramirez et al., 2022; Swanson et al., 2017). This change in expectations of shared caregiving has had adverse effects on the psychological health of fathers who are unable to share in the care of their infant (Chen et al., 2010; Reisz et al., 2019; Swanson et al., 2017). In concert with these changes in childrearing, there has been a gradual shift in the impact of postnatal depression on psychological health to include not only new mothers but also new fathers (Ahlqvist-Björkroth et al., 2016; Paulson & Bazemore, 2010).

Studies have reported approximately 10% of expectant fathers develop depressive symptoms before or after delivery, with this number peaking 3 to 6 months after the birth of the child (Paulson & Bazemore, 2010). Serhan et al. (2013) reported the prevalence rates of postnatal depression to be 1.8% in new fathers and 9.1% in new mothers. The development of postnatal depressive symptoms in new mothers is due to the difficulties of caring for a newborn, which includes frequent feeding, incessant crying, and sleep problems (Burke, 2003; Serhan et al., 2013), which can cause physical and emotional imbalance (Pérez & Brahm, 2017). Approximately 10% of new fathers also develop depressive symptoms due to the postnatal depression experienced by the mother, resulting in increased conflict in the marital relationship (Burke, 2003; Pérez & Brahm, 2017). Numerous studies have reported occupation, financial status, and social support also influence the development of postnatal depression in fathers (Leung et al., 2017; Molgora et al., 2017; Serhan et al., 2013; S. Y. Wang & Chen, 2006). The development of postnatal depression in new fathers affects all family members and is detrimental to the physiological and psychological development of infants as well (Isik & Ergol, 2018; Pérez & Brahm, 2017).

Postnatal depression in fathers and mothers can result from a reciprocal influence between partners (Paulson et al., 2016). A systematic review and meta-analysis reported that symptoms of postpartum depression in both parents can be traced back to the mother from 0 to 12 weeks before delivery to as late as 12 months after delivery, which occurred in up to 3% of couples (Smythe et al., 2022). Factors such as unemployment, low social support, and history of mood disorders also increase the risk of postpartum depression (Carlberg et al., 2018; Finnbogadóttir & Persson, 2022). A meta-analysis of studies from multiple countries reported a positive correlation between parental postpartum depression (Thiel

et al., 2020). The methodological and cultural heterogeneity of these studies suggest additional research is needed to determine whether there is a relationship between parental postnatal depression in the early postpartum period for parents in Taiwan.

Delivering infant care requires an understanding of their health care needs and stressors. One study reported that a more positive relationship between a husband and wife ensures more consistent parenting attitudes, further investment in parenting work, and greater support to their spouses (Lin & Zhou, 2009). Compared with fathers of infants who are bottle fed, fathers of breastfed infants demonstrate greater participation in parenting tasks, which include performing household chores, caring for older children, ensuring the mother's comfort, providing meals, identifying the overall condition or hunger of the infant, and changing diapers (de Montigny et al., 2018; Rempel & Rempel, 2011).

The diagnosis of postnatal depression can vary. Teissedre and Chabrol (2004) reported that postnatal depression could be predicted on the third day after delivery, whereas another study demonstrated the optimal time for predicting postnatal depression was between 2 weeks and 6 months following delivery (Boyd et al., 2005). One means of assessing postnatal depression is to screen populations at high risk in advance using a valid measurement scale, which can allow for early interventions (Moraes et al., 2017; Pearlstein et al., 2009). Two scales that have been widely used to assess symptoms of postnatal depression are the Edinburgh Postnatal Depression Scale (EPDS) developed in 1987 by Cox et al. and the Beck Depression Inventory—Second Edition (BDI-II; Beck et al., 1996).

The EPDS comprises 10 questions regarding depressive symptoms that an individual has experienced within the last 7 days. A higher score indicates a higher level of postnatal depression (Cox et al., 1987). The BDI-II contains 21 questions regarding feelings an individual has experienced in the previous 2 weeks (Beck et al., 1996). The EPDS has been translated into numerous languages (Gibson et al., 2009) and the Cronbach's alpha for its reliability is .75 to .8 (Teissedre & Chabrol, 2004; Töreki et al., 2014). One study reported that at 3 days postpartum, the sensitivity, specificity, and cutoff for the scale were 0.88, 0.50, and 9, respectively. Lee et al. (2001) reported that the BDI-II provided an accurate assessment of depression in Chinese women who had delivered an infant within the previous 6 weeks and receiver operating characteristic (ROC) curves were comparable with the EPDS. Heh (2001) analyzed scores for Chinese translations of the EPDS and BDI-II for women 4 weeks postpartum and found good validity of 0.79 for both scales.

