

**NON-FOOD RISK FACTORS OF ANEMIA AMONG CHILD-BEARING AGE
WOMEN (15-45 YEARS) IN INDONESIA
(FAKTOR RISIKO NON-MAKANAN TERHADAP KEJADIAN ANEMIA PADA
PEREMPUAN USIA SUBUR [15-45 TAHUN] DI INDONESIA)**

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ABSTRAK

Latar Belakang: Anemia merupakan salah satu masalah kesehatan masyarakat yang paling banyak ditemukan, baik di negara sedang berkembang maupun negara maju. Kelompok masyarakat yang rentan di antaranya ibu hamil dan perempuan usia subur (PUS). Identifikasi faktor risiko diperlukan dalam penajaman program mengatasi anemia. **Tujuan:** Menganalisis perbedaan karakteristik antara kelompok anemia dan non-anemia, serta faktor risiko non-pangan terhadap anemia defisiensi-besi pada kelompok PUS. **Metode:** Analisis data sekunder dari Survei Kesehatan Nasional (SURKESNAS) 2001. Kriteria sampel adalah PUS berusia 15-45 tahun dengan sampel darah dan diukur kadar hemoglobin (Hb). Sebanyak 4.893 sampel memenuhi syarat analisis, yang diperoleh dari 13.000 sampel. Analisis faktor risiko anemia menggunakan *regresi logistik*. **Hasil:** Rata-rata hemoglobin, indeks massa tubuh (IMT), lingkar pinggang, lingkar pinggul, dan tingkat pendidikan lebih rendah pada perempuan anemia dibandingkan dengan non-anemia defisiensi-besi ($p < 0,01$). Indikator lain seperti umur, tinggi badan, rasio lingkar pinggang/pinggul, pendapatan, aktivitas fisik, status merokok, kebiasaan minum minuman beralkohol, dan status perkawinan tidak berbeda di antara kedua kelompok. Perubahan status perkawinan, tingkat pendidikan, IMT, dan tekanan darah diastol berhubungan nyata dengan kejadian anemia defisiensi-besi ($p < 0,01$). Analisis regresi logistik menunjukkan, kelompok PUS dengan IMT $> 18,5$ cenderung tidak anemia (OR=0,6) dibandingkan kelompok dengan IMT $< 18,5$ ($p = 0,00$). Kelompok PUS dengan IMT $< 25,0$ berpeluang untuk menjadi anemia sebesar 1,3 dibandingkan PUS $> 25,0$ ($p = 0,01$). **Kesimpulan:** Ukuran antropometri berhubungan dengan risiko terjadinya anemia defisiensi-besi. PUS dengan IMT tinggi cenderung tidak anemia defisiensi-besi. **[Penel Gizi Makan 2010, 33(2): 102-109]**

Kata kunci: anemia defisiensi-besi, perempuan usia subur, faktor risiko, indeks massa tubuh

INTRODUCTION

The World Health Organization (WHO) estimates about 50 percent of the world's population (more than two billion individuals) suffered from iron-deficiency anemia.¹ The groups with the highest prevalence are preschool-age children 47.4 percent, pregnant women 41.8 percent, and non-pregnant women 30.2 percent.² The prevalence of anemia in developing countries is about four times than in the developed countries. Current estimates for anemia in pregnant women in the developing and developed countries respectively are 56 and 18 percent.¹

At certain periods of life, iron requirements are particularly high; therefore less likely to be met. Women have a substantially higher prevalence of anemia than men, because about half of their iron requirement is needed to replace

iron losses in menstruation. This explains why most women enter pregnancy with depleted iron stores.

