Italian Journal of
Gynæcology & Obstetrics
September 2023 - Vol. 35 - N. 3 - Quarterly - ISSN 2385 - 0868

Factors affecting the depression and impact of depression on maternal outcomes: a prospective observational study from a rural tertiary care South Indian Hospital

Rajesh **Venkataraman** [1], Shiv Kumar **Yadav** [1,*], Ravindra **S. Pukale** [2]

[1] Department of Pharmacy Practice, Sri Adichunchanagiri College of Pharmacy, Adichunchanagiri University, BG Nagara, Mandya, Karnataka, India.
[2] Department of Obstetrics and Gynaecology, Sri Adichunchanagiri Institute of Medical Science and Research Centre, Adichunchanagiri University, BG Nagara, Mandya, Karnataka, India.

ARTICLE INFO

History
Received: 06 September 2022
Received in revised form: 03 November 2022
Accepted: 08 November 2022
Available online: 20 September 2023

DOI: 10.36129/jog.2022.81
Key words
Pregnancy; obstetrics; prenatal; depression; gestation; mental health.

***Corresponding author:** Shiv Kumar **Yadav**, Research Scholar. Department of Pharmacy Practice, Sri Adichunchanagiri College of Pharmacy, Adichunchanagiri University, BG Nagara, Mandya – 571448, Karnataka, India.
Email: yadavshiv1222@gmail.com.
ORCID: 0000-0003-2641-6605.

ABSTRACT

Objective. There is a dearth of evidence from lower income countries on impact of depression and mental health issues on pregnancy outcomes. This study aimed to examine the factors affecting the depression and its effect on maternal outcomes in a rural South Indian tertiary care hospital.
Materials and Methods. A 9-month prospective observational study was carried out among the pregnant women in a tertiary care facility in south India. The pregnant woman aged 18 years or above were included in the study. The participants with a history of depressive symptoms and not willing to provide the informed consent were excluded from the study. The depression was measured using The Edinburgh Postnatal Depression Scale and a score of ≤ 13 and > 13 was considered to be no abnormality and possible depression. The effect of various demographics on depression and effect of depression on maternal outcomes is assessed using the chi-square and regression analysis, respectively. A P-value < 0.05 considered to be significant.
Results. A total of 150 patients were included in the study and 48% (n = 72) had the possible depression. The factors such as being obese (p = 0.020) and being a housewife (p = 0.000) were significantly associated with depression. Depression was significantly associated with the gestational diabetes (p = 0.036), but not with gestational hypertension and pre-eclampsia.
Conclusions. Among pregnant women, being obese, and housewife was significantly associated with depression. The depression was significantly associated with gestational diabetes.

INTRODUCTION

The depression can exist in an undetected state before becoming pregnant and can aggravate during pregnancy due to many issues. Pregnancy-related effects of depression cause higher hazards to the developing baby and a heavy burden on obstetric care providers [1]. Depression has been associated with various maternal outcomes such as heavy, larger, thicker, and less effective placentas and poor pregnancy consequences [2, 3]. It also causes postnatal abnormalities and other long-term consequences to the mother as well as the newborn [4]. Many abnormal physiological issues like decreased oesophageal sphincter tone, hormonal changes (human chorionic gonadotropin hormone), increased uterine size, and increased micturition can occur due to the emotional disturbance in pregnant woman [5].

The occurrence of noxious events such as miscarriage, complicated delivery, postpartum morbidity, and adverse health impacts on the offspring's short- and long-term development seem to be more common in women with clinical depression than the healthy woman [6, 7]. Appropriate medical care and diligent monitoring is crucial to avoid the depression related natal adverse events and depression is a known component that grows with gestational age [8-11].

This may start during pregnancy and continue after delivery, affecting the mother and the unborn child is very rare [12, 13]. There are few Indian studies [14, 15] that evaluated the complications of pregnancy and motherhood linked to psychiatric disorders like depression. However, these studies have limited sample size and did not address these issues in the rural community. The studies need to be conducted among the group of people who are on insufficient surveillance among the rural population. Hence, this study aimed to address the maternal outcomes among the pregnant woman with depression and also to explore the factors affecting the depression among them.

MATERIALS AND METHODS

Ethical approval and consent

The study was commenced after procuring an ethics approval from the institution's ethics committee (IEC/029/2021), and all study procedures were carried out in accordance with the Declaration of Helsinki. Prior to their participation in the study, each subject was asked to provide a signed informed consent. A written informed consent was obtained from all the participants before enrolling to the study.

