MATERNAL ANEMIA IS ASSOCIATED WITH DEPRESSIVE SYMPTOMS IN THE FIRST TWO YEARS OF POSTPARTUM IN INDONESIA

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Abstract: Becoming a mother is a normal women phase, but it needs cognitive and adaptive behavior. Some women have difficulties passing this phase and develop depressive symptoms. Also, anemia postpartum is a global public health problem. This study was to determine the association between anemia and maternal depressive symptoms. This study is a cross-sectional study and used data from the fifth wave of the Indonesia Family Life Survey (IFLS). The unit of analysis is ever-married women and gave the last birth in recent two years preceding the survey. Depressive symptoms were measured by CESD-10. A CESD-10 total score of ten or more indicates that there are any depressive symptoms. Anemia was defined by hemoglobin concentration below 12 g/dl. Logistic regression was performed to determine the association between anemia and depressive symptoms after controlling for potential confounders. Anemia was significantly associated with depressive symptoms. Women with anemia were 1.32 times more likely to have depressive symptoms than non-anemic women. It is crucial to screen depressive symptoms and anemia in the postpartum period. Since anemia and maternal depressive symptoms were associated, maternal-focused interventions are suggested to reduce both maternal anemia and depressive symptoms in the first two years postpartum..

Keywords: depressive symptoms, anemia, center of epidemiological studies depression, hemoglobin

Introduction

Depression causes a global total of over 50 million Years Lived with Disability (YLD) in 2015 (World Health Organization, 2017). The postpartum period will increase the risk of depression (Moses-Kolko et al., 2012; Muzik, Marcus, Heringhausen, & Flynn, 2009). Becoming a mother is a regular women phase, but it needs cognitive and adaptive behavior. Becoming a mother is a primary life transition and developmental process that may be eased or impeded by many personal and contextual factors. However, some women have difficulties passing this phase and develop depressive symptoms (Kuehner, 2017; Meighan, 2017). Postpartum depression is affecting 13 – 19 percent of women in the world in 2013 (O'hara & McCabe, 2013). Symptoms of postpartum depression are mostly the same with depression that occurs at other times, including depressed mood, inability to feel pleasure, sleep disorder, and low energy. The onset of postpartum depression symptoms usually occurs in one month to the first year postpartum, and it can persist until two years postpartum (Sutter-Dallay, Cosnefroy, Glatigny-Dallay, Verdoux, & Rascle, 2012).

The first 1,000 days of life (the period from conception to the child's 2nd birthday) is a critical period for children's growth and development. The growth and development of children increased rapidly in this period (Black et al., 2013; Cusick & Georgieff, 2014). Some developmental and functional delays during this period are either irreversible or only partially reversible (Schwarzenberg & Georgieff, 2018). Over 200 million children

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under five years fail to achieve their potential development in consequences of poverty, poor health and nutrition, and lack of care (Grantham-McGregor et al., 2007).

Maternal postpartum hormonal change and childcare stress are believed to be the leading cause of postpartum depressive symptoms (Abdollahi, Lye, & Zarghami, 2016). Either, many studies found some sociodemographic factors such as maternal age at birth, type of residence, education, working status, and social support also associated with depressive symptoms. Women with low education levels, unemployment, having a cesarean birth, and had more than one young child were more likely to have postpartum depression. Also, women living with their parents-in-law had higher probability of having postpartum depression (Kim & Dee, 2018; Vigod et al., 2013; Wang et al., 2017). Maternal health factors also associated with postpartum depressive symptoms, including anemia and chronic diseases (Alharbi & Abdulghani, 2014; Katon, Russo, & Gavin, 2014).

Anemia postpartum is a global public health problem both in developing and developed country. Women are vulnerable to anemia during the lactation period (Lakew, Biadgilign, & Haile, 2015). The major causes of postpartum anemia are prenatal iron deficiency or prenatal anemia, and it combines with excessive blood losses at delivery. After a healthy pregnancy and delivery without iron deficiency, mothers in the lactation period require higher iron than the basal requirement, and the iron requirement is considerably higher if perinatal bleeding occurred. Anemia postpartum is associated with fatigue and poorer general health, including physical disability, cognitive problems, and psychiatric disorders (Milman, 2011b). Association and mechanism of anemia and depressive symptoms in the postpartum period remain unclear. Many studies found that anemia associated with depressive symptoms (Albacar et al., 2011; Alharbi & Abdulghani, 2014; Corwin, Murray-Kolb, & Beard, 2003). However, questionable associations have also reported between maternal anemia and depressive symptoms (Armony-Sivan et al., 2012). This paper aims to determine the association between anemia and maternal depressive symptoms in the first two years postpartum.

