

# The relationship between body image and tea drinking habits with anemia among adolescent girls in Badung District, Bali, Indonesia



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## ABSTRACT

**Background and purpose:** The prevalence of anemia among adolescent girls in Indonesia remains high. Poor nutrition is a risk factor of anemia among adolescent girls, which is likely related to food intake restrictions to achieve a desired body shape (body image), and the habit of drinking tea while eating which can affect the absorption of iron. This study aims to determine the relationship between anemia with body image perception and tea drinking habits among adolescent girls.

**Methods:** This study used a cross-sectional design carried out from March-May 2018, involving girls aged 15-18 years at high schools in Badung District. Two schools were selected from 44 high schools, then a sample of 106 students were selected by systematic random sampling. Data collected included hemoglobin levels measured with hematology autoanalyzer, nutritional status with anthropometric measurements, and data on socio-demographics, socio-economics, tea drinking and eating habits, menstrual pattern, helminthiasis, knowledge and perception of body image with face-to-face individual interviews. Data were analyzed using

the Chi square test for bivariate analysis, and multivariate using logistic regression

**Results:** The prevalence of anemia (hemoglobin <12 g/dL) in adolescent girls was 13.2%. The results of the logistic regression analysis showed that the variables associated with anemia were poor knowledge about anemia with an adjusted odds ratio (AOR)=11.4 (95%CI: 1.6-83.1), no iron supplement consumption (AOR=14.7; 95%CI: 1.9-109.8), negative body image (AOR=30.6; 95%CI: 2.9-321.1), tea drinking habits while eating (AOR=52.2; 95%CI: 4.2-642.9) and excessive menstrual volume (AOR=17.1; 95%CI: 1.6-185.9).

**Conclusion:** Negative perceptions of body image and tea drinking habits while eating increase the risk of anemia among adolescent girls aged 15-18 years. In addition, poor knowledge about anemia, a history of not consuming iron supplements and excessive menstrual volume can also increase the risk. These factors need to be considered when designing policies to reduce anemia among adolescent girls.

**Keywords:** anemia, adolescent girls, perception of body image, tea drinking habits

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## INTRODUCTION

Anemia is a serious public health problem throughout the world.<sup>1</sup> National anemia prevalence among women in Indonesia is relatively higher than men, especially in pregnant women and adolescent girls.<sup>2</sup> The occurrence of anemia in adolescent girls is caused by increased nutritional needs related to physical and reproductive growth.<sup>3</sup> Globally in 2011, 36.4% or 7.5 million young women aged 10-19 years are reported to have anemia,<sup>4</sup> and in Indonesia it was reported in 2013 as 26.4% in young men and women aged 5-14 years, and 18.4% in ages 15-24 years.<sup>5</sup>

The results of previous studies indicate that anemia is influenced by many factors including socio-demographic factors (sex, age, number of family members, ethnicity, parental education),<sup>6-10</sup>

socio-economic factors (poverty, employment, food insecurity),<sup>6,8,9,11</sup> behavioral factors (smoking, eating patterns, physical activity, nutritional intake, vegetarianism),<sup>6,8,10-14</sup> nutritional status (body mass index, middle upper arm circumference less than normal, obesity),<sup>6,14</sup> reproductive history (age of menarche, menstruation, post-partum health),<sup>8,6,10,12</sup> and parasitic infections (intestinal worms).<sup>12</sup>

Nutritional problems such as anemia or other malnutrition problems are caused by two main factors namely poor nutrition and infectious diseases.<sup>15</sup> Anemia that occurs in adolescents can be caused by inadequate food intake, considering adolescence is still overshadowed by the desire to always appear with a proportional and slim body (body image).<sup>16</sup> Body image perceived as an

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important issue to young women, which leads many of them to make poor nutritional decisions in order to achieve their desired weight.<sup>16</sup> Because of such negative body image perception, teenagers often choose to limit food intake and even reduce their appetite which has affected their nutritional status.<sup>17</sup>

In addition to body image, the habits of drinking tea while eating meals is also important cause of anemia in young women. Tea inhibits iron absorption when consumed together with food/meals, so, it can cause anemia.<sup>18</sup> Although tea has many health benefits, but it can inhibit the absorption of non-heme iron by 79-94% if consumed together with foods.<sup>19</sup>

Several studies have looked at the relationship between anemia with body image perception, and the relationship between anemia with the habit of drinking tea while eating, but these have not produced consistent results. Some reported that body image was related to anemia,<sup>17</sup> while others reported that body image was not related to anemia.<sup>20</sup> Similarly, with regards to the relationship between anemia and tea drinking habits, some studies showed an association between drinking tea with anemia,<sup>13</sup> whereas other studies reported otherwise.<sup>21</sup>

This study aims to determine the relationship between body image perception and tea drinking habits while eating with anemia among adolescent girls.

