

# The Level of Depression in Third Trimester Pregnancy, With and Without Anemia

Lyla Fitriana Primada<sup>1</sup>, Natalia Dewi Wardani<sup>2</sup>, M. Besari Adi Pramono<sup>3</sup>

<sup>1</sup>Resident Psychiatry, Faculty of Medicine, Diponegoro University, Central Java, Indonesia

<sup>2</sup>Department of Psychiatry, Faculty of Medicine, Diponegoro University, Central Java, Indonesia

<sup>3</sup>Department of Obstetrics and Gynecology, Faculty of Medicine, Diponegoro University, Central Java, Indonesia

---

**DATE OF ARTICLE:**

Received: 28 May 2023

Reviewed: 20 Oct 2023

Revised: 03 Jan 2024

Accepted: 12 Jan 2024

**\*CORRESPONDENCE:**

lyla.fp@gmail.com

**DOI:**

10.18196/mmjkk.v24i1.18655

**TYPE OF ARTICLE:**

Research

**Abstract:** Anemia is a health problem worldwide, especially in pregnancy, as it can cause depression. Antenatal depression can cause impaired fetal growth and development, bleeding and abortion, prematurity, low birth weight babies, and postpartum depression. This research aims to determine the difference in levels of depression between anemia and non-anemia in the third trimester of pregnancy. It is an observational study with a cross-sectional design. The samples were 75 last-trimester pregnant women who did antenatal care in Diponegoro National and Amino Gondohutomo Hospital, and also Halmahera and Ngesrep Health Center in Semarang and willing to be respondents selected using a purposive sampling method. Data collection used a validated Edinburgh Postnatal Depression Scale (EPDS) questionnaire with a Content Validity Index (CVI) of 1.00 and a reliability of 0.706. Mann Whitney and Kruskal Wallis were utilized to analyze data. There were 38 respondents with anemia and 37 respondents without anemia. The 12 respondents (31.6%) with anemia had a risk of depression, and 13 respondents (35.1%) without anemia had a risk of depression. There was no significant difference in the level of depression in the third trimester of pregnancy with and without anemia ( $P>0,05$ ).

**Keywords:** anemia; risk of depression; EPDS; third trimester of pregnancy

---

## INTRODUCTION

Anemia is a health problem that occurs throughout the world. Anemia is characterized by a decrease in hemoglobin levels in the blood. Anemia in pregnancy is mainly caused by iron deficiency due to a lack of nutritional intake. Anemia in pregnancy can cause complications for both the mother and the fetus. Pregnant women are likely to experience depression during pregnancy and are at risk for postpartum depression.<sup>1</sup>

Depression is a mental health problem that often occurs in women during pregnancy. It is estimated that 15% of women in the world experience depression throughout their lives, especially during pregnancy. The prevalence of depression during pregnancy varies between low, medium, and high-income countries. Countries with higher incomes have lower depression rates when compared to countries with lower incomes.<sup>2</sup> Research conducted in Jakarta revealed that pregnant women in the third trimester experienced mild depression at 26.4% and moderate depression at 6.9%.<sup>3</sup>

Depression in pregnancy can harm the health of the mother, fetus, and family during pregnancy and after birth. Among the effects of depression are disrupting the growth and development of the fetus, the risk of bleeding during pregnancy, the risk of abortion, premature birth, and low birth weight babies.<sup>3</sup>

Pregnancy, giving birth, and becoming a mother are a physiological condition of a woman. These events can give a different meaning to each woman. Some experience stress caused by physical and psychological changes from the time of conception to after delivery, so they have the potential to experience depression during pregnancy.<sup>4</sup> However, most women will feel that this event is a positive aspect and becomes a pleasant transition process to the next stage in their life journey.<sup>5</sup>

There are significant physical and psychological changes in the third trimester of pregnancy. Physically, pregnant women will begin to experience difficulties in their activities, and psychologically, mothers will

begin to feel worried about the birth process that will be undertaken later. Thus allowing the emergence of depression in pregnant women.<sup>6</sup> High levels of estrogen are known to play a role in neurotransmitters that affect mood, cognitive function, sleep, and eating.<sup>7-9</sup>

Biological, genetic, and environmental factors can influence perinatal depression, such as a history of mental disorders in the respondent or her family, unwanted pregnancies, pregnancies with a mother's age less than 17 years, more than 2 pregnancies, a history of bad births, lack of support, low socioeconomic level, a history of substance and alcohol abuse, and a history of physical and sexual violence.<sup>10</sup>

