Journal of Biostatistics and Epidemiology

J Biostat Epidemiol. 2021;7(2): 143-153

Original Article

The Prevalence of Postpartum Depression and Identification of Its Risk Factors in South-Western of Iran in 2019-2020

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ARTICLE INFO

Received 20.04.2021
Revised 23.05.2021
Accepted 01.06.2021
Published 19.06.2021

Key words:
Postpartum;
Depression;
Women;
Prevalence;
Iran

ABSTRACT

Introduction: Postpartum depression (PPD) is a major cause of burden of diseases in women within the first 4 weeks of delivery. The aim of this study was to determine the prevalence and the role of various factors in PPD in the northern and northeastern regions of Khuzestan province.

Methods: This descriptive-analytical study was undertaken as the first phase of a case-control study on 1424 mothers in the first 24 to 48 hours after childbirth between January 2019 and January 2020. The data collected covered three areas: baseline characteristics, medical history, and PPD. The latter was measured using the Edinburgh Postpartum Depression Scale with a cut-off point of equal to or greater than 12. The collected data were analyzed using Stata-16 software and simple and multiple Logistic Regression models.

Results: The prevalence of PPD was estimated at 26.6% in the study sample. In the multiple model, the History of elective abortion (OR= 2.26, 95%CI=1.19, 4.27), delivery in the summer (OR= 2.11, 95%CI=1.39, 3.20), birth defect (OR= 2.09, 95%CI=1.10, 3.94), the history of infertility treatment (OR= 0.33, 95CI=0.18, 0.61) and living in urban areas (OR= 0.52, 95%CI=0.39, 0.70), had relationship with the chance of developing PPD.

Conclusion: The results of this study, which sought to identify factors reinforcing and preventing PPD, can be used to identify mothers at risk for PPD. Moreover, it can help make appropriate interventions, including psychological and emotional support of mother during and even before pregnancy to alleviate PPD.

Introduction

Depression is one of the most prevalent psychological conditions in women of childbearing age (1). Postpartum depression (PPD) is a major cause of burden of gynecological disease during the first 4 weeks after childbirth (2). Depressed mothers are

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unable to properly take care of their infants, exhibit negative maternal behaviors, and forge a weak mother-child connection (3). Also, the children of depressed mothers are more likely to have poor emotional, social, and cognitive development (4-6).

PPD describes an intense feeling of sadness, desperateness, and recurring thoughts of death or harming oneself and the baby, or even suicide (7), which affects the mother's brain response and behavior (8). PPD can have severe short or long-term consequences for the mother, baby, and family; as for the infant, these side effects may include low immunization, psychological problems, increased risk of diarrhea, breastfeeding disorders, and impeded physical and mental development of the infant (9).

According to the World Health Organization, 20-40% of women in developing countries suffer from PPD (10). Globally, 10-20% of mothers struggle with PPD (11). The incidence of PPD varies in various parts of Iran and is estimated to be in the range of 5.5% to 43%; In a meta-analysis study, the overall incidence of this disorder in Iran was estimated at 28.7%, which varied proportional to the job of the mother, wanted or unwanted nature of pregnancy, type of delivery and place of residence (12-15).

All women are potentially at risk for PPD, but some factors such as childbirth at a young age, low level of education, history of abortion, discontent with the sex of the infant, factors related to parturition, poverty and low social support have been found to wield greater influence this disorder (8, 16-20).

The health of women, especially mothers after delivery, is a public concern and the health status of this group can subsequently affect the health of other family members and the society at large. Moreover, ethnic diversity and consequently cultural diversity in different provinces of Iran affect the incidence of mental health disorders such as PPD. Therefore, the present study was undertaken to determine the prevalence and the role of various factors in PPD in the northern and northeastern regions of Khuzestan province in 2019-2020.

Materials and Methods

Study design

This descriptive-analytical study was conducted as the first phase of a case-control study, which was approved by Dezful University of Medical Sciences in 2015, entitled "Investigating the relationship between diet and postpartum depression".

