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Consumption Of Zinc (Zn) And Iron (Fe) And Hemoglobin Levels In Female Students Of Senior High School 1 Gianyar

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Abstract

Young women are susceptible to nutritional problems, one of which is anemia. The cause of anemia is the lack of consumption of macro and micronutrients, such as iron and zinc. The problem of anemia in adolescent girls will cause adverse effects such as causing babies born with low weight, stunting babies, and high prenatal mortality. The purpose of this study was to determine the relationship between zinc and iron consumption and hemoglobin levels in high school students Negeri 1 Gianyar. The type of data in this study is analytical using a cross sectional design. The population in this study was grade 11 and 12 students with a sample of 60 people selected by random sampling. Data on zinc and iron consumption were obtained using a 24-hour food recall questionnaire processed using the 2007 Nutri Survey program, and hemoglobin levels were obtained by digital multicheck method, namely with GCHb Easy Touch. Data were analyzed using bivariate analysis using the Spearman rank test. The results showed the level of zinc and iron consumption was still lacking. The average consumption of zinc and iron after the data was processed was zinc consumption which was 4.3 mg and iron consumption was 4.5 mg.

Keyword: Zinc Consumption; Iron; Hemoglobin Levels

INTRODUCTION

In a healthy body, hemoglobin has various important functions. Hemoglobin not only makes blood cells red, but also helps all body tissues receive oxygen from the lungs. Anemia is a health problem related to hemoglobin. A red blood cell count or hemoglobin level of less than 12 grams per 100 ml indicates anemia. If the hemoglobin level is low or between 7 and 11 g/dL, which is below normal, it will have a bad impact on health. Less oxygen will be sent to all parts of the body when hemoglobin levels are low. One of the reasons for low hemoglobin levels in the blood is the result of inadequate food consumption. Based on RISKESDAS in 2007, 2013 and 2018, the prevalence of anemia in adolescents has increased, specifically by 6.90% in 2007, 18.40% in 2013, and 32% in 2018. Based on data from the Bali Provincial Health Service in 2020, the prevalence of anemia increased to 5.78% in 2020 from 5.07% in 2019. Based on RISKESDAS in 2018, 34.6% of young women had received blood supplement tablets. Based on the health profile of Gianyar Regency in 2020, the number of anemic adolescents aged >15 years among women was 19.7%.

Hemoglobin level examination is carried out to determine the hemoglobin level in the body. Various inspection methods can be carried out, one of which is the digital multicheck method, namely Easy Touch GCHb. From childhood to adulthood, they experience a transition phase. They grow and develop both physically and mentally at this time, which will also result in greater nutritional requirements. According to the Regulation of the Minister of Health of the Republic of Indonesia Number 25 of 2014 aged 10 to 18 years are included in the group of people known as teenagers. Based on research by Sanggelorang, et al in 2016, most teenagers have bad eating habits and like snacks and ready-to-eat foods as daily meals and avoid foods rich in iron. Iron deficiency during brain development will cause disturbances in cognitive function which are usually permanent. Based on research by Eme (2019) in (Rachmayanti et al., 2021) consumption of micronutrients among teenagers is still low because of the tendency to consume foods high in sugar and ready-to-eat foods but low in fruit and vegetables, this shows a lack of nutrition and food diversity. consumed by teenagers. A lack of variety in food ingredients tends to lead to nutritional problems. Deficiency of various micronutrients will disrupt iron metabolism and red blood cell

production. The body's system of interconnected systems that change micronutrient status and produce at least two different micronutrients is referred to as micronutrient interactions. One of them is zinc. One of the most important micronutrients in the human body is zinc. The amount of zinc in the body impacts zinc absorption. The body absorbs more zinc when needed. Zinc indirectly interacts in the body and supports the synthesis of iron transport proteins. Iron consumption for adolescent girls according to research by Eka Padmiari (2020) in Gianyar Regency, Bali Province is (55%), zinc is (74.25%). Based on data obtained (Wijayanti et al, 2019), in their research, on average, women of childbearing age who experience anemia consume less iron, folic acid and zinc than they need. Therefore, researchers wanted to examine the consumption of zinc and iron (Fe) and hemoglobin levels in female students at SMA Negeri 1 Gianyar (9).The general objective of this research is to determine the relationship between zinc (Zn) and iron (Fe) consumption and hemoglobin levels in female students at SMA Negeri 1 Gianyar. The specific objectives of this research are measuring hemoglobin levels, determining the level of zinc (Zn) consumption, determining the level of iron (Fe) consumption, analyzing the relationship between zinc consumption and hemoglobin levels, as well as analyzing the relationship between iron consumption and hemoglobin levels in female students of SMA Negeri 1 Gianyar Bali

