

# The Influence of Total Suspended Particulate (TSP), Carboksihemoglobin and Individual Characteristics of Vital Capacity of Lung Fish Craffickers in Fishing Center

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**The Influence Of Total Suspended Particulate (TSP), Carboksihemoglobin And Individual Characteristics Of Vital Capacity Of Lung Fish Craffickers In Fishing Center**

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The ingredients used for fish fogging are coconut shells and corncobs. As a result of combustion can produce dust and carbon monoxide, exposure to the process of fumigation continuously can cause a decrease in lung function capacity.

Individual characteristics are factors that can affect the decrease in lung function capacity. The purpose of this study was to determine the effect of total suspended particulate, carboxyhemoglobin and individual characteristics on the vital capacity of the

pulmonary smoked fish craftsmen. This research is a quantitative study with a cross-sectional study method. The number of samples was 80 respondents. 33 respondents in the Semarang fumigation center and 47 respondents in the Wonosari demum fumigation. Statistical tests used chi-square and multiple logistic regression. The results showed that there was an influence between age on vital lung capacity p-value = 0.004 with PR = 4.6. There is an influence between the working period on vital lung capacity p-value = 0.001 with PR = 5. There is an influence between carboxyhemoglobin on vital lung capacity p-value = 0.032 with PR = 3. Gender, body mass index and exercise habits do not influence the capacity of vital lung. Workers are advised to take a break when burning smoke has filled the work area and feel the initial symptoms of decreased respiratory function, Public Health center through the UKK post conducts preventive activities in the form of dissemination of respiratory health.

**Keywords:** Total suspended particulate, carboxyhemoglobin, work period, body mass index

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## INTRODUCTION

Fumigation of fish is a way of processing fish with a drying technique (dehydration) which is carried out to maintain the durability of fish, by administering smoke compounds into fish meat through the process of burning wood, coconut shells or corncobs. thereby producing heat which causes a reduction in water content in fish and results in inhibition of microorganism activity. (Nazara, 2010)

Semarang fish smoke center is an informal sector business that has been recognized by the Semarang City Industry and Trade Office. The Kali Asin fish fumigation center located in Bandarharjo Sub-district, North Semarang District is the biggest fish fumigation in Semarang. The Kali Asin fumigation center was built in 1992 which consisted of 75 fish fumigation businesses. The fish fogging activity is carried out at the house of the skipper, but the fish fogging activity disturbs the surrounding population, especially the smoke, then the government established a special area to carry out the fish fogging activity near the center. Currently there are only 20 Kali Asin smoked fish. Wonosari is a village in Bonang District in Demak Regency, Central Java Province. According to data from the Marine and Fisheries Office, every day 8-9 tons of smoked fish of various types are able to be produced by local residents. At least 125 processors have been doing the business ten years ago and is one form of community-based economic activity in the Wonosari village based on households.

The process of smoking fish begins with cutting the fish into pieces, then cleaning the fish, stabbing the fish with bamboo and placing the fish on the grill. The material used to burn or smoke fish using corn cobs and coconut shell. Corncob is a food storage for the growth of corn kernels as long as it is attached to corncobs. The burning of corn cobs which become charcoal depends on the rate of reaction between carbon and oxygen on the surface and the rate of diffusion of oxidation in the boundary layer and the inside of the charcoal. The reaction on the surface forms carbon monoxide (CO). CO particles will react further to form CO<sub>2</sub> and the residue will turn to ash, in combustion there are combustible gases such as CO, CH<sub>4</sub>, H<sub>2</sub>, formaldehyde, methane, formic acid and acetic acid and non-combustible gases such as CO<sub>2</sub>, H<sub>2</sub>O and liquid tar are released into the air. (Badan Pusat Statistik, 2018) In addition to the tall cobs of smoked fish craftsmen, coconut shells are also used. Coconut shell has a hard coating with thickness between 3mm-5mm. consisting of lignin, cellulose, hemicellulose and ash with a moisture content of 6% -9%. (Harahap, 2011) Smoke from burning coconut shells can produce pollutants consisting of CO<sub>2</sub>, HC, NO<sub>2</sub>, and particulates. (Badan Pusat Statistik, 2018) Work environment which is full of dust, steam, gas and others which on the one hand disturbs productivity and disturbs health on the other hand. This often causes respiratory problems or can disrupt the vital capacity of the lungs (Sulistijowati, rienny. S. Djunaedi, otong suhara Nurhajati, jety Afrianto, eddy Udin, 2011)

Occupational lung disease is a disease or lung damage caused by dust, smoke, gas or hazardous vapors inhaled by workers in the workplace. Impaired pulmonary function is the result of exposure to dust particle pollution which can be in the form of restrictions and obstruction or both, a person is considered to have obstructive pulmonary function impairment if the value of



the forced seconds expiratory volume in one second (FEV1) is less than 75% and suffers from interference Restrictive pulmonary function when the vital capacity (VC) value is less than 80% compared to the standard value (Statistics Indonesia, 2018).

