Effect of blood iron level on prevalence of Recurrent Aphthous Stomatitis (RAS) in traffic police officers

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Effect of blood iron level on prevalence of Recurrent Aphthous Stomatitis (RAS) in traffic police officers

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Abstract

Introduction: Iron is one of human micronutrients which is the most abundant micro mineral in the body. Iron deficiency can affect the human immune system because this mineral is essential for cell differentiation and growth. In addition, white blood cells that function to destroy bacteria becomes unable to work effectively and will result in changes in oral microorganisms which can increase intensity of oral mucosa inflammation including recurrent aphthous stomatitis (RAS). This study aimed to determine the association between blood iron levels and recurrent aphthous stomatitis in traffic police officers at Surabaya Police Department.

Materials and Methods: This research was an analytical observational with cross sectional approach. The respondents of this research were 98 traffic police officers at Surabaya Police Department, they were selected by simple random sampling method by fulfilling several criteria. Researchers then performed intra oral examination and anamnesis to know the history of ulceration in the mouth of the respondents.

Results: Respondents who had abnormal iron levels experienced RAS more than respondents with normal iron levels. The correlation test between iron blood level of and RAS with chi-square test resulted in P-value of 0.034. Because the p-value (0.034) is less than significance level (0.05), the null hypothesis is rejected. Thus, this means that there is a relationship between blood iron levels and RAS.

Conclusion: There is relationship between blood iron levels and Recurrent aphthous stomatitis in traffic police officers at Surabaya Police Department.

Keywords: Stomatitis Aphthous, Fe blood level, police, lead poisoning

Introduction

Iron is one of the essential human micronutrients which is the most abundant micro mineral in the body. It is essential for survival. The ability to obtain, store and use iron is a universal requirement for all organisms[1]. Iron is absorbed through the duodenal mucosa. Iron levels in the body are affected by iron absorption rate. Factors affecting iron absorption rate are, amount and form of iron, ascorbic acid, phytic acid, tannin, gastric pH level, iron requirement level and intrinsic factors such as body iron requirement level[2]. In addition, Pb or lead in high amount and frequency can also affect the iron absorption process. Lead is a direct competitor of iron on the bonding site at the duodenal receptors. Therefore, people who experience lead poisoning will be accompanied by iron deficiency. Consistent with this, iron deficiency can exacerbate lead poisoning in the body[3].

Chronic or continuous iron absorption disorder will lead to a state of iron deficiency in the body[4]. Iron deficiency can affect the immune system of the individual because iron is essential for cell differentiation and growth. In addition, in the state of iron deficiency, white blood cells that function to destroy bacteria becomes unable to work effectively[5]. Reduced bactericidal substances produced by the body result in changes in oral microorganisms. This change causes increasing intensity of oral mucosa inflammation including

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recurrent aphthous stomatitis (RAS)[6].

Traffic police officers are the implementing element of traffic regulation. Traffic is a major factor supporting productivity in modern society to improve the quality of life of the community. In order to support these tasks, nutritional adequacy is needed to achieve excellent health. The oral cavity with a variety of normal flora inside is very sensitive to changes in the immune response. Oral infections can serve as a marker for subclinical malnutrition[7]. Based on the above background, this study aimed to determine the association between blood iron levels and recurrent aphthous stomatitis (RAS) in traffic police officers at Surabaya Police Department.

Subjects and Method

This research was an analytical observational with cross sectional approach. The respondents of this research were 98 traffic police officers at Surabaya Police Department, they were selected by simple random sampling method by fulfilling criteria of physical and mental health, not taking drugs, willing to do blood examination to obtain blood levels of iron and willing to be interviewed about meal and Recurrent Aphthous Stomatitis frequency. Participants first filled the informed concern then proceeded to the blood sampling. Blood sample was obtained as much as 3 ml in the cubital vein using EDTA as anticoagulant. Then it was inserted into the tube and stored in cold storage with temperature maintained about 4℃. The levels of iron and pb in blood were measured using atomic absorption spectrophotometer (SSA) method with µ / l unit. Respondents were asked about the frequency of consumption of iron, vitamin C sources consumption, tannin sources consumption, and general data through interviews using questionnaire. Researchers then performed intra oral examination and anamnesis to know the history of ulceration in the mouth of the respondents.

Findings

This research was conducted on traffic police officers at Surabaya Police Department with 98 respondents. The average age of respondents was 37.3 years with an average working life of 15.5 years. RAS-affected respondents accounted for 14.28% of total respondents with average blood Fe and blood Pb 938.61 µ / l and 146,71 respectively. Characteristics of respondents are described in table 1.