Sampling technique and sample size calculation

A prospective random sampling technique was adapted in this study. We estimated a minimum sample size of 148 participants with a margin of error of 5%, power of 80%, precision of 0.05, at confidence interval of 95% and a prevalence of 24% by considering the prevalence in Indian studies to be in this range [15].

Study design and study setting

This was a prospective observational research study in a rural tertiary care hospital for a period of nine months (October 2021 to June 2022). The hospital setting is a 1,300 bedded hospital with all the facilities for the medical and maternal care with an advanced woman and child block. The hospital is accessible to more than three districts.

Participants inclusion and exclusion criteria

The pregnant women aged 18 or above and who are on their first and second trimester from a south Indian tertiary care teaching hospital were considered for this study. After obtaining an explanation of all the specific study methods, those who were accepted and willing to give written informed consent were included for this study. Participants who had a history of any psychological problem were not allowed to participate. The patients had a right to withdraw from the study at any point of time without even giving any justification.

Data collection and instruments

A detailed data collection form which included the patients' demographics, diagnosis, pregnancy details, stage of pregnancy, comorbidities, drugs used, clinical outcome, were designed to collect the data from patients. The enrolled patient was followed up to the third trimester and the depression were calculated using The Edinburgh Postnatal Depression Scale Questionnaire [16] as per the data from the patient record during third trimester. A

score of 13 or lesser considered to be no abnormality and a score of above 13 considered to be possible depression [16]. The maternal outcomes such as gestational hypertension (GHT), gestational diabetes (GDM) and pre-eclampsia was also measured at the last stage or third trimester of pregnancy.

Statistical analysis

All collected data were entered into Microsoft Excel, and statistical analysis was done with the help of a computer with Statistical Package for the Social Sciences version 16.0 developed by IBM [17]. The descriptive statistics were computed; the categorical and continuous data were presented as frequencies with percentage and mean with standard deviation, respectively. The demographic factors (age, BMI, education, diet, haemoglobin abnormality, occupation, annual income, BP in 3 months and BP in 6 months) and the depression were considered to be the independent and dependent factors, respectively while analysing the factors affecting the depression. Whereas depression and maternal outcomes (GDM, GHTN and preeclampsia) were considered to be the independent and dependent factors, respectively in case of analysing the effect of depression on maternal outcomes. A chi-square test and regression analysis were used to assess the effect of demographic factors on depression and effect of depression on maternal outcomes, respectively. The outcomes were expressed in odds ratios along with its 95% confidence interval. A probability value of less than 0.05 is considered to be statistically significant.

RESULTS

Demographic characteristics of the patients

As per the aforementioned criteria, 150 individuals in total with an average age of 25.05 ± 5.5 years were included in this study. 96.7% (n = 145) of the participants were aged 18 to 35, and the 3.3 percent (n = 145) were aged 36 to 60. Majority (65.3%) had a normal BMI, whereas 32% were obese. Among the participants, 52% had a higher secondary education and 71.3% were following the mixed diet. A major population (69.3%) were housewives. Among the included participants, 21 (14%), and 10 (6.7%) had a high BP at 3 months and 6 months, respectively.

Table 1. *Demographic details and pregnancy outcomes in the included participants.*

Demographic character	Frequency (%)
Age	
Mean age	25.05 ± 5.5 years
18-35	145 (96.7)
36-60	5 (3.3)
BMI	
Underweight	4 (2.7)
Normal	98 (65.3)
Overweight	48 (32)
Education	
Illiterate	7 (4.7)
High school	65 (43.3)
Higher secondary and above	78 (52)
Diet	
Mixed	107 (71.3)
Vegetarian	43 (28.7)
Occupation	
Private	30 (20)
Housewife	104 (69.3)
Government	16 (10.7)
Haemoglobin abnormality	
No	64 (42.7)
Yes	86 (57.3)
Family members	
Below 4	2 (1.3)
4-10	143 (95.3)
Above10	5 (3.3)
Annual Income (INR)	
Below 1 Lakh	99 (66)
Above 1 Lakh	51 (34)
BP at 3 months	
Normal	129 (86)
High	21 (14)
BP at 6 months	
Normal	140 (93.3)
High	10 (6.7)
Depression as per EPDS scale	
No abnormality	78 (52)
Possible depression	72 (48)
GDM	
No	91 (60.7)
Yes	59 (39.3)
GHT	
No	137 (91.3)
Yes	13 (8.7)
Pre-eclampsia	
No	142 (94.7)
Yes	8 (5.3)

Among the included participants, 48% (n = 72), 39.3 (n = 59), 8.7 (n = 13), and 5.3 (n = 8) of the participants observed to have a possible depression, GDM, GHT, and preeclampsia, respectively. The demographics and outcomes are presented in **Table 1**.