Based on Premana's research on the prevalence of pulmonary function disorders due to exposure to smoke in satay traders in Denpasar, it was found that the most common lung function disorders were restrictive pulmonary function that is 41 people (82%), the remaining 2 people (4%) had lung function disorders obstructive, 1 person (2%) with mixed lung function disorder and 6 people (12%) with normal lung function (Premana, 2017) Another study conducted by Martinus Ginting in Jakarta showed that 60.9% of traffic police in Jakarta experienced mild retention and 39.1% experienced mild or moderate obstruction (Rachmawati, 2018)

Based on the description above, the researchers are interested in conducting a study of the effect of total suspended particulate, carboxyhemoglobin and individual characteristics on the vital capacity of the pulmonary smoked fish craftsmen in the center of Semarang fish and Wonosari Demak

## **METHOD**

This research is a quantitative study with cross sectional design. The overall population in this study was 385 people consisting of 225 people working in the Wonosari Village of Demak Village and 160 people in Semarang smoking center. A large number of samples were 80 respondents, the selection of the research sample used the stratified random sampling method so that the sample was divided into two places namely Semarang fumigation centers as many as 33 respondents in Wonosari Demak fumigation centers as many as 47 respondents. The study was conducted in July-November 2019.

Data collection tools used in this study were: stationery, questionnaire sheets containing questions about matters related to the respondent's identity, age, years of service, body mass index. Data were collected by conducting interviews, measurements using a personal dust sampler, measurement of carboxyhemoglobin (COHb) in blood and lung capacity measurement with a spirometer.

Data analysis in this study using univariate analysis was carried out to obtain a picture of the distribution and frequency of age, years of service, body mass index, carboxyhemoglobin (COHb), total suspended particulate) lung vital capacity. Bivariate analysis using chi-square test. Multivariate analysis uses logistic regression to see the most dominant influence.

## **RESULTS AND DISCUSSION**

### **1. Univariate Analysis**

Table 1 Characteristics of Respondents by Age, Education Level, Parity, Nutrition Status in the Treatment Group and Control Group in the Baso Kataji Company in Majalengka Regency in 2019



Variable	F	(%)	Mean	SD	Min	Max
<b>Gender</b>						
Male	22	27,5	-	-	-	-
Girl	58	72,5				
<b>Age</b>						
≥35 years old	53	66,3	38,90	8,562	18	61
<35 years old	27	33,8				
<b>Years of service</b>						
≥ 5 years	38	47,5	6,30	4,541	0,3	21
<5 years	42	52,5				
<b>IMT</b>						
Over weight	68	85,0	25,96	2,983	20	34
Normal	12	15,0				
<b>Sports habits</b>						
Never	51	63,8	-	-	-	-
Rarely	29	36,3				
<b>CoHb</b>						
Abnormal	50	62,5	1,4324	0,71354	0,10	2,62
Normal	30	37,5				
<b>TSP</b>						
TMS	36	45,0	3,0224	1,02694	1,24	6,30
MS	44	55,0				
<b>FEV1</b>						
Abnormal	43	53,8	72,89	14,611	39	97
Normal	37	46,3				

Table 1 explains that the majority of respondents were female as many as 58 respondents or 72.5%. The percentage of age was mostly ≥35 years at 66.3%, the average age of respondents was 38.90 years, the lowest age was 18 years and the highest age was 61 years. The percentage of respondent's service life ≥ 5 years is 47.5%, the average working period of the respondent is 6 years, the lowest working period is 3 years and the highest service period is 21 years. The percentage of BMI of respondents was mostly in the Overweight group by 85%, the average BMI of respondents was 25.96. Percentage of Sports Habit of respondents mostly in the group never exercise 63.8%, Percentage of Carboxyhemoglobin (COHb) of respondents mostly in the abnormal group is 62.5%, the average COHb of respondents is 1.4324 with a standard deviation of 0.71354. The lowest COHb of respondents was 0.10% and the highest was 2.62%. The percentage of Total Suspended Particulate (TSP) was mostly in the group that did not meet the standard (TMS) of 45%, the highest TSP was at 1.24 mg / m<sup>3</sup> and the lowest was 6.30 mg / m<sup>3</sup>. The percentage of Lung Vital Capacity is mostly in the Abnormal group of 53.8%