To date, few studies concern postpartum depression in males. There is a lack of understanding or clear definition

regarding postnatal depression in males. A longitudinal study in Germany reported that 7.8% of fathers developed depressive symptoms 6 weeks after the birth of their infant (Gawlik et al., 2014). A Japanese study on postnatal depression in fathers of infants reported that 11.2% of fathers experienced postnatal depression 1 month after the birth of their child, and the incidence of depression increased to 12% at 6 months (Nishigori et al., 2020). Studies in Turkey and Japan reported an association between low income or having a newborn with a disease requiring drug treatment and postnatal depression in fathers at 1 month (Nishigori et al., 2020; Serhan et al., 2013). In Japan, symptoms of postnatal depression at 6 months after the birth of a child were associated with psychological distress, unemployment, and postnatal depression in the child's mother (Nishigori et al., 2020). Although studies on postnatal depression in fathers of infants rely on the EPDS and the BDI-II as assessment tools (D. Wang et al., 2021), it is not clear whether either is valid for fathers in Chinese cultures.

The studies cited above demonstrate that assessment of postnatal depression in fathers typically is conducted at 3 months after the birth of a child, which is the period when symptoms are most prevalent. This is also the early screening time period recommended by the *DSM-5*. None of these studies assessed earlier timepoints postdelivery, which has resulted in a dearth of information regarding the onset of depressive symptoms from delivery to 2 months postnatal for fathers, especially with regard to fathers in Taiwan. This study aimed to determine the validity and reliability the Chinese version of the EPDS developed by Heh (2001) and evaluate incidence of symptoms of postnatal depression in fathers within 2 months after the birth of their child.

Method

Study Design

This cross-sectional study examined the validity and reliability of a Chinese version of the EPDS. This paper is reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement (von Elm, et al. 2008).

Study Participants

Parents of newborn infants were recruited by purposive sampling from a medical center in northern Taiwan. Inclusion criteria for participation were the natural parents of a healthy newborn infant ≤ 2 months of age without any physical or neurological disease, and without need of medical care. Fathers and mothers were excluded if they had a previous diagnosis of depression prior to the

birth of their infant, they did not speak Chinese, they were not the birth parents, or the newborn was experiencing any health-related problems. The recruitment period was from September 2020 to January 2021. The study was approved by the Institutional Review Board (IRB) of Chang Gung Medical Foundation (202100733B0). Written informed consent was obtained from all participants prior to conducting data collection. All participants were informed of their right to withdraw from the study at any time for any reason. All data were deidentified and coded.

Measurements

Participant Characteristics. A researcher developed questionnaire collected data regarding the characteristics of the fathers, which included age, type of employment (military service, civil service, teachers, bank employees, self-employed, technology, research, research and development, medical profession, lawyer), and whether or not the father participated in infant feeding (yes/no).

Chinese Version of the EPDS. The EPDS was developed by Cox et al. in 1978 and the Chinese version of the scale was created by a Taiwanese researcher in 2001 (Heh, 2001). The EPDS contains 10 questions asking the individual about the frequency of their emotional feelings in the last week, which are scored on a 4-point Likert-type scale from 1 = *never* to 4 = *always*. Two questions are positively worded: "I have been able to laugh and see the funny side of things" and "I have looked forward with enjoyment to things." The other eight questions are negatively worded, such as "I have blamed myself unnecessarily when things went wrong" and "I have been anxious or worried for no good reason." The total score ranges from 0 to 30 points; higher scores indicate greater depression. The Cronbach's alpha for the Chinese version of the EPDS was reported as .87 (Heh, 2001) and was demonstrated to be a valid reliable scale for screening postnatal depression in a sample of Taiwanese women.

Chinese Version of the BDI-II. The BDI was revised in 1996 to better conform to the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; APA, 1994) criteria for depression and is referred to as the BDI-II (Beck et al., 1996). The Chinese version of the BDI-II, translated by the Chinese Behavioral Science Corporation (Beck et al., 2000), is a validated instrument (Lu et al., 2002) and one of the most frequently used for measuring depression in individuals in Taiwan (Wu & Huang, 2014). Individuals are asked to respond to each of the 21 questions by circling the sentence that best represents their feelings in the last 2 weeks, on a 4-point Likert-type scale from 0 to 3. Two questions, one regarding sleep

pattern and one about appetite changes, offer seven options to determine an increase or decrease in behavior and motivation (0, 1a, 1b, 2a, 2b, 3a, and 3b). The BDI-II is scored by summing the answers to the 21 questions. Total scores range from 0 to 63 (Beck et al., 1996). The cutoff score for delineating depression is 14 points (Beck et al., 1996). Total score of 0 to 13 is considered in the normal range, and ≥ 14 is classified as mild to severe depression. Hence, the scores from the self-evaluation on the BDI-II were grouped as nondepressed (0–13 points) and depressed (≥ 14 points).