Table 1. Characteristic of respondents.

Variable	Total	Mean	%
Gender			
Male	82	-	83,67
Female	16	-	16,32
Age (25-64 y.o)	-	37,3	-
Job Position			
Field Officer	49		50
Administrative officer	49		50
Work Period (year)		15,5	
RAS			
Positive	14		14,28
Negative	84		85,71
Fe Whole Blood (µ/l)		938,61	
Pb Whole Blood (µ/l)		146,71	

Cross tabulation between Fe blood levels is divided into abnormal and normal categories with RAS in respondent is categorized as positive and negative described intable 2. The results of cross-tabulation were found that from 16 people who had abnormal iron levels, 31.3% experienced RAS and from 82 people who had normal iron levels, only 11.0% was affected by RAS. Respondents who had abnormal iron levels experienced more RAS than respondents with normal iron levels. The correlation test between blood iron level and RAS with chi-square test resulted in P-value of 0.034. Because the p-value (0.034) is less than significance level (0.05), the null hypothesis is rejected. Thus, this means that there is a relationship between iron blood levels and RAS.

Table 2. Cross tabulation between Fe and Recurrent Aphthous Stomatitis (RAS)

	RAS					
Fe Blood Levels	-	%	+	%	Total	%
Abnormal	11	68,8	5	31,3	16	100
Normal	73	89	9	11	82	100

The correlation test was conducted on the type of food that can affect blood iron levels. Cross tabulation between Fe blood level which is divided into abnormal and normal categories and RAS which is categorized as positive and negative. They are differentiated based on frequent or rare consumption of foods containing iron, Vitamin C and Tannin as described in Table 3.

Table 3. Cross-tabulation between Fe in blood and RAS based on the variable of food consumption that affects blood iron level

			RAS					
Food variable	**Frequency**	**Fe blood level**	-	%	+	%	**Total**	%
Iron	Rare	Abnormal	10	19.6	3	5.88	13	100
		Normal	33	64.7	5	9.8	38	100
	Frequent	Abnormal	1	2.12	2	4.25	3	100
		Normal	40	85.1	4	8.51	44	100
Vitamin C	Rare	Abnormal	6	10.34	1	1.72	7	100
		Normal	44	75.86	7	12.06	51	100
	Frequent	Abnormal	5	12.5	4	10	9	100
		Normal	29	72.5	2	5	31	100
Tannin	Rare	Abnormal	4	10.26	0	0	4	100
		Normal	29	74.36	6	15.38	35	100
	Frequent	Abnormal	7	11.11	5	7.94	12	100
		Normal	44	69.84	7	11.11	51	100

In the correlation test between the blood iron level and RAS in respondents who rarely consume Fe, chi-square test showed value of 0.396, while the relationship between blood levels of iron and RAS in respondents who often consume Fe have chi-square test value of 0.004. Because the p-value is (0.004) less than (0.05), the null hypothesis is rejected which means that there is a correlation between blood iron levels and RAS in respondents who frequently consume Fe.

In the correlation test between iron blood levels and RAS in respondents who frequently consume Vitamin C, chi-square test showed value of 0.005. Because the p-value is (0.005) < (0.05), then the null hypothesis is rejected which means that there is a correlation between blood iron levels and RAS in respondents who frequently consume Vitamin C.

The correlation test between blood iron levels and RAS in the respondents who often consume tannin chi-square showed test value of 0.027. Because the p-value of (0.027) < (0.05), the null hypothesis is rejected which means that there is a correlation between blood iron levels and RAS in respondents who frequently consume tannin. Risk estimation test showed value of 1.09 which means that frequent tannin-consuming traffic police officers are 1.09 times more susceptible to the incidence of RAS than those who rarely consume.

The correlation test was tested on lead in the blood and the factors of lead entry in the blood that could affect blood iron levels as described in table 4.

Table 4. Cross-tabulation between Fe in blood and RAS based on the variables of lead blood levels and the factors of lead entry in the blood.

			RAS					
Pb variable		**Fe blood level**	-	%	+	%	**Total**	%
Pb Blood Level	Normal	Abnormal	2	4.88	1	2.44	3	100
		Normal	31	75.61	7	17.07	38	100
	Abnormal	Abnormal	9	15.79	4	7.02	13	100
		Normal	42	73.68	2	3.51	44	100
Working Period	Short	Abnormal	4	7.84	3	5.88	7	100
		Normal	38	74.51	6	11.76	44	100
	Long	Abnormal	7	13.21	2	3.77	9	100
		Normal	35	66.03	9	16.98	44	100
Position	Field Officers	Abnormal	7	12.96	3	5.55	10	100
		Normal	44	81.48	0	0	44	100
	Administrative	Abnormal	4	8	2	4	6	100
		Normal	34	68	10	20	44	100

Form the table, we can see that respondents who had normal iron levels and did not experience RAS were more likely occurred in normal blood Pb. In the correlation test between the correlation between blood iron levels and RAS on the respondents who had abnormal blood levels of Pb, chi-square test showed value of 0.07. Because the p-value of (0.07) ≥ (0.05), then the null hypothesis is accepted which means that there is no correlation between iron blood levels and RAS in the respondents who are abnormal blood Pb.