Table 2. Factors Affecting the Lung's Vital Capacity of Smoked Fish Craftsmen in Semarang and Wonosari Demak Smokers

Variable	FEV1		Total F(%)	PR (95% CI)	P Value
	abnormal F(%)	Normal F(%)			
<b>Gender</b>					
Male	11 (50.0)	11 (50.0)	22 (100)	0.813 (0.304-2.171)	0.870
Female	32 (55.2)	26 (46.3)	58 (100)		
<b>Age</b>					
≥35 year	35 (66.0)	18 (34.0)	53 (100)	4.618 (1.694- 12.588)	0.004*
<35 year	8 (29.6)	19 (70.4)	27 (100)		
<b>Years of service</b>					
≥ 5 year	28 (73.7)	10 (26.4)	38 (100)	5.040 (1.932- 13.150)	0.001*
< 5 year	15 (35.7)	27 (64.3)	42 (100)		
<b>Body Mass Index</b>					
Over weight	38 (55.9)	30 (44.1)	68 (100)	1.773 (0.511-6.149)	0.551
Normal	5 (41.7)	7 (58.3)	12 (100)		
<b>Sport habits</b>					
Never	24 (47.1)	27 (52.9)	51 (100)	0.468 (0.182- 1.201)	0.174
Rarely	19 (65.5)	10 (46.3)	29 (100)		
<b>CoHb</b>					
Abnormal	32 (64.0)	18 (36.0)	41 (100)	3.071 (1.199-7.866)	0.032*
Normal	11 (36.7)	19 (63.3)	39 (100)		
<b>Total Suspended Solid</b>					
TMS	25 (69.4)	11 (30.6)	36(100)	3.283 (1.296-8.317)	0.020*
MS	18 (40.9)	26 (59.1)	44(100)		

Ket: \* P<0.05

Workers aged ≥35 years in the abnormal lung function group by 66%, while in the normal lung function group <35 years by 70.4%, there was a relationship between age and lung function in fish fogging workers in the Semarang and Wonosari fumigation centers. Demak (p = 0.004), the age variable is a risk factor for vital lung capacity in fish fogging workers as evidenced by the PR value: 4.618 at 95% CI: (1,694-12,588). Workers who have a working period ≥ 5 years in the lung function group do not normal by 73.7%, whereas in the normal lung function group by 64.3%, including <5 years. there is a relationship between work period and lung function in fish fogging workers at Semarang and Wonosari Demak fish fogging centers (p = 0.001). Variable length of service is a risk factor for vital lung capacity in fish smoke workers as evidenced by the



PR value: 5,040 at 95% CI: (1,932-13,150). Workers who have carboxyhemoglobin (COHb) levels in the blood in the abnormal lung function group by 64%, while in the normal lung function group by 63.3% workers who have normal COHb levels, there is a relationship between COHb lung function in fish fogging workers in Semarang and Demak ( $p = 0.032$ ). The COHb variable is a risk factor for vital lung capacity in fish fogging workers as evidenced by the PR value: 3.071 at 95% CI: (1.199-7.866). Workers who do not meet the standards (TMS) in the abnormal lung function group by 69.4%, while in the normal lung function group by 59.1%, including the Meet the Standard (MS) group. Statistical Test Results obtained  $p$ -value = 0.020 ( $p$ -value  $< \alpha$ ), it can be concluded, there is a relationship between Total Suspended Particulate (TSP) and lung function in fish fogging workers in Semarang and Demak. The TSP variable is a risk factor for vital lung capacity in fish fogging workers as evidenced by the PR value: 3.283 at 95% CI: (1,298-8,317). While gender, BMI and exercise habits did not correlate with lung function in fish fumigation workers in Semarang fumigation centers and Wonosari Demak ( $p > 0.05$ ).