Data Analysis

The software package SPSS Statistics for Windows, version 22.0, was used for data analysis. Descriptive statistics were used to report frequency (percentage), mean, and standard deviation (*SD*). Independent-sample *t* test analyzed differences in mean scores of the EPDS based on participant characteristics of age, occupation, and participation in infant feeding. For age, participants were divided into two groups based on a cutoff of >34 years, which is considered to be a geriatric pregnancy in Taiwan (Health Promotion Administration, Ministry of Health and Welfare, 2022).

Participants were categorized into three subgroups: (a) age (≤ 34 years or >35 years), (b) type of employment: nontechnical job (military service, civil service, teachers, bank employees, or self-employed) or technical/professional job (those with advanced degrees in technology, research, research and development, medicine, law; Tsai et al., 2021), and (c) participating in infant feeding (yes/no).

Criterion validity of the Chinese version of the EPDS for new fathers was evaluated by determining the value of the correlation coefficient, *r*, with the Chinese version of the BDI-II and their partners' EPDS scores, which allowed us to establish correlations between scores on the EPDSs and BDI-II. Internal consistency of the Chinese EPDS was measured with Cronbach's alpha, which was .87 for postpartum women (Heh, 2001).

The curve for the receiver operated characteristic (ROC) for the BDI-II was used as a reference to determine the validity of the measure of postnatal depression. Using the recommended cutoff score of ≥ 14 points for delineating depression (Beck et al., 1996), the scores from the self-evaluation on the BDI-II were grouped as nondepressed (0–13 points) and depressed (≥ 14 points). The greater the area under the curve (AUC) of the ROC, the higher the diagnostic performance. An AUC of 0.9 to 1.0 was defined as high accuracy; AUC of 0.9 to 0.8 as moderate accuracy; and AUC of 0.5 to 0.7 as low accuracy.

Results

Participants

A total of 368 eligible fathers were recruited to participate; all were first-time fathers and all were employed full-time. The mean age was 36.87 (*SD* = 5.25) years; most were >35 years of age (68.2%, *n* = 251), employed in a nontechnical job (72%, *n* = 265), and slightly more than half (58.9%, *n* = 217) participated in feeding their newborn. When scores on the EPDS were compared between fathers ≤ 34 years and >35 years, scores were significantly higher for fathers who were older ($t = -2.35$, $p < .05$), who were employed in a technical job ($t = -2.59$, $p < .05$), and who participated in infant feeding ($t = 3.19$, $p < .01$), suggesting these fathers had more symptoms of postnatal depression (Table 1).

Criterion-Related Validity of the Chinese EPDS

The mean score for all participants on the EPDS score was 5.41 (*SD* = 3.81); the mean score on the BDI-II was 5.14 (*SD* = 5.53). The correlation coefficient between the scales was significant ($r = 0.64$, $p < .001$), indicating the Chinese EPDS and BDI-II had a moderate level of criterion-related validity. The correlation coefficient between parents for EPDS scores was too low ($r = .12$, $p > .05$) to demonstrate a similarity in postpartum depression.

Reliability of the Chinese EPDS

The mean total score on the Chinese EPDS ranged from 4.58 to 5.37 for all participants. The Cronbach's alpha for the 10 questions ranged from .79 to .82 and was .83 for the total scale. Therefore, the scale can be considered a reliable instrument for assessing the postnatal depressive symptoms for fathers of newborns. The internal consistency the Cronbach's alpha of the EPDS for fathers was .83.

ROC Curve Analysis

The most suitable cutoff for the ROC curve of the EPDS score for fathers was determined to be ≥ 8 points with a sensitivity and specificity of 81% and 86%, respectively (see Table 2). Figure 1 illustrates the ROC for the EPDS using the BDI-II. The AUC of 0.91 ($p < .001$) demonstrated this Chinese EPDS performed well as a predictor of depressive symptoms for fathers of newborns.

Discussion

Our cross-sectional study demonstrated a cutoff score of ≥ 8 on the Chinese EPDS had a sensitivity of 81% and specificity of 86%, indicating its use as a predictor of postnatal

Table 1. Characteristics and Scores on the EPDS for Participants (N = 368).