In Indonesia, the nutrition and health status are relatively lower than other ASEAN countries. The Indonesian MDGs 2010 report showed that the maternal mortality rate was 390 in 1991, and then improve became 290 in 2007.³ This indicators related with the high prevalence of anemia among pregnant mothers that about 40-50 percent, and Indonesia was considered as high (40.1%).⁴ Multi-country studies in Asia and Africa showed that maternal mortality is about 20-30 percent due to anemia, and other factors such as infection and pre-eclampsia. Severe maternal anemia (Hb < 8.0 g/dL) is almost certainly a greater mortality risk factor than mild or moderate anemia.⁵

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OBJECTIVES

The objectives of study generally are to compare the selected characteristics between anemic and non-anemic groups, and to identify the non-dietary risk factors of anemia at the child-bearing age women 15-45 years (CBAW) in Indonesia.

METHODS

Design of this research was *cross-sectional study*. Data used in this analysis based on the National Health Surveys (SURKESNAS) in 2001. Generally, this survey was objected to provide the national pictures related on the common health at community. Anemia status is one of the many variables at the SURKESNAS, since not all of the subjects were assessed their hemoglobin (Hb).

Total samples in this survey were 13,000 men and women with age more than 15 years. Criteria's sample for this study were women, age between 15-45 years, and Hb tested. Based on those criteria the number of 4893 samples was eligible for analysis. Data was collected with interviewed using the structural questionnaire. Hemoglobin level was tested with the cyanmethemoglobin by finger-prick blood. Women categorized as anemic if their Hb < 12.0 g/dL.⁶

To address the above objectives, it was hypothesized that the selected characteristics are proposed for the risk factors of anemia among the child-bearing age women (Figure 1). Since those actual direct variables were not available at the data set of SURKESNAS, authors used the proxy and indirect variables to represent the selected variables.

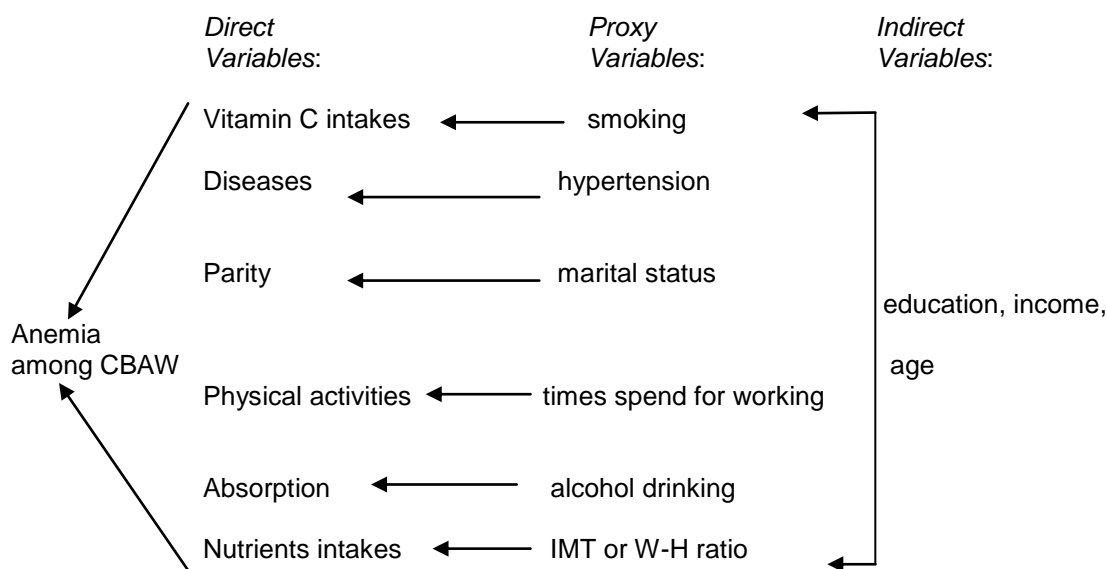


Figure 1
Framework Non-food Risk Factors of Anemia Status at the Child-Bearing Age Women (CBAW)

The elementary and statistical test was as follows:

- a. Elementary statistic such as mean, standard deviation, frequency for the continuous variables and median for the categorical variables,
- b. T-test and Mann-Whitney U were applied to compared the continues and categorical variables respectively,

between the anemic and non-anemic groups,

- c. Mantel-Haenszel test is used to analyzed significance of Odd Ratio (OR) two-by-two variables, where the confidence interval (CI) was set at 95%
- d. Risk factors analysis by the logistic regression for multiple variables with formula:

$$Y = \alpha + \beta X_1 + \beta X_2 + \beta X_3 + \beta X_4 + \beta X_5 + \beta X_6 + \beta X_7$$

Where,

Y = anemia status (0=anemia, Hb<12 g/dL; 1=non-anemia, Hb≥12 g/dL)

X1 = age (0=15-19 years, 1=20-45 years)

X2 = marital status (0= not yet married, 1= married or ever-married)

X3 = education (0= up to secondary school; 1=higher than secondary school)

X4 = body mass index (1<18.5 kg/m²; 2=18.5-24.9 kg/m²; 3=≥25.0 kg/m²)

X5 = current smoking status (0=not smoking, 1=smoking)

X6 = current alcohol drinking (0=not drinking, 1=drinking alcohol)

X7= diastole (0= <80 mmHg, 1= diastole ≥80 mmHg)

RESULTS AND DISCUSSION

The number of total samples from SURKESNAS data was 13,000 persons. After excluding criteria of this study (women, age 15-45 years, Hb tested), it was found number of 4893 eligible samples. The prevalence of anemic of this study was 1377 (28.1%), and it was lower compared with prevalence of non-pregnant women at the national data (SKRT) in 1995 (39.5%) and relatively the same with data in 2001 (27.9%).⁴ The mean hemoglobin level between the two groups were significantly different ($p < 0.01$), namely 10.9 ± 1.1 g/dL and 13.2 ± 0.9 g/dL at the anemic and non-anemic groups respectively (CI 95%: 2.9-3.1).

Table 1
Selected Characteristics According to the Anemia Status

No	Characteristics	Anemic Group ¹ (n=1377)	Non-anemic Group ¹ (n=3516)	Mean difference (CI 95%)
1.	Hemoglobin (g/dL) ²	9.8 ± 1.2	12.9 ± 1.9	2.9-3.1
2.	Age (years)	29.8 ± 8.7	29.2 ± 8.5	0.2-1.4
3.	Weight (kg)	48.2 ± 8.5	50.3 ± 8.9	1.4-2.9
4.	Height (cm)	150.5 ± 5.5	151.3 ± 5.8	0.2-1.2
5.	Body mass index (kg/m ²)	21.4 ± 3.5	22.1 ± 3.7	0.4-1.0
6.	Waist (cm) ²	72.1 ± 9.2	74.3 ± 10.3	1.3-3.2
7.	Hip (cm) ²	87.4 ± 8.2	90.1 ± 9.9	1.8-3.7
8.	Waist-hip ratio	0.83 ± 0.07	0.82 ± 0.07	0.007-0.009
9.	Family income (Rp/months)	593,885 ± 513,803	615,707 ± 525,014	24,837-24,130
10.	Physical activities related to working (hours/week)	7.0 ± 2.7	7.1 ± 2.8	0.2-0.3
11.	Blood pressure (diastole, mmHg)	76.9 ± 13.4	77.8 ± 10.0	0.5-2.3
12.	Blood pressure (sistole, mmHg)	116.5 ± 17.8	118.5 ± 15.3	0.1-3.9
13.	Current smoking (0=no, 1=yes)	0 (0.0)	0 (0.0)	-
14.	Education (0=< SMP, 1=>SMP) ³	0 (0.0)	0 (0.1)	-
15.	Drinking alcohol (0=no 1=yes)	0 (0.0)	0 (0.0)	-
16.	Marital status (0=not married, 1=married)	1 (1.1)	1 (1.1)	-

¹ Plus-minus values are means ± SD. Other values are medians (25th and 75th percentiles)

² T-test, significantly different ($p < 0.05$)

³ Mann-Whitney U Test, significantly different $p = 0.01$ (SMP=secondary school)

