

# Screening of postpartum depression among new mothers in Istanbul: a psychometric evaluation of the Turkish Edinburgh Postnatal Depression Scale

**Perran Boran**

Marmara Universitesi

**Ahmed Waqas** (✉ [ahmedwaqas1990@hotmail.com](mailto:ahmedwaqas1990@hotmail.com))

CMH Lahore Medical College and Institute of Dentistry <https://orcid.org/0000-0002-3772-194X>

**Öykü Ozboru Askan**

Marmara Universitesi

**İrem Topçu**

Marmara Universitesi

**Tugay Dogan**

Marmara Universitesi

**Atif Rahman**

University of Liverpool

---

## Research note

**Keywords:** Edinburgh Postnatal Depression Scale, Turkey, validation, reliability

**Posted Date:** May 17th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-28021/v1>

**License:** © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

**Version of Record:** A version of this preprint was published on July 28th, 2020. See the published version at <https://doi.org/10.1186/s13104-020-05196-x>.

# Abstract

**Objective** This study is the first concerted effort to ascertain factor structure of EPDS using evidence based analytical techniques. It is the most widely used scale for assessing postpartum depression in Turkey, and yet no investigations have been conducted to assess its factor structure. This study was conducted from April 2012 to April 2018 at the Marmara University Hospital operating under the name of Marmara University Pendik Training and Research Hospital in Istanbul Turkey.

**Results** A total of 1700 women were included in this study, who responded to the EPDS, in addition to demographic characteristics and well-being of their offspring. A total of 1615 mothers provided adequate data for inclusion in analysis. Standardized Chronbach's alpha for EPDS was 0.81 with corrected item-total correlations ranging from 0.35 to 0.62. Parallel analysis, MAP Velicer Test and Hull's method dictated retaining of one factor structure. All the items revealed adequate communalities (> 0.20) except item 2 (enjoyment) and item 10 (self-harm). Their communalities were 0.16 and 0.19, however, these items were not dropped. All of the items yielded moderate to strong factor loadings. Minimum factor loading was for item 2 (0.40) and highest for item 8 (0.71).

## Introduction

Postpartum depression (PPD) is a debilitating common mental disorder and constitutes a major public health concern in low- and middle-income countries. Recent studies have shown that timely screening of PPD using psychometric scales is significantly beneficial in reducing its severity by manifolds (OR = 0.61; 95% CI 0.48–0.76) [1]. These psychometric scales have shown superiority over spontaneous detection in routine clinical evaluations and as a cost-effective method to identify new mothers eligible for psychological therapies [1].

One of the most popular and globally used instrument used for screening of postpartum depression is the Edinburgh Postnatal Depression Scale (EPDS) [2]. It is a 10 item self-report scale, originally developed for detection of postpartum depression in community and primary care setting, demonstrating adequate criterion, face and factor validity [3]. It was developed on the basis of Research Diagnostic Criteria for depressive illness obtained from Goldberg's Standardized Psychiatric Interview [3]. The scale is easily comprehensible, completed in a short time (~ 5 minutes) and has a simple scoring pattern. A Turkish translation of this scale was also found reliable among a Turkish perinatal population in the year 2004, albeit reporting poor criterion validity [4]. More than 90% of the studies conducted in Turkey utilize the EPDS scale for detection of PPD among new mothers [5, 6]. Yet no investigations so far have been conducted to ascertain dimensionality, or factor structure of EPDS in Turkey. Therefore, this study aims to validate EPDS using exploratory and confirmatory factor analytical techniques.

## Methods

### Study design & Setting

This psychometric validation study is part of a prospective birth cohort study of newborn infants followed up at the well-child outpatient clinic, Marmara University Pendik Training and Research Hospital from the year 2012 to 2018. The university hospital is located in Pendik, İstanbul; the largest city in Turkey. The district of Pendik is İstanbul's fifth most crowded district with a population of 646,400.