RESEARCH METHODS

This research was carried out by SMA Negeri 1 Gianyar, Gianyar District, Gianyar Regency, Bali from July to December 2022. This type of research is analytical observational research with a cross sectional approach. The population in this study were all female students who were active at SMA Negeri 1 Gianyar. The target population is female students in grades 11 and 12. The sample in this study was 60 people. The sampling technique uses simple random sampling. Data collection was carried out by direct interviews using a sample identity form. Measurement of hemoglobin levels was carried out by directly measuring hemoglobin levels with an Easy Touch GCHb brand Hb meter, zinc and iron consumption levels were collected using the 24 hour food recall method and analyzed using Nutri Survey 2007. The data obtained was then analyzed using frequency distribution and linkage tables. Between variables were analyzed using cross tables.

RESULTS AND DISCUSSION

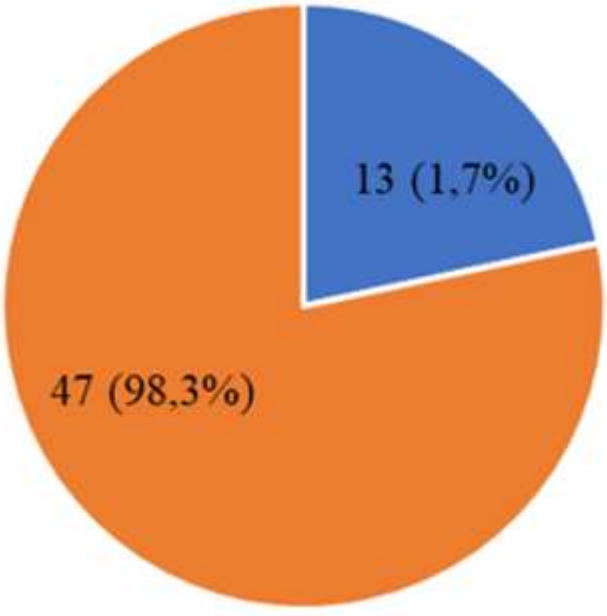
In this research, female students at SMAN 1 Gianyar were the samples, there were 60 samples used. The lowest and highest ages of the 60 samples were respectively 16 years for 17 samples (28.3%) and 17 years for 43 samples (71.7%). The sample menstrual cycle of 42 samples (70.0%) experienced a normal menstrual cycle, namely 21-35 days, 7 samples (11.7%) experienced a menstrual cycle <21 days, and 11 samples (18.3%) experienced a normal menstrual cycle. menstruation >35 days. Regarding the characteristics of menstrual duration, 17 In this research, female students at SMAN 1 Gianyar were the samples, there were 60 samples used. The lowest and highest ages of the 60 samples were respectively 16 years for 17 samples (28.3%) and 17 years for 43 samples (71.7%). The sample menstrual cycle of 42 samples (70.0%) experienced a normal menstrual cycle, namely 21-35 days, 7 samples (11.7%) experienced a menstrual cycle <21 days, and 11 samples (18.3%) experienced a normal menstrual cycle. menstruation >35 days. Regarding the characteristics of menstrual duration, 17 samples (28.3%) experienced normal menstruation, namely 3-7 days, 6 samples (10.0%) experienced abnormal menstruation <3 days, and 37 samples (61.7%) experiencing menstruation >7 days. Complete sample characteristics can be seen in table 1.
Table 1

Distribution of Sample Characteristics at SMAN Negeri 1 Gianyar

Characteristics	n	%
Age		
16	17	28,3
17	43	71,7
Menstrual Cycle		
<21	7	11,7
Normal (21-35)	42	70,0
>35	11	18,3
Length of Menstruation		
< 3	6	10,0
(Normal) 3-7	17	28,3
>7	37	61,7
Total	60	100