Methodology

Study design and population

This study is a cross-sectional study and used data from the fifth wave of the Indonesia Family Life Survey (IFLS) that having been completed in 2015. The IFLS is a large-scale longitudinal survey-based on population, which represents about 83% of the population in Indonesia that began in 1993. The community surveys collected data on the household, individual, and community level (Strauss, Witoelar, & Sikoki, 2016). The unit of analysis of this study is ever-married women and gave the last birth in recent two years preceding the survey. Respondents were excluded from the analysis if the last child is twin or did not live in the same household. Mothers with twin children were excluded from the analysis because the burden of parenting was different between single and twin. Mothers with deceased children were excluded from the analysis to rule out the onset of depressive symptoms caused by infant or child mortality.

Research variables

The appearance of depressive symptoms was defined as Total CESD-10 score is ten or more. The gold standard for diagnosing depression is structured interviews by skilled health workers. Besides instruments for diagnosing, various instruments also have been developed to screen depressive symptoms at the community level. In epidemiological studies, screening scales can give estimates of the depression prevalence using consistent measurement criteria. One instrument that commonly used self-report depression screening scales is the 20-item Center for Epidemiologic Studies Depression Scale (CES-D). CES-D has been broadly used to assess depressive symptoms in community-based studies. CES-D is designed to be able to screen depressive symptoms at the community level (King, 2012). CESD-10 is one of various short and simplified forms of the 20-item CES-D. CESD-10 consists of ten questions about depressive symptoms in the last seven days before the survey. It includes three items on depressed affect, five items on somatic symptoms, and two on positive effect. CESD-10

has four responses on a 4-point scale, coded 0 to 3. Option for each item are respondents didn't complain about symptoms or symptoms are complained less than a day (score of 0), symptoms have complained for 1-2 days (score of 1), respondents complain about symptoms for 3-4 days (score of 2), respondents complain of symptoms for 5-7 days (score of 3). Scoring is reversed for the positive effect items. For epidemiology studies, the sum of all item scores is recommended to measure the level of depressive symptoms. The total scores of CESD-10 can range from 0 to 30. A CESD-10 total score of ten or more indicates that there are any depressive symptoms, while a CESD-10 score of less than ten indicates that there are no depressive symptoms (Andresen, Malmgren, Carter, & Patrick, 1994). Although the CESD-10 is not considered as a diagnostic instrument for major depression, the CES-D-10 has excellent psychometric properties (Baron, Davies, & Lund, 2017). The Cronbach α reliability coefficient of CESD 10-item in this study was 0.72.

A finger prick was taken, and blood drops drawn for testing hemoglobin using a handheld meter. Hemoglobin was measured using a Hemocue handheld meter, model Hb201+ with HB201 micro cuvettes. The presence of anemia was defined as a hemoglobin level lower than 12 g/L.

Control variables are maternal age at birth, parity, type of residence, education level, working status, household expenditure, maternal chronic diseases, child health status, and family type. Maternal age at birth was divided into three groups, 20 or younger, 21-35, and older than 35. Educational level was divided into no education-elementary school, junior high school, senior high school, and university. Working status was divided into working and did not work. The type of residence was divided into urban and rural areas. Household expenditure was divided into five groups (quintile). Maternal chronic diseases were divided into two groups, have chronic diseases, and did not have. Child health status is self-rated health of children according to the mother's admission at the survey and was divided into good and bad. The family type was divided into the nuclear and extended family.

Statistical analysis

The statistical analyses were undertake using STATA 15.1. Respondent characteristics and bivariate analysis were presented as the frequency and the proportion. Logistic regression was performed to determine the association between anemia and depressive symptoms after controlling for potential confounders. A p-value of <0.05 was considered to indicate statistical significance.