Since 2012, the outpatient clinic provides care for newborns of the mothers who give birth at the university hospital's maternity clinic. They receive a pamphlet with information regarding how to make an appointment at the well child outpatient clinic. Each term newborn ( $\geq 37$  weeks of gestational age) is generally scheduled for a first appointment at 1 month of age and is then followed up on a monthly basis for the first 6 months, at 3 months intervals until 18 months of age, and then every 6 months thereafter up to 5 years of age. Mothers are screened for postpartum depression at one month well child visit using the EPDS [4]. Ethical approval for this study was taken from the Ethical Review Committee at the Marmara University, Turkey. Written informed consent was taken from all participating mothers, who were ensured anonymity and that only group findings would be reported.

## **Statistical analysis**

Recent evidence for minimum sample size recommendations, however, suggest that psychometricians should consider number of number of factors, variables to factor ratio ( $p/f$ ), strength of communalities as well as level of criterion for a particular scale [7]. Therefore, keeping recent literature on EPDS, a minimum sample size of 50 seems to be appropriate for wide communalities.  $p/f$  (10), unidimensional factor structure and excellent criterion (0.98) [2, 3, 8, 9].

All analyses were conducted using SPSS (v.25) and FACTOR software [10]. Descriptive statistics were calculated for all quantitative and categorical variables. Visualization of histogram, Q-Q plots as well as values of skewness and kurtosis were used to assess normality in EPDS scores of participants. Floor and ceiling effects were considered significant if  $\geq 20\%$  either scored the lowest or maximum score on EPDS [11]. Internal consistency of the EPDS was tested using the Cronbach's alpha value, which was considered adequate at  $\geq 0.7$  [12, 13]. Mislevy & Block and McDonald's Omega was also utilize to assess internal consistency of EPDS [13, 14]. Convergent validity was assessed performing item-scale Pearson's product moment correlations corrected for overlaps, considered adequate at  $\geq 0.2$  for all items [15]. To assess the factor structure and dimensionality of EPDS in present sample, exploratory factor analyses was conducted using two techniques namely: Principal Axis Factoring (PFA) and Maximum Likelihood technique (ML). Total number of factors to retain was judged using several criteria including Cattell's Scree plot, parallel analysis based on minimum rank factor analysis, MAP Velicer Test and Hull's method [16]. Thereafter, suitability of each item to include in the final scale was assessed using several criteria: a) communality ( $\geq 0.2$ ) and b) factor loadings  $\geq 0.32$ .

Confirmatory factor analysis was further run to analyze the goodness of fit of the factor structure of EPDS. Several goodness of normed and non-normed fit indices were utilized including comparative fit index (CFI), normed fit index (NFI), Tucker-Lewis index (TLI), incremental fit index (IFI). While absolute fit indices included the goodness-of-fit index (GFI) and adjusted goodness-of fit index (AGFI) as well as root

mean square error of approximation (RMSEA), root mean squared residual (RMR), standard root mean squared residual (SRMR) [18]. Cut-off values for goodness of fit indices were  $> 0.90$ , RMSEA at  $< 0.08$  or not significantly greater than Kelley's criterion, and  $< 0.10$  for SRMR [18].

## Results & Discussion

### Demographic characteristics

EPDS data of 1614 mothers with a mean age of 28.87 years (5.46) was included in the exploratory and confirmatory factor analyses. Complete data was not available for 86 mothers and thus, excluded from the study. A significant majority 1313 (81.4%) reported being in a non-consanguineous marriage and lived in a nuclear family 1320 (81.8%). Mean number of years of education received by mothers were reported to be 8.64 (3.83). Most of the mothers were housewives 1314 (81.4%), 22 (1.4%) were unqualified workers, 100 (6.2%) low to middle quality workers, 136 (8.54%) were qualified government workers and 42 (2.6%) were professional workers. Around half of the mothers delivered their current child with normal vaginal delivery (808, 50.1%) while rest (804, 49.8%) delivered through caesarean section.

### Face and content validity

The participants generally reported good comprehensibility of the EPDS scale at the time of administration, pointing to a good face validity. Content validity however, was not assessed as it was done in a previous publication that details the forward and backward translation process and criterion validity of the questionnaire [4].

