

## Eating habit and other factors related to anemia in civil female flight attendant in Indonesia

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Received: October 15, 2014; Revised: November 23, 2014; Accepted: November 11, 2014.

### Abstract

**Latar belakang:** Anemia masih merupakan masalah kesehatan pada wanita yang dapat mengganggu performa kerja termasuk pramugari. Tujuan penelitian ialah untuk mengidentifikasi faktor-faktor dominan terhadap anemia pada pramugari.

**Metode:** Penelitian potong lintang dengan metode sampling purposif pada pramugari yang melakukan pemeriksaan kesehatan berkala di Balai Kesehatan Penerbangan pada 1-15 Mei 2013. Data dikumpulkan menggunakan formulir khusus untuk penelitian ini. Data yang dikumpulkan adalah karakteristik demografi dan pekerjaan, kebiasaan makan, riwayat haid, indeks masa tubuh (IMT), serta kadar hemoglobin. Kadar hemoglobin berasal dari rekam medik di Balai Kesehatan Penerbangan. Anemia ialah jika kadar hemoglobin kurang dari 12 g/dl.

**Hasil:** Di antara 225 pramugari yang melakukan pemeriksaan kesehatan, 185 di antara pramugari berusia 18-46 tahun bersedia untuk berpartisipasi studi ini, dan 28,1% menderita anemia. Frekuensi makan daging merah per minggu, masa kerja total, jenis penerbangan, dan menstruasi merupakan faktor risiko yang dominan yang berhubungan dengan anemia. Faktor risiko yang paling dominan adalah makan daging merah / minggu. Pramugari yang makan daging 3 kali atau lebih dalam per minggu dibandingkan yang kurang dari 3 kali per minggu berisiko 43% lebih kecil mengalami anemia [risiko relatif suaian (RRa) = 0,57; 95% interval kepercayaan (CI) = 0,32-1,03; P = 0,064]. Pramugari yang mengalami menstruasi berlebihan dibandingkan yang menstruasi normal memiliki risiko 3,5 kali lebih tinggi mengalami anemia (RRa = 3,45; P = 0,000).

**Kesimpulan:** Kebiasaan makan daging kurang dari tiga kali seminggu dan yang mengalami menstruasi berlebihan memiliki risiko lebih tinggi mengalami anemia di antara Pramugari di Indonesia. (*Health Science Indones 2014;2:67-72*)

**Kata kunci:** anemia, pramugari, daging merah, menstruasi, Indonesia

### Abstract

**Background:** Anemia is a health problem in women that can interfere work performance including female flight attendant. This study aimed to identify several dominant risk factors related to anemia in female flight attendants.

**Method:** A cross-sectional study with purposive sampling was conducted to female flight attendant who performing periodic medical check-up at the Civil Aviation Medical Center, Jakarta on May 1-15 2013. Data collected using structured questionnaire. The data collected were demographic data, job characteristics, the characteristics of eating habits, menstrual history, body mass index, and hemoglobin levels. Hemoglobin levels were taken from flight attendant's medical records at the Civil Aviation Medical Center, Jakarta. Anemia defined if hemoglobin levels less than 12 g/dl.

**Results:** Out of 225 female flight attendants who did medical checkup, 185 of them age 18-46 years old who willing to participate in this study, and 28.1% of them had anemia. Frequency of eating red meat/week, total working period, type of flight, and menstruation were dominant risk factors related to anemia. The most dominant risk factor was of eating red meat/week. Flight attendant who had eat meat for 3 times or more a week compared to less than 3 times a week had 43% less risk of having anemia [adjusted relative risk (RRa) = 0.57; 95% confidence interval (CI) = 0.32 – 1.03; P = 0.064]. Flight attendant who had heavy flow menstruation than normal flow menstruation have 3.45 times higher risk of having anemia [RRa = 3.45; P = 0.000].

**Conclusion:** Flight attendant who had eating meat habit less than three times a week and having menstrual heavy flow has a high risk of having anemia. (*Health Science Indones 2014;2:67-72*)

**Key words:** anemia, flight attendant, meat, menstruation, Indonesia

Anemia is one of the health problems that are still going on in the community. The effects of anemia should not be underestimated, even mild anemia can cause interference in the functioning of organs that are often ignored by the patient.<sup>1</sup> Anemia can reduce oxygenation in tissue and disrupt organ function in general. In addition, anemia has an impact on social and economic issues, cause cognitive impairment and decline work productivity.<sup>2-4</sup>