Characteristic	n (%)	EPDS score		
		M ± SD	t	p value
Age, years			-2.35	.02
≤ 34	117 (31.8)	4.74 ± 3.52		
> 35	251 (68.2)	5.73 ± 3.90		
Type of employment			-2.59	.01
Non-technical job ^a	265 (72.01)	5.09 ± 3.61		
Technical/professional job ^b	103 (27.99)	6.23 ± 4.16		
Participated in infant feeding			3.19	.002
Yes	217 (58.9)	5.94 ± 3.99		
No	151 (41.1)	4.66 ± 3.40		
Involvement of nonparents			0.62	.53
Yes	159 (43.2)	5.27 ± 4.0		
No	209 (56.8)	5.52 ± 3.7		
Father's role			0.48	.63
First time	240 (65.2)	5.48 ± 3.96		
Experienced	128 (34.8)	5.28 ± 3.51		
Annual household income			0.71	.48
NT\$200,000–NT\$599,999	64 (17.4)	5.72 ± 3.85		
NT\$600,000–NT\$≥1,200,000	304 (82.6)	5.35 ± 3.80		

Note. EPDS = Edinburgh Postnatal Depression Scale.

^aNontechnical job (military service, civil service, teachers, bank employees, or self-employed). ^b Technical/professional job (advanced degree in technology, research, research and development, medicine, law).

Table 2. Cutoff Scores on the Chinese Version of the EPDS.

EPDS cutoff	Sensitivity	Specificity
≥5	0.92	0.59
≥6	0.92	0.67
≥7	0.88	0.77
≥8	0.81	0.86
≥9	0.73	0.92
≥10	0.54	0.95
≥11	0.50	0.97
≥12	0.38	0.98
≥13	0.31	0.99
≥15	0.19	0.99
≥16	0.12	1.00

Note. EPDS = Edinburgh Postnatal Depression Scale.

depression for new fathers in Taiwan with 2-month-old infants. This is the first study to show the fathers who were older than 34 years of age, employed in a professional occupation, and participated in feeding their newborn were more likely to have higher scores on the Chinese EPDS. The age of marriage has been increasing every year in Taiwan and the current mean age is 34.3 years for males (Gender Equality Council, Ministry of Home Affairs, Executive Yuan, 2021). This may be one explanation that most fathers who participated in this study were >35 years of age. Our finding that these older fathers were more likely to have

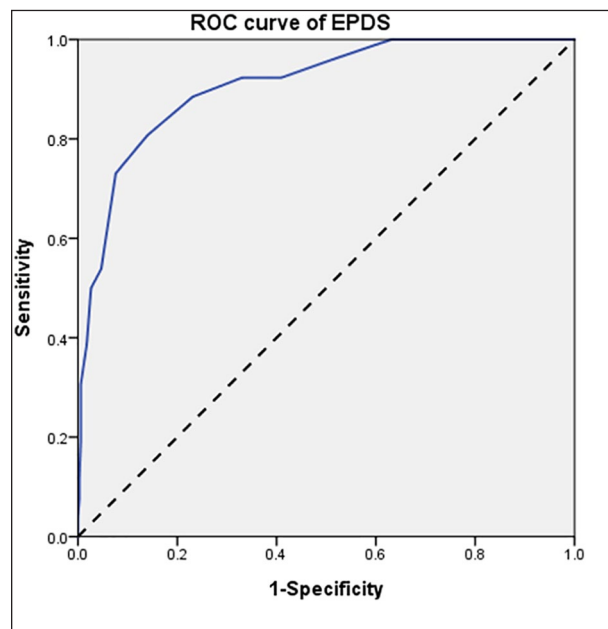


Figure 1. ROC Curve.

Note. EPDS = Edinburgh Postnatal Depression Scale; ROC = receiver operating characteristic.

higher scores on the EPDS is consistent with a meta-analysis, which reported a father's age was a predictor of postnatal depressive symptoms (Rao et al., 2020).

To investigate whether job qualities might influence the onset of postnatal depression in new fathers, we divided participants' type of employment into nontechnical jobs and technical/professional jobs. This categorization identified fathers employed in a nontechnical job had significantly higher scores on the EPDS compared with fathers employed in technical or professional positions. These findings might suggest that fathers employed in technical/professional positions might have experienced more disruptions in their lives as a result of having a newborn, which could result from difficulty balancing work life and family life, which can affect mental health status (Tsai et al., 2021). The increased level of EPDS identified in fathers employed in technical/professional positions may reflect the difficulty of investing in infant care and supporting their spouse/partner in childrearing. These findings are supported by a qualitative study of first-time university educated fathers in the United Kingdom, many of whom experienced stress, exhaustion, and poor concentration as they attempted to navigate their new role as fathers (Darwin et al., 2017).