Iron deficiency in anemia has a role in depression. Normally, iron will be well distributed in the basal ganglia, which is the place that produces GABA and dopamine. Iron also affects neurotransmitter synthesis, such as serotonin, nor-epinephrin, and dopamine. Serotonin and nor-epinephrin are neurotransmitters that have a big role in depression. Iron also works as a co-factor of tyrosine-hydroxylase and tryptophan hydroxylase, an enzyme that has a role in dopamine and serotonin synthesis. A lack of iron will affect serotonin synthesis, which can cause depression.<sup>11-13</sup>

In Indonesia, there is still no data about the relationship between anemia and depression in the last trimester of pregnancy. The available data was about depression frequency in primigravida and multigravida. There was the same research in Turkey in 2016, in which the result showed a significant relationship between anemia and depression in the last trimester of pregnancy. The difference between this research and Turkey's research is the exclusion criteria. In this research, the participant who had mental health disorder before following the research was excluded.

## MATERIAL AND METHOD

This research is an analytic observational study with a cross-sectional design that emphasizes collecting data on independent and dependent variables, which is only done once at the same time using a measuring instrument. The independent variable was anemia, and the dependent variable was depression.

Sampling was carried out using the non-probability sampling method through purposive sampling, namely by selecting samples from among the population based on the criteria according to the inclusion and exclusion criteria as well as the research objectives.

The respondents were pregnant women in the last trimester who had antenatal care at Diponegoro National Hospital, Amino Gondohutomo Psychiatric Hospital, Halmahera Health Center, and Ngesrep Health Center in Semarang City, Central Java Province, and were willing to be a respondent. The inclusion criteria were pregnant women in the last trimester (27-42 weeks) who could read or use Google Forms and were willing to be a respondents. The exclusion criteria are an uncompleted questionnaire, physical illness and use of medication, pregnancy problems and bad pregnancy history, history of mental health problems in respondent and their family, and an experience of physical and sexual abuse.

Research and data collection began from January to March 2022 using the Edinburgh Postnatal Depression Scale (EPDS) questionnaire. Based on the independent variable, we found that 38 respondents had anemia, and 37 respondents had no anemia. Based on the dependent variable, we found that 50 respondents (66,7%) had no risk of depression, and 25 respondents (33,3%) had the risk of depression. Data consisted of demographic and correlation analysis and were analyzed using Mann Whitney and Kruskal Wallis.

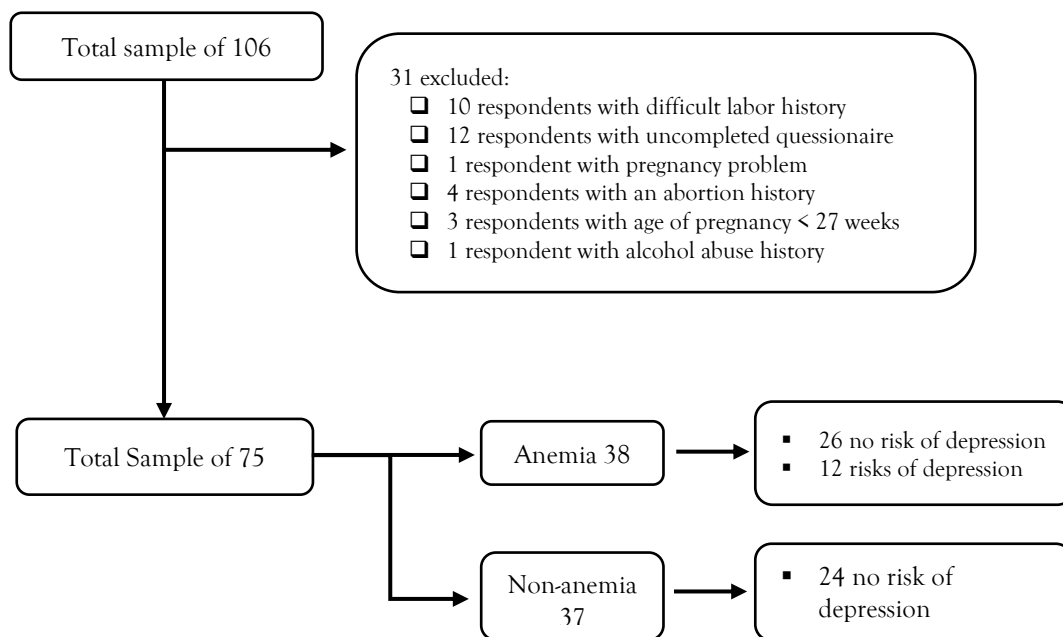


Figure 1. Sampling flowchart

## RESULT

Table 1 shows the characteristics of the respondents where most were aged 20-35 years (93.3%), with lower secondary education (54.7%), not working (83.1%), income below the minimum wage (57.3%), multigravida (58.7%), anemia (50.7%), and no risk of depression (66.7%).

