

The Correlation Between Gestational Age, Education, and Work Status on The Incidence of Anemia at Gresik Regency

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Abstract

Introduction: Anemia in pregnancy contributed to high maternal and infant mortality and morbidity rate and increased the risk of Low Weight Baby Born. This study was carried out to determine the factors associated with anemia among pregnant women in Gresik.

Methods: This study was an analytical type of observational study with a cross-sectional design. The sampling was used to take 282 pregnant women who attended antenatal care (ANC) at the community health centre in Gresik from August-September 2021. Data were analyzed by Chi-square with a significance level of $\alpha = 0,05$ as bivariate and binary logistic regression as multivariate. Data were analyzed by chi-square test with $p > 0,05$ and logistic regression.

Result: The prevalence of anaemia in pregnant women found in this study was 41,5%. Analysis bivariate result showed p-value on gestational age, education, and work were 0,000; 0,002; 0,011. Logistic regression analysis showed that gestational age (OR = 7,814; 95% CI 4,121 to 12,400; $p = 0,000$) was the most dominant variable.

Conclusion: Factors associated with anaemia among pregnant women in Gresik were gestational age, education, and work. Gestational age was the most dominant variable.

Keywords: anemia; pregnant women; maternal risk factors

1. Introduction

Anemia in pregnancy is a condition of hemoglobin in the mother's blood less than 11 g/dL which is a health problem related to maternal and child health that reflects the welfare, social and economic development of the community and has an impact on the quality of human resources. Anemia in pregnant women is referred to as a potential danger to mother and child or a condition that endangers the mother and child associated with increased maternal morbidity, thus requiring special attention from health services. This is because anemia in pregnancy can adversely affect the mother and fetus.

Based on Riset Kesehatan Dasar in 2018, the prevalence of anemia in pregnant women increased by 1.8% from 2013 (37.1%) to 48.9% with 95% of cases caused by iron deficiency. This condition says that anemia is quite high in Indonesia and shows that the number exceeds severe public health problems with an anemia prevalence limit of 40%^[1].

Anemia contributes to 20% of maternal deaths globally and is a factor in the occurrence of antepartum and post-partum bleeding which is the biggest cause of maternal death in Indonesia^[1]. Research states that the risk of bleeding during delivery is 5 times greater in mothers who experience anemia during pregnancy compared to mothers who do not experience anemia during pregnancy^[2]. Maternal death is death during pregnancy, childbirth, or within 42 days after the termination of pregnancy, due to all causes related to or aggravated by the pregnancy or its management, but not due to accident or injury^[3]. Data from World Health Organization (WHO) states that 40% of the causes of maternal death in developing countries including Indonesia are anemia caused by acute bleeding and poor nutritional status during pregnancy.

Profil Kesehatan Indonesia 2015 shows that in the range from 1991 to 2015, Maternal Mortality Rate in Indonesia decreased from 390 to 305 out of 100.000 live births. Despite this, the fact is that Indonesia has not yet reached the MDGs target of 2015, which is 102 of 100.000 live births. According to the health data of East Jawa Province in 2018, Gresik Regency was ranked 17th with the highest incidence of maternal mortality in East Jawa Province, which was 96.64 of 100.000 live births. This figure is higher than the provincial average of 91.45 of 100.000 live births. Although the MMR achieved by East Jawa has already reached the target by Supas, efforts must still be made to reduce the MMR^{[4][5]}. The main etiology of anemia in pregnant women is iron deficiency in the body. Iron deficiency anemia can occur because the body lacks iron, folic acid, and vitamin B12. Low availability of iron and its inadequate content are the causes of iron deficiency anemia^[6].

Pregnant women are said to have anemia if the hemoglobin level in their blood is <11 g/dL. The Departemen Kesehatan (2000) classifies the severity of anemia in pregnant women as mild anemia if the Hb level is 10-11 g/dL, moderate if the Hb level is 8-10 g/dL, and severe if the Hb level is <8 g/dL. Meanwhile, the WHO classifies anemia in pregnant women based on their trimester^[7]. The Hb level which describes iron deficiency anemia in pregnant women is <11 g/dL in the I and III trimesters and <10,5 g/dL in the II trimester^[8].

During pregnancy physiologically there will be an increase in blood volume or what is known as hypervolemia. This is partly due the increased need for oxygen during pregnancy which triggers an increase in plasma volume and red blood cells. However, in the process of increasing blood volume, the addition of red blood cells is less than the addition of plasma, resulting in a process of blood thinning and an impact on the decrease in Hb concentration. Therefore, during pregnancy are prone to anemia and normal hemoglobin levels in pregnant women are different from women who are not pregnant.

