There Is No Relationship Between The Level Of Zinc Consumption And The Incidence Of Anemia In Female Workers At The Badung Mall, Bali

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Abstract
Women workers are included in the group of women of childbearing age who are prone to health problems due to the low intake of nutrients consumed. The low intake of nutrients consumed and the bleeding experienced during menstruation can affect hemoglobin levels and productivity in workers. The health problem that is often experienced by female workers is anemia. Anemia is a condition where the level of hemoglobin in the blood is below the normal value. This study aims to determine the relationship between the level of consumption of micronutrients (iron, zinc, folic acid, and vitamin C) with the incidence of anemia in female workers at Mall Badung. The research design used was cross-sectional with a sample of 35 female workers at Mall. The data taken were Hb levels using the easy touch tool, and food intake data obtained using a 24-hour recall form. Data analysis used the Pearson Product Moment Correlation and Spearman Rank Correlation tests. The results showed that the proportion of anemia was 22,9%. The average Hb level obtained was 13,8 g/dL. The average level of consumption of iron (86,2%), zinc (80,6%), folic acid (84,9%), and vitamin C (93,7%). Based on the results of the correlation test showed that there was a significant relationship between the level of iron consumption (p-value = 0,000), folic acid (p-value = 0,009), and vitamin C (p-value = 0,026) with the incidence of anemia in female workers and there was no relationship between levels of consumption of zinc (p-value = 0,601) with the incidence of anemia in female workers..

Keywords: Intake Of Iron; Zinc; Folic Acid; Vitamin C And Anemia; Women Workers

INTRODUCTION

Indonesia is a developing country that is trying to increase economic development. Economic development that promotes equal distribution of income will mean increasing food consumption and the nutritional state of the population. Data from the Central Bureau of Statistics shows that the number of workers in Indonesia has increased every year. In the Province of Bali, the working population is 2,559,706 million, of which the percentage of female workers is 70.75% and male workers is 83.37% and in Badung Regency itself in 2020 there were 394,943 working people (1). The high number of workers in Indonesia is still not matched by the fulfillment of adequate nutrition for workers, which can lead to a decrease in work productivity.

Work nutrition is the nutrition needed by workers to meet their needs. Fulfillment of nutrition for workers is aimed at improving health status and increasing work capacity as high as possible (2). Work nutrition is one of the promotive efforts to improve the health status and work productivity of workers. Improvement and improvement of nutrition play a very important role in efforts to prevent morbidity, reduce absenteeism and increase work productivity. Community groups that are prone to anemia are women, especially young women, women of childbearing age, pregnant women, breastfeeding mothers and working women (3).

According to the World Health Organization (4) anemia is one of the top 10 health problems in recent years. Overall, anemia occurs in 45% of women in developing countries and 13% of women in developed countries. The prevalence of anemia in women of childbearing age (WUS) worldwide is 30.2%. Based on data from the 2013 Riskesdas results, the prevalence of anemia in Indonesia is 21.7% (5). Based on the 2018 Riskesdas(6) it shows that the prevalence of anemia in women of childbearing age (WUS) in Indonesia is 23.7%. Based on the 2016 Bali Riskesdas data, the prevalence of anemia in women of childbearing age (WUS) is 27.1%. The nutritional and health

problems that are often experienced by the majority of female workers are anemia, anemia is a condition where the hemoglobin level is below normal limits. The low intake of nutrients consumed and bleeding during menstruation is one of the factors causing anemia. Anemia can have an impact on female workers such as affecting work productivity and decreasing the immune system (7). According to the results of Sudikno's research, (2016) showed that the prevalence of anemia in women of childbearing age (WUS) aged <20 years was 13.8% higher than WUS aged 20-35 years (6.8%). At the level of nutrient consumption, the percentage of anemia with vitamin C consumption was in the deficit category by 9%, while the percentage of anemia with iron consumption was in the deficit category by 10.1% and the percentage of anemia with zinc consumption was in the deficit category by 9.7% (8). According to the results of Fithra's research, (2019) showed that 11.4% of subjects experienced anemia. The subject's intake of vitamins and micronutrients was still lacking, namely zinc 68.6%, iron 92.9%, and folic acid 90% and most of the subjects (68.6%) intake of vitamin C was in the good category (9). The low intake of macro and micro nutrients consumed can affect the process of iron metabolism, erythropoiesis and the formation of hemoglobin (10).