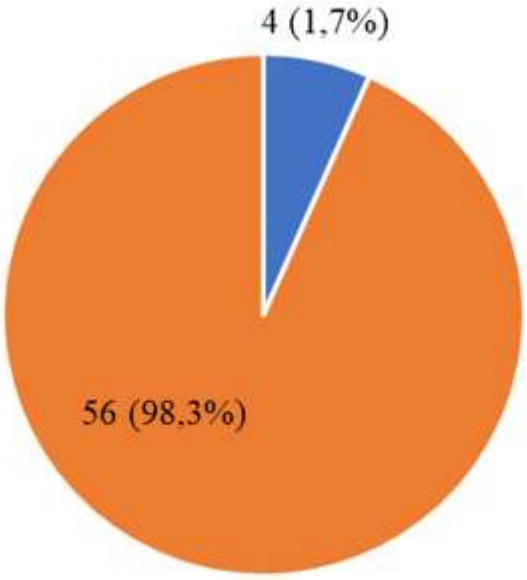
Hemoglobin levels of female students at SMA Negeri 1 Gianyar

Hemoglobin level data was taken directly using an Hb meter with the Easy Touch GCHb brand. The highest hemoglobin level from the 60 samples was 16 g/dL, the lowest was 8.6 g/dL, and the average was 12.92 g/dL. A total of 47 samples (78.3%) had normal hemoglobin levels, and 13 samples (21.7%) had abnormal levels. Complete data can be seen in Figure 1.



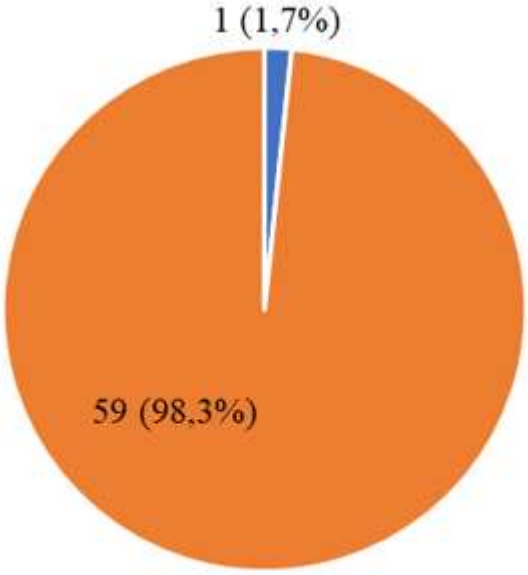
Zinc Consumption Levels with 24 hour Food Recall of Female Students at SMA Negeri 1 Gianyar Data on zinc consumption levels was collected by means of a 24 hour recall using the 1x24 hour food recall form. Of the 60 samples, 56 samples (93.3%) included samples with low consumption levels, and 4 samples (6.7%) included samples with good consumption levels. The lowest zinc consumption was 0.9 mg, the highest was 9.6 mg, and the average was 4.3 mg. This data shows that the average zinc consumption is still less than the requirement, namely 9 mg/day. Complete data can be seen in Figure 2.

Figure 2. Distribution of samples based on zinc consumption levels



Iron Consumption Levels with 24 hour Food Recall of Female Students at SMA Negeri 1 Gianyar, Data on iron consumption levels were collected by means of a 24 hour recall using the 1x24 hour food recall form. Of the 60 samples, 1 sample (1.7%) included samples with good consumption levels, and 59 samples (98.3%) included samples with poor consumption levels. The lowest iron consumption was 0.6 mg, the highest was 15.4 mg, and the average was 3.9 mg. This data shows that the average iron consumption is still less than the requirement, namely 9 mg/day. Complete data can be seen in Figure 3.

Figure 3. Distribution of samples based on iron consumption levels



The Relationship Between Zinc Consumption and Hemoglobin Levels of Female Students at SMA Negeri 1 Gianyar. The level of zinc consumption was related to hemoglobin levels in 60 samples, where 1 sample (1.7%) had good zinc consumption and 12 samples (20.0%) had insufficient zinc consumption, both of which had low hemoglobin levels (anemia) . The Spearman correlation test

was used to test the relationship between zinc consumption and hemoglobin levels. The result is a p-value of 0.870 which is more than 0.05 and shows that there is no significant relationship between zinc consumption and hemoglobin levels. Complete data can be seen in table 2.