The process of blood thinning is a physiological adaptation in pregnancy and serves as an effort to fulfill the blood supply for uterine enlargement, protect the mother and fetus from the negative effects of decreased venous return when supine, and protect the mother from the negative effects of blood loss during childbirth. Hemodilution is also useful to help relieve the work of the heart which is getting heavier with pregnancy due to increased blood volume. In other words, hemodilution helps the mother maintain normal circulation by reducing the burden on the heart^[9]. The increase in plasma volume occurs through the process of fetal development and growth which is characterized by rapid growth and improvement in the composition of the body's organs. This increase in blood volume causes the need for iron during pregnancy to also increase. The need for iron in the second and third trimesters of pregnancy will increase to 6.3 mg/day^[10].

Anemia in pregnancy can be caused by several factors including gestational age, education, and working status. Research conducted by Rizkah (2017), his research states that there is a correlation between gravida and work status on the incidence of anemia in pregnancy^[11]. Research conducted by Permatasari (2021) also states that there is a correlation between gestational age and parity in the incidence of anemia in pregnancy^[12].

Education affects a person's ability to obtain nutritional information. A low level of knowledge can affect the acceptance of information so knowledge about iron nutrition is limited and has an impact on iron

deficiency during pregnancy^[13]. Research conducted by Edison (2019) states that there is a significant correlation between education level and the incidence of anemia in pregnant women, with a p-value = 0.00^[14].

The mother's occupation is one of the contextual determinants of maternal mortality. This is related to the knowledge and economy of pregnant women. Working mothers have better access to various information including health that can be obtained from the work environment, namely gaining experience and knowledge both directly and indirectly. Work can increase family autonomy and women's reproductive health status, so it is assumed that for pregnant women who work and earn income other than their husbands, antenatal care (ANC) care and visits can be fulfilled properly^[15].

During pregnancy, anemia can cause abortion, pre-maturation labor, susceptibility to infection, antepartum bleeding, and premature rupture of membranes. Meanwhile, during labor, anemia can cause his disorder resulting in prolonged labor. Not only that, but during the puerperium, anemia can also cause postpartum bleeding, the uterus is slow to return, and breast milk does not come out^[16]. Anemia in pregnancy is closely related to nutritional problems in pregnant women. When nutritional intake during pregnancy is lacking, the fetus cannot grow properly, causing the risk of a low birth weight in the fetus. This is because the growth and development of the fetus are determined by nutrition derived from mobilization during pregnancy and after the baby is born. Anemia in pregnancy can also cause neonatal and maternal mortality. Anemia in pregnancy can cause shortness of breath, fatigue, palpitations, sleep disturbances, and increase the risk of bleeding during childbirth, preeclampsia, and sepsis. Premature birth which is also one of the consequences of pregnancy anemia is associated with new problems such as low birth weight, and immune response deficiency, and tends to have psychological and growth problems that can cause decreased learning abilities and low IQ in children. Of course, this has an impact on the productivity and quality of human resources, as well as economic implications^[17].

Efforts to prevent anemia in pregnancy can be done by giving blood (Fe) tablets with a low dose of 30 mg to pregnant women who are not anemic ($Hb \geq 11$ g/dL), while pregnant women with anemia can be given 325 mg sulfate supplements as much as 1- 2 times a day. For anemia caused by folic acid deficiency can be given folic acid 1 mg/day or for prevention doses can be given 0.4 mg/day and vitamin B12 100-200 mcg/day^[18].

Another thing that can help pregnant women prevent anemia during pregnancy is to pay attention to the composition of food by eating more and diverse foods such as green vegetables, nuts, animal protein, adjusting their diet, and continuing to eat fruits rich in vitamin C such as oranges, tomatoes, mango, and so on which can increase iron absorption^[19]. This statement is following research conducted by Azra (2015) which states that there is a significant correlation between vitamin C consumption and anemia in pregnancy^[20].