Most fathers express support for infant feeding and the recognition of its importance (Bennett et al., 2016). This finding is strengthened by the results of our study showing more than half of the fathers were participants in their child's feeding. However, these fathers had significantly higher scores on the EPDS, suggesting their role may have increased paternal postnatal depression. This result might reflect findings of other studies, which have demonstrated that some fathers feel unable to effectively care for a new infant, or feel neglected, and can cause role conflict and poor psychological health (Chen et al., 2010; Darwin et al., 2017; Reisz et al., 2019; Swanson et al., 2017). To the best of our knowledge, there is no related evidence that reports a correlation between participation in infant feeding and postnatal depression in fathers of infants.

The Chinese version of the EPDS has been used for evaluating depressive symptoms in postpartum women for several years. It is only since 2010 that attention has shifted to the psychological changes that might occur in fathers after the birth of their infant (Paulson & Bazemore, 2010; Thombs et al., 2010). The criterion-related validity of the EPDS was satisfactory and moderately correlated with the BDI-II scores, which is in agreement with a study by Thiel et al. (2020), who reported postpartum depression in parents was positively correlated within 2 weeks to 12 months following the birth of their child, which is similar to the correlation of EPDS reported in this study. Our findings are in contrast to studies by Nishigori et al. (2020) and Kim et al. (2021), who reported there was no correlation between these scores. Thus, further studies will be required to confirm our findings.

The internal consistency of the Cronbach's alpha of .83 for fathers' scores on the EPDS was close to the value

of .83 reported for postpartum women (Heh, 2001), indicating that this scale had good reliability for assessing postnatal depression in fathers of infants. The BDI-II was used as the gold standard for the ROC analysis of the EPDS scale. The optimal cutoff of the EPDS was found to be 7/8 points, sensitivity was 81%, and specificity was 86%. The EPDS exhibited extremely good discrimination capacity when used to differentiate postnatal depression tendency. Correlation analyses conducted by previous studies have reported inconsistent cutoff scores. Cutoffs higher than 7/8 points include a U.K. study that reported a cutoff of 10/11 points, sensitivity of 89.5%, and specificity of 78.2% (Edmondson et al., 2010); an Italian study reported a cutoff of 12/13 points, sensitivity of 89.5%, and specificity of 78.2% (Loscalzo et al., 2015); and a Saudi Arabian study reported a cutoff of 8/9 points, sensitivity of 77.8%, and specificity of 81.3% (Shaheen et al., 2019). Studies with cutoffs lower than 7/8 include a Vietnamese study with a cutoff of 4/5 points (Tran et al., 2012) and an Australian study with a cutoff of 5/6 points (Matthey et al., 2001). These differences may be due to cultural influences.

Despite of its strengths, this study had some limitations. We used the BDI-II as the gold standard for the ROC analysis of the EPDS rather than a formal diagnosis by a psychiatrist of postnatal depression. Ideally, we would have encouraged fathers to visit a psychiatrist for an evaluation and an interview, but this was not practical given the time constraints of the participants. If time constraints can be overcome in future studies, a psychiatric diagnosis along with qualitative interviews will be conducted to add more information about paternal postnatal depression for new fathers in Taiwan. A second limitation is our conclusions about the impact of the fathers' occupations on EPDS scores. We did not evaluate the presence or absence of others at home to assist with caregiving, or whether finances allowed for outside assistance, which could have contributed to elevated postpartum depression. Although we examined the relationship between household income and EPDS, there was no difference between the two income brackets. We suggest collecting additional demographic data in future studies regarding caregiving support and allocation of finances.

Conclusion

Our findings demonstrated that the Chinese version of the EPDS developed by Heh (2001) had an internal consistency for fathers that is similar to that demonstrated for mothers. ROC curve analysis calculated the optimal AUC for determining the possible presence of postnatal depression in fathers of newborns. Although the cutoff score for postnatal depression differed from scores for fathers in other countries, our results are useful as a reference for

further research on postnatal depression for fathers of newborns in Taiwan. The validity and reliability of the EPDS indicate this instrument can be used in clinical practice.

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Criteria for Authorship

All authors made a substantial contribution to the concept or design of the work; or acquisition, analysis or interpretation of data. All authors have approved the version of the manuscript, which has not been submitted elsewhere for publication.



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ORCID iDs

Wei-Hsuan Jen  <https://orcid.org/0000-0002-4468-4948>
Yun-Fang Tsai  <https://orcid.org/0000-0002-2148-314X>

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