Setting

This study was performed between January 2019 and January 2020 in training hospitals, Dezful General as well as Alhadi Obstetrics and Gynecology in Shushtar, in the north and northeast of Khuzestan province, that more than 90% of deliveries in Dezful and Shushtar cities are conducted in these hospitals. Sampling was performed at the hospitals within the first 24 to 48 hours after delivery and prior to the discharge of mothers

Participants

The study participants were mothers referring to the above hospitals for childbirth at the time of the study and met the eligibility criteria. In this phase of the study, all mothers referring to the hospital during the sampling days, who were willing to participate in the study and signed a inform consent and were able to answer the questions, were enrolled. Participants were ensured that the refusal to attend the study had not effect on the quality of services they were provided with.

Variables

The collected information covered three sections including baseline characteristics, medical history and PPD status. As for the baseline characteristics section, maternal information such as age, occupation, pre-pregnancy weight, height, place of residence, level of education, husband's age, husband's occupation, family income and infant gender were collected. Regarding the medical records, information such as history of infertility

treatment, history of spontaneously abortion, history of elective abortion, newborn's birth defect, delivery rank and weeks of pregnancy at the time of childbirth were obtained. PPD was also measured using the Edinburgh Postnatal Depression Scale 1 (EPDS).

In this study, basic background characteristics and medical records were considered as exposures and PPD as the outcome. In multiple models, when determining the association of each factor with the outcome, the effect of other factors as confounders were controlled.

Data collection instrument

Baseline characteristics and medical history were obtained through a questionnaire (or in-person interview) and by reviewing participants' health and hospital records, respectively. EPDS was used to assess PPD status.

The EPDS contains 10 items, and the total score of this scale is between 0 and 30, the score of 12 or higher indicating PPD. Items 1, 2 and 4 are scored in the range of 0 to 3 and items 3, 5, 6, 7, 8, 9 and 10 are scored in the range of 3 to 0. The validity and reliability of the Iranian version of this questionnaire have been assessed by Ahmadi Kani Golzar et al. (21).

Sample size and sampling method

The sampling was conducted by a team of questioners consisting of two female students (one BA in nutrition and the other BA in midwifery). The members of the questioning teams, after receiving the necessary training, performed sampling in a hospital independently. Sampling was clustered and conducted in several stages. Accordingly, the number of days in each month was considered as clusters and 10 days of each month were randomly selected for sampling. On the selected days, the questioning teams visited the obstetrics and gynecology wards of the hospitals at 8 am (beginning of the morning shift of the hospital) and collected information from all of admitted mothers who the eligibility criteria of the study, by census method. Mothers who were literate completed the questionnaire and any ambiguities in the questions was addressed by the questioners. For mothers who were illiterate, the questionnaires were completed by the questioners in the form of a questionnaire-interview. If the participants spoke a language other than the official language of the country (Persian), the questions were translated into the desired language with the help of hospital staff or the patient's companion. The sampling process was observed in all seasons and finally 1424 subjects were selected to enter the study.

Statistical analysis

Data were analyzed using Stata-16 software. Quantitative variables were analyzed continuously and using mean and standard deviation, and qualitative variables were analyzed categorically and using the frequency percentage.

To calculate BMI, the ratio of weight (Kg) divided by the square of height (meter) was used. Accordingly, the participants were analyzed in groups of low weight (less than 18.5), normal (18.5-24.9), overweight (25-29.9), class 1 obesity (30-34.9), class 2 obesity (35-39.9) and class 3 obesity (equal to and greater than 40).

In data analysis, first, based on baseline characteristics and medical records the general prevalence of PPD was calculated. In the next step (According to the Hosmer and Lemeshow method(22)), the simple Logistic Regression model was employed at a significant level of $\alpha = 0.2$ for determine the crude relationship of each variable with PPD, then to control the confounding effect of the variables on each other, the variables that had a significant relationship with the chance of PPD, were included in the multiple Logistic Regression model at a significant level of $\alpha = 0.05$.

Results

Of the mothers who were eligible to participate in the study, 86 were not willing to participate in the study. Finally, 1424 mothers with a mean age of 27.47±5.40 years and a gestational age at

the time of childbirth of 38.70±1.50 weeks were studied. The majority of mothers had natural delivery (20.1%) and were overweight or obesity (76.8%) before pregnancy. About 20% had a history of spontaneously abortion and less than 4% had a history of elective abortion.