2. Research Elaboration

This research is an analytic observational type with a cross-sectional study approach, which is an approach that studies independent variables (risk factors) and dependent variables (effects) by taking instantaneous measurements. From the data obtained, the prevalence of incidence in the group with risk factors will be compared with the prevalence of incidence in the group without risk factors. This study uses gestational age, education, and working status as independent variables. While the dependent variable is the level of hemoglobin in the mother's blood. This study used 282 pregnant women in the I-III trimester who performed antenatal care (ANC) in five sub-district health centers in Gresik Regency, namely Manyar District, Kebomas District, Sitsampeyan District, Gresik District, and Cerme District as the population and sample. The minimum number of samples is determined using the slovin formula and the results are 76 samples. Samples were taken by total sampling technique (non-probability sampling) considering the exclusion and inclusion criteria. Inclusion criteria: mothers who received iron-added tablets both in anemic and non-anemic conditions and mothers who measured hemoglobin levels during ANC visits. Exclusion

criteria: a mother who is in labor and/or is seriously ill and/or with a history of certain diseases that can cause anemia such as malaria, infection, and genetics.

This study uses secondary data, namely medical records in the form of a cohort of pregnant women as an instrument because it is more efficient to use and supports data acquisition by the operational definitions of predetermined variables. The data that has been collected were analyzed by univariate, bivariate, and multivariate using SPSS 2.3 software. The data obtained were analyzed by descriptive statistics to get the results of the frequency distribution in the form of proportions or percentages of each variable in tabular form. Then the data were analyzed again using Chi-square as bivariate analysis to determine the correlation of each independent variable with the dependent variable with the significant value used was $p < 0.05$. Logistic regression analysis (multivariate) uses 95% CI with results that can be seen through the exposure value or odds ratio (OR).

3. Results

3.1. General Description

The results of data collection conducted on 282 pregnant women at the five sub-district health centers of Gresik Regency in August – September 2021 found that 117 mothers had anemia. The results showed that most pregnant women did not experience anemia, as many as 165 of 282 pregnant women (58.5%) so the prevalence of anemia in pregnant women was 41.5%. This figure is close to the anemia prevalence limit, which is 48.9%, it can be concluded that the incidence of anemia in pregnant women in Gresik Regency is still high and close to a serious public health problem in the region. Prevention and treatment of anemia must still be considered by the parties concerned, especially health workers.

Table 1. Frequency Distribution of Research Variables

Variables		Percentage N (%)
Gestational Age	First-Trimester	80 (28.4%)
	Second-Trimester	137 (48.6%)
	Third-Trimester	65 (23.0%)
Education	High Risk	29 (10.3%)
	Low Risk	253 (89.7%)
Working Status	Worker	108 (38.3%)
	Not Worker	174 (61.7%)
Anemia	Anemia	117 (41.5%)
	Not Anemia	165 (58.5%)

3.2. The Correlation of Gestational Age and The Incidence of Anemia

Table 2. Table of The Correlation of Gestational Age with Anemia Incidence in I-III Trimester Pregnant Women at the Gresik District Health Center in August-September 2021

Category	Not Anemia	Anemia	n	Chi Square
First-Trimester	63	17	80	0,000
Second-Trimester	102	35	137	
Third-Trimester	0	65	65	

The results in the table above show that 100% of pregnant women in the third trimester, 26% in the second trimester, and 21% in the first trimester have anemia. The results of statistical tests with Chi-square obtained p value = 0.000 which indicates that there is a significant correlation between gestational age and the incidence of anemia in pregnant women in Gresik Regency.

The results of this study are in line with research conducted by Irul Hidayati (2018) which states that there is a correlation between gestational age and the incidence of anemia in pregnancy ($p = 0.012$) and Yana Luthfiyati in 2018 ($p\text{-value} = 0.000$) at Jetis Health Center Yogyakarta City ^[21]. Hemodilution or blood thinning also increases with increasing gestational age and peaks at 32-36 weeks^[9].

Hemodilution in pregnancy reaches its peak at 24 weeks of gestation and can continue to increase until 37 weeks of gestation^[22]. This causes pregnant women whose gestational age is 24 weeks to be susceptible to anemia. The results of this study support the statement that there is a correlation between gestational age and the incidence of anemia. In the third trimester, which is 28-40 weeks or the maturation period, improving nutritional quality is very important because at this stage the mother begins to prepare fat and other nutrients as a reserve for the formation of breast milk. At this time the weight gain reached approximately 3 kg ^[23]. In the third trimester group, the mother will tend to experience anemia because at this time the fetus accumulates iron reserves for itself as a supply for the first month after birth so that Hb levels are reflected below 11 g/dL ^[24].