## METHODS

This was an analytic cross-sectional study carried out at senior high schools in Badung Districts. Badung is one of the nine districts in Bali province, Indonesia. Geographically, Badung stretches from the South, Nusa Dua, to North, Plaga, which are both economically diverse. South Badung (urban) is a central to the tourism sector including the development of tourism destinations, while northern Badung (rural) is an agricultural, buffer and water catchment area.

Two schools were selected purposively from 44 public and private senior high schools in Badung district, namely one school representing the northern Badung area (Abiansamal 1 Senior High School) and one school representing the southern Badung area (Kuta 2 Senior High School). The total population was 1,375 students, and a sample of 106 adolescent girls aged 15-18 years was selected by systematic random, with division of 53 female students in each school. The number of samples was determined with a significance level of 95%, power 80%, the proportion of anemia in adolescents with positive body image 57.4% and in adolescents with negative body image as much as 42.6%.<sup>16</sup>

Data collected included: hemoglobin levels measured by hematological panel examination (hemogram) with Hematology Autoanalyzer (brand Mindray BC-2800), nutritional status based on body mass index/BMI by means of anthropometric measurements (body weight and height). Data on socio-demographics (age, number of family members, paternal education), socio-economics (paternal occupation, family income), behavior (iron supplement consumption, breakfast habits, frequency of eating, dietary restrictions, fruit consumption, vegetable consumption, meat consumption, drinking tea while eating and dieting). Menstrual patterns (age of menarche, menstrual status, menstrual cycle, number of replacement pads per day during menstruation, duration of menstruation), history of worms' infestation (from childhood to the time of research), knowledge (about anemia), and perception of body image. These variables were collected by individual face to face interviews using a standardized questionnaire,<sup>13,17</sup> which were conducted in each school.

Anemia status was grouped based on blood hemoglobin level, namely anemia (Hb<12 g/dl) and non-anemia (Hb≥12 g/dl).<sup>22</sup> Body image perception was categorized into two, positive body image perception and negative body image perception (using a Likert scale with 32 statements),<sup>17</sup> and the habit of drinking tea (warm tea/iced tea) while eating main foods was categorized into drinking tea while eating and not drinking tea while eating (with a time limit of the past month until the time of the study).<sup>13</sup>

Data were analyzed descriptively, then, bivariate analysis using Chi-square test, and multivariate analysis using logistic regression were performed. Data were presented in the form of anemia prevalence, odds ratio, 95% confidence interval (CI) and significant value (p). This study was approved by the Ethics Committee, Faculty of Medicine, Udayana University/Sanglah General Hospital Denpasar on April 11, 2018, Number: 851/UN14.2.2/PD/KEP/2018.

## RESULTS

Of the 106 high school students involved in the study, 13.2% had anemia. [Table 1](#) shows that the age is normally distributed, average age (±SD) was 16.37 (±0.68) years, with the majority being 16 years (46.2%). With regards to the socio-economic status of the family, more than half (56.6%) have permanent jobs and 66% of the family have income above the minimum wages in Badung District (IDR 2,499,900)<sup>23</sup> with an average income of IDR 3,420,000. From the number of family members,

59.4% of respondents had family members of five or above, ranging from 2-13 people with an average family size of 5.04 people and most of the respondents' father (94.3%) completed junior high school or above.

Table 2 shows the results of anthropometric and nutritional status of adolescent girls, with an average of weight 52.37 kg, height 156.97 cm and BMI 21.26 kg/cm<sup>2</sup>. Most of the samples, 77.4%, had normal nutritional status and others were categorized as abnormal/malnourished (underweight, overweight and obese). Furthermore, to illustrate eating behavior variables, most of the samples (60.4%) had a habit of eating breakfast, frequency of complete meals three times/day (56.6%), did not have dietary restrictions (81.1%), reported consuming fruit (81.5%) and vegetables (85.5%); however, the majority (70.8%) also said that they had the habit of drinking tea while eating. In addition, almost all samples had the habit of consuming meat dishes and were not on a diet, with percentages of 98.1% and 90.6%, respectively. Nearly three-quarters of the respondents (74.5%) also consumed iron supplements.