The selected characteristics of samples between anemic and non-anemic were shown on the Table 1. The women age of reproductive was analyzed into two different of age: adolescents (15-19 years) and adult women (20-45 years). Based on this two categories, the number adolescent was 788 (16.1%) and 4105 (83.9%) for adult women. There is a tendency that body weight and height are lower among the anemic group than the non-anemic group. The average weight of anemic

group 48.2 kg and non-anemic group 50.3 kg was significantly different ($p < 0.01$), and not significant for the height 150.5 cm and 151.3 cm respectively. Most of the women were categorized at the normal level of BMI ($18.5-24.9 \text{ kg/m}^2$).⁷ However, the BMI anemic group was significantly lower ($21.4 \pm 3.5 \text{ kg/m}^2$) than the non-anemic group ($22.1 \pm 3.7 \text{ kg/m}^2$) (CI 95%: 0.4-1.0). Figure 2 present the mean of hemoglobin among the thin, normal, and overweight women were significantly different ($p < 0.01$).

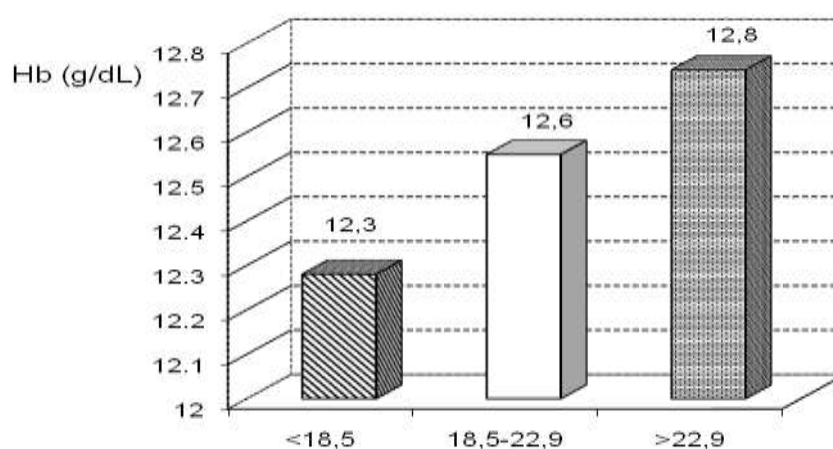


Figure 2
Mean of Hemoglobin Based on the BMI

Other anthropometric indicators such as waist and hip was significantly lower at the anemic compared with the non-anemic group ($P < 0.01$). Since most of the samples were adult (83.9%), the waist-hip ratio was not significantly different between the two groups, namely 0.83 ± 0.07 (anemic) and 0.82 ± 0.07 (non-anemic) (CI 95%: 0.007-0.009). It seems that this ratio may more sensitive for the older age group rather than adolescent. The deposit of fat accumulated at the waist and hip area and started appear at the age 30-40 years.⁷

Most of the samples (74.8%) in this analysis has been (or ever) married. By the Mann-Whitney U test, the median of marital status was not significantly different among anemic and non-anemic group, and both mostly ever married. The marital status was a proxy for the frequency of childbirth (parity) status, where the high parity tend to be anemia.⁸ The physical activities among

two groups were almost the same, when they allocated about 7 hour per week related to their work. The physical activity was proposed as anemia risk factor; since heavy working was tend to reduce the life of red blood cells.⁹ However, in this study between the groups there was not different at time spending for working.

Other characteristics that may relate to anemia status were smoking and alcohol drinking. Smoker needs more vitamin C to decrease free radicals, meanwhile this vitamin needed for iron absorption.¹⁰ Alcohol drinking may also inhibit the absorption of iron at the intestine.^{8,10} It was found that only a few samples having habits of smoking 170 (3.5%) as well as alcohol drinking 41 (0.8%). The median of both variables were not significantly different between the anemic and non-anemic groups.