Factors affecting the depression

Various demographics factors were correlated with the depression and the factors such as being obese (p = 0.020; OR 2.356; 95%CI 1.147-4.838), and being a housewife (p = 0.000; OR 14.300; 95%CI 3.217-63.568) were significantly associated with a higher risk of depression. No other factors were correlated with depression among the pregnant women. The detailed analysis on factors affecting depression is provided in **Table 2**.

Effect of depression on maternal outcomes

The depression was significantly associated with the higher risk of gestational diabetes (p = 0.036; OR 2.051; 95%CI 1.049-4.008), but not with gestational hypertension (p = 0.073; OR 3.382; 95%CI 0.892-12.827) and preeclampsia (p = 0.137; OR 0.289; 95%CI 0.056-1.483) (**Table 3**). The overall findings of the study are provided in **Table 4**.

DISCUSSION

Depression is a major threat and identified as a global health hazard among the pregnant woman which is associated with negative impact on delivery and child health, hence this condition should be taken care very effectively to have better maternal outcomes [16]. This study analysed the factors contributing the depression among pregnant woman and how the depression affects the maternal outcomes.

It is observed that, a major proportion (96.7%) of the included participants were aged between 18 and 35. A Bangalore based study by Sheeba *et al*., recorded similar findings wherein 72.9% of their population were aged above 20. However, remaining 27.1% were ≤ 20 years of age [15]. This might be the result of Indian culture, where the girls will get married and becoming pregnant at their early stages of life [5, 17]. An earlier cross-sectional study

Table 2. *Factors affecting the depression among the pregnant women.*

Demographic	Variable	P-value	Odds ratio (95%CI)
Age	18-35	NA	1
	36-60	0.369	0.261 (0.028-2.388)
BMI	Underweight	NA	1
	Normal	0.134	6.000 (0.577-62.374)
	Overweight	**0.020***	**2.356 (1.147-4.838)***
Education	Illiterate	NA	1
	High school	0.126	5.415 (0.622-47.099)
	Higher secondary and above	0.093	0.564 (0.289-1.101)
Diet	Mixed	NA	1
	Vegetarian	0.896	0.954 (0.470-1.937)
Haemoglobin abnormality	No	NA	1
	Yes	0.220	0.665 (0.346-1.276)
Occupation	Private	NA	1
	Housewife	**0.000***	**14.300 (3.217- 63.568)***
	Government	0.533	1.432 (0.463-4.423)
Annual income	Below 1 Lakh	NA	1
	Above 1 Lakh	0.868	1.059 (0.538-2.083)
BP at 3 months	Normal	NA	1
	High	0.061	2.619 (0.956-7.175)
BP at 6 months	Normal	NA	1
	High	0.371	1.917 (0.461-7.967)

*Indicates the significant effect.

Table 3. *Effect of depression on maternal outcomes.*

Variable	Maternal outcome	P-value	Odds ratio (95%CI)
Depression	Gestational diabetes	**0.036***	**2.051 (1.049-4.008)***
	Gestational hypertension	0.073	3.382 (0.892-12.827)
	Pre-eclampsia	0.137	0.289 (0.056-1.483)

*Indicates the significant effect.

Table 4. *Overall interpretation of the findings.*

Significant factors affecting the depression	Significant effect of depression on maternal outcomes
Overweight (p = 0.020) Being housewife (p = 0.000)	Gestational diabetes (p = 0.036)

by Raj *et al*., among Indian woman 20-24 years indicated that, 44.5% reporting the child marriage; 22.6% reporting marriage before 16 years and 2.6% reporting marriage prior 13 years of age [17]. Another Ethiopian study recorded that, 53.9%, 34.1% and 12.0% were aged between 20-30, 15-19 and >30, respectively [16]. The woman carrying the baby during their early age should be provided with utmost care for a better maternal outcome.