Since 379 participants had PPD (26.6%). Table 1 shows the prevalence of PPD based on subgroups.

In the analysis of factors affecting PPD, the simple model suggested that the variables of higher-than-normal pre-pregnancy BMI, higher level of education, birth defect, History of elective abortion, delivery in the summer and cesarean delivery are risk factors, and variables of difference age between mother and husband, living in urban areas, history of infertility treatment, low delivery rank are preventive factors for PPD (Table 2).

In the multiple model and after adjustment for the factors, it was observed that the history of elective abortion (OR = 2.26, 95% CI = 1.19-4.27, P = 0.012), delivery in summer (OR = 2.11, 95% CI = 1.39-3.20, P <0.001) and newborn's birth defect (OR = 2.09, 95% CI = 1.10-3.94, P = 0.023), had relationship with elevated chance of PPD. Moreover, the history of infertility treatment (OR = 0.33, 95% CI = 0.18-0.61, P <0.001) and living in urban areas (OR = 0.52, 95% CI = 0.39-0.70, P<0.001), were related to the decreased chance of developing PPD (Table 2).

Table 1. Prevalence of PPD according to baseline characteristics of participants in the northern and northeastern regions of Khuzestan province in 2019-2020.

Variable		**Number of participant (Percent)**	**Prevalence of PPD[a] (%)**
Mother's age (Mean± Sd[b])		27.47±5.40	
Difference of parental age		4.46 ± 4.35	
Pregnancy weeks at childbirth (Mean± Sd[2])		38.70±1.50	
newborn's birth defect	No	1372 (96.3)	26.1
	Yes	52 (3.7)	40.4
BMI	Normal weight	211 (15.3)	23.2
	Overweight	531 (38.4)	25.6
	Class 1 Obesity	398 (28.8)	25.9
	Class 2 Obesity	176 (12.7)	32.4
	Class 3 Obesity	66 (4.8)	43.9
Delivery rank	1	485 (34.1)	19.2
	2	610 (42.9)	34.4
	3	208 (14.6)	26.4
	4	63 (4.4)	19
	More than 5	57 (4)	15.8
Type of delivery	Natural	782 (54.9)	20.1

	Cesarean	642 (45.1)	34.6
History of infertility treatment	No	1312 (92.1)	27.8
	Yes	112 (7.9)	12.5
History of spontaneously abortion	No	1130 (79.4)	28.1
	Once	216 (15.2)	22.7
	More than once	77 (5.4)	15.6
History of elective abortion	No	1372 (96.3)	26.1
	Yes	52 (3.7)	40.4
Place of residence	Rural	494 (35)	30
	Urban	919 (65)	24.9
Gender of newborns	Female	650 (46.4)	26
	Male	726 (51.8)	27.5
	Twin	26 (1.9)	38.5
Mother's education	Primary education	708 (49.8)	21.2
	Diploma	479 (33.7)	30.5
	University degree	236 (16.6)	35.2
Economic status	Weak	646 (52.3)	33.3
	Moderate	483 (39.1)	25.7
	Good	106 (8.6)	19.8
Mother's job	Housewife	1362 (96.2)	27.1
	Self-employed	17 (1.2)	23.5
	Employee	37 (2.6)	8.1
Husband's job	Unemployed	110 (7.7)	22.7
	Self-employed	913 (64.2)	27.1
	Employee	201 (14.3)	30.9
	labor	196 (13.8)	22.4
Total		1424(100)	379(26.6)

(a) Postpartum Depression (b) Standard Deviation

Table 2. Relationship between various factors and chance of PPD in the northern and northeastern regions of Khuzestan province in 2019-2020.