Table 3 Multivariate Statistical Test Results

Variable	B	P value	Exp(B)	95% CI	
				Lower	Upper
Age	2.125	.001	8.371	2.372	29.536
Years of service	2.155	.000	8.628	2.603	28.595
Constant	-2.230				

Table 3 explains that the variable of length of service which has the lowest significant level compared to age that is equal to  $p$  value = 0,000, the variable of years of service has a very strong influence on lung capacity compared to other variables. The working period has an OR or Exp (B) of 8,628; 95% CI: 2,603-28,595 means that fish smokers with a working period of  $\geq 5$  years have an 8.6-fold risk of decreasing lung capacity compared to workers who have a working period of  $< 5$  years. After controlling for the age variable, in the table there is also a constant value of -2.050 while the value of B work period is 2.155. Variable length of service  $\geq 5$  years has a probability of lung capacity in fish smoking workers of 98%. While the remaining 98% is likely caused by other factors not examined in this study.

In general, advanced age has an impact on a person's physical strength. Physical decline is in line with changes in bodily functions in both the hormonal and cardiovascular systems. The peak of muscle strength is at the age of 25-35 years. At the age of 35 years, the first complaint is usually felt and at the age of 50-60 years the strength of human muscle will decrease by around 15-25%. (Effendi, 2010; Irianto, 2014) As we age, the maximum amount of oxygen delivered from the lungs to the muscles a decline. This decrease can result in a decrease in maximum heart rate and maximal reserve volume. (Juarfianti, Engka and Supit, 2015; Mercado, Ito and Barnes, 2015) This study is in line with research conducted by Fadilah in 2016 which results that with increasing age there is a decrease lung function is 3 times higher compared to someone  $< 45$  years



old. Despite the decline, the respiratory system is able to maintain adequate oxygenation and ventilation (Fadilah, 2016)

The period of work is the period of time people have worked from the first start entering until now still working. The period of work can be interpreted as a rather long period of time in which a workforce enters an area of business until a certain time limit. The work period can affect the workforce both positively and negatively will have a positive influence on the workforce if with the length of time a person works, he will be more experienced in doing his work. On the contrary it will have a negative effect if the longer a person works it will lead to boredom and work fatigue which results in damage to body organs. (Budiono, 2003; Meo et al., 2013) Tualeka states that years of service have a strong relationship with lung disorders. This is because workers who breathe aluminum dust continuously and accumulate and cause damage to the parenchymal tissue in the lungs. (Rahmadani and Tualeka, 2016) Working period can determine the length of a person's exposure to risk factors, the longer the work period the more likely it is to be exposed with unfavorable working environment conditions. For work conditions that have an accumulative impact, long-term exposure to polluted air can cause health problems, one of which is impaired vital lung capacity (Hanum, 2011).

Carbon monoxide is produced from incomplete combustion. Carbon monoxide toxicity can reduce the function of hemoglobin to bind oxygen in the blood. (Zhao et al., 2019) High CO concentrations in the body can interfere with the circulatory system such as the heart, lungs and blood vessels. It can also interfere with the heart's rhythm in pumping blood apart from that exposure to high concentrations of CO can also interfere with the O<sub>2</sub> and CO alveoli exchange mechanism in the lungs; causes several types of lung disease, for example, asthma and bronchitis. High-level CO breathing creates acidity in the blood which causes tissue death and even cancer. (Charlene, 2017)

Total Suspended Particulate can be used as one indicator of pollution used to indicate the level of environmental hazards. The effect of dust on health depends on solubility, chemical composition, dust concentration, and dust particle size. Exposure to dust can cause restrictions on airflow, thickening of the bronchial wall, increasing mucus secretion, lowering the reflex threshold and coughing, increasing susceptibility to respiratory infections and asthmatic symptoms. (J, 2001) Particles that float in the air for long periods or particles found in the air, including dust, dirt, soot, and smoke. Particles smaller than 10 micrometers (PM<sub>10</sub>) can cause health problems because they can be inhaled and accumulated into the respiratory system. Particles smaller than 2.5 micrometers (PM<sub>2.5</sub>) are called fine particles and are believed to pose the greatest health risk because of their small size (about 1/30 the average width of a human hair) so they can enter the lungs. The Environmental Protection Agency (EPA) revealed that the smoke produced by combustion contained dust particles based on their size divided into 2 categories: dust particles  $\leq$  10 micrometers and dust particles  $\leq$  2.5 micrometers. PM<sub>2.5</sub> is dust particles consisting of a mixture of particles solid and liquid. PM<sub>2.5</sub> that is inhaled by humans can cause inflammation resulting in limited lung development (Wulandari and Lulu, 2008)