Based on the background that has been described, the problem of nutritional anemia in Indonesia, especially in female workers, is still quite high, which is influenced by the low intake of nutrients consumed by workers which causes a decrease in the work productivity of female workers. From this, researchers are interested in conducting research on the relationship between the level of zinc consumption and the incidence of anemia in female workers at the Badung Mall.
The purpose of this study was to find out the relationship between the level of zinc consumption and the incidence of anemia in female workers at the Badung Mall.

RESEARCH METHODS

The location of this research is located in a mall, Jl. By Pass Ngurah Rai, Kuta, Badung Regency, this research was conducted in December 2021, the type of research was observational with a cross-sectional research design, the population in this study were all female workers, namely 53 people, the sample needed in this study was 35 samples , the sampling technique in this study used a purposive sampling method, data collection was carried out by taking blood samples in the sample using the easy touch brand hb meter and interviews using the 24-hour recall form, data processing in this study was carried out according to the type of data, namely consumption level data Micronutrients (iron, zinc, folic acid, and vitamin C) are collected and then processed with the help of computer software which is then compared with needs and grouped based on the cut off point of each consumption level, as well as data analysis in this study using a correlation test Pearson product moment and Spearman's rank correlation test.

RESULTS AND DISCUSSION

The sample in this study were 35 female workers at Mall Badung. Of the 35 samples, 14 samples (40.0%) were at the age of 20-24 years, 7 samples (20.0%) were at the age of 25-29 years, and 5 samples (14.0%) respectively were at aged 30-34 years and aged 35-39 years. The distribution of samples by age is shown in Table 1.

Table 1
Distribution of Samples by Age and Education

Age(Years)	n	%
20 – 24	15	43,0
25 – 29	7	20,0
30 – 34	5	14,0
35 – 39	5	14,0

40 – 44	1	3,0
45 – 49	2	6,0
Total	35	100,0
Education	n	%
Elementery	1	2,9
Intermediate	32	91,4
High	2	5,7
Total	35	100,0

Of the 35 samples, there were 32 samples (91.4%) graduated from secondary education, 2 samples (5.7%) graduated from higher education and 1 sample (2.9%) graduated from basic education.`

The results of observations of female workers at the Badung Mall obtained are as follows:

The distribution of samples based on anemia status is shown in Figure 1.
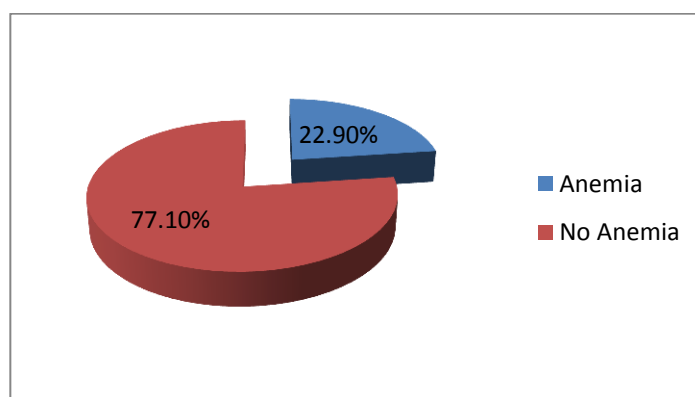

Figure 1. Sample Distribution Based on Anemia Status

Of the 35 samples, 8 samples (22.9%) had anemia and 27 samples (77.1%) did not have anemia. The level of consumption of nutrients is obtained based on 2x24 hour recall data which is then processed using the nutrisurvey application and then compared with individual needs based on the nutritional adequacy rate (RDA) approach.

Of the 35 samples, 8 samples (22.9%) had a severe level of iron consumption and as many as 14 samples (40.0%) had a normal iron consumption level. If the level of iron consumption is crossed with anemia, it is presented in table 2.