Table 2
Sample Distribution Based on Zinc Consumption and Hemoglobin Levels

Variable	Hemoglobin Levels				Total	
	Not Normal		Normal			
Zinc Consumption	**n**	**%**	**n**	**%**	**n**	**%**
Good	1	7,7	3	6,4	4	6,7
Not good	12	92,3	44	93,6	56	93,3
Total	13	100	47	100	60	100

The Correlation between Iron Consumption and Hemoglobin Levels of Female Students at SMA Negeri 1 Gianyar. The level of iron consumption was related to hemoglobin levels in 60 samples, of which 13 samples (21.7%) had insufficient levels of iron consumption and had low hemoglobin levels (anemia). The Spearman correlation test was used to test the relationship between iron consumption and hemoglobin levels. The result is a p-value of 0.603 which is more than 0.05 and shows that there is no significant relationship between iron consumption and hemoglobin levels. Complete data can be seen in table 3.

Table 3
Sample Distribution Based on Iron and Hemoglobin Levels

Variable	Kadar Hemoglobin				Total	
	Anemia		**Not Anemia**			
Iron Consumption	**n**	**%**	**n**	**%**	**n**	**%**
Good	0	0	1	2,1	1	1,7
Not Good	13	100	46	97,9	59	98,3
Total	13	100	47	100	60	100

Of the 60 samples included in this study, most of the samples or 43 samples (71.7%) were 17 years old, while 17 samples (28.3%) were 16 years old. Most of the samples had regular menstrual cycles, with a percentage of 70.0%. With an average Hb level of 12.92 g/dl from the 60 samples used, 21.7% of the samples were still anemic, which is quite a high percentage. When compared with the profile of the Gianyar District Health Service in 2020, the number of anemic adolescents aged >15 years among women was 19.7%. Based on the data obtained, it is known that the incidence of anemia in this study is still relatively high, possibly due to blood loss related to menstruation, where the percentage of menstrual sample duration of >7 days is quite long, namely 61.7% and samples who did not consume blood supplement tablets by 75%. This is in accordance with Triwahyuni's 2019 study, which found a relationship between the duration of the menstrual cycle in teenage women and the incidence of anemia in teenage girls at SMAN 7 Cirebon City. Prolonged menstruation or more than 7 days or bleeding of more than 80 cc will cause anemia, as a result, the amount of iron in hemoglobin will decrease. Longer menstrual cycles result in more blood loss from the body, which increases iron excretion, disrupts the body's iron balance, and increases the risk of

anemia. Anemia is not a sign of disease or a problem with a biological process. Anemia is physiologically caused by a lack of hemoglobin, which carries oxygen to tissues. Compared to teenage boys, teenage girls are more susceptible to anemia. This is because adolescent women's iron requirements are three times higher than men's. Every month, young women experience regular menstruation. In order for their bodies to return to their original state, young women need iron. Unfortunately, most young women are not aware of it .

There was no significant relationship between zinc consumption levels and hemoglobin levels in this study, with a p-value of 0.870. The results of this study contradict Marissa's research. et al (2021) who stated that zinc consumption had a significant effect on the incidence of anemia in adolescent girls at SMAN 1 Kampar Utara, because in data collection the samples used were larger and the tests used were different. The results of this study are in line with research conducted in 2021 by Meliyan, et al., which did not find a relationship between zinc consumption and hemoglobin levels that would change the prevalence of anemia in school children. in the working area of the Air Betiti Health Center, Musi Rawas Regency. Zinc consumption is needed to help form hemoglobin. The body needs zinc to maintain and restore health because it has an important role in this process. As a micronutrient, zinc can influence iron metabolism. Zinc helps in the stimulation of HCL synthesis by carbonic anhydrase in the stomach, which can increase hemoglobin levels. Improving immune system performance is another benefit of zinc. The results of this study showed that the majority of samples only consumed food sources from animal sources. The 24-hour recall results showed that some samples consumed less foods containing zinc. Lack of zinc-rich food sources, increased zinc requirements and excretion or impaired zinc absorption can lead to a zinc deficit in the body. It can be seen in table 8 that the average zinc consumption is 4.3 mg. This shows that zinc consumption is lower than the daily zinc requirement for teenagers aged 16-18 years, namely 9 mg. This is because the sample did not consume a variety of zinc-rich foods. This is evident from the sample recall results which are still monotonous due to the average consumption of staple foods twice a day and the sample's habit of rarely consuming varied and nutritionally balanced foods, the sample's habit of skipping meals due to limited time at school and in extracurricular activities, as well as outside school hours. which requires the sample to replace it by consuming snacks that are low in zinc, so that the zinc nutritional adequacy figure is below normal. From the results of the recall data collected, the samples often consumed foods containing zinc, such as chicken and tempeh.