The need for nutrients, including iron, which also increases with increasing gestational age, needs special attention. The results showed that the total number of pregnant women in the third trimester was anemic, illustrating that the nutritional and iron needs have not been fulfilled. This can be caused by several other factors, such as the mother's non-compliance in taking iron tablets and the mother's low knowledge of health during pregnancy. Non-compliance with taking iron-added tablets should be controlled from the start of giving tablets, this can be done by providing a control card for the consumption of blood-added drugs that are filled every day. As for the mother's knowledge factor, several cooperative efforts can be made between health workers and their families, such as the family care program, namely the family pays attention to, controls, and regulates the consumption and nutritional needs of mothers every day. Not only that, but the family can also take a role in reminding the consumption of iron-added tablets, to increase compliance.

Anemia that is reflected in third-trimester pregnant women may be caused by the mother experiencing less nutrition than before pregnancy. So, it is necessary to develop education and socialization efforts regarding premarital nutrition health. This can be done by targeting teenagers as a provision to enter family

life, so it is hoped that prospective parents, especially mothers, can understand the importance of fulfilling nutritional needs during pregnancy.

3.3. The Correlation of *Mother's* Education and The Incidence of Anemia

Table 3. Cross Table of the Correlation between Education and the Incidence of Anemia in I-III Trimester Pregnant Women at the Gresik District Health Center in August-September 2021.

Category	Not Anemia	Anemia	N	Chi Square
Low Risk	156	97	253	0,002
High Risk	9	20	29	

The results of the study in the table above show that 20 of 29 pregnant women with low education category (high risk) or more than half (69%) have anemia. Meanwhile, of the 253 low-risk pregnant women, most of them did not experience anemia, and as many as 156 pregnant women (62%). The results of the Chi-square test obtained p value = 0.002 ($p < 0.05$), which means that there is a significant correlation between education and the incidence of anemia in pregnant women in Gresik Regency.

This study is in line with research conducted by Ahmad (2010) which shows the results that there is a significant correlation between education level and the incidence of anemia with $p < 0.001$. The same results from the research conducted by Ernawati (2020) with p -value = 0.001^[25]. However, this study is inconsistent with research conducted by Handayani (2012) in South Kalimantan, which showed that there was no significant correlation between education and the incidence of anemia in pregnant women^[26].

Theoretically, the education taken by a person influences the level of thinking ability, in other words, someone with higher education can make more rational decisions, generally open to accepting changes or new things compared to individuals with lower education. The level of education of pregnant women affects the acceptance of information on knowledge about anemia and the factors associated with it, as well as the importance of iron during pregnancy^[9]. However, in the modern era, as it is today, the level of education should not be a barrier to utilizing various existing facilities to increase knowledge and access public health services. So even though the mother has low education, she still cares about her health during her pregnancy.

In this study, pregnant women with anemia were still found in the category of mothers with high education or low risk, as many as 97 of 253 pregnant women or equivalent to 38% of these categories. These results may be influenced by other factors not examined in this study, such as culture. Even though highly educated mothers do not rule out the possibility of following the wrong cultural traditions of their predecessors, for example, they should not eat certain foods such as fish and some other myths about pregnancy that can affect the mother's actions towards her pregnancy. So it is necessary to do a good KIE (Komunikasi, Informasi, Edukasi) regarding hoaxes or myths about pregnancy, especially regarding certain foods.

3.4. The Correlation of Working Status with The Incidence of Anemia

Table 4. Cross Table of the Correlation between Work Status and the Incidence of Anemia in Pregnant Women in Trimester I-III at the Gresik District Health Center in August-September 2021.

Category	Not Anemia	Anemia	N	Chi Square
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Not Worker	112	62	174	0,011
Worker	53	55	108	

The results of the study in the table above show that most of the pregnant women who work experience anemia, namely 55 out of 108 pregnant women (51%). While 64.3% of mothers who do not work, namely 112 of 174 pregnant women, do not experience anemia. The results of statistical tests using the Chi-square test showed that the value of $p = 0.011$ ($p < 0.05$) which means that there is a significant correlation between work status and the incidence of anemia in pregnant women in Gresik Regency.

The results of this study are in line with research conducted by Rizkah (2017) which shows that work status has a significant influence on the incidence of anemia in pregnancy, with a p-value of 0.011. Pregnant women who work tend to have a lower economic status and they have to work hard to make ends meet even when they are pregnant so that their nutritional needs and antenatal care are not adequately met^[11].

Mothers who do not work does not mean that they do not have the risk of developing anemia during their pregnancy. As the results of this study showed that less than 50% of pregnant women who did not work experienced anemia, namely 62 of 174 pregnant women (36%). This could be because mothers who do not work depending on their husband's income to fulfill their daily needs. It is possible that mothers who do not work belong to a society with a low socio-economic level.