Most of the respondents (77.4%) had a good level of knowledge about anemia, with an average knowledge score of 20.57, with scores ranging from 12-28. However, it was evident that knowledge is

still lacking on the causes of anemia and types of foods that high in iron.

Menstrual patterns are measured based on the age of menarche, menstrual status, menstrual cycle, length of menstruation and number of pads use per day. From the analysis, it was found that almost all girls (98.1%) experienced menarche at age  $\geq 11$  years (average 12.91 years), 90.6% were not menstruating at the time of measurement and 92.5% had an average menstrual period of  $\leq 7$  days. The majority (89.6%) of respondents had a menstrual cycle of  $> 28$  days (average 28.25 days) and half (50.9%) reported changing of pads less or equal to 3 times/day. Only a small proportion (3.8%) of respondents had a history of helminthiasis.

From the Chi-square test as presented in Table 3, there was no significant relationship between nutritional status and anemia. Regarding the relationship between nutritional status and anemia, 9/82 (11%) of respondents with normal nutritional status had anemia, while among respondents with abnormal nutritional status, there were 5/24 (20.8%) with anemia. Likewise, for eating behavior variables such as breakfast habits, frequency of eating, dietary restrictions, fruit consumption, vegetable consumption, meat consumption and dietary habits were not related to anemia in adolescent girls.

There was a significant relationship between tea drinking habits while eating and consumption of iron supplements with anemia. Almost a third, 9/31 (29%) of respondents who had the habit of drinking tea while eating had anemia, while only 5/75 (6.7%) of those who did not drink tea when eating had anemia. With regards to iron supplement consumption, 9/27 (33.3%) respondents who did not consume iron supplements were anemic while those who consumed iron supplements who had anemia were 5/79 (6.3%).

From the analysis of menstrual patterns, it was found that age of menarche, menstrual status, menstrual cycle and length of menstruation did not significantly correlate with anemia in adolescent girls. As for the variable of menstrual volume (sanitary pad usage) there was a significant correlation, where 11/52 (21.2%) adolescents who had a frequency of usage of more than 3 times/day experienced anemia, compared to 3/54 (5.6%) of those with frequency of 3 times or less a day. There was no significant relationship between the history of helminthiasis with anemia among the respondents.

With regards to family socio-economic status including paternal education, paternal occupation, family income and number of family members were not significantly related with anemia among adolescent girls (Table 4). There was a significant

**Table 1. Sociodemographic and socioeconomic characteristics of adolescent girls in Badung District**

Variable	n	%
<b>Socio-Demographics</b>		
Age		
Mean $\pm$	16.3 $\pm$ 0.7	
Min-max	15-18	
15 years	10	9.4
16 years	49	46.2
17 years	45	42.5
18 years	2	1.9
Number of family members (include parents)		
$\leq 5$ people	43	40.6
$> 5$ people	63	59.4
Paternal education		
High (senior high school and above)	100	13.2
Low (junior high school and below)	6	86.8
<b>Hemoglobin (Hb)</b>		
Anemia	14	13.2
No anemia	92	86.8
<b>Family socio-economic status</b>		
Paternal occupation		
Full time employment	60	56.6
Not full time employment	46	43.4
Family income		
$\geq$ Minimum wage (IDR 2,499,900)	70	66.0
$<$ Minimum wage (IDR 2,499,900)	36	34.0
<b>Total</b>	<b>106</b>	<b>100</b>

**Table 2. Nutrition status, eating behaviors, knowledge, body image perception, menstruation patterns, and intestinal worm infestation in adolescent girls**

Variable	n	%
<b>Nutritional Status</b>		
Underweight	3	2.8
Normal	82	77.4
Overweight	18	17.0
Obese	3	2.8
<b>Habits</b>		
Breakfast habits		
Breakfast	64	60.4
No breakfast	42	39.6
Eating frequency		
≥3 times a day	60	56.6
<3 times a day	46	43.4
Fasting		
Never	86	81.1
Sometimes	20	18.9
Fruit consumption		
Yes	97	81.5
No	9	8.5
Vegetable consumption		
Yes	91	85.8
No	15	14.2
Meat consumption		
Yes	104	98.1
No	2	1.9
Diet		
Not dieting	96	90.6
Dieting	10	9.4
Tea drinking during meals		
No	75	70.8
Yes	31	29.2
Iron supplements		
Yes	79	74.5
No	27	25.5
<b>Knowledge about anemia</b>		
Good	82	77.4
Poor	24	22.6
<b>Body image</b>		
Positive	68	64.2
Negative	38	35.8
<b>Menstrual cycle</b>		
Age of menarche		
<11 years	2	1.9
≥11 years	104	98.1
Menstrual status		
Not menstruating	96	90.6
Menstruating	10	9.4
Cycle		
≤28 days	11	10.4
>28 days	95	89.6
Bleeding volume (change of pads)		
≤3 a day	54	50.9
>3 a day	52	49.1
Length of menstruation		
≤7 days	98	92.5
>7 days	8	7.5
<b>History of intestinal worms</b>		
No	102	96.2
Yes	4	3.8
<b>Total</b>	<b>106</b>	<b>100</b>