Table 2
Distribution of Samples According to Anemia Status with Iron Consumption Level

Consumption Rate Iron	Anemia Status				Total		P-Value
	Anemia		No Anemia				
	n	%	n	%	n	%	
Normal	0	0	14	40,0	14	40,0	
Mild Deficit	0	0	10	28,6	10	28,6	0,000
Moderat Deficit	2	5,7	1	2,8	3	8,5	
Weight Deficit	6	17,2	2	5,7	8	22,9	
Total	8	22,9	27	77,1	35	100	

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Based on the results of the cross table in table 4, it shows that 8 samples who experienced anemia had a severe level of iron consumption deficit as many as 6 samples (17.1%). In addition, 10 samples (28.6%) of the 27 samples who were not anemic had a mild level of iron consumption deficit. The results of bivariate analysis using the Pearson Product Moment Correlation test obtained a significant value of 0.000 ($p < 0.05$) so it can be concluded that there is a significant relationship between the level of iron consumption and anemia.

Of the 35 samples, 5 samples (14.3%) had a severe level of zinc consumption deficit, each of 11 samples (31.4%) had a mild and normal level of zinc consumption deficit. If the consumption level of zinc is crossed with anemia, it is presented in table 3. The distribution of samples according to the level of zinc consumption is shown in Table 3.

Table 3
Sample Distribution According to Zinc Consumption Level

Zinc Consumption Level	n	%
Normal	11	31,4
Defisit tk. ringan	11	31,4
Defisit tk. sedang	8	22,9
Defisit tk. berat	5	14,3
Total	35	100,0

Of the 35 samples, 5 samples (14.3%) had a severe level of zinc consumption deficit, each of 11 samples (31.4%) had a mild and normal level of zinc consumption deficit. If the consumption level of zinc is crossed with anemia, it is presented in table 4

Table 4
Distribution of Samples According to Anemia Status with Level of Zinc Consumption

Consumption Rate Zinc	Anemia Status				Total		P-Value
	Anemia		No Anemia				
	n	%	n	%	n	%	
Normal	0	0	10	28,6	10	28,6	
Mild Deficit	2	5,7	10	28,6	12	34,3	0,601
Moderat Deficit	4	11,5	4	11,4	8	22,9	
Weight Deficit	2	5,7	3	8,5	5	14,2	
Total	8	22,9	27	77,1	35	100	

Based on the results of the cross table in table 4, it shows that 8 samples who experienced anemia had a moderate level of zinc consumption deficit as many as 4 samples (11.4%). In addition, of the 27 samples who were not anemic, there were 10 samples (28.6%) of the zinc consumption levels who had mild deficits and normal zinc consumption levels. The results of bivariate analysis using the Pearson Product Moment Correlation test obtained a significant value of 0.601 ($p < 0.05$) so it can be concluded that there is no significant relationship between the level of zinc consumption and anemia.

Of the 35 samples, 4 samples (11.4%) had a severe deficit of folic acid consumption and 14 samples (40.0%) had normal folic acid consumption. If the consumption level of folic acid is crossed with anemia, it is presented in table 5.

Table 5
Distribution of Samples According to Anemia Status with Consumption Level of Folic Acid

Consumption Level of Folic Acid	Anemia Status				Total		P- Value
	Anemia		No Anemia				
	n	%	n	%	n	%	
Normal	0	0	14	40,0	14	40,0	
Mild Deficit	2	5,7	10	28,6	12	34,3	0,009
Moderat Deficit	4	11,5	1	2,8	5	14,3	
Weight Deficit	2	5,7	2	5,7	4	11,4	
Total	8	22,9	27	77,1	35	100	

Based on the results of the cross table in table 5, it shows that 8 samples with anemia, the level of consumption of folic acid deficit was moderate in 4 samples (11.4%). Of the 27 samples who did not experience anemia, 10 samples (28.6%) had mild levels of deficit folic acid consumption. The results of bivariate analysis using the Spearman Rank Correlation test obtained a significant value of 0.009 (p <0.05) so it can be concluded that there is a significant relationship between the level of consumption of folic acid and anemia.

Of the 35 samples, 1 sample (2.9%) had a severe level of vitamin C consumption and 19 samples (54.2%) had a normal vitamin C consumption level. If the level of consumption of vitamin C is crossed with anemia, it is presented in table 6.