There was no significant relationship between iron consumption levels and hemoglobin levels in this study, with a p-value of 0.603. According to research by Tazkia, et al. In 2022, there will be no significant relationship between iron consumption and hemoglobin levels which has an impact on the incidence of anemia in young women in middle and high schools in the Bantul area. This research supports that conclusion. This is due to the fact that adolescents consume iron on average only 1-2 times per week in small amounts, and with the same type of food. Previous research conducted by Yulianingsih in 2013 which found no relationship between iron consumption and hemoglobin levels in women of childbearing age in Cangkringan District, Sleman Regency, provided additional support for this research. Other variables outside the researchers' control may have had an impact on the absence of a relationship between iron consumption and hemoglobin levels. The amount of iron used by the body depends on how well it is absorbed from the foods commonly consumed. The bone marrow's ability to make red blood cells will be supported by sufficient iron reserves. Hemoglobin levels fall below normal levels as a result of decreased iron reserves and low iron consumption, which disrupts the body's iron balance and results in iron nutritional anemia. A decrease in hemoglobin and plasma iron levels indicates iron deficiency anemia.

According to the research results, the sample showed little interest in consuming foods that contain sufficient iron, especially animal protein to meet their needs, which causes iron consumption in adolescents to be low. This is evident from the recall results regarding the monotonous

consumption of sample food, which is caused by the sample's habits. However, something different happened in the samples that consumed less iron but did not experience anemia. Apart from the low iron consumption, the researchers assumed that digestive disorders could have a negative impact on the absorption of iron in the bodies of the samples. Anemia can also be caused by menstruation. Adolescent girls need iron to restore iron lost during menstruation and to increase their body's hemoglobin levels. It can be seen in table 9 that the average iron consumption is 3.95 mg, this shows that iron consumption is less than the daily requirement of 15 mg for teenagers between the ages of 16 and 18 years. This is caused by the less diverse food sources of iron consumed by the sample at the time of data collection. This is evident from the sample recall results which are still small due to the average pattern of consuming staple foods twice a day and the sample's habit of rarely consuming foods that are diverse and nutritionally balanced. The sample missed meal times due to time constraints during activities at school and after school hours which required the sample to replace it by consuming snacks. From the results of the recall data obtained, the source of food containing iron consumed by the samples came from animals such as chicken and eggs.

CONCLUSION

The conclusion obtained from the research is that students at SMAN 1 Gianyar have normal hemoglobin levels with an average of 12.92 g/dL. Students at SMAN 1 Gianyar have a zinc consumption level in the good category of 6.7% and in the poor category of 93.3%. Students at SMAN 1 Gianyar have iron consumption levels in the good category of 1.7% and in the poor category of 98.3%. Zinc consumption and hemoglobin levels did not have a significant relationship, shown by a p-value of 0.870, which is higher than 0.05. Zinc consumption and hemoglobin levels were not significantly correlated, as shown by the p-value of 0.603, which was higher than 0.05. Based on the research that has been carried out, there are still many female students who have deficient levels of zinc and iron consumption, namely 93.3% zinc and 98.3% iron. It is hoped that schools can be more active in providing education regarding the amount and type of nutritious and balanced food ingredients. For schools to increase supervision of female students in consuming blood supplement tablets.