Etiology of anemia is various and multifactorial, but most of it caused by iron deficiency.<sup>5</sup> Eating habit related with people's iron intake. Red meat is source of heme iron with good absorption for human body.<sup>6</sup> One study show red meat eating habit related with anemia in reproductive age female. Other study show relationship between anemia and body mass index (BMI).<sup>7</sup>

Female flight attendant are part of population of reproductive age woman who became one of the most vulnerable anemic populations. Flight attendants have an important role in maintaining the safety of passengers on the flight. Anemia in flight make the body difficult to adaptation when it has to face hypoxia, but hypoxic condition will also force the body's capacity to compensate anemia.<sup>8</sup>

The results of preliminary research from data hemoglobin only conducted by the author in 629 flight attendants who perform annual tests in Civil Aviation Medical Centre Indonesia in Jakarta during the period of October 2012 to January 2013 showed the prevalence of anemia was 19.6%. Presence of anemia on flight attendants will disrupt organ function which impact on the performance of duty. Currently we have did not find other studies of anemia in Indonesia in female flight attendant.

This study aimed to identify several dominant risk factors related to anemia in female flight attendants in Indonesia.

## METHODS

This was a cross sectional study with purposive sampling. Subjects consisted of civilian female flight attendants who did medical examination during 08.00-12.00 AM at Civil Aviation Medical Centre Indonesia in Jakarta during the period of 1 to 15 May 2013.

Data collected using a structured form for this study. The data collected were age, education, type of flight, total working time, total flight hours, total

flight hours for the last 1 year, flight hours for the last 1 month, eating red meat habit, eating vegetables habit, eating fruit habit, drinking tea habit, take supplements habit, menstrual history, body mass index (BMI), and hemoglobin levels. Hemoglobin levels were taken from flight attendant's medical records at Aviation Medical Centre Indonesia.

Type of flight divided into three types (short-haul flights = the flight was less than 4 hours; the medium-haul flight = flying about 4-6 hours; and long-haul flight = the flight lasts more than 6 hours). Total working period was calculated based on how long the subject working in aviation as a flight attendant and categorized into two groups (0=1 month-4 years; 1= >4 -16 years). Total flight hours are calculated based on estimates of the overall flight hours while working as a flight attendant, and categorized into two groups (0=12- 3500 hours; 1 = 3501- 15000 hours). Flight hours for the last 1 year is calculated based on the estimated hours flown in a flight attendant while working in last 1 year and categorized into two groups ( 0 = 0-930 hours; 1 = 931-1500 hours). While flight hours last 1 month were calculated based on the estimated flight hours during the last 1 month and categorized into two groups ( 0 = 0-80 hours; 1 = 80-130 hours). The categories of total flight hours based on the mean flight hours of this study.

Eating red meat habit based from the frequency of eating red meat a week, categorized into 2 groups (0 = less than 3 times a week; 1 = three times or more a week). Vegetable eating habits assessed by the frequency and timing of eating vegetables, and the frequency categorized into 2 groups (0 = less than 3 times a week; 1 = and three times or more a week). While time of eating vegetables is divided into 3 groups (0= while eating; 1 = outside meal times; 2 = never). Eating fruit and tea drinking habits assessed by time eating the fruit or drinking tea, categorized into 3 groups (0 = while eating; 1 = outside meal times; 2 = never). Iron supplement drinking habits categorized into 2 groups (0 = taking iron supplements; 1 = no taking iron supplements).

Menstrual history based on whether subjects had heavy flow menstruation and blood spots between period of menstruation. Heavy flow menstruation assessed if the subject changed their menstrual pad more than 7 times a day, there is a large blood clots during menstruation and menstruation lasting more than 7 days, and normal menstruation assessed if didn't fill the criteria of heavy flow menstruation.

Heavy flow menstruation categorized into two groups (0=No; 1=Yes). Blood spots between period of menstruation if the subject experienced menstrual bleeding between period of menstruation categorized into two groups (0 = no; 1 = yes).

Body Mass Index was calculated as weight (kg) divided by height squared (m<sup>2</sup>). We used WHO category for the Asia Pacific, divided into 3 categories (0 = normal = BMI 18.5 to 22.9 kg/m<sup>2</sup>; 1 = underweight = BMI less than 18.5 kg/m<sup>2</sup>; 2 = overweight = BMI 23-25 kg/m<sup>2</sup>).<sup>9</sup> Hemoglobin levels categorized into 2 groups (0 = normal = hemoglobin level of 12-15 g / dl; 1 = abnormal = less than 12 g/dl).<sup>10</sup>

The relative risk (RR) using Cox regression analysis with constant time.<sup>11</sup> The analysis was using STATA released 9.

Ethical clearance was obtained from the Research Ethics Committee of the Medical Faculty, Universitas

Indonesia. This study was approved by the Head of Health Flight.