Variables		Crude[a] model		Adjusted[b] model	
		OR[c] (80% CI[d])	P-Value	OR[c] (95%CI[d])	P-Value
Difference age between mother and Husband (continues)		0.97(0.95, 0.98)	**0.038**	0.96(0.93, 0.99)	**0.031**
BMI (trend)		1.20(1.11, 1.29)	**0.001**	1.25(1.10, 1.43)	**<0.001**
Mother education (trend)		1.45(1.31, 1.60)	**<0.001**	1.82(1.48, 2.24)	**<0.001**
newborn's birth defect	Have not	(Reference)		(Reference)	
	Have	1.91(1.32, 2.77)	**0.024**	2.09(1.10, 3.94)	**0.023**
History of elective abortion	Have not	(Reference)		(Reference)	
	Have	1.91(1.32, 2.77)	**0.024**	2.26(1.19, 4.27)	**0.012**
Place of residence	Rural	(Reference)		(Reference)	
	Urban	0.77(0.66, 0.90)	**0.041**	0.52(0.39, 0.70)	**<0.001**
History of spontaneously abortion	Have not	(Reference)		(Reference)	
	Once	0.74(0.59, 0.93)	**0.1**	0.65(0.44, 0.96)	**0.033**
	More than once	0.47(0.31, 0.71)	**0.019**	0.61(0.30, 1.22)	0.165
History of infertility treatment	Have not	(Reference)		(Reference)	
	Have	0.37(0.25, 0.53)	**0.001**	0.33(0.18, 0.61)	**<0.001**
Type of delivery	Natural	(Reference)		(Reference)	
	Cesarean	2.10(1.79, 2.45)	**<0.001**	1.67(1.27, 2.19)	**<0.001**
Mother's job	housewife	(Reference)		(Reference)	
	Self-employed	0.82(0.39, 1.73)	0.743	0.61(0.18, 2.03)	0.425
	Employee	0.23(0.10, 0.51)	**0.018**	0.18(0.05, 0.64)	**0.008**
Father's job	Unemployed	(Reference)		(Reference)	
	Self-employed	1.26(0.92, 1.71)	0.333	1.10(0.64, 1.87)	0.716
	Employee	1.51(1.07, 2.15)	**0.126**	1.08(0.57, 2.05)	0.790
	labor	0.98(0.68, 1.41)	0.955	1.10(0.59, 2.03)	0.759
Delivery Rank	1	(Reference)		(Reference)	
	2	2.21(1.84, 2.65)	**<0.001**	1.86(1.34, 2.57)	**<0.001**
	3	1.51(1.18, 1.94)	**0.033**	1.84(1.20, 2.83)	**0.005**
	4	0.99(0.64, 1.53)	0.981	1.43(0.69, 2.96)	0.325
	More than 5	0.79(0.48, 1.28)	0.537	1.13(0.51, 2.50)	0.756

Season	Spring	(Reference)		(Reference)	
	Summer	2.19(1.73,2.77)	**<0.001**	2.11(1.39, 3.20)	**<0.001**
	Fall	1.24(0.97, 1.59)	0.261	1.14(0.75, 1.74)	0.524
	Winter	0.99(0.79, 1.23)	0.960	0.85(0.59, 1.25)	0.429

(a) Simple logistic regression, (b) Multiple logistic regressions, (c) Odds Ratio, (d) Confidence Interval

Discussion

The goal of this study was to determine the prevalent and role of various factors affecting PPD in the northern and northeastern regions of Khuzestan province. In this study, 1424 mothers were examined in the first 24 to 48 hours after delivery in the Obstetrics and Gynecology Ward of two hospitals prior to their discharge. The general prevalent of PPD was estimated at 26.6%. Also, controlling the confounding effect of variables on each other, the history of elective abortion, delivery in summer and newborn's birth defect were found to be strongly related to the higher chance of PPD and the history of infertility treatment and living in urban areas had the strongest relationship with a lower chance of PPD.

In various studies conducted in the Middle East, the prevalent of PPD has been reported to be 10-51.8%. For example, the prevalent of PPD in Syria (28.2%), Turkey (27.2%), Egypt (51.8%), Qatar (17.6%), the United Arab Emirates (10-22%), Iran (5.5-43%) and Palestine (19-14%) have been measured in previous studies (12-15, 23-25). These values are higher than the prevalent of PPD in developed countries such as the United States (10%), Sweden (13%), Australia (3.3%), Canada (4.7%) and Norway (10.1%) (26-30). Moreover, the prevalent of PPD in Arab immigrants was 36% in the United States and 25% in Ethiopia (27, 31). The reason for the low prevalence of depression in developed countries can be the existence of codified programs for men to participate and support their wives during the prenatal period, during childbirth and after childbirth, which plays an essential role in maternal health and feeling more capable of enduring and adapting to the stresses and difficulties of pregnancy and childbirth, as well as reducing the stress of this period(32).