### Descriptive statistics

Mean score on Edinburgh Postnatal Depression Scale (EPDS) was 6.64 (4.63). Visualization of histogram and normal Q-Q plot revealed some degree of non-normality where distribution of total scores on EPDS was mildly skewed (0.78) and non-kurtotic (0.42) (Fig. 1). Mean scores on individual items ranged from 0.08 for item 10 exhibiting fewer symptoms of suicidality to 1.39 for item 3 exhibiting self-blaming or guilt among mothers. Furthermore, symptoms of anxiety (Item 4) and panic (Item 5) were most reported by the mothers.

Overall, a total of 310 (19.2%) of the mothers screened positive for depressive symptoms. Symptoms of guilt were reported by 1246 (77.20%), anxiety 1120 (69.39%), panic 979 (60.66%), sadness 893 (55.34%), poor coping 743 (46.03%), lack of sleep 660 (40.89%), crying spells 650 (40.27%), anhedonia 240 (14.87%), decreased mood 230 (14.25%), and suicidal ideation 90 (5.58%). Floors and ceiling effects were not evident in total scores of EPDS scale with less 20% of the respondents scoring either the lowest or highest of the possible scores on EPDS. A total of 99 (6.1%) respondents reported the lowest score on EPDS while only 1 (0.1%) reported the highest scores on it. This indicates that psychometric testing using EPDS was fit to measure depressive symptoms and responsive to change without being impaired by floor and ceiling effects.

# Reliability and convergent validity

Standardized Chronbach's alpha for EPDS was 0.81 with corrected item-total correlations ranging from 0.35 to 0.62. All the items had adequate item-total correlations, revealing no multicollinearity or singularity and were retained at this stage for exploratory factor analyses. Moreover, inter-item correlation matrix was run to ascertain convergent validity with all items exhibiting a correlation value of 0.2 with at least one other item. Moreover, other tests for reliability yielded adequate reliability of EPDS as assessed by McDonald's Omega (0.81) and Mislevy & Bock (1990) reliability estimate of 0.83.

## Factor Validity

Prior to running exploratory factor analyses, sampling adequacy was ascertained using the KMO statistics, yielding a good sampling adequacy (0.88), along with a significant Bartlett test of sphericity ( $\chi^2 = 3456.03$ ,  $P < 0.001$ ). Thereafter, observation of correlation matrix revealed that all EPDS items had yielded a correlation  $> 0.2$ , at least with one other item. Item 9 (crying spells) yielded highest correlation value of 0.54 with Item 8 (sadness). Thus, there were no issues of multicollinearity in the data. Sampling adequacy for each item was measured using KMO measure of sampling adequacy obtained in anti-image correlation matrix. It ranged from 0.863 (Item 1) to 0.915 (Item 7), therefore, yielding marvellous to meritorious KMO values for individual items. Therefore, all items were taken into exploratory factor analyses.

The criteria for determining the number of factors to retain was multifaceted and dependent on several factors including Eigen values  $> 1$ , Cattell's Scree plot as well as more advanced methods such as parallel analysis, Hull's method and MAP Velicer test. A total of 2 factors yielded an Eigen Value greater than 1.0 in present analysis. The first factor had an Eigen value of 3.68 explaining a variance of 36.77% while the second factor had an Eigen value of 1.10 leading to a cumulative 47.79% of variance explained by the two factors. However, Cattell's Scree plot (Fig. 2) favoured a one-dimensional model, demonstrating a sharp drop in Eigen value, from first to second factor. This uni-dimensionality was further confirmed in more advanced statistical analyses such as Parallel analysis. Parallel Analysis was run based on minimum rank factor analysis with 500 replicates (Timmerman & Lorenzo-Seva, 2011). This simulation revealed that the mean of random percentage of variance (18.1%) explained by second factor was greater than the percentage of variance obtained through EFA (12.9%). These were further confirmed by Minimum Average Partial Velicer test as well as the Hull Method.