Table 6
Distribution of Samples According to Anemia Status with Vitamin C Consumption Level

Tingkat Konsumsi Vitamin C	Anemia Status				Total		P- Value
	Anemia		No Anemia				
	n	%	n	%	n	%	
Excess	0	0	1	2,9	1	2,9	
Normal	0	0	19	54,2	19	54,2	
Mild Deficit	2	5,7	5	14,3	7	20,0	0,026
Moderat Deficit	5	14,3	2	5,7	7	20,0	
Weight Deficit	1	2,9	0	0	1	2,9	
Total	8	22,9	27	77,1	35	100	

Based on the results of the cross table in table 10, it shows that 8 samples who experienced anemia had a moderate level of vitamin C consumption deficit of 5 samples (14.3%). In addition, of the 27 samples who were not anemic, 5 samples (14.3%) had a mild deficit of vitamin C consumption. The results of bivariate analysis using the Pearson Product Moment Correlation test obtained a significant value of 0.026 (p <0.05) so it can be concluded that there is a significant relationship between the level of consumption of vitamin C and anemia.

Discussion

This study was conducted in a Mall in Badung, Bali Province with 35 samples of female workers. Characteristics in this study are age, education, and service life of the sample. The age of the sample obtained showed that the average is 28 years, with the youngest age is 18 years and the oldest age is 45 years and most of the sample age is in the age range of 20-24 years as many as 14 samples (40%). In this study there were no workers with age below the standard age to work. This is in accordance with law no. 13 of 2003 on employment which states that it is not allowed to employ minors (less than 18 years old).

Education is concerned with awareness of the importance of health issues. According Notoatmodjo (2007) states that a person who has higher education has a good knowledge compared to someone who is less educated so that the lower the level of education of a person, the lower the

understanding of anemia. In this study, most of the samples have secondary education, namely SMA / SMK (91.24%). Another characteristic is the period of work, the period of work is the period of time a person has worked in an agency, company and so on. The working period was grouped into 2 groups of 11 years and 11 years, in this study the working period of most samples were in the period of 11 years (57%).

Anemia is a condition where hemoglobin levels are below normal values. Based on the results obtained in this study, the proportion of anemia in female workers is 22.9%. The proportion of anemia of female workers from this study when compared with Riskesdas data, 2018 is still below the prevalence of anemia in Indonesia with a percentage of 23.7%. Anemia in female workers can occur due to the wrong diet, lack of intake of nutrients both macronutrients and micronutrients, tend to eat the same food and not diverse, there are obstacles in the absorption of nutrients , increased nutritional needs, and experiencing other diseases or disorders that cause excessive blood loss during labor, bleeding, and menstruation.

In this study obtained the sample consumption rate of each nutrient. The level of consumption can be interpreted as the amount of intake consumed in a day which is then compared with individual needs based on the nutritional adequacy rate (RDA) approach. Consumption levels were obtained from interviews using a 24-hour recall form. Based on the level of iron consumption, there are 22.9% of samples have a deficit level of consumption of weight, this is due to lack of consumption of food sources containing iron, and there are samples that consume tea and coffee before meals and during meals. Tea or coffee is one of the inhibitors in the absorption of iron. According to research by Sriningrat et al (2019) which states that the process of iron absorption can experience obstacles caused by several factors such as phytic acid contained in nuts, seeds; phosphitin in egg yolk; oxalic acid contained in vegetables and tannin substances contained in tea and coffee(13). This is in line research Thankachan et al. (2008) who said that consuming tea or coffee 1-2 cups a day can decrease iron absorption, both in women who have anemia and not(14). Iron has an essential function in the body as a carrier of oxygen in the form of hemoglobin, myoglobin, or cytochrome, in case of severe iron deficiency can cause anemia with symptoms such as fatigue, palpitations, dizziness and signs related to disturbances in oxygen transport, in addition to iron as an integrated part of various enzyme reactions in body tissues(15). In addition, in this study it was found that most of the samples did not consume blood supplement tablets regularly and had regular menstrual cycles. According to Raharjo (2003) losing a lot of blood during menstruation is also one of the causes of anemia. Menstruation causes an increase in iron loss by 1 mg/day.

Based on the results of statistical tests using Pearson product moment's correlation test on the level of iron consumption with anemia showed a significant value = 0.000 ($p < 0.05$) it can be concluded that there is a significant relationship between the level of iron consumption with anemia in female workers in Mall Badung. The strength of the relationship is indicated by the value r = 0.671. The results of this study are in line with the research of Al Rahmad (2017) which states that there is a meaningful relationship between the level of iron consumption with hemoglobin levels or anemia in women who work in the Pante Raja Sub-District of Pidie Jaya regency with a value of r = 0.641 and p-value = 0.001.