In this study, pre-pregnancy overweight and obesity manifested a positive and significant relationship with a higher chance of PPD. This means that elevated BMI increases the chance of developing PPD by 1.25 times. In the same studies, it has been shown that a BMI of above 35 (class 2 obesity or higher) increases the risk of PPD(33, 34), which is consistent with the results of the present study. According to the study of Adkins et al., weight gain during pregnancy in mothers with class 3 obesity before pregnancy was not associated with PPD(35). This finding could indicate the effect of pre-pregnancy overweight and obesity on postpartum depression, and pregnancy overweight may not have a significant effect on postpartum depression. Various studies have examined the relationship between consumption of certain dietary factors that are a major cause of overweight and obesity, and mental health, and the results show that the consumption of certain substances and dietary factors can affect a person's physiological, neurological and psychological response, including depression to stress (36-46).

The multiple model, after being adjusted for other factors, revealed that mothers whose infants were born with a birth defect were 2.06 times have a higher Chances of develop PPD. In the study of Laudi et al., there was no any statistically significant relationship between neonatal encephalopathy at birth and PPD (47). The discrepancy of their results with our results could be due to the focus on a specific defect. While, in some studies, infant health problems

within the first 12 hours after birth are one of the main determinants of PPD (48, 49), which is consistent with the findings of our study.

The results of many studies have illustrated the effect of cesarean on elevated chances of PPD (14, 25, 29). It is in keeping with the results of our study, according to which cesarean significantly increases the chances of PPD compared to the normal delivery.

A history of elective abortion can be due to an unwanted pregnancy or medical problems for the fetus or mother. Furthermore, if the pregnancy is planned, the mother is reluctant to have an abortion, but spontaneously abortion is beyond the mother's control. A history of elective abortion was significantly related to elevated chance of PPD and there was a significant relationship between the history of one-time spontaneously abortion and decreased chance of PPD. Research has shown that in American states where abortion is banned, the prevalence of PPD has been dramatically higher than states where abortion is legal (50). Also, in the study of Burgut et al., the threat of abortion as well as unwanted pregnancy, which increases the risk of elective abortion, raise the chances of PPD by 2.55 and 1.84 times (25), respectively. In Asaye et al.'s study, unwanted pregnancy and the history of abortion increased the chances of PPD by 2.02 and 1.79 times (31) respectively which is aligned with the findings of our study. Since non-differential misclassification bias with regard to the history of elective abortion could not be eliminated, the relationship between the history of elective abortion and the chance of PPD is probably stronger than the value obtained in our study.

In this study, the history of infertility treatment, as a function of infertility history, significantly reduced the chance of PPD. In the study of Burgut et al., the history of infertility increased the chance of unadjusted PPD by 3.54 times (25), which is inconsistent with the findings of our study. This discrepancy may be due to the unadjusted of other effective variables. Also, in similar studies, after adjusting the possible effective factors, no statistically significant relationship has been observed between the history of infertility treatment and PPD(51, 52), which is in disagreement with the results of our study. This disagreement may be due to the cultural differences of participants or the nature of the adjusted variables.

One of the limitations of this study was the collection of information about history of infertility treatment, history of spontaneous abortion and history of voluntary abortion, which was subject to information bias and non-differential misclassification due to the self-reporting nature of data collection. This is because mothers are likely to underreport abortions, avoid reporting elective abortions or misreport elective as spontaneously.