The results of multivariate analysis of the joint effect between the independent and dependent variables where the variable length of work which has the lowest significant level compared with age is equal to  $p$  value = 0,000, the length of service variable has a very strong influence on lung capacity compared to other variables. The working period has an OR or Exp (B) of 8,628; 95% CI: 2,603-28,595 means that fish smokers with a working period of  $\geq 5$  years have an 8.6-fold risk of decreasing lung capacity compared to workers who have a working period of  $<5$  years. The results of the calculation of the probability concluded that the working period variable  $\geq 5$  years has a probability of lung capacity in fish smoking workers by 50%. While the remaining 50% is likely caused by other factors not examined in this study such as the wet temperature index, smoking behavior, health status associated with this study such as a history of disease. . The work period and length of work each day will have a greater potential for the occurrence of disease-causing illnesses. The length of work is one of the factors that influence workers to be exposed to occupational diseases The longer workers work in the workplace, the more likely they are exposed to factors in the work environment that can cause health problems or illness due to work (Wahyu, 2003).

#### CONCLUSION

The work period factor has a strong influence on the vital lung capacity compared with other variables. Working period has Exp (B) of 8,628; 95% CI: 2,603-28,595 means that fish smokers with a working period of  $\geq 5$  years have an 8.6-fold risk of decreasing lung capacity compared to workers who have a working period of  $<5$  years. Workers immediately take a break when burning smoke has filled the work area and feel the initial symptoms of decreased respiratory function, making artificial ventilation to suck dust. Puskesmas through the UKK post monitor the health status of workers and dissemination of respiratory health.

#### DISCUSSION

##### 1. Characteristics of Respondents

Characteristics of respondents based on age showed that the average respondent was included in the WUS category (women of childbearing age) namely women who were still in reproductive age between the ages of 15-49 years. Where WUS is prone to anemia because of menstrual cycles where women will lose blood during menstruation every month. Characteristics of respondents based on education indicate that most respondents fall into the category of secondary education (senior and senior high school). The results of data collection related to the education level of respondents in the treatment group and the control group showed a homogeneous data variant test or equality test equal to  $p = 0.060 > \alpha (0.005)$ . This indicates that the level of education does not affect the results of the study. The higher the level of one's education, the easier he receives information and finally the more knowledge they have. Conversely, if a person's education level is low, it will hinder the development of his behavior towards the reception of new information and knowledge. (Sarliana, 2018) Characteristics of respondents based on parity indicate that most respondents are included in



- the multipara category. Based on data related to parity in the treatment group and the control group showed homogeneous data variance test or equality test equal to  $p = 0.336 > \alpha (0.005)$ . This shows that parity does not affect the results of the study. The results of this study are in line with Suharni's research that more frequent pregnant and giving birth women then the risk of anemia is greater because pregnancy depletes iron reserves in the body. (Suharni, 2013) Characteristics of respondents based on nutritional status illustrated through BMI (Body Mass Index) some of the respondents included in the category of normal nutritional status. Based on data related to nutritional status in the treatment group and the control group showed homogeneous data variance test or equality test equal to  $p = 0.082 > \alpha (0.005)$ . This indicates that the nutritional status does not affect the results of the study. Female workers with normal nutritional status will have better work capacity and endurance. Female workers with poor nutritional status even though the percentage is not large, but need attention. This is because inadequate energy consumption which causes the need for allergies to work will be taken from the energy reserves that are in the cell. If this happens it can result in female workers not being able to do their jobs properly and their work productivity will decline and even reach a low target. (Muhadjir, 1994) Conversely, female workers with more nutritional status then the person is less nimble and slow working. While those who have normal weight will be more agile in working women workers who are underweight will be less able to work hard. (Suma'mur, 2001)
2. The effect of giving a combination of tomatoes with oranges on changes in hemoglobin levels
- Based on the results of statistical tests that have been done to see differences in hemoglobin levels in the four groups showed a significant change. In the treatment group hemoglobin levels increased higher than those in the control group. The highest increase occurred in treatment group 2 (oranges and Fe tablets), then in treatment group 1 (tomatoes and Fe tablets) and treatment group 3 (combination of tomatoes with oranges and Fe tablets).
- The above results can be explained that giving tomatoes and oranges to anemic female workers can increase hemoglobin levels, this is because tomatoes and oranges contain iron and vitamin C which are high enough so that it can help the process of absorption of iron in the body. The role of vitamin C in the process of absorption of iron is by reducing ferric iron ( $Fe^{3+}$ ) to Ferro ( $Fe^{2+}$ ) in the intestine so that it is easily absorbed, the reduction process will be even greater if the pH in the stomach is more acidic. Vitamin C inhibits the formation of hemosiderin which is difficult to mobilize to free iron when needed. While the iron absorption inhibitors are materials containing polyphenol compounds such as tannin contained in tea that can reduce up to 80%. 16,81 The results of research conducted by S Mehnaz, et al with the title research Iron, Folate and Vitamin C Supplementation On The Prevalence Of Iron Deficiency Anemia In Non-Pregnant Females Of Perurban Aries Of Algarh showed that non-pregnant women who experienced anemia when given vitamin C, folic acid and iron showed a very good increase in iron. (Mehnaz, 2006) Likewise with research conducted by Krisnapilai Madhavan Nair, Ginnela NV Brahmam with the result that the absorption of non-heme iron was significantly greater in the group consuming iron tablets coupled with