Table 1. Basic Characteristics of Respondents

Variable	Frequency	%
<b>Age</b>		
<20	2	2.7
20 - 35	70	93.3
> 35	3	4.0
<b>Education</b>		
Low	21	28.0
Intermediate	41	54.7
Tall	13	17.3
<b>Profession</b>		
Unemployed	61	81.3
Employed	14	18.7
<b>Income</b>		
<Minimum wage average	43	57.3
≥ Minimum wage average	32	42.7
<b>Parity</b>		
Primigravida	31	41.3
Multigravida	44	58.7
<b>Anemia</b>		
Yes	38	50.7
No	37	49.3
<b>Depression</b>		
No risk	50	66.7
Possibility of depression	14	18.7
High risk	8	10.7
Depression	3	4.0

Bivariate analysis was carried out to analyze the relationship of each characteristic with the level of risk of depression and the difference levels of depression in the last trimester of pregnancy with and without anemia (Table 2). With the Mann Whitney and Kruskal Wallis tests it was found that age, education, occupation, income, parity, and anemia did not have a significant difference with the level of risk of depression.

Table 2. Differentiation of Various Characteristic Variables to The Level of Risk of Depression Based on The Edinburgh Postnatal Depression Scale

Variable	Depression				P value
	No risk	Possible depression	High risk	Depression	
<b>Age</b>					
<20	1 (50)	0 (0)	0 (0)	1 (50)	0.299 <sup>s</sup>
20 - 35	48 (68.6)	13 (18,6)	7 (10)	2 (2.9)	
> 35	1 (33.3)	1 (33.3)	1 (33.3)	0 (0)	
<b>Education</b>					
Low	14 (66.7)	4 (19)	2 (9.5)	1(4.8)	0.666 <sup>s</sup>
Intermediate	29 (70.7)	6 (14.6)	4 (9.8)	2 (4.9)	
Tall	7 (53.8)	4 (30.8)	2 (15.4)	0 (0)	
<b>Profession</b>					
Unemployed	41 (67.2)	10 (16,4)	7 (11.5)	3 (4.9)	0.948 <sup>‡</sup>
Employed	9 (64.3)	4 (28.6)	1 (7,1)	0 (0)	
<b>Income</b>					
<Minimum wage average	26 (60.5)	11 (25.6)	5 (11.6)	1(2.3)	0.317 <sup>‡</sup>
≥ Minimum wage average	24 (75)	3 (9.4)	3 (9.4)	2 (6.3)	
<b>Parity</b>					
Primigravida	21 (67.7)	5 (16.1)	3 (9.7)	2 (6.5)	0.985 <sup>‡</sup>
Multigravida	29 (65.9)	9 (20.5)	5 (11.4)	1(2.3)	
<b>Anemia</b>					
Yes	26 (68.4)	9 (23.7)	3 (7.9)	0 (0)	0.461 <sup>‡</sup>
No	24 (64.9)	5 (13.5)	5 (13.5)	3 (8.1)	

## DISCUSSION

Respondents are generally between 20 and 35 years old, a fairly good age for a pregnant mother.<sup>14</sup> Depression is more common between the ages of 20-40 years so that the age of the respondents in this study is an age that is at risk of experiencing depression.<sup>15</sup> However, the results of this study indicated no significant difference in the level of risk of depression in the age group since the respondent's age is at a safe age for pregnancy, indicating a lower risk of depression.