Majority (65.3%) had a normal BMI, whereas 32% were obese. The cross-sectional study by Cochrane *et al*. recorded that more than 50% of their included participants were overweight or obese during the start of pregnancy, out of which 5.2% of mothers were morbidly obese. They also noted that the birth weight of mothers during delivery was further increased with a BMI of > 25 [18]. Among the participants, 52% had a higher secondary education and 71.3% were following the mixed diet. A study by Duko *et al*. recorded that 54% of their population had a higher secondary education [16].

A major population (69.3%) were housewives. A similar observation was reported by Duko *et al*., where 63.7% of their participants were housewives [16]. In India, major proportion of the woman engaged with household works and housewives. Though they are happy for being a housewife and taking care of family, proper support should be provided by the husband and in-laws. A qualitative research by Naz *et al*. observed a reduced support from the husbands and in-laws in terms of emotional, physical, psychological, housekeeping, and financial aspects during pregnancy [19]. This might further contribute to the anxiety and depression among the woman and affect their maternal health.

This study indicates that being obese (OR 2.35; p = 0.020) was significantly associated with a higher risk of depression. Many studies reported the similar findings. The study by Jani *et al*., among the 16,528 participants, recorded that the obesity at early pregnancy stage was significantly associated with perinatal depression (OR 1.421; p < 0.001), although this risk was mediated by vitamin D levels [20]. Another study Kumpulainen *et al*., among 3,234 pregnant women observed that maternal obesity was correlated with depressive symptoms during pregnancy (OR 1.43; p < 0.001) and after pregnancy (OR 1.36; p = 0.01) [21]. The other determinants of obesity such as gestational weight gain, pre-pregnancy obesity, higher BMI, and severe pre-pregnancy maternal obesity, were significantly associated with pre-natal depression and depressive symptoms [22-26].

The study by Cochrane *et al*. indicated that increased BMI was associated with a higher risk of transfer, GDM, and elective caesareans [18].

This study observed that being a housewife (p = 0.000) were significantly associated with a higher risk of depression. The study conducted by Fall *et al*. indicated that, women's employment status was significantly affecting the prenatal depression. The status such as women who had stopped working (OR 1.61) and housewives (OR 1.46; 95%CI 1.10-1.94) were a significant predictors depression [27]. Marital adjustment is very important, and findings indicate that a 52% reduction in depression after childbirth observed after explaining marital adjustment and social support [28]. Many other factors were found to be associated with the depression which include age, education, abortion status, loss of newborn child, history and current pregnancy, partner support, family feeling, poor social support and planned pregnancy were significantly associated with depression [16].

The findings from this study indicated a significant association between depression and gestational diabetes (p = 0.036; OR 2.051). A systematic review and meta-analysis by Delanerolle *et al*. observed a significant risk of GDM (OR 1.30; p = 0.01) among the women with history of depression [29]. A study by Mahale *et al*., among 600 post-natal woman, recorded that 7.7% of the pregnant woman had

a postpartum depression and 135 of them had a score of > 13 on the EPDS on the 3rd postpartum day [30]. Another systematic review by OuYang *et al*. also indicated a significant association between the depression and GDM among pregnant woman [31]. Antenatal and perinatal care is very important, and the studies are evident for a better neonatal and maternal outcomes among those who are adhering to the antenatal care interventions [32]. Successful interventions should be planned to control the depression among the pregnant women.

Sub-threshold psychiatric symptoms are a major important factor in predicting postpartum depression. Anger and its expression can be considered as significant factors for postpartum mood disorders onset. Early identification of these symptoms which potentiate the development of depression in the pregnant woman is very important for a better mental health and prevention of mental problems [33-35]. Evidences also indicates that rapid metabolic, hormonal, physiologic, and developmental changes, especially in adolescent pregnant woman, can lead to depression, though it is a complex process of change in physiology [36, 37].