relationship between knowledge about anemia with the prevalence of anemia. A total of 6/82 (7.3%) of knowledgeable young women experienced anemia, while among young women of poor knowledge, there were 8/24 (33.3%) who were anemic. There was also a significant relationship between perception of body image with anemia among respondents. About one third of respondents (28.9%) who had negative body image perceptions had anemia, whilst only about 4.4% of young women who had positive body image perceptions had anemia.

Table 5 shows the factors associated with anemia in adolescent girls analyzed using logistic regression with forward stepwise (likelihood ratio) method. Of the 11 variables included in the multivariate analysis, only 5 variables showed significant association. These predictors were poor knowledge about anemia (AOR=11.4; 95%CI: 1.6-83.1; p=0.017), lack of iron supplements (AOR=14.7; 95%CI: 1.9-109.8; p=0.009), negative body image perception (AOR=30.6; 95%CI: 2.9-321.1; p=0.004), tea drinking habits while eating (AOR=52.2; 95%CI: 4.2-642.9; p=0.002), and menstrual volume (pad usage) >3 times/day during menstruation (AOR=17.1; 95%CI: 1.6-185.9; p=0.020).

## DISCUSSION

The result of this study indicates that the prevalence of anemia among adolescent girls in Badung District's High Schools is as high as 13.2%, which based on WHO standards falls into the mild category, within the range of 5%-19.9%.<sup>24</sup> This prevalence is much lower compared to a previous study in 2015, which reported the prevalence of anemia in Badung was 71.3%.<sup>13</sup> This might be caused by differences in measurement of hemoglobin level and not all samples in this study are coming from Abiansemal High School. The previous study was using Portable Nesco tool, whereas in this study, we used complete blood examination with an autoanalyzer hematology tool which has a higher level of accuracy.

In addition, Badung District government established iron supplementation to adolescent girls to overcome this anemia problem, the program yet to implement in 2015 when the first study was conducted, while it was already running during our research in 2018, which may contribute to the reduction of anemia prevalence in this present study. This fact is supported by our results which showed that the majority of the adolescent girls take iron tablets and that the consumption of iron supplements was associated with a reduction in probability of being anemic. Young women who did not take iron supplements had a 14.7 times

tendency to suffer from anemia compared to those who did. This is in line with another study which shows that the provision of long-term weekly iron-folate supplementation is a practical, safe, effective, and inexpensive method for improving iron nutrition in young women.<sup>25</sup>

**Table 3. Relationship between nutritional status, behavior, menstruation patterns, and intestinal worm history and anemia among adolescent girls**