The results demonstrated that higher education had a higher risk level of 46.2% compared to secondary education, which was 29.3%, and lower education, which was 33.3%. The results of this study align with studies conducted in Jembrana and Thailand, revealing a higher risk of depression in respondents with a higher education level.<sup>16, 17</sup> In this study, there were no significant difference levels of risk of depression in education levels caused by sufficient education. The respondents can accept and process the problems they encounter so that the risk of depression becomes higher.<sup>18</sup>

In this study, it was found that multigravida pregnancies had a greater risk of depression compared to primigravida. The research conducted in Jembrana showed the same results, namely, multigravida pregnancies more experienced the risk of depression.<sup>16</sup> The results of this study demonstrated that the parity group had no significant difference in the level of risk of depression.

Furthermore, the results of this study revealed that there was no significant difference in the level of risk of depression in the marital status group caused by lack of husband and family support for respondents, although marital status was married.

In this study, there was no significant difference in the level of risk of depression in the economic and occupational level group in respondents as each work condition has different risks for each individual.

Based on the study's results, it was found that the number of respondents who had anemia was 38 (50.7%), and those who did not have anemia were 37 (49.3%). Data from WHO stated that 41.8% of pregnant

women worldwide experienced anemia.<sup>19</sup> Research in India revealed that around 48.4% of pregnant women suffer from anemia.<sup>20</sup> Research conducted in Baturaja found that around 42.6% of pregnant women had anemia.<sup>19</sup> Data from the Ministry of Health showed that 48.9% of pregnant women experienced anemia.<sup>21</sup>

The third trimester of pregnancy is the peak of the increase in blood plasma used for the growth of the placenta and fetal development, and it meets the need for additional blood volume in the mother. Thus, if pregnant women in the third trimester do not get enough nutrition to produce erythrocytes, anemia will occur.<sup>22</sup>

Based on the results of the study, it was found that 50 respondents (66.7%) were not at risk of depression, and 25 respondents (33.3%) were at risk of depression. Research conducted in South Africa showed that 11.7% of respondents were at risk of experiencing depression.<sup>23</sup> Meanwhile, research conducted in Ethiopia revealed that 16.6% of pregnant women were at risk of experiencing depression.<sup>24</sup> Research conducted in Purwokerto showed that 58.8% of pregnant women experienced depression.<sup>4</sup> In line with the results of research conducted in Banyuwangi, it also showed that 50% of pregnant women were at risk of experiencing depression.<sup>25</sup>

Depression in pregnancy can be caused by maladaptive behavior patterns, poor coping mechanisms, problems in relationships with others, difficulties experienced and negative events, and lack of social support.<sup>26</sup>

Based on the results of data analysis, it was found that age, education, occupation, income, parity, and anemia had no significant difference in the level of the risk of depression in the third trimester of pregnancy. These results do not align with the results obtained from other studies conducted in Turkey, which showed a significant relationship between anemia and the risk of depression in the third trimester of pregnancy. In that study, it was stated that there were differences in EPDS scores between the anemic and non-anemic groups, with the anemic group obtaining higher EPDS scores than those in the non-anemic group. Another difference in this study included a history of previous depression as a predictor factor, whereas in this study, a history of previous depression was included in the exclusion criteria.<sup>27</sup>

In this study, genetic factors have been excluded through initial screening so that genetic factors as a risk factor for depression in this study can be excluded. Other factors, such as psychosocial and biological, in this study cannot be ruled out, so these two factors may still cause the risk of depression in the respondents of this study.

In this study, psychosocial factors such as anxiety about the delivery process, support from the family, especially husbands, physical discomfort due to a growing belly, and concerns about the condition of the baby, which can affect the mood of pregnant women, are not excluded.<sup>28</sup> Other psychosocial factors besides the patient's pregnancy problems, such as relationships with other family members, relationships with the surrounding environment, and co-workers, can also affect the mood of pregnant women who have not been ruled out.<sup>15</sup> The results of research conducted in Greece and Nigeria stated that psychosocial factors such as satisfaction in marriage and social support are significantly associated with depression in pregnancy.<sup>29, 30</sup>

Anemia as one of the biological factors related to depression, includes affecting the production of monoamine neurotransmitters, especially norepinephrine and serotonin.<sup>15</sup> Anemia is expected to reduce the production of monoamines, which will cause depression. However, reproductive hormones such as estrogen and progesterone also have a role in regulating mood and cognition. Ovarian hormones are known to affect modulating synaptic transmission by altering postsynaptic receptor response or presynaptic neurotransmitter release. These mechanisms affect neurochemical systems, such as dopamine, serotonin, glutamate, and GABA, in controlling emotion and cognition.<sup>7</sup>

In conditions of pregnancy, high levels of estrogen as well as serotonin levels are synthesized by the placenta. Estrogen increases the activation of 5-HT<sub>2</sub>, which then increases the concentration of 5-HT.<sup>8</sup> Progesterone amplifies the effects of estrogen in increasing serotonin activity at synapses. Progesterone will also increase dopamine release in the striatum and decrease dopamine release in the prefrontal cortex. Therefore, these hormones can affect the stability of the mood in pregnant women.<sup>9</sup>

The limitations in this study include; first, a purposive sampling technique used in this study allows pregnant women to meet the criteria but are not present to be not represented. Second, two respondents in their teens were included in this study. Third, uniformity in parity is not differentiated.