All the items revealed adequate communalities ( $> 0.20$ ) except item 2 (enjoyment) and item 10 (self-harm). Their communalities were 0.16 and 0.19, however, these items were not dropped. All the items yielded moderate to strong factor loadings (Table 2). Minimum factor loading was for item 2 (0.40) and highest for item 8 (0.71).

Table 1  
Internal consistency and item-total correlations for individual items on EPDS

<b>Item</b>	<b>Mean</b>	<b>SD</b>	<b>Scale Mean if Item Deleted</b>	<b>Corrected Item-Total Correlation</b>	<b>Cronbach's Alpha if Item Deleted</b>
1. I have been able to laugh and see the funny side of things	0.16	0.433	6.48	0.409	0.785
2. I have looked forward with enjoyment to things	0.17	0.448	6.47	0.346	0.789
3. I have blamed myself unnecessarily when things went wrong	1.39	0.954	5.25	0.455	0.779
4. I have been anxious or worried for no good reason	1.16	0.934	5.49	0.545	0.765
5. I have felt scared or panicky for no very good reason	1.02	0.980	5.63	0.483	0.775
6. Things have been getting on top of me	0.83	1.003	5.82	0.507	0.772
7. I have been so unhappy that I have had difficulty sleeping	0.62	0.857	6.02	0.474	0.775
8. I have felt sad or miserable	0.71	0.802	5.93	0.619	0.756
9. I have been so unhappy that I have been crying	0.50	0.707	6.15	0.578	0.763
10. The thought of harming myself has occurred to me	0.08	0.339	6.57	0.369	0.790

Table 2  
Factor loadings for individual items obtained with PFA and ML

Statements	PAF	ML	Communalities
1. I have been able to laugh and see the funny side of things	0.483	0.477	0.234
2. I have looked forward with enjoyment to things	0.400	0.395	0.160
3. I have blamed myself unnecessarily when things went wrong	0.493	0.493	0.243
4. I have been anxious or worried for no good reason	0.592	0.591	0.350
5. I have felt scared or panicky for no very good reason	0.512	0.506	0.262
6. Things have been getting on top of me	0.567	0.562	0.322
7. I have been so unhappy that I have had difficulty sleeping	0.535	0.536	0.286
8. I have felt sad or miserable	0.714	0.721	0.510
9. I have been so unhappy that I have been crying	0.674	0.681	0.454
10. The thought of harming myself has occurred to me	0.434	0.435	0.188

## Confirmatory Factor Analysis

Confirmatory Factor Analysis with the ML was run to confirm the goodness of fit for one-dimension structure of EPDS. It revealed that the one-dimension structure for EPDS yielded adequate values for all the indices representing the goodness of fit. It yielded a RMSEA value of 0.066 ( $< 0.08$ ) which was not significantly greater than the cut-off value of 0.05. And according to Hair et al. (2010) and Hu & Bentler (1999), revealed a good fitness of the model. All goodness of fit indices  $> 0.90$  including CFI (0.93), TLI (0.91), GFI (0.99), AGFI (0.98), and GFI without diagonal values (0.97). RMSR was 0.047 which was not significantly larger than the expected mean value of RMSR for an acceptable model, as obtained by the Kelley's criterion ( $4/\sqrt{\text{sample size}}$ ).

## Known group analysis with characteristics of mother

There was significant association of EPDS scores with improved housing index ( $r = 0.1, p < 0.05$ ) and high income ( $r = 0.1, p < 0.05$ ). There were no significant relationships between type of delivery ( $\chi^2 = 0.69, p > 0.05$ ), mother's education levels ( $P > 0.05$ ) and age ( $P > 0.05$ ).

## Limitations

This study is the first concerted and largest effort to ascertain factor structure of EPDS using evidence based analytical techniques. Inclusion of a large sample size from an entire district of Turkey favours adequate power of the study and generalizability of its results. Important criterion and concurrent validation have already been reported in the past, and therefore, not included in present study.