The public and healthcare sector policy makers should make the relevant guidelines and should implement the interventional programs such as awareness campaigns and individualized counselling centres to tackle the depression and other mental health issues in the pregnant woman especially in rural areas for a better maternal outcomes and an excellent future generation. The study conducted by Quaresima *et al*. indicated that the post-diagnosis counselling plays an important role in improving women awareness about GDM, depression and foetal-maternal related risks [38]. A structured counselling should be planned with respect to the incidence, pathophysiology, risk factors, foetal-maternal risks, glucose monitoring, and pregnancy management among the pregnant woman which in turn helps to reduce the occurrence of maternal complications. A good trained team consist of a diabetologist and an obstetrician can perform the counselling for approximately 20-25 min to each woman and later they can be given a chance to ask their queries and share their feelings [38]. Moreover, these patients should be a followed up to check whether they are adherent to the recommendations or not.

The smaller population was a limitation of study, and further studies with a larger population shall be planned to strengthen our findings. This study was conducted among the rural population and hence future comparative studies are needed to understand the effect of living status, economic status and employability status in prenatal outcomes.

CONCLUSIONS

The current evidence implies that, being obese and housewife was significantly associated with the depression and depression was significantly associated with the gestational diabetes. Further adequately powered prospective studies are needed to strengthen these findings.

COMPLIANCE WITH ETHICAL STANDARDS

Authors contribution

R.S.V., R.V.: Conceptualization, project administration, writing – original draft. S.KY.: Data curation. S.K.Y., R.V., R.S.V.: Writing – review & editing.

Funding

None.

Study registration

N/A.

Disclosure of interests

All authors declare they have no conflict of interests.

Ethical approval

All study procedures were carried out according to the Declaration of Helsinki, and the study was approved by the institutional ethical committee (IEC/029/2021).

Informed consent

A written informed consent was obtained from all the participants before enrolling to the study.

Data sharing

Data are available under reasonable request to the corresponding author.

ACKNOWLEDGEMENTS

The authors would like to thank Department of Pharmacy Practice, Sri Adichunchanagiri College of pharmacy, Adichunchanagiri Hospital and Research Centre, and Adichunchanagiri University for their support to complete this project.

REFERENCES

1. Figueiredo B, Pacheco A, Costa R. Depression during pregnancy and the postpartum period in adolescent and adult Portuguese mothers. Arch Womens Ment Health. 2007;10(3):103-9. doi: 10.1007/s00737-007-0178-8.
2. Howard LM, Ryan EG, Trevillion K, Anderson F, Bick D, Bye A, et al. Accuracy of the Whooley questions and the Edinburgh Postnatal Depression Scale in identifying depression and other mental disorders in early pregnancy. Br J Psychiatry. 2018;212(1):50-6. doi: 10.1192/bjp.2017.9.
3. Howland MA, Kotlar B, Davis L, Shlafer RJ. Depressive Symptoms among Pregnant and Postpartum Women in Prison. J Midwifery Womens Health. 2021;66(4):494-502. doi: 10.1111/jmwh.13239.