Conclusion

The overall prevalence of postpartum depression in this study is similar to the prevalence of this disorder in the Middle East and other developing countries, but factors associated with this type of depression seem to vary in different countries and cultures. In conclusion, the high level of mother's education, overweight and obesity, a history of elective abortion, above second delivery rank, cesarean, delivery in summer and birth defects in newborn are major factors that increase the chance of PPD while a history of spontaneously abortion, a history of infertility treatment, and living in urban areas reduce the chances of developing PPD. The results of this descriptive-analytical study on factors reinforcing and preventing PPD can be used to identify mothers at risk of PPD. Accordingly, by planning for psychological and emotional support of these mothers during pregnancy and even before pregnancy, PPD could be alleviated.

Acknowledgments

We would like to thank all mothers and officials of Dezful general hospitals and Alhadi Shushtar Obstetrics and Gynaecology Hospital, who cooperated with the research team.

Financial support and sponsorship

This article is part of a research project approved by Dezful University of Medical Sciences, and confirmed by the ethics committee of this university (ethics code IR.DUMS.REC.1394.12).

Conflicting of Interest

All the authors of the article state that they have no conflict of interest regarding the results.

References

1. Parsons CE, Young KS, Rochat TJ, Kringelbach ML, Stein A. Postnatal depression and its effects on child development: a review of evidence from low-and middle-income countries. British medical bulletin. 2012;101(1):57-79.

2. Edition F. Diagnostic and statistical manual of mental disorders. Am Psychiatric Assoc. 2013.

3. Abebe A, Tesfaw G, Mulat H, Hibdye G. Postpartum depression and associated factors among mothers in Bahir Dar Town, Northwest Ethiopia. Annals of general psychiatry. 2019;18(1):19.

4. Kirchengast S. The insane woman-mental disorders and female life history-a Darwinian approach. Neuropsychiatry. 2016;6(5):286–97.

5. Reiter SF, Veiby G, Daltveit A-K, Engelsen BA, Gilhus NE. Psychiatric comorbidity and social aspects in pregnant women with epilepsy—the Norwegian Mother and Child Cohort Study. Epilepsy & Behavior. 2013;29(2):379-85.

6. Gjerdingen DK, Yawn BP. Postpartum depression screening: importance, methods, barriers, and recommendations for practice. The Journal of the American Board of Family Medicine. 2007;20(3):280-8.

7. Hansotte E, Payne SI, Babich SM. Positive postpartum depression screening practices and subsequent mental health treatment for low-income women in Western countries: a systematic literature review. Public Health Reviews. 2017;38(1):3.

8. Farajzadegan Z, Nourbakhsh SF, Mostajeran M, Loghmani AJJoIMS. Cervical Cancer Screening Status in 35 to 60 Year-old Women in Isfahan, Iran. 2012;30(208).

9. Iranian center for control and prevention. Cancer registration in Iran. Tehran, Iran: Ministry of Health and Medical Education; 2006.

10. Khalifa DS, Glavin K, Bjertness E, Lien L. Postnatal depression among Sudanese women: prevalence and validation of the Edinburgh Postnatal Depression Scale at 3 months postpartum. International journal of women's health. 2015;7:677.

11. Salem MN, Thabet MN, Fouly H, Abbas AM. Factors affecting the occurrence of postpartum depression among puerperal women in Sohag city, Egypt. Proceedings in Obstetrics and Gynecology. 2017;7(1):1-10.

12. Veisani Y, Sayehmiri K. Prevalence of postpartum depression in Iran-A systematic review and meta-analysis. The Iranian Journal of Obstetrics, Gynecology and Infertility. 2012;15(14):21-9.

13. Goshtasebi A, Alizadeh M, Gandevani SB. Association between maternal anaemia and postpartum depression in an urban sample of pregnant women in Iran. Journal of health, population, and nutrition. 2013;31(3):398.

14. Taherifard P, Delpisheh A, Shirali R, Afkhamzadeh A, Veisani Y. Socioeconomic, psychiatric and materiality determinants and risk of postpartum depression in border city of ilam, Western iran. Depression research and treatment. 2013;2013.

15. Abdollahi F, Etemadinezhad S, Lye M-S. Postpartum mental health in relation to sociocultural practices. Taiwanese Journal of Obstetrics and Gynecology. 2016;55(1):76-80.

16. Khalifa DS, Glavin K, Bjertness E, Lien L. Determinants of postnatal depression in Sudanese women at 3 months postpartum: a cross-sectional study. BMJ open. 2016;6(3):e009443.