At the level of zinc consumption, there are 14.3% of the sample experienced a deficit in weight level. This is because the sample did not consume food sources of zinc such as meat, chicken liver, fish and milk. Zinc plays an essential role in various body functions, zinc plays a role in hemoglobin biosynthesis and oxygen exchange. Zinc can interact directly or indirectly. Zinc interactions indirectly occur in the synthesis of proteins including iron transport proteins, namely transferrin (18). Zinc derived from food interacts with iron directly as a cofactor of the Amino levulinic heme (ALA)-dehydratase enzyme that plays a role in heme synthesis when in the cytosol of bone marrow cells. Based on the results of statistical tests using Pearson Product moment's correlation test on the level of zinc consumption with anemia showed a significant value = 0.601 ($p < 0.05$) which can be concluded that there is no meaningful relationship between the level of zinc

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consumption with anemia in female workers in Mall Badung. The strength of the relationship is indicated by the value r = -0.092. The results of this study are in line with the research of Fithra Dieny et al (2019) which states that there is no meaningful relationship between the level of zinc consumption and anemia in contraceptive women in Semarang Regency with a p-value value = 0.819.

Based on the level of consumption of folic acid, obtained as many as 11.4% of the sample had a severe deficit. This is because there is still a lack of eating foods rich in folic acid. According to(Chayu, 2019) folic acid deficiency can interfere with DNA synthesis, inhibit growth, cause megaloblastic anemia, gastrointestinal disorders and other blood disorders (19). Based on the results of statistical tests using Spearman Rank Correlation test on the level of folic acid consumption with anemia showed a significant value = 0.009 (p < 0.05) which can be concluded that there is a significant relationship between the level of folic acid consumption with anemia in female workers in Mall Badung. The strength of the relationship is indicated by the value r = 0.436. This study is in line with the research of Suyardi et al (2009) which states that there is a meaningful relationship between the level of folic acid consumption with anemia in female labor(20). This study is also in line with Chayu's (2019) Research which states that there is a meaningful relationship between folic acid consumption and hemoglobin levels in junior high school girls. Folic acid derived from food enters the body mostly in the form of polyglutamates. Folate in the body is not stored in large quantities, so to meet the needs of folic acid can be obtained from a balanced diet by eating foods rich in folate. Folic acid deficiency can cause red blood cell nuclei to enlarge, this is because the process of maturation (maturation) of the cell nucleus is inhibited, but the process of hemoglobin formation still occurs so that hemoglobin is still formed but with an enlarged cell nucleus(megalobast).

At the level of vitamin C consumption, there are 2.9% of samples that have a deficit in weight and the average consumption of vitamin C in the sample has been fulfilled. Based on the results of statistical tests using Pearson Product moment's correlation test on the level of vitamin C consumption with anemia showed a significant value = 0.026 (p < 0.05) which can be concluded that there is a significant relationship between the level of vitamin C consumption with anemia in female workers in Mall Badung. The strength of the relationship is indicated by the value r = -0.377. This study is in line with the research of Setyandari and Margawati (2017) which states that there is a significant relationship between the level of vitamin C consumption and hemoglobin levels in female workers(22). Vitamin C can help increase the absorption of hem Iron up to four times, that is, by turning ferric iron into ferric in the small intestine. Absorption of vitamin C can also be hampered due to infections in the digestive tract. Infections that occur in the digestive tract will cause nutrients contained from food can not be absorbed properly and wasted along with feces. Vitamin C helps in delivering iron (Fe) from the blood to the liver as well as activating Fe-containing enzymes. Vitamin C affects the incidence of anemia because vitamin C has a big role in helping strengthen the immune system, fight infection and iron absorption efforts.

CONCLUSION

Based on the results of research conducted in Mall Badung, regarding the relationship of micronutrient consumption levels with the incidence of Anemia in female workers in Mall Badung can be concluded that :
1. The proportion of anemia in female workers in Mall Badung was 22.9%.
2. The level of zinc consumption in female workers in Mall Badung was 14.3% severe deficit, 22.9% moderate deficit, 31.4% mild deficit, and 31.4% normal.
3. There is a relationship between the level of consumption of iron, folic acid and vitamin C with anemia in female workers in Mall Badung

4. There is no relationship between the level of zinc consumption with anemia in female workers in Mall Badung

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