Blood pulses was measured with diastole, and it was categorized prehypertension when the diastole >80 mmHg.¹¹ Liver disorder was one of the cause of hypertension, and this possible lead to disturbing erythropoiesis (developing of red blood cell).⁹ In fact, the diastole between the two groups were not significantly different ($p>0.05$), namely 76.9 mmHg in anemic and 77.8 mmHg in non-anemic group (CI 95%: 0.5-2.3). The association between diastole with anemia was low (OR=1.3), although it was statistically significant ($p=0.00$) (Table 2).

Mandatory of minimum education in Indonesia was a nine years at the formal schools (elementary and secondary school). However, there were 3531 samples (72.1%) having education below the standard of minimum education. And among of them mostly (53.8%) were graduated at the elementary school, including 8.7 percent were never entering the elementary school. Meanwhile only 4.8 percent of total samples were having academic background at the university level. The national data in 2010 showed the number of Indonesian having education at the elementary school was 95.2 percent.⁴ The median education level was lower at the anemic group than non-anemic groups ($P<0.01$). The women having education less than secondary school tend to be anemic 1.35 times than those having

higher education, and it was shown the OR=1.35 (CI 95%: 1.17-1.56). The low education may related to the limited access on social, economic, health facilities, and that all caused the women fall into the vulnerable groups.

Family income was proposed influencing the anemia status. Higher income is expected improve iron status through food quality and health access. In this study, the more sensitive indicators, such as income per capita, were not available. Family income (Rp/ family/ month) between the two groups were not significantly different, namely $593,885 \pm 513,803$ in anemic and $615,707 \pm 525,014$ in non-anemic.

Two-by-two table present the distribution of selected variables by the anemia status (Table 2). To see the association between two variables, the Odd Ratio (OR) was calculated then tested with Mantel-Haenszel using 95 percent confidence interval (CI). Marital status among women 15-45 years significantly influenced the cases of anemia ($p=0.01$), where possibility unmarried women was 0.83 times not suffering from anemia than those married/ever married (CI 95%=0.71-0.96). Married or ever married women were as a proxy for parity which related to the anemia cases, since they loss more blood during childbirth.⁸

Table 2
Distribution of Sample's Characteristics between Anemia Status and its
Odd Ratio (OR)¹

No	Characteristics	Anemic Group	Non-anemic Group	Total	OR (CI:95%), p	
1	Age (years)	15 - 19	223 (28.3%)	565 (71.7%)	788 (100.0%) OR=1.00 (CI:0.85-1.20), p=0.92	
		20 - 45	1154 (28.1%)	2951 (71.9%)		4105 (100.0%)
2	Marital status ²	Not married	312 (25.3%)	921 (74.7%)	1233 (100.0%) OR=0.83 (CI:0.71-0.96), p=0.01	
		Married	1065 (29.1%)	2593 (70.9%)		3660 (100.0%)
3	Education ²	Up to secondary school	1052 (29.8%)	2479 (70.2%)	3531 (100.0%) OR=1,35 (CI:1.17-1.56), p=0.00	
		Higher than secondary school	325 (23.9%)	1037 (76.1%)		1362 (100.0%)
4	Body mass index ² (kg/m ²)	< 18.5 (thin)	270 (35.4%)	492 (64.6%)	762 (100.0%) OR(1,2) =1.42 (CI:1.20-1.68), p=0.00	
		18.5– 24.9 (normal)	911 (27.9%)	2354 (72.1%)		3265 (100.0%) OR(2,3)=1.36 (CI:1.13 -1.63), p=0.00
		≥25.0 (over weight)	181 (22.2%)	634 (77.8%)		815 (100.0%) OR(1,3)=1.92 (CI:1.54 -2.40), p=0.00
5	Cigarette smoking	Yes	52 (30.6%)	118 (69.4%)	170 (100.0%) OR=0.89 (CI:0.64 -1.23), p=0.47	
		No	1325 (28.1%)	3398 (71.9%)		4723 (100.0%)
6	Drinking alcohol	Yes	18 (43.9%)	23 (56.1%)	41 (100.0%) OR=2.01 (CI:1.08 -3.74), p=0.08	
		No	1359 (28.0%)	3493 (72.0%)		4852 (100.0%)
7	Diastole ² (mm Hg)	< 80	403 (31.5%)	875 (68.5%)	1278 (100.0%) OR=1.26 (CI:1.08-1.47), p=0.00	
		≥80	524 (26.7%)	1437 (73.7%)		1961 (100.0%)