Results

Table 1 provides the respondent's characteristics and covariate analysis. The mean age of 2,012 respondents entering this study was 28.5 years (SD=6.00, range: 15-50), and the mean age of birth was 27.6 years (SD=6.0, range: 14-48). The mean period of postpartum was 11.5 months (SD=7.0, range: 0-23). The mean of total CESD-10 scores was 6.3 (SD=4.7, range: 0-26). The mean hemoglobin level was 12.3 g/L (SD=1.4, range: 5.6-16.1). The proportion of respondents with depressive symptoms was 22.07 %, and the proportion of anemia among respondents was 36.68 %. Almost two-thirds (62.28%) of respondents were multipara, did not have chronic diseases (66.30%). Moreover, their children were healthy (81.46%). The proportion of respondents with depressive symptoms was higher in the anemic group (25.2%) compared with the non-anemic group.

Table 1   Sample characteristics and prevalence of depressive symptoms among women in the first two years postpartum

Characteristics	No depressive symptoms n (%)	Any depressive symptoms n (%)	p
Anemia			
No	1,015 (79.7)	259 (20.3)	
Yes	553 (74.9)	185 (25.1)	
Age at birth			
≤20 years old	182 (68.7)	83 (31.3)	0.001
21 - 35 years old	1,226 (79.3)	319 (20.7)	
>35 years old	160 (79.2)	42 (20.8)	
Parity			
Primipara	567 (74.7)	192 (25.3)	0.007
Multipara	1,001 (79.1)	252 (20.1)	
Type of residence			
Urban	914 (78.2)	254 (21.8)	0.683
Rural	654 (77.5)	190 (22.5)	
Education level			
No education - elementary school	316 (75.1)	105 (24.9)	0.029
Junior high school	375 (76.7)	114 (23.3)	
Senior high school	607 (77.8)	173 (22.2)	
University	270 (83.8)	52 (16.2)	
Working status			
Did not work	896 (78.39)	247 (21.6)	0.570
Work	672 (77.33)	197 (22.7)	
Quintile expenditure			
Poorest	311 (76.0)	98 (24.0)	0.090
Poorer	316 (78.8)	85 (21.2)	
Middle	309 (75.9)	98 (24.1)	
Richer	305 (76.2)	95 (23.8)	
Richest	327 (82.8)	68 (17.2)	
Chronic Diseases			
No	1057 (79.2)	1057 (20.8)	0.048
Any	511 (75.4)	511 (24.6)	
Child health status			
Good	1,303 (79.5)	336 (20.5)	0.000
Bad	265 (71.1)	108 (28.9)	
Family type			
Nuclear	897 (79.8)	227 (20.2)	0.023
Extended	671 (75.6)	217 (24.4)	
Total	1,568 (77.93)	444 (22.07)	

Table 2 describes the association between anemia and maternal depressive symptoms in the first two years postpartum. Anemia was associated with maternal depressive symptoms in the first two years of postpartum before and after adjustment. After controlling with covariate variables, anemia was significantly and positively associated with the presence of depressive symptoms. Anemic women were 1,32 times more likely to have depressive symptoms than non-anemic women. We also found a significant association between working status, maternal chronic diseases, children's health status, and maternal depressive symptoms. Working mothers were more likely to have depressive symptoms than mothers who did not work. Mothers with chronic diseases were more likely to have depressive symptoms than mothers without chronic diseases.

Table 2. Associations between anemia, confounding factors, and maternal depressive symptoms in the first two years postpartum

Characteristics	Model 1		Model 2	
	COR (95% CI)	p	AOR (95% CI)	p
Anemia				
No	Reference		Reference	
Yes	1.31 (1.06-1.63)	0.014	1.32 (1.07-1.64)	0.014
Age at birth				
≤20 years old			Reference	
21 - 35 years old			0.69 (0.49-0.97)	0.033
>35 years old				0.157
Parity				
Primipara			Reference	
Multipara			0.81 (0.62-1.05)	0.111
Type of residence				
Urban			Reference	
Rural			0.97 (0.78-1.22)	0.809
Education level				
No education - elementary school			Reference	
Junior high school			0.86 (0.63-1.18)	0.351
Senior high school			0.80 (0.60-1.08)	0.146
University			0.57 (0.37-0.86)	0.008
Working status				
Did not work			Reference	
Work			1.25 (1.00-1.57)	0.050
Quintile expenditure				
Poorest			Reference	
Poorer			0.91 (0.65-1.27)	0.574
Middle			1.06(0.76-1.48)	0.712
Richer			1.11 (0.79-1.56)	0.552
Richest			0.80 (0.55-1.17)	0.254
Chronic Diseases				
No			Reference	
Any			1.29 (1.03-1.62)	0.026
Child health status				
Good			Reference	
Bad			1.52 (1.17-1.98)	0.002
Family type				
Nuclear			Reference	
Extended			1.16 (0.92-1.46)	0.200