Work is defined as any activity that produces goods or services. People assume that work can determine economic welfare so that someone who works or earns can meet the nutritional needs of his family. According to Supariassa, socio-economic conditions including work are one of the factors that determine the amount of food available in the family, so it also determines the nutritional status of the family.

Research conducted by Kartikasari (2012) in Semarang shows that work affects family income which is an indirect factor in determining purchasing power and the adequacy of the quantity and quality of food consumed for the family so that they can consume more varied and nutritious foods. Nutrition is very influential on the nutritional state of a person, both micronutrients and macronutrients so if the fulfillment of these nutrients is lacking during pregnancy, pregnant women will be at risk of experiencing nutritional disorders or Chronic Energy Deficiency (KEK) which can increase the risk of anemia. Most cases of KEK are found in families with low economic status^[6].

The Indonesian government in UU No. 13 tahun 2003 concerning Manpower has regulated rest periods or maternity leave for working pregnant women, namely Pasal 82 ayat (1) states that:

"Pekerja/buruh perempuan berhak memperoleh istirahat selama 1,5 (satu setengah) bulan sebelum saatnya melahirkan anak dan 1,5 (satu setengah) bulan sesudah melahirkan menurut perhitungan dokter kandungan atau bidan."^[27].

The above regulation is clear that pregnant women who work can take a break at the time of entering the 34th week or in the third trimester. This has similarities with the results in this study in that 39 out of 65 third-trimester pregnant women (65%) were workers.

This study also obtained significant results between gestational age and the incidence of anemia, which the researcher assumes that the incidence of anemia in third-trimester pregnant women is also caused by the influence of the mother's daily activities or in this case, work. So, if you follow government regulations that allow pregnant women to rest or take maternity leave in the third trimester or 1.5 months before the due date, there must be the development of KIE efforts for pregnant women who work related to how to maintain and regulate health patterns while working. This KIE can be done either directly when the mother makes a pregnancy visit or indirectly by creating platforms and/or other media that are easily accessible to pregnant women as a guide to maintaining a healthy pregnancy during work which is written officially by the health department and related health institutions so that pregnant women will be easy to receive and follow the

information.

3.5. Risk Factors Most Associated with The Incidence of Anemia

Tabel 5. Multivariate Analysis Results

Variables	Slope	P value	OR	Confidence Interval (95%)	
				Lower Limit	Upper Limit
Gestational Age	1,967	0,000	7,149	4,121	12,400
Education	0,535	0,270	1,707	0,660	4,415
Working Status	0,252	0,412	1,287	0,704	2,351
Constanta	-2,455	0,000	0,086		

Multivariate analysis using a binary logistic regression test with the Backward Likelihood Ratio method was used to determine the most influential factors on anemia in pregnant women in Gresik Regency. The results of the analysis showed that the variable that had the most influence on the incidence of anemia was gestational age (p-value = 0.000), while the education and working status of the mother had no effect.

The gestational age variable has an OR of 7.641 which means that pregnant women with a higher gestational age or in this study the highest in the third trimester have a 7.641-fold risk of anemia compared to mothers in the first and second trimesters. Based on the calculation of Nagelkerke's R square, the number 0.384, means that gestational age contributes of 38.4% to the incidence of anemia in pregnant women in Gresik Regency.

Although the factor of gestational age is the only factor that has the most influence on the incidence of anemia in pregnancy in Gresik Regency, as described in the previous discussion, anemia that occurs in third-trimester pregnant women can be influenced by other factors studied and not studied in the third trimester. this study, such as the level of knowledge, adherence to taking iron tablets, poor nutritional conditions before pregnancy, low socio-economic conditions, and physical activity (occupation) of the mother.

4. Conclusions

Of the 282 respondents, 117 (41.5%) pregnant women in Gresik Regency experienced anemia. The description of the distribution of pregnant women in Gresik Regency in August-September 2021 is 48.6% in the second trimester, 75.5%, 89.7% have a high level of education or are at low risk (high school graduation), and 61.7% are classified as pregnant women do not work. There is a significant correlation between gestational age and anemia in pregnant women in Gresik Regency ($p = 0.000$). There is a significant correlation between education level and anemia in pregnant women in Gresik Regency ($p = 0.002$). There is a significant correlation between work status and anemia in pregnant women in Gresik Regency ($p = 0.011$). The factor most related to the incidence of anemia in pregnant women in Gresik Regency is gestational age.

Acknowledgements

Thank you to all employees of the Poli Kesehatan Ibu dan Anak of the Public Health Center of Gresik Regency, East Jawa who helped and guided the author, so the research could be completed.

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