Variable	Anemia n (%)	No anemia n (%)	p
<b>Nutritional status</b>			
Abnormal	5 (20.8)	19 (79.2)	0.301
Normal	9 (11.0)	73 (89.0)	
<b>Eating habits</b>			
<b>Breakfast habits</b>			
No breakfast	3 (7.1)	39 (92.9)	0.156
Breakfast	11 (17.2)	53 (82.8)	
<b>Eating frequency</b>			
<3 times a day	6 (13.0)	40 (87.0)	1.000
≥3 times a day	8 (13.3)	52 (86.7)	
<b>Fasting</b>			
Sometimes	5 (25.0)	15 (75.0)	0.134
Never	9 (10.5)	77 (89.5)	
<b>Fruit consumption</b>			
No	2 (22.2)	7 (77.8)	0.339
Yes	12 (12.4)	85 (87.6)	
<b>Vegetable consumption</b>			
No	3 (20.0)	12 (80.0)	0.415
Yes	11 (12.1)	80 (87.9)	
<b>Meat consumption</b>			
No	1 (50.0)	1 (50.0)	0.248
Yes	13 (12.5)	91 (87.5)	
<b>Dieting</b>			
Dieting	1 (10.0)	9 (90.0)	1.000
Not dieting	13 (13.5)	83 (86.5)	
<b>Tea drinking during meals</b>			
Yes	9 (29.0)	22 (71.0)	0.004
No	5 (6.7)	70 (93.3)	
<b>Iron supplements</b>			
No	9 (33.3)	18 (66.7)	0.001
Yes	5 (6.3)	74 (68.6)	
<b>Menstrual cycle</b>			
<b>Age of menarche</b>			
≥11 years	13 (12.5)	91 (87.5)	0.248
<11 years	1 (50.0)	1 (50.0)	
<b>Menstrual status</b>			
Menstruating	3 (30.0)	7 (70.0)	0.126
Not menstruating	11 (11.5)	85 (88.5)	
<b>Cycle</b>			
>28 days	12 (12.6)	83 (87.4)	0.637
≤28 days	2 (18.2)	9 (81.8)	
<b>Bleeding volume (change of pads)</b>			
>3 times a day	11 (21.2)	41 (78.8)	0.022
≤3 times a day	3 (5.6)	51 (94.4)	
<b>Length of menstruation</b>			
>7 days	1 (12.5)	7 (87.5)	1.000
≤7 days	13 (13.3)	85 (86.7)	
<b>History of intestinal worms</b>			
Yes	1 (25.0)	3 (75.0)	0.438
No	13 (12.7)	89 (87.3)	

Our study found a significant relationship between perceptions of body image and anemia in young women. This result is in line with a previous study in Makassar which indicated a relationship between body image and Hb levels in young women, where those who are anemic tend to have a negative body image. It was also found that there was a positive relationship between body image and dietary behavior among young women in Makassar, where those who had a positive body image had a healthy diet.<sup>16</sup> Negative body image can often have health impacts such as overuse of laxatives, vomiting of food, strenuous physical activity, and unhealthy behavior/eating patterns due to inappropriate weight control.<sup>26</sup>

Body image is personal perception that is viewed as important for most young women. Some of them usually do anything to keep their body shape slim including restrictions on food intake and weight control that can be dangerous.<sup>16</sup> Studies showed that overweight young women tend to have a negative body image, whereas non-overweight adolescent girls more likely to have a positive body image.<sup>27</sup> Adolescents who have positive eating behaviors and body image tend to have better nutritional status compared to adolescents who have poor eating behaviors and negative body image.<sup>28</sup> Poor interpretation and perception of bodily changes during the adolescent years can also influence exercise frequency and food choices.<sup>27</sup>

Meanwhile, the habit of drinking tea while eating was also associated with anemia among adolescent girls. This finding supported by previous study among young women in Gunungsari which found that there was a correlation between the consumption patterns of Fe inhibitors (caffeine, tannins, oxalates, phytate) found in soybeans, tea, and coffee, with the status of anemia among female students.<sup>18</sup> Habits of consuming foods that can interfere with the absorption of iron (such as coffee and tea) together at mealtime, causes iron absorption to be lower.<sup>29</sup> Consumption of one cup of tea a day can reduce iron absorption by 49% in people with iron deficiency anemia, while consumption of two cups of tea a day decreases absorption by 67%.<sup>18</sup> Tea consumed up to one hour after meals would reduce the absorption capacity of red blood cells to iron by 64% and therefore it is recommended to consume tea at least two hours after meals.<sup>18</sup>

On the other hand, adolescent's knowledge about anemia was a protective factor for the risk of anemia in adolescent girls. The girls who have poor knowledge about anemia have more than ten folds tendency to have anemia compared to those with good knowledge about anemia. This is in line with other studies wherein respondents with

**Table 4. Relationship between family socio-economic status, knowledge and body image perception with anemia among adolescent girls**

Variable	Anemia	No anemia	P
	n (%)	n (%)	
<b>Family socio-economic status</b>			
Paternal education			
Low	2 (33.3)	4 (66.7)	0.178
High	12 (12.0)	88 (88.0)	
Paternal occupation			
Not full time employment	5 (10.9)	41 (89.1)	0.578
Full time employment	9 (15.0)	51 (85.0)	
Family Income			
<Average Wage	4 (12.7)	32 (87.3)	0.768
≥Average Wage	10 (14.0)	60 (86.0)	
Number of Family Members			
>5 people	8 (8.3)	55 (54.7)	1.000
≤5 people	6 (5.7)	37 (37.3)	
<b>Knowledge about anemia</b>			
Poor	8 (33.3)	16 (66.7)	0.003
Good	6 (7.3)	76 (92.7)	
<b>Body image</b>			
Negative	11 (28.9)	27 (71.1)	0.001
Positive	3 (4.4)	65 (95.6)	