4. Zhang CJP, Wu H, He Z, Chan NK, Huang J, Wang H, et al. Psychobehavioral Responses, Post-Traumatic Stress and Depression in Pregnancy During the Early Phase of COVID-19 Outbreak. Psychiatr Res Clin Pract. 2020;3(1):46-54. doi: 10.1176/appi.prcp.20200019.
5. Aguilar-Cordero MJ, Sánchez-García JC, Rodriguez-Blanque R, Sánchez-López AM, Mur- Villar N. Moderate Physical Activity in an Aquatic Environment During Pregnancy (SWEP Study) and Its Influence in Preventing Postpartum Depression. J Am Psychiatr Nurses Assoc. 2019;25(2):112-21. doi: 10.1177/1078390317753675.
6. Zhang Y, Muyiduli X, Wang S, Jiang W, Wu J, Li M, et al. Prevalence and relevant factors of anxiety and depression among pregnant women in a cohort study from south-east China. J Reprod Infant Psychol. 2018;36(5):519-29. doi: 10.1080/02646838.2018.1492098.
7. van den Heuvel MI, van Assen MALM, Glover V, Claes S, Van den Bergh BRH. Associations between maternal psychological distress and salivary cortisol during pregnancy: A mixed- models a p - proach. Psychoneuroendocrinology. 2018;96:52-60. doi: 10.1016/j.psyneuen.2018.06.005.
8. Xu LL, Li JQ, Pu YQ, Zhou C, Feng SW, Luo Q. Effect of prenatal depression during late pregnancy on maternal and neonatal outcomes. Clin Exp Obstet Gynecol. 2020;47(5):681-6. doi: 10.31083/j.ceog.2020.05.5398.
9. Anastasopoulou SV, Bonotis KS, Hatzoglou C, Dafopoulos KC, Gourgoulianis KI. Smoking Patterns and Anxiety Factors Among Women Expressing Perinatal Depression. Womens Health Rep (New Rochelle). 2022;3(1):198-206. doi: 10.1089/whr.2021.0111.
10. Ångerud K, Annerbäck EM, Tydén T, Boddeti S, Kristiansson P. Adverse childhood experiences and depressive symptomatology among pregnant women. Acta Obstet Gynecol Scand. 2018;97(6):701-8. doi: 10.1111/aogs.13327.
11. Buglione-Corbett R, Deligiannidis KM, Leung K, Zhang N, Lee M, Rosal MC, et al. Expression of inflammatory markers in women with perinatal depressive symptoms. Arch Womens Ment Health. 2018;21(6):671-9. doi: 10.1007/s00737-018-0834-1.
12. Mersky JP, Janczewski CE. Adverse Childhood Experiences and Postpartum Depression in Home Visiting Programs: Prevalence, Association, and Mediating Mechanisms. Matern Child Health J. 2018;22(7):1051-8. doi: 10.1007/s10995-018-2488-z.
13. Chalise A, Bhandari TR. Postpartum Depression and its Associated Factors: A Community- based Study in Nepal. J Nepal Health Res Counc. 2019;17(2):200-5. doi: 10.33314/jnhrc.v0i0.1635.
14. Ajinkya S, Jadhav PR, Srivastava NN. Depression during pregnancy: Prevalence and obstetric risk factors among pregnant women attending a tertiary care hospital in Navi Mumbai. Ind Psychiatry J. 2013;22(1):37-40. doi: 10.4103/0972-6748.123615.
15. Sheeba B, Nath A, Metgud CS, Krishna M, Venkatesh S, Vindhya J, et al. Prenatal Depression and Its Associated Risk Factors Among Pregnant Women in Bangalore: A Hospital Based Prevalence Study. Front Public Health. 2019;7:108. doi: 10.3389/fpubh.2019.00108.
16. Duko B, Ayano G, Bedaso A. Depression among pregnant women and associated factors in Hawassa city, Ethiopia: an institution-based cross-sectional study. Reprod Health. 2019;16(1):25. doi: 10.1186/s12978-019-0685-x.
17. Raj A, Saggurti N, Balaiah D, Silverman JG. Prevalence of child marriage and its effect on fertility and fertility-control outcomes of young