17. Saleh E-S, El-Bahei W, del El-Hadidy MA, Zayed A. Predictors of postpartum depression in a sample of Egyptian women. Neuropsychiatric disease and treatment. 2013;9:15.

18. Hamdan A, Tamim H. Psychosocial risk and protective factors for postpartum depression in the United Arab Emirates. Archives of women's mental health. 2011;14(2):125-33.

19. Islam MJ, Broidy L, Baird K, Mazerolle P. Intimate partner violence around the time of pregnancy and postpartum depression: The experience of women of Bangladesh. PloS one. 2017;12(5):e0176211.

20. Acharya DR, Bell JS, Simkhada P, Van Teijlingen ER, Regmi PR. Women's autonomy in household decision-making: a demographic study in Nepal. Reproductive health. 2010;7(1):15.

21. Ahmadi kani Golzar A, GoliZadeh Z. Validation of Edinburgh Postpartum Depression Scale (EPDS) for screening postpartum depression in Iran. Iranian Journal of Psychiatric Nursing. 2015;3(3):1-10.

22. Harbord R. Statistics for Epidemiology. Nicholas P Jewell. Boca Raton: Chapman & Hall/CRC, 2004, pp. 352, $69.95 (HB) ISBN: 1-58488-433-9. International Journal of Epidemiology. 2004;33(5):1158-a--a.

23. Qandil S, Jabr S, Wagler S, Collin SM. Postpartum depression in the Occupied Palestinian Territory: a longitudinal study in Bethlehem. BMC pregnancy and childbirth. 2016;16(1):375.

24. Haque A, Namavar A, Breene K-A. Prevalence and risk factors of postpartum depression in Middle Eastern/Arab women. Journal of Muslim mental health. 2015;9(1).

25. Burgut FT, Bener A, Ghuloum S, Sheikh J. A study of postpartum depression and maternal risk factors in Qatar. Journal of Psychosomatic Obstetrics & Gynecology. 2013;34(2):90-7.

26. Ogbo FA, Eastwood J, Hendry A, Jalaludin B, Agho KE, Barnett B, et al. Determinants of antenatal depression and postnatal depression in Australia. BMC psychiatry. 2018;18(1):49.

27. Alhasanat D, Fry-McComish J, Yarandi HN. Risk for postpartum depression among immigrant Arabic women in the United States: A feasibility study. Journal of Midwifery & Women's Health. 2017;62(4):470-6.

28. Fok CCT, Hayes DK, Curtis AB, Nihoa WK, Shim MJ. Prevalence and Risk Factors for Self-Reported Postpartum Depression Symptoms (SRPDS) in Hawai ‘i, 2012–2015. Hawai'i Journal of Health & Social Welfare. 2020;79(5):153.

29. Eckerdal P, Georgakis MK, Kollia N, Wikström AK, Högberg U, Skalkidou A. Delineating the association between mode of delivery and postpartum depression symptoms: a longitudinal study. Acta obstetricia et gynecologica Scandinavica. 2018;97(3):301-11.

30. Daoud N, O’Brien K, O’Campo P, Harney S, Harney E, Bebee K, et al. Postpartum depression prevalence and risk factors among Indigenous, non-Indigenous and immigrant women in Canada. Canadian Journal of Public Health. 2019;110(4):440-52.

31. Asaye MM, Muche HA, Zelalem ED. Prevalence and Predictors of Postpartum Depression: Northwest Ethiopia. Psychiatry Journal. 2020;2020.

32. Mehran N, ALAVI MH. A review of men's participation in perinatal care: A systematic review. 2020.

33. Silverman ME, Smith L, Lichtenstein P, Reichenberg A, Sandin S. The association between body mass index and postpartum depression: A population-based study. Journal of affective disorders. 2018;240:193-8.

34. LaCoursiere D, Barrett-Connor E, O’Hara M, Hutton A, Varner M. The association between prepregnancy obesity and screening positive for postpartum depression. BJOG: An International Journal of Obstetrics & Gynaecology. 2010;117(8):1011-8.