REFERENCES

Arima, L. A. T., Murbawani, E. A., & Wijayanti, H. S. (2019) 'Hubungan Konsumsi Zat Besi Heme, Zat Besi Non-Heme Dan Fase Menstruasi Dengan Serum Feritin Remaja Putri', Journal of Nutrition College, 8(2), 87. https://doi.org/10.14710/jnc.v8i2.23819

Dinas Kesehatan Kabuaten Gianyar. 2022. Profil Kesehatan Kabupaten Gianyar Tahun 2021. Gianyar: Dinas Kesehatan

Hamidiyah, A. (2020) 'Hubungan Konsumsi Nutrisi Dengan Kejadian Anemia Pada Remaja Putri', JOMIS (Journal of Midwifery Science), 4(1), 1-8

Kementerian Kesehatan Republik Indonesia. 2007. Riset Kesehatan Dasar Tahun 2007. Jakarta: Kementerian Kesehatan.

Kementerian Kesehatan Republik Indonesia. 2013. Riset Kesehatan Dasar Tahun 2013. Jakarta: Kementerian Kesehatan.

Kementerian Kesehatan Republik Indonesia. 2018. Riset Kesehatan Dasar Tahun 2018. Jakarta: Kementerian Kesehatan.Marissa, M., & Hendarini, A. T. (2021)' Hubungan Konsumsi Fe, Seng Dan Asam Folat Dengan Kejadian Anemia Pada Remaja Putri Di SMAN 1 Kampar Utara Tahun 2021', Jurnal Kesehatan Tambusai, 2(4), 391-397

Meliyanti, M., & Rostika Flora, R. F. (2021) Pengaruh Konsumsi Zat Besi Dan Zink Terhadap Kejadian Anemia Pada Anak Sekolah Dasar Di Wilayah Kerja Puskesmas Air Beliti

Kabupaten Musi Rawas. Skripsi. (Doctoral dissertation, Sriwujaya University)Ningsih, E. W., Fajrin, H. R., & Fitriyah, A. (2019) P'endeteksi Hemoglobin Non Invasive', Medika Teknika : Jurnal Teknik Elektromedik Indonesia, 1(1). https://doi.org/10.18196/mt.010102

Rachmayanti, H., Endayani, D., Maulida, N. R., Muhammadiyah, U., Hamka, P., Limau, J., Kota,(2021) 'Analisis kelompok makanan dietary diversity score (DDS) pada remaja usia 10-19 tahun', Jurnal Pangan Kesehatan Dan Gizi, 2(September), 16–30..

Sanggelorang, Yulianty; H. Kapantow, Nova; S.H. Malonda, N. (2016) 'Hubungan Antara Konsumsi Zat Besi Dengan Kadar Feritin Anak Kelas 4 Dan 5 Sekolah Dasar Di Kelurahan Maasing Kecamatan Tuminting Kota Manado', Menara Medika, (July), 1–23.

Padmiari, I. A. E. (2020). Penyuluhan Gizi Dan Pemeriksaan Kadar Hb Serta KEK Pada Remaja Putri Di Kecamatan Sukawati, Kabupaten Gianyar Tahun 2019. Jurnal Pengabmas Masyarakat Sehat, 2(3), 138-144

Triwahyuni, R. Y. (2022) 'Faktor Risiko Yang Berhubungan Dengan Kejadian Anemia Defisiensi Zat Besi Pada Remaja Putri Di Sma Negeri 7 Kota Cirebon Tahun 2019', Midwife's Research, 8(2), 91-105.

Padmiari, I. A. E., & Sugiani, P. P. S. (2022) Konsumsi Zat Gizi Mikro dan Kadar Ferritin pada Remaja Putri Di Kabupaten Gianyar, Provinsi Bali. Bali: CV Royal Bali

Putri, T. F., & Fauzia, F. R. (2022) 'Hubungan Konsumsi Sumber Zat Besi dengan Kejadian Anemia Pada Remaja Putri SMP dan SMA di Wilayah Bantul', Jurnal Ilmu Keperawatan dan Kebidanan, 13(2), 400-411

Widyaningsih, E. N., & Toto Suharto, S. K. M. (2013) ‘Hubungan Antara Konsumsi Protein dan Zat Besi dengan Kadar Hemoglobin pada Wanita Usia Subur (WUS) di Kecamatan Cangkringan Kabupaten Sleman’, Skripsi. (Doctoral dissertation, Universitas Muhammadiyah Surakarta)