## Abbreviations

EPDS

Edinburgh Postnatal Depression Scale

PPD

Postpartum depression

PFA

Principal Axis Factoring

ML

Maximum Likelihood technique

CFI

comparative fit index

NFI

normed fit index

TLI

Tucker-Lewis index

IFI

Incremental fit index

GFI

Goodness-of-fit index

AGFI

Adjusted goodness-of fit index

RMSEA

Root mean square error of approximation

RMR

Root mean squared residual

SRMR

Standard root mean squared residual

## Declarations

## Ethics approval and consent to participate

Ethical approval for this study was taken from the Ethical Review Committee at the Marmara University, Turkey. Written informed consent was taken from all participating mothers, who were ensured anonymity and that only group findings would be reported.

### Consent to publish

Not applicable.

## Availability of data and material

All data associated with this manuscript are available on request to the corresponding author.

## Competing interests

The authors report no declarations of interest. Dr. Ahmed Waqas serves BMC Research Notes as an associate editor, however, he was not involved in the peer review process for this manuscript.

## Funding

There was no funding for this study.

# Acknowledgements

Not applicable

## References

1. Hewitt CE, Gilbody SM. Is it clinically and cost effective to screen for postnatal depression: a systematic review of controlled clinical trials and economic evidence. 2009;;1019–27.
2. Gibson J, Shakespeare J, Price J, Gray RA. A systematic review of studies validating the Edinburgh Postnatal Depression Scale in antepartum and postpartum women. 2009;;350–64.
3. Cox JL, Sagovsky JMHR. Detection of Postnatal Depression Development of the 10-item Edinburgh Postnatal Depression Scale. 1987;;782–6.
4. Aydin N, Inandi T, Yigit A, Nalan Sahin Hodoglugil N. Validation of the Turkish version of the Edinburgh Postnatal Depression Scale among women within their first postpartum year. Soc Psychiatry Psychiatr Epidemiol. 2004;39:483–6.
5. Karaçam Z, Çoban A, Akbaş B, Karabulut E. Status of postpartum depression in Turkey: A meta-analysis. Health Care Women Int. 2018;39:821–41.
6. Özcan NK, Boyacıoğlu NE, Dinç H. Postpartum Depression Prevalence and Risk Factors in Turkey: A Systematic Review and Meta-Analysis. Arch Psychiatr Nurs. 2017;31:420–8. doi:10.1016/j.apnu.2017.04.006.
7. Mundfrom DJ, Shaw DG, Ke TL. Minimum Sample Size Recommendations for Conducting Factor Analyses. Int J Test. 2005;5:159–68. doi:10.1207/s15327574ijt0502\_4.
8. Tsai AC, Scott JA, Hung KJ, Zhu JQ, Matthews LT. Reliability and Validity of Instruments for Assessing Perinatal Depression in African Settings: Systematic Review and Meta-Analysis. 2013;8:1–12.
9. Thombs BD, Benedetti A, Kloda LA, Levis B, Riehm KE, Azar M, et al. Diagnostic accuracy of the Edinburgh Postnatal Depression Scale (EPDS) for detecting major depression in pregnant and

- postnatal women: protocol for a systematic review and individual patient data meta-analyses. 2015;;1–8.
10. Lorenzo-Seva U, Ferrando PJ. FACTOR: a computer program to fit the exploratory factor analysis model. *Behav Res Methods*. 2006;38:88–91.
  11. Waqas A, Farooq F, Raza M, Javed ST, Khan S, Ghumman ME, et al. Validation of the Internet Addiction Test in Students at a Pakistani Medical and Dental School. *Psychiatr Q*. 2017.
  12. Streiner DL. Starting at the beginning: An introduction to coefficient alpha and internal consistency. *J Pers Assess*. 2003.
  13. Dunn TJ, Baguley T, Brunsden V. From alpha to omega: A practical solution to the pervasive problem of internal consistency estimation. *Br J Psychol*. 2014.
  14. Mislevy R, Bock R. *BILOG 3: Item analysis and test scoring with binary logistic models*. 1990.
  15. Streiner DL, Norman GR. *Health Measurement Scales: A practical guide to their development and use*. 2008.
  16. Gaskin CJ, Happell B. On exploratory factor analysis: A review of recent evidence, an assessment of current practice, and recommendations for future use. *Int J Nurs Stud*. 2014;51:511–21.
  17. Gaskin CJ, Happell B. On exploratory factor analysis: A review of recent evidence, an assessment of current practice, and recommendations for future use. *Int J Nurs Stud*. 2014;51:511–21.
  18. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct Equ Model A Multidiscip J*. 1999;6:1–55.