**Table 5. Adjusted odds ratio (AOR) determinants of anemia among adolescent girls**

Variable	AOR	95%CI	p
<b>Knowledge about anemia</b>			
Good	1 (Ref)		
Poor	11.4	1.6-83.1	0.017
<b>Iron supplements</b>			
Yes	1 (Ref)		
No	14.7	1.9-109.8	0.009
<b>Body image</b>			
Positive	1 (Ref)		
Negative	30.6	2.9-321.1	0.004
<b>Tea drinking during meals</b>			
No	1 (Ref)		
Yes	52.2	4.2-642.9	0.002
<b>Bleeding volume (change of pads)</b>			
≤ 3 times a day	1 (Ref)		
> 3 times a day	17.1	1.6-185.9	0.020

poor knowledge about anemia have higher chance to suffer from anemia compared to respondents who have a good level of knowledge.<sup>30</sup> Adequate knowledge about anemia is related to good eating behaviors, supported by our analysis of knowledge variables and dietary variables. Teenagers who consumed fruit, vegetables and meat dishes mostly had good knowledge about anemia with a percentage of 77.3%, 79.1% and 77.9%, respectively. Likewise, among the young women who did not drink tea while eating, most had good knowledge about anemia. This finding signifies that knowledge about anemia influences adolescent girls' decisions

on the food consumption, so the efforts to improve adolescent knowledge about anemia and healthy eating patterns should be continued and upscaled.

Furthermore, we found that menstrual volume (pad replacement) was significantly associated with anemia in the adolescent girls. Girls who changed pads more than three times/day during menstruation had a tendency of 17 times to suffer from anemia compared to those who used fewer pads per day. The frequency of changing pads is a proxy of higher volume of blood loss during menstruation. This means that those with higher volume of blood loss are more at risk of anemia than those with less bleeding during menstruation. The average blood loss during menstruation is about 30 ml/day which is equal to additional need of 0.5 mg of iron per day. Daily blood loss is calculated from the iron content in blood lost during menstruation for a period of one month. About 10% of women will lose as much as 80 ml of blood which is equivalent to 1 mg of iron per day. By taking this higher value of 1 mg/day, total iron loss (basal loss plus menstruation) in a woman will be 30µg/kg body weight/day (>1.5 mg/day). Women would not be able to maintain a positive iron balance if her iron needs are based on an average loss of 30 ml blood during menstruation.<sup>31</sup> Other menstrual pattern variables are not related to anemia among adolescent girls. This is in line with another study which state that there is no relationship between menstrual patterns and anemia ( $r=0.031$ ;  $p=0.789$ ).<sup>32</sup>

Based on our findings, we recommend policy makers to develop an education program for girls at school age, regarding anemia including the importance of consuming iron supplements, healthy food consumption and other eating habits that may increase chance of anemia such as consuming tea while eating. It is also necessary to provide adequate information regarding body image perception, and reproductive health education.

This study has several limitations. The study was conducted among adolescent girls in high school setting, so its generalization may be limited to those settings with similar characteristics. The samples were selected only from two high schools, again we must be cautious when generalizing the finding. Regarding the menstrual volume, we can only estimate bleeding from the frequency of sanitary pads changes, which may not be the best indicator of blood loss.

## CONCLUSION

The prevalence of anemia among adolescent girls in Badung District was 13.2%, much lower than previous study suggesting the current anemia prevention program may have a positive impact.

Our study shows relationship between negative body image perception and the habit of drinking tea while eating with risk of anemia among adolescence girls. We also found that poor knowledge about anemia, inadequate consumption of iron supplements and excessive menstrual volume can also increase the risk of anemia.

The iron supplementation program among high school students established by Badung District government has a positive impact on reducing the prevalence of anemia, hence it should be maintained and upscaled. It is also necessary to introduce a comprehensive measure to increase knowledge of adolescent girls on good eating patterns and a campaign to build positive body image perception.

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### AUTHOR CONTRIBUTION

DP designed and conceived the study, collected and analysed the data, wrote the first draft of the manuscript and edited the manuscript; NKS was involved in the design and conception of the study, supported the analysis, provided feedback and edited the manuscript; CD critically reviewed the study proposal, conducted data management, and edited the manuscript.

### CONFLICT OF INTEREST

None declared (There is no conflict of interest)

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