## CONCLUSION

The results showed that there was no significant difference in the level of depression in the third trimester of pregnancy with and without anemia. However, cases of pregnant women with a high risk of depression were found, so it is suggested to screen the risk of depression in pregnant women.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## REFERENCES

1. Yuliani E. Hubungan Riwayat Anemia saat Kehamilan dengan Kejadian Anemia Postpartum pada Ibu Nifas. *EMBRIO*. 2020;12(2):102–7. <http://dx.doi.org/10.36456/embrio.v12i2.2796>
2. 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. <http://dx.doi.org/10.3389/fpubh.2019.00108>
3. Kusuma R. Karakteristik Ibu yang Mengalami Depresi dalam Kehamilan. *jab*. 2019;8(1):99. <http://dx.doi.org/10.36565/jab.v8i1.107>
4. Tyas DI, Ma'rifah AR, Triana NY. Perbedaan depresi pada ibu hamil dengan ibu postpartum terhadap kesiapan peran menjadi ibu di RSIA Bunda Arif Purwokerto. 2017;8(1). <https://ejournal.uhb.ac.id/index.php/VM/article/view/278>
5. Kusuma PD. Karakteristik penyebab terjadinya depresi postpartum pada primipara dan multipara. *Jurnal Keperawatan Notokusumo*. 2017;5(1):36-45. <https://jurnal.stikes-notokusumo.ac.id/index.php/jkn/article/view/59>
6. Elvina L, Za RN, Rosdiana E. Faktor Yang Berhubungan dengan Kesiapan Psikologis Ibu Hamil Trimester III dalam Menghadapi Persalinan. *Journal of Healthcare Technology and Medicine*. 2018;4(2):176. <http://dx.doi.org/10.33143/jhtm.v4i2.207>
7. Barth C, Villringer A, Sacher J. Sex hormones affect neurotransmitters and shape the adult female brain during hormonal transition periods. *Front Neurosci*. 2015;9. <http://dx.doi.org/10.3389/fnins.2015.00037>
8. Thibeault H, Sanderson JT, Vaillancourt C. Serotonin-estrogen interactions: What can we learn from pregnancy? *Biochimie*. 2019;161:88–108 <http://dx.doi.org/10.1016/j.biochi.2019.03.023>
9. McOsker K. Hormonal Balance and the Female Brain: A Review. *National Women's Health Week. Facts About Fertility*. 2018.
10. Van Niel MS, Payne JL. Perinatal depression: A review. *Cleve Clin J Med*. 2020;87(5):273–7. <http://dx.doi.org/10.3949/ccjm.87a.19054>
11. Burroughs SA. An examination into relationship between iron deficiency and postpartum depression. *Scholar Crossing: The Institutional Repository of Liberty University*. 2016.
12. Kim J, Wessling-Resnick M. Iron and mechanisms of emotional behavior. *J Nutr Biochem*. 2014;25(11):1101–7. <http://dx.doi.org/10.1016/j.jnutbio.2014.07.003>
13. Dama M, Van Lieshout RJ, Mattina G, Steiner M. Iron deficiency and risk of maternal depression in pregnancy: An observational study. *J Obstet Gynaecol Can*. 2018;40(6):698–703. <http://dx.doi.org/10.1016/j.jogc.2017.09.027>
14. Amanupunnyo NA, Shaluhyah Z, Margawati A. Analisis Faktor Penyebab Anemia pada Ibu Hamil di Puskesmas Kairatu Seram Barat. *J Aisyah J Ilmu Kesehat*. 2018;3(2):173–81. <http://dx.doi.org/10.30604/jika.v3i2.134>
15. Amir N. *Depresi: Aspek Neurobiologi, Diagnosis, Dan Tatalaksana*. Jakarta. Edisi kedua. Badan penerbit FK UI; 2016.
16. Masyuni PUS, Nata IWS, Aryani P. Kejadian Depresi Pada Ibu Hamil di Wilayah Kerja Puskesmas 1 Negara, Kabupaten Jembrana Tahun 2017. *E-Journal Medika Udayana*. 2303-13. 2020;8(4).
17. Tuksanawes P, Kaewkiattikun K, Kerdcharoen N. Prevalence and associated factors of antenatal depressive symptoms in pregnant women living in an urban area of Thailand. *Int J Womens Health*. 2020;12:849–58. <http://dx.doi.org/10.2147/ijwh.s278872>
18. Asih I. Hubungan Usia, Pendidikan, dan Paritas Ibu dengan Pengetahuan Kesehatan Mental Ibu Hamil di Kota Surakarta. *Institutional Repository, UMS Library*. 2020.