¹ OR analyzed by Mantel-Haenszel test

² OR statistically significant (p<0.05)

Someone with low BMI score indicated suffering from chronic energy deficiency.⁷ This status was due to the low intake of energy and protein, and usually

followed by micro-nutrients deficiency as well. Therefore, the women with low BMI may have a risk of anemia. The thin women (BMI<18.5 kg/m²) are significantly

tend to be anemia 1.4 times (CI 95%: 1.20 -1.68) and 1.9 times (CI 95%: 1.54 -2.40) than those normal and overweight ($p < 0.00$). Meanwhile, the normal weight was possible to occurred anemia 1.4 times than the overweight women (OR=1.36; CI 95%: 0.13 -1.63).

The OR of other characteristics such as age, cigarette smoking and alcohol drinking were presented at Table 2. The proportion of age distribution between the two groups was not different, so the association with anemia was not significant. And then, in the logistic regression analysis the age variables were excluded from analysis.

In this study, alcohol drinking consumption was not associated with anemia, may be due to low number of samples having this habits (0.8%). Indonesians, especially who are Moslem, was not recognized as alcohol drinking. It was the same with smoking variable, when only 3.5 percent women smoked and not

related with the anemia. There was no data about how many cigarettes per day, start of smoking, type of cigarette, etc.

Logistic regression used to analyze multi variables related to anemia. However, among the independent variables it was only BMI showed the association with the anemia ($p < 0.005$). Women with BMI > 18.5 tend to reduce risk of anemia 0.6 times than those having BMI < 18.5 kg/m^2 (OR=0.57; CI 95%: 0.45-0.72). And the women with BMI < 25.0 kg/m^2 associated with the risk of anemia 1.3 times than those women's BMI > 25.0 kg/m^2 (OR=1.31; CI 95%: 1.07-1.61). Study by Permaesih and Herman (2003)¹² revealed at the adolescent boys and girls, the wasting (BMI < 5 percentile) was a risk factor for anemia. Weight reduction were common among the women, therefore the underweight included a risk factor for anemia.⁸ Meanwhile, since other women characteristics having several weaknesses for proxy variables, there were not significant associated with the anemia.

Table 3
Result of Logistic Regression on Anemia Status

Variables*	B	SE	Wald	Df	Sig.	OR	95.0% C.I. for OR	
							Lower	Upper
Married	-0.09	0.16	0.28	1	0.60	0.92	0.67	1.26
Education	0.24	0.10	5.93	1	0.02	1.28	1.05	1.56
BMI (0=2.3; 1=1)	-0.56	0.12	22.84	1	0.00	0.57	0.45	0.72
BMI (0=1.2; 1=3)	0.27	0.10	6.84	1	0.01	1.31	1.07	1.61
Smoking	-0.20	0.20	1.03	1	0.31	0.82	0.56	1.20
Alcohol drinking	0.52	0.37	1.94	1	0.16	1.68	0.81	3.49
Diastole	0.19	0.08	5.24	1	0.02	1.21	1.03	1.42
Constant	-0.60	0.79	0.59	1	0.44	0.55		

* Variable(s) entered on step 1: married, education, BMI, smoking, alcohol drinking, and diastole.

The variable AGE is constant for all selected cases. Since a constant was requested in the model, it will be removed from the analysis.

CONCLUSION

1. The characteristics of anemia among child-bearing age women were lower in hemoglobin, BMI, waist and hip circumferences, and education than the non-anemic.
2. The non-food risk factor for anemia was BMI, where the normal and overweight women tend to be protected from anemia.

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