## RESULTS

There were 225 female flight attendants who did medical checkup, and 185 of them age 18-46 years old who willing to participate this study, and 52 (28.1%) had anemia.

Table 1 showed that normal and anemic subjects similarly distributed in term of age, marital status, total flight hours, and total flight hours in last 1 year.

Table 2 showed that normal and anemic subjects similarly distributed in terms of iron supplement drinking habit, frequency of eating vegetable/week, and tea drinking habit. Compared with normal BMI subjects, overweight subjects were more likely had higher risk to be anemia.

Table 1. Several demographic and employment characteristics and risk of anemia in civil female flight attendants in Indonesia

	Anemia				Crude relative risk	95% confidence interval	P
	No (n=133)		Yes (n=52)				
	n	%	n	%			
Age							
18-29 years old	118	72.8	44	27.2	1.00	Reference	
30-46 years old	15	65.2	8	34.8	1.28	0.60-2.72	0.520
Marital status							
Never married	114	72.6	43	27.4	1.00	Reference	
Married	19	67.9	9	32.1	1.17	0.57-2.41	0.662
Total flight hours							
12-3500 hours	81	74.3	28	25.7	1.00	Reference	
3501-15000 hours	52	68.4	24	31.6	1.23	0.71-2.12	0.458
Total flight hours in last 1 year							
0-930 hours	48	70.3	19	29.7	1.00	Reference	
931-1500 hours	85	72.7	33	27.3	0.98	0.52-1.61	0.961

Table 2. Several habits, body mass index and anemia in civil female flight attendant

	Anemia				Crude relative risk	95% confidence interval	P
	No (n=133)		Yes (n=52)				
	n	%	n	%			
Iron supplement drinking habit							
Yes	6	54.5	5	45.5	1.00	Reference	
No	127	73.0	47	27.0	0.59	0.24-1.49	0.269
Frequency of eat vegetables/week							
0-2 times	23	67.6	11	32.4	1.00	Reference	
3 times or more	110	72.8	41	27.2	0.84	0.43-1.63	0.606
Tea drinking habit							
Never	19	70.4	8	29.6	1.00	Reference	
In meal time	53	63.9	30	36.1	1.22	0.56-2.66	0.617
Not in meal time	61	81.3	14	18.7	0.63	0.26-1.50	0.297
Body mass index							
Normal	101	74.8	34	25.2	1.00	Reference	
Underweight	28	66.7	14	33.3	1.32	0.71-2.47	0.377
Overweight	4	50.0	4	50.0	1.98	0.70-5.59	0.195

Table 3, our final selected model, showed that frequency of eating red meat/week, total working period, type of flight, and menstruation were dominant risk factors related to anemia. The most dominant risk factor was of eating red meat/week. The subjects who had working period 4-16 years had 51% higher risk to be anemia compared with subjects who had total work period 1 month-4 years [adjusted relative risk (RRa) = 1.51; 95% confidence interval (CI) = 0.96 to 2.37; P = 0.073].

In term of eating red meat, subjects who ate meat three times or more a week had a 43% lower

probability of experiencing anemia compared with subjects who ate meat less than three times a week (RRa = 0.57, 95% CI = 0.32 to 1.03; P = 0.064). Furthermore, in term of flight, compared to flight attendants who worked with short-haul flights, flight attendant who worked with long-haul flights had 91% higher risk to be anemia (RRa = 1.91; P = 0.034). Furthermore, female flight attendant who had heavy flow menstruation had 3.5 times higher risk to be anemia (RRa = 3.45; p = 0.000).

Table 3. Relationship of eating habit and other factors related to anemia in civil female flight attendant

	Anemia				Adjusted relative risk*	95% confidence interval	P
	No (n=133)		Yes (n=52)				
	n	%	n	%			
Frequency of eating red meat/week							
0-2 times	92	68.7	42	31.3	1.00	Reference	
3 times or more	41	80.4	10	19.6	0.57	0.32–1.03	0.064
Total working period							
1-47 month	101	75.9	32	24.1	1.00	Reference	
4-16 years	32	61.5	20	38.5	1.51	0.96–2.37	0.073
Type of flight							
Short-haul flight	98	74.8	33	25.2	1.00	Reference	
Medium-haul flight	26	68.4	12	31.6	1.32	0.78–2.26	0.292
Long-haul flight	9	56.3	7	43.8	1.91	1.05–3.46	0.034
Heavy flow menstruation							
No	133	73.1	49	26.9	1.00	Reference	
Yes	0	0.0	3	100.0	3.45	2.36–5.02	0.000

\* Adjusted each other between risk factors listed on this table

## DISCUSSION

This study may be the first study about anemia in civil female flight attendant in Indonesia. However, there were several limitations of this study. First, diagnosis anemia was based on hemoglobin level and did not do further examination about etiology of anemia. Secondly, we did not ask the amount on eating habits..