consuming guava fruit, because vitamin C found in guava can help good absorption of iron. (Nair, 2013)

Tomatoes used in this study were plum tomatoes, plum tomatoes are one of the fruits that contain vitamin C and other beneficial compounds in the formation of red blood cells such as vitamin E, folate, minerals (Fe and Cu). (Besuni, 2013) Every 100 gr consumed tomatoes contain vitamin C 40 mg. The content of vitamin C in plum tomatoes can help in the process of absorption of iron so that it can overcome the problem of anemia. (Merida, 2014) Provision of Fe tablets together with 250 gr tomatoes for 14 days on a regular basis turned out to have a significant effect on changes in hemoglobin levels.

Oranges used in this study are sweet oranges. The content of vitamin C in 100 gr oranges is 49 mg. Besides containing a lot of vitamin C, oranges also contain energy, protein, water, fat carbohydrates, calcium, iron, and vitamin B1 and vitamin A. vitamin C contained in oranges increases the absorption of iron by the body. (Nurashih, 2015) Provision of Fe tablets along with 200 gr oranges for 14 days on a regular basis it has a significant effect on changes in hemoglobin levels. The combination of 125 grams of tomatoes with 100 grams of oranges and Fe tablets for 14 days regularly turned out to have a significant effect on changes in hemoglobin levels.

### 3. The effect of giving a combination of tomatoes and oranges on changes in ferritin levels

From the results of statistical studies of ferritin levels showed that in the treatment and control groups an increase occurred. The average ferritin content in the control group consuming Fe tablets was lower than the average ferritin content in treatment group 1, treatment group 2, and treatment group 3.

Serum or plasma ferritin concentrations can reflect the total iron stores in the body when there is no inflammation or infection. Increased serum ferritin levels in individuals can also be an indicator of inflammation. Normal categories of serum ferritin that exceed the maximum upper limit can indicate the presence of an iron overload condition. Conversely serum ferritin levels lower than  $10 \mu\text{g} / \text{ml}$  may indicate a decrease in iron stores. (Lubis, 2019) Serum ferritin levels will be low in conditions of long bleeding, anemia, iron deficiency and poor nutritional status whereas inflammatory conditions will increase ferritin levels. Serum ferritin can be affected in a number of clinical settings such as acute liver disease, cirrhosis, horgkin's disease, acute leukemia, chronic kidney failure infections, and solid tumors. These clinical conditions can affect fake serum ferritin levels or even in iron deficiency anemia sufferers who should have low serum ferritin levels, but due to the above conditions, serum ferritin levels may become normal or even increase.51 The role of vitamin C in the process of absorption of iron is helps reduce ferric iron ( $\text{Fe}^{3+}$ ) to ferrous iron ( $\text{Fe}^{2+}$ ) in the small intestine so that it is easily absorbed, the reduction process will be even greater if the pH in the stomach gets more acidic. Vitamin C can increase acidity so that it can increase iron absorption by up to 30%. Vitamin C inhibits the formation of hemosiderin which is difficult to mobilize to free iron when needed. Vitamin C plays a role in transferring iron from transferrin in plasma to liver ferritin. (Varney, 2008)



## CONCLUSION

For female workers to consume vitamin C in 250 gr tomatoes, 200 gr oranges or a The work period factor has a strong influence on the vital lung capacity compared with other variables. Working period has Exp (B) of 8,628; 95% CI: 2,603-28,595 means that fish smokers with a working period of  $\geq 5$  years have an 8.6-fold risk of decreasing lung capacity compared to workers who have a working period of  $<5$  years. Workers immediately take a break when burning smoke has filled the work area and feel the initial symptoms of decreased respiratory function, making artificial ventilation to suck dust. Community health centers through the Occupational Health Enterprises (UKK) post monitor the health status of workers and disseminate respiratory health.

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