The result of cross tabulation between blood glucose level and RAS based on work period, respondents who had normal iron levels and did not experience RAS were more likely occurred in long working period. In the correlation test between blood iron levels and RAS on short or new working period, chi-square test value is 0.060. Because the p-value is (0.060) ≥ (0.05), the null hypothesis is accepted which means that there is no correlation between blood iron levels and RAS in the respondents whose working period is short.

The result of cross tabulation between blood levels of iron with RAS differentiated by type of position in traffic police officers found that respondents who had abnormal levels of iron and experienced RAS more likely occurred in field officers. In correlation test between blood iron levels and RAS on field officers, chi-square test showed

value of 0.000. The null hypothesis is rejected, and there is a correlation between blood iron levels and RAS in respondents whose position as field officers.

Traffic police officers assumed to have iron deficiency due to high lead exposure turned out to only 16.3% of respondents who have blood levels below normal blood levels. In fact, they are officers with lead blood value above the normal value of 58.2%. This is due to the fact that iron deficiency in the body is a terminal symptom caused by various factors such as blood loss, increased need for iron such as during growth and pregnancy condition, low iron intake from foods, iron absorption disorders and iron metabolic disorders.

In this study, respondents who had abnormal levels of iron and experienced RAS more likely in rare iron intake. This is in accordance with the literature where the main cause of iron deficiency in the blood is due to a lack of iron intake and low absorption[9]. The absorption of iron in the blood is influenced by other factors such as tannin and vitamin c intake. In this study the frequency of consumption of vitamin C and tannins was studied and used as a moderate variable equivalent to blood lead levels as a factor affecting iron absorption.

Respondents who had abnormal levels of iron and experienced RAS more likely occurred in respondents who often consumed Vitamin C. This is not in accordance with the literature stating that vitamin C intake from food will provide an acidic atmosphere to facilitate the reduction of ferric iron into ferro to make it easier to be absorbed in small intestine. Iron absorption in the form of nonheme increases fourfold with vitamin C presence[10]. In addition to helping in the iron absorption, vitamin C also plays a role in maintaining endurance if consumed adequately. This is caused by the function of vitamin C involves various aspects of metabolism such as electron transport. Administration of vitamin C meant for supportive care through tissue regeneration, thereby shorten healing time.

Another factor that affects iron absorption is tannin consumption. Tannin has polyphenolic compounds such as tannins in the tea and coffee. Tea can reduce absorption by up to 80% as a result of the formation of iron-tannate complex. Coffee also contains polyphenols but, in less amount, compared to tea[11]. In this study, iron inhibition due to high tannin consumption will lead to a decrease in the body's immune system to infections that cause an increase in RAS incidence by 1.09 times higher than low tannin consumption cases.

Respondents who had normal iron levels and did not experience RAS were more likely to occur in respondents with normal Pb blood level. This is in accordance with the literature which mentioned that iron deficiency and lead poisoning should be interconnected and will occur together[12]. Exposure to lead can interfere with erythropoiesis which will ultimately interfere with iron absorption. Almost 50% of erythropoiesis activity is inhibited at Pb blood levels of 15 µg / dl[13]. In normal Pb blood level, there is no decrease in immunity that can increase the incidence of RAS. Pb blood level that affect Fe blood levels can be affected by the working period and job position of respondents. Based on the results of this study, it is found that the working period does not affect the emergence of RAS, while the position affects theoccurrence of RAS. This is not in accordance with previous experiments in which both work and occupation could affect blood levels of iron. The longer the work period and duration will affect the level of lead in the blood. This is in accordance with previous research which states that long working periods will lead to longer lead exposure, therefore increasing lead levels in the blood[13,14,15]. Differences with previous experiments may be caused by that members of administrative officers who have long working period but possibly have lower lead exposure.s

Conclusion

From this study, we can conclude that there is a significant relationship between blood iron levels and Recurrent aphthous stomatitis in traffic police officers at Surabaya Police Department.

Conflict of Interest: Nill

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Ethical Clearance: Taken

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GENERAL COMMENTS

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