## Figures

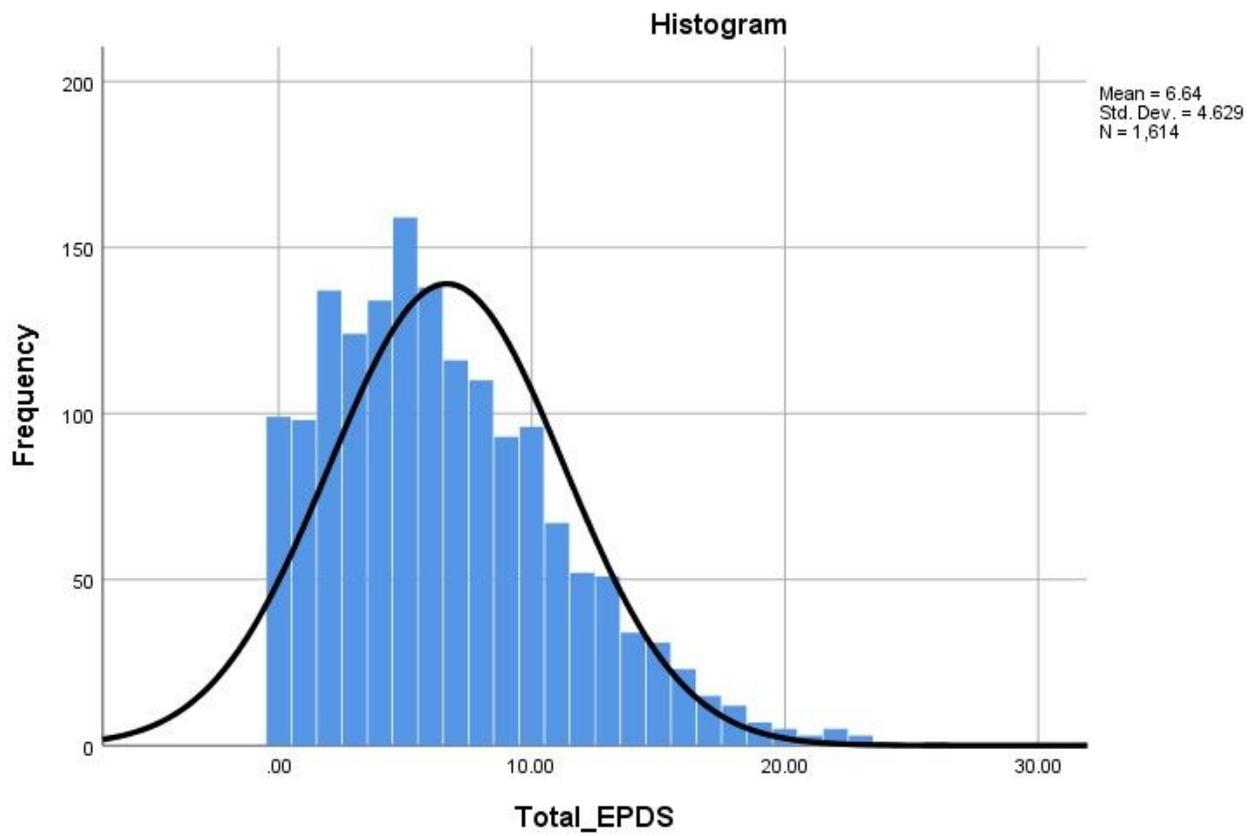


Figure 1

Histogram presenting distribution of EPDS scores among new Turkish mothers