women in India: a cross-sectional, observational study. Lancet. 2009;373(9678):1883-9. doi: 10.1016/S0140-6736(09)60246- 4.
18. Cochrane L, Brumpton K, Winter S, Bell K, Burnham H, Wadwell K, et al. Prevalence and outcomes of overweight and obesity among pregnant women in rural Queensland. Aust J Rural Health. 2019;27(2):164-9. doi: 10.1111/ajr.12495.
19. Naz S, Muhammad D, Ahmad A, Shabnam, Ali P. Pregnant women perceptions regarding their husbands and in-laws' support during pregnancy: a qualitative study. Pan Afr Med J. 2021;39:229. doi: 10.11604/pamj.2021.39.229.25659.
20. Jani R, Knight-Agarwal CR, Bloom M, Takito MY. The Association Between Pre-Pregnancy Body Mass Index, Perinatal Depression and Maternal Vitamin D Status: Findings from an Australian Cohort Study. Int J Womens Health. 2020;12:213-9. doi: 10.2147/IJWH.S239267.
21. Kumpulainen SM, Girchenko P, Lahti-Pulkkinen M, Reynolds RM, Tuovinen S, Pesonen AK, et al. Maternal early pregnancy obesity and depressive symptoms during and after pregnancy. Psychol Med. 2018;48(14):2353-63. doi: 10.1017/S0033291717003889.
22. Cunningham SD, Mokshagundam S, Chai H, Lewis JB, Levine J, Tobin JN, et al. Postpartum Depressive Symptoms: Gestational Weight Gain as a Risk Factor for Adolescents Who Are Overweight or Obese. J Midwifery Womens Health. 2018;63(2):178-84. doi: 10.1111/jmwh.12686.
23. Ertel KA, Huang T, Rifas-Shiman SL, Kleinman K, Rich-Edwards J, Oken E, et al. Perinatal weight and risk of prenatal and postpartum depressive symptoms. Ann Epidemiol. 2017;27(11):695-700. e1. doi: 10.1016/j.annepidem.2017.10.007.
24. Ruhstaller KE, Elovitz MA, Stringer M, Epperson CN, Durnwald CP. Obesity and the association with maternal mental health symptoms. J Matern Fetal Neonatal Med. 2017;30(16):1897-901. doi: 10.1080/14767058.2016.1229766.
25. Han SY, Brewis AA, Wutich A. Body image mediates the depressive effects of weight gain in new mothers, particularly for women already obese: evidence from the Norwegian Mother and Child Cohort Study. BMC Public Health. 2016 29;16:664. doi: 10.1186/s12889-016- 3363-8.
26. Mina TH, Denison FC, Forbes S, Stirrat LI, Norman JE, Reynolds RM. Associations of mood symptoms with ante- and postnatal weight change in obese pregnancy are not mediated by cortisol. Psychol Med. 2015;45(15):3133-46. doi: 10.1017/S0033291715001087.
27. Fall A, Goulet L, Vézina M. Comparative study of major depressive symptoms among pregnant women by employment status. Springerplus. 2013;2(1):201. doi: 10.1186/2193-1801-2-201.
28. Mohammadi A, Aghdam GA, Ranji S. Comparison of postpartum depression of working women and housewives and its relationship with social support and marital adjustment. Procedia-Social and Behavioral Sciences. 2011;30:1837-9. doi: 10.1016/j.sbspro.2011.10.354.
29. Delanerolle G, Phiri P, Zeng Y, Marston K, Tempest N, Busuulwa P, et al. A systematic review and meta-analysis of gestational diabetes mellitus and mental health among BAME populations. EClinicalMedicine. 2021;38:101016. doi: 10.1016/j.eclinm.2021.101016.
30. Mahale N, Prabhu M, Pai K, Mahale A, Nayak A. A study of postpartum depression and its risk factors in a tertiary hospital in India. Ital J Gynaecol Obstet. 2021;33(2):120-7. doi: 10.36129/jog.33.02.06.
31. OuYang H, Chen B, Abdulrahman AM, Li L, Wu N. Associations between Gestational Diabetes and Anxiety or Depression: A Systematic Review. J Diabetes Res. 2021;2021:9959779. doi: 10.1155/2021/9959779.
32. Yousefi M, Khedmat L, Akbari N, Kashanian M, Moradi Lakeh M. The adherence adequacy to antenatal care in alleviating the adverse maternal and neonatal outcomes of iranian pregnant women: A retrospective-prospective study. Ital J Gynaecol Obstet. 2020;32(2):107-18. doi: 10.36129/jog.32.02.03
33. Muscatello MR, Lorusso S, Bruno A, Reale R, Ciura GL, Lagana AS, et al. Anger in women treated with assisted reproductive technology (ART): effects on mother and newborn. J Matern Fetal Neonatal Med. 2016;29(5):813-7. doi: 10.3109/14767058.2015.1019459.
34. Bruno A, Laganà AS, Leonardi V, Greco D, Merlino M, Vitale SG, et al. Inside–out: the role of anger experience and expression in the development of postpartum mood disorders. J Matern Fetal Neonatal Med. 2018;31(22):3033-8. doi: 10.1080/14767058.2017.1362554.
35. Rizzo A, Bruno A, Torre G, Mento C, Pandolfo G, Cedro C, et al. Subthreshold psychiatric symptoms as potential predictors of postpartum de-

pression. Health Care Women Int. 2022;43(1-3):129-41. doi: 10.1080/07399332.2021.1963730.
36. McClanahan KK. Depression in pregnant adolescents: considerations for treatment. J Pediatr Adolesc Gynecol. 2009;22(1):59-64. doi: 10.1016/j.jpag.2008.04.006.
37. Basraon S, Costantine MM. Mood disorders in pregnant women with thyroid dysfunction. Clin Obstet Gynecol. 2011;54(3):506-14. doi: 10.1097/GRF.0b013e3182273089.
38. Quaresima P, Visconti F, Interlandi F, Puccio L, Caroleo P, Amendola G, et al. Awareness of gestational diabetes mellitus foetal-maternal risks: an Italian cohort study on pregnant women. BMC Pregnancy Childbirth. 2021;21(1):692. doi: 10.1186/s12884-021-04172-y.