19. Astriana W. Kejadian Anemia pada Ibu Hamil Ditinjau dari Paritas dan Usia. *J Aisyah J Ilmu Kesehat.* 2017;2(2):123–30. <http://dx.doi.org/10.30604/jika.v2i2.57>
20. Rawat K, Rawat N, Mathur N, Mathur M, Chauhan N, Kakkar R, et al. Prevalence and pattern of anemia in the second and third trimester pregnancy in Western Rajasthan. *Int J Res Med Sci.* 2016;4:797–9. <http://dx.doi.org/10.18203/2320-6012.ijrms20163768>
21. Riskesdas, K. Hasil utama RISKESDAS 2018. Hasil utama riskesdas 2018. Repositori Badan Kebijakan Pembangunan Kesehatan Kementerian Kesehatan Republik Indonesia. 2018.
22. Aryanto E, Sugiartha AD, Darmawan PH, Pande NPYA. Gambaran anemia pada kehamilan trimester III di bagian obstetri dan ginekologi RSUD Waikabubak, Nusa Tenggara Timur periode 2019–2020. *Intisari Sains Medis.* 2021;12(2):463–7. <http://dx.doi.org/10.15562/ism.v12i2.1010>
23. Govender D, Naidoo S, Taylor M. Antenatal and postpartum depression: Prevalence and associated risk factors among adolescents' in KwaZulu-Natal, South Africa. *Depress Res Treat.* 2020;2020:1–12. <http://dx.doi.org/10.1155/2020/5364521>
24. Tesfaye Y, Agenagnew L. Antenatal depression and associated factors among pregnant women attending antenatal care service in Kochi Health Center, Jimma town, Ethiopia. *J Pregnancy.* 2021;2021:1–10. <http://dx.doi.org/10.1155/2021/5047432>
25. Putra AJE, Nurrobi RMYAS, Prasetyo DM, Akbar MV, Oktaviana N, Fatimah A, et al. Determinants of perinatal depression in licin banyuwangi 2019. *Journal of Community Medicine and Public Health Research.* 2020;1(1):14. <http://dx.doi.org/10.20473/jcmphr.v1i1.20295>
26. Sunnqvist C, Sjöström K, Finnbogadóttir H. Depressive symptoms during pregnancy and postpartum in women and use of antidepressant treatment – a longitudinal cohort study. *Int J Womens Health.* 2019;11:109–17. <http://dx.doi.org/10.2147/ijwh.s185930>
27. Yılmaz E, Yılmaz Z, Çakmak B, Gültekin İB, Çekmez Y, Mahmutoğlu S, et al. Relationship between anemia and depressive mood in the last trimester of pregnancy. *J Matern Fetal Neonatal Med.* 2017;30(8):977–82. <http://dx.doi.org/10.1080/14767058.2016.1194389>
28. Kurniawan ES, Ratep N, Westa W. Faktor Penyebab Depresi pada Ibu Hamil Selama Asuhan Antenatal Setiap Trimester. *Jurnal Harian Regional.* 2013:1-13.
29. Kleanthi G. Psychosocial Risk Factors of Depression in Pregnancy: A Survey Study. *Health Science Journal.* 2015;9(1):1-6.
30. Ayamolowo SJ, Olajubu AO, Akintola FE. Perceived social support and depression among pregnant and child-rearing teenagers in Ile-Ife, Southwest Nigeria. *Afr J Midwifery Womens Health.* 2019;13(4):1–9. <http://dx.doi.org/10.12968/ajmw.2018.0033>