Discussion

This study found an association between anemia and maternal depressive symptoms in the first two years postpartum. Anemic mothers were more likely to have depressive symptoms compared to non-anemic mothers after controlling for potential confounder. Anemia during the postpartum period was global health problems, especially in developing countries. The nutritional deficiency was associated with depressive symptoms in the postpartum period include omega-3 fatty acids, zinc, and iron (Price, Abernathy, Dobbs, & Gallaher, 2017). Iron deficiency is a common nutrient deficiency in childbearing women in the world (Patterson, Brown, Roberts, & Seldon, 2001). Postpartum iron-deficiency anemia caused by excessive blood loss during child delivery. Some previous studies have reported that anemia was associated with the presence of depressive symptoms in the postpartum period (Albacar et al., 2011; Alharbi & Abdulghani, 2014; Corwin et al., 2003).

The association between anemia and depressive symptoms may be supported by both reciprocal causal effects and shared vulnerability factors. Anemia may lead to the presence of depressive symptoms. Anemia is associated with fatigue, leading to more mediocre quality of life, and decreased emotional wellbeing. Fatigue, a common symptom of anemia, can have detrimental effects on a person's quality of life and determine the onset of depressive symptoms. These symptoms might affect how a mother feels during the postpartum period and how she attaches to her infant (Brown et al., 2013). Another mechanism of the association between anemia and depressive symptoms may be mediated by altered cerebral oxygen delivery. Anemic patients were more likely to increase in global or regional cerebral blood flow, and especially to frontotemporal and subcortical brain structures, which are involved in the depression pathway (Oda et al., 2003; Onder et al., 2005).

However, conversely, depressive symptoms may lead to anemia. A possible explanation of this finding is depressed patient is frequent practice unhealthy eating and may lead to vitamin and mineral deficiencies that contribute to anemia (Ng, Feng, Niti, Kua, & Yap, 2009; Quirk et al., 2013). Anemia and depressive symptoms may also share common vulnerability factors. Stress, both acute and chronic, is associated with elevated blood biomarkers of oxidative stress, which may lead to both depressive symptoms and anemia (Bakunina, Pariante, & Zunszain, 2015; Miller & Sadeh, 2014). Moreover, oxidative stress and inflammatory response may increase during the delivery process (Goetzl et al., 2010; Protonotariou et al., 2010). Finally, women in the postpartum period have an increased risk of developing anemia and depressive symptoms (Brummelte & Galea, 2016; Milman, 2011a). The leading causes of postpartum anemia are antepartum anemia and combination with excessive blood losses at delivery (Milman, 2011b). Also, maternal postpartum hormonal change and childcare stress lead to postpartum depressive symptoms (Abdollahi et al., 2016).

Few limitations are reported in this analysis. The paper used cross-sectional data, and no causal relationship can be made. Also, although we controlled for several factors that might confound the association between anemia and maternal depressive symptoms such as hormonal level, maternal diet, and inflammatory biomarkers.

Conclusion and policy implication

In conclusion, our study demonstrated that anemia was associated with depressive symptoms in the first two years postpartum, and this finding should be further investigated as a potential risk factor for postpartum depressive symptoms. Since anemia and maternal depressive symptoms were associated, maternal-focused interventions are suggested to reduce both maternal anemia and depressive symptoms in the first two years postpartum. In the Indonesia context, professional health workers can screen for anemia and depressive symptoms during postnatal check-ups. Initial counseling can be provided to whose detected depressive symptoms and refer to a referral health facility if need be.

Author contributions

IS and DS conceptualized the research idea. IS conducted data analysis and drafted the article under the supervision of DS. IS and DS substantially contributed to the study design, data analysis, and reviewed the article.

Disclosure statement

The authors declare that they have no competing interests.

Ethics and consent

All procedures in the IFLS-5 were reviewed and approved by the Institutional Review Boards (IRBs) in the USA (at Rand Corporation) and Indonesia (at Universitas Gadjah Mada). All respondents of IFLS wrote informed consent, and it was collected by IFLS's enumerators

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