The percentage of anemia in this study was 28.1%. This percentage is lower than the data anemia in reproductive age woman in Indonesia in 2008 was 33.1%.<sup>12</sup> These results suggest that a flight attendant is a population with better nutritional status, socio-economic and education levels of the population than other women of reproductive age in Indonesia. Lower percentage of anemia in women aged 15-55 years obtained from data on basic health research in

Indonesia (RISKESDAS) 2010 where the percentage was 25.2%.<sup>13</sup> This difference may be caused by a number of samples on the basic health research are far more numerous and range in age population taken more wide range. But from this data, lower percentage of anemia in the general population compare with this study should be the concern of the stakeholders that are high rate of anemia in a flight attendant. Flight attendants must be a population with good health as its main task is to help maintain the safety of passenger aircraft.

Overweight subjects than subjects with normal BMI had a 2.1 times higher risk of having anemia. This result is different from cross-sectional studies conducted in China in 1537 women in China are getting the overweight women had a lower risk of anemia. In a study in China, it is estimated that overweight subjects had a higher intake of iron a lot,

so has lower risk of anemia. Distribution of BMI in the study using the normal category with a BMI of 18.5 to 24.9 kg/m<sup>2</sup> and overweight as BMI 25-30 kg/m<sup>2</sup>.<sup>7</sup> Similar results were obtained from a cross-sectional study conducted in 3267 non-pregnant women aged 13 - 49 years in Colombia where women who are overweight have a lower risk of anemia.<sup>14</sup> But the different results obtained in studies conducted in the USA on 241 military women aged 18-41 years showed that the overweight subjects has higher risk of experiencing anemia.<sup>15</sup> There is a hypothesis that explain the relationship of the high iron deficiency in people who are overweight because of low intake of iron in the poor quality diet . They're overweight because foods high in carbohydrates or fat but intakes of micronutrients including the iron is still low.<sup>16</sup> Another hypothesis states there were chronic inflammation in obese people that can increased production of leptin and this will make secretion of hepsidin increase in liver along with increase hepsidin from adipose tissue. Hepsidin will decrease the absorption of iron in gut.<sup>17</sup>

In this study, subjects with eating meat more than twice a week had a lower risk of anemia compared to subjects who ate meat less than three times a week. These is similar with the results of other studies on the population of reproductive age women in Vietnam.<sup>6,18</sup> However, the limitations of this study did not ask amount of meat are eaten by subjects, so we could not identify whether the meat were adequate for meet the iron needs in although the subjects ate meat three times or more a week.

Subject with heavy flow menstruation had a higher risk of anemia compared with normal menstruation subjects. These results are similar to studies in women of reproductive age in Orissa India that showed a significant relationship between anemia with heavy flow menstruation.<sup>19</sup> During menstruation there is an increase in iron secretion about 1 mg per day in women with normal menstruation. In people with heavy flow menstruation amount of blood that came out is more than in normal menstrual, so iron secretion are also higher and therefore iron requirement increase.<sup>20</sup>

Subjects who works in long-haul flights have a higher risk of anemia compared to working in short-haul flights. Differences in exposure to intermittent hypoxia per day and total time exposure to hypoxia could be one of the causes of differences in hematological response.<sup>21</sup> Further research is needed with intermittent hypoxia protocol similarly with the type of flight of air crew to know hematological

response to differences duration and total time of hypoxia exposure.

Work period of more than 4 -16 years be one of the dominant risk factor. These results are in contrast to the results of other studies in Korea where subjects with a longer work period has a risk of anemia only 1% higher than shorter work periode.<sup>22</sup> This result is different because different type of work of both subject, in this study subject work as flight attendant previous study work as factory worker in Korea. Hypoxic exposure accumulated during the working period is question that need to be solved. Currently the authors have not found research the effect of accumulated hypoxia exposure in flight attendant's hematology. But there are studies explaining exposure to intermittent hypoxia on long term can increase erythrocytes and eritropoetin expresion.<sup>23</sup>

In conclusion, in civil female flight attendant in Indonesia, the dominant risk factors related to anemia were frequency of eating red meat a week, total working period, type of flight, and menstruation were. The dominant risk factor was eating red meat less than three time in week.

### Acknowledgments

The authors wish to thank all subjects who cooperatively participated in this study. We also would like to express our gratitude to Dr. Thamrin Abudi for facilitating this study.

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