35. Adkins LD, Tucker A, Gatta LA, Siegel AM, Reiff E, Brown HL, et al. Gestational weight gain and postpartum depression in women with class III obesity. American journal of perinatology. 2020;37(01):019-24.

36. Brody S, Preut R, Schommer K, Schürmeyer TH. A randomized controlled trial of high dose ascorbic acid for reduction of blood pressure, cortisol, and subjective responses to psychological stress. Psychopharmacology. 2002;159(3):319-24.

37. Carter JR, Schwartz CE, Yang H, Joyner MJ. Fish oil and neurovascular reactivity to mental stress in humans. American Journal of Physiology-Regulatory, Integrative and Comparative Physiology. 2013;304(7):R523-R30.

38. Harris E, Kirk J, Rowsell R, Vitetta L, Sali A, Scholey AB, et al. The effect of multivitamin supplementation on mood and stress in healthy older men. Human Psychopharmacology: Clinical and Experimental. 2011;26(8):560-7.

39. Hellhammer J, Hero T, Franz N, Contreras C, Schubert M. Omega-3 fatty acids administered in phosphatidylserine improved certain aspects of high chronic stress in men. Nutrition research. 2012;32(4):241-50.

40. Hellhammer J, Vogt D, Franz N, Freitas U, Rutenberg D. A soy-based phosphatidylserine/phosphatidic acid complex (PAS) normalizes the stress reactivity of hypothalamus-pituitary-adrenal-axis in chronically stressed male subjects: a randomized, placebo-controlled study. Lipids in health and disease. 2014;13(1):121.

41. Adam TC, Epel ES. Stress, eating and the reward system. Physiology & behavior. 2007;91(4):449-58.

42. . Lindsay KL, Buss C, Wadhwa PD, Entringer S The interplay between maternal nutrition and stress during pregnancy: Issues and considerations Annals of Nutrition and Metabolism 2017;70(3):191-200.

43. Jans G, Matthys C, Bogaerts A, Ameye L, Delaere F, Roelens K, et al. Depression and anxiety: lack of associations with an inadequate diet in a sample of pregnant women with a history of bariatric surgery—a Multicenter Prospective Controlled Cohort Study. Obesity surgery. 2018;28(6):1629-35.

44. Opie RS, O'Neil A, Itsiopoulos C, Jacka FN. The impact of whole-of-diet interventions on depression and anxiety: a systematic review of randomised controlled trials. Public health nutrition. 2015;18(11):2074-93.

45. Li B, Lv J, Wang W, Zhang D. Dietary magnesium and calcium intake and risk of depression in the general population: A meta-analysis. Australian & New Zealand Journal of Psychiatry. 2016;51(3):219-29.

46. Wang L, Shen X, Wu Y, Zhang D. Coffee and caffeine consumption and depression: A meta-analysis of observational studies. Australian & New Zealand Journal of Psychiatry. 2015;50(3):228-42.

47. Laudi A, Peeples E. The relationship between neonatal encephalopathy and maternal postpartum depression. J Matern Fetal Neonatal Med. 2019:1-5.

48. Lasheras G, Farré-Sender B, Porta R, Mestre-Bach G. Risk factors for postpartum depression in mothers of newborns admitted to neonatal intensive care unit. Journal of Reproductive and Infant Psychology. 2020:1-15.

49. Nishigori H, Obara T, Nishigori T, Metoki H, Mizuno S, Ishikuro M, et al. The prevalence and risk factors for postpartum depression symptoms of fathers at one and 6 months postpartum: an adjunct study of the Japan Environment & Children's Study. The Journal of Maternal-Fetal & Neonatal Medicine. 2018:1-8.

50. Medoff MH. The relationship between restrictive state abortion laws and postpartum depression. Social Work in Public Health. 2014;29(5):481-90.

51. Lynch CD, Prasad MR. Association between infertility treatment and symptoms of postpartum depression. Fertility and Sterility. 2014;102(5):1416-21.

52. Akyuz A, Seven M, Devran A, Demiralp M. Infertility history: is it a risk factor for postpartum depression in Turkish women? The Journal of perinatal & neonatal nursing. 2010;24(2):137-45.