# Effects of Vitamin E Administration on Menstrual Disorders among Adolescents who have Smoking Family Members

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## Abstract

Smoking habit can cause health problems and disease in the community. One of the effects is elated to reproductive health and fertility problems among women who are second hand smokers. Vitamin E is a supplement to treat fertility problems. The purpose of this study was to determine the effect of giving Vitamin E to menstrual disorders among adolescents who have smoking family members in Senior High School 2 Sorong Regency. Design of the study was quasi-experimental study using 30 samples who are chosen by purposive sampling techniques. The sample was divided into 2 groups. The experiment group was given vitamin E 100 IU/day for 3 months and the control group was not given anything. The result of the data analysis used Mann Whitney Statistical Test obtained p value 0.031<0.05. Conclusion there is a significant effect of giving vitamin E to menstrual disorders among passive smoker adolescents or those who have smoking family members in Senior High School 2 Sorong Regency. It is highly recommended that vitamin E be given as an antioxidant for both active and passive smokers.

***Keywords:*** *Cigarette, vitamin E, menstrual disorders.*

## Introduction

Adolescence is a period of transition from children to adulthood where adolescents are experiencing physical and psychological changes. The number of teenagers in Indonesia continues to increase annually. In Indonesia according to the Central Bureau of Statistics, the 10-19 years age group is around 22% of the population, consisting of 50.9% of male and 49.1% of female adolescents. Female adolescents are experiencing various changes marked by secondary sex growth such as enlargement of the breasts, growth of pubic hair and menarche.

Smoking causes health problems for the community and cause several diseases such as heart disease, chronic lung disease, infectious diseases, cancer by Bayoumi et al., [1], and risk factors for asthma, respiratory infections, coughing, sneezing, middle ear infections, and sudden infant death syndrome and can affect reproductive health and fertility in women[2]. Various studies have shown, passive smokers have the same risk as active smokers for coronary heart disease, stroke, emphysema, lung cancer, and chronic lung disease[3]. Cigarette smoke components that affect the female reproductive system, for example, nicotine, cotinin, the main metabolites of nicotine, carbon monooxides, cadmium, and some mutagenic polycyclic aromatic hydrocarbons[4-10]

In developing countries, the number of smoking men is higher than smoking women. Smoking men are usually surrounded by children and women including female adolescents. This makes adolescents become passive smokers or second-hand smokers which causes reproductive health issues such as problem during menstrual cycle[2]. Components of cigarettes also cause oxidative stress and DNA damage to follicles in the ovary and affect folliculogenesis by inhibiting follicular growth[11,12]. An important component that is able to save human body cells from the danger of free radicals is antioxidants. Alfa-tocopherol or Vitamin E functions as the main antioxidant in the lipid compartment and has

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the ability to protect from lipid peroxidation[13]. Research conducted by Neunteufl[14] that oral alfa-tocopherol supplementation can reduce transient endothelial function disorders among heavy smokers.

Preliminary study conducted in June 2019 at Senior High School 2 Sorong Regency by the interviews with 69 female adolescents about the existence of smoking family members and consumption of antioxidants. Result shows that 79% of them have family members who smoke either father, mother or other siblings. Further, those female adolescents also have never consumed any antioxidants or supplements.

## Material and Method

The design of the study is a quasi-experimental study using one-shot case study with control group design techniques. The sample in this study was 30 respondents, which were divided into 2 groups, the experiment group consisted of 15 respondents and the control group consisted of 15 respondents. Both groups were interviewed about their menstrual problems. The experiment given to experiment group was administration of vitamin E or alfa-tocopherol for 3 months with dosage 100 IU per day. After 3 months of treatment, interviews were then conducted about menstrual problems experienced during the 3-month of intervention.

## Results

1. **Overview of Research Locations:** This study was carried out at Senior High School 2 Sorong Regency, located on Nangka Malawili Street, Aimas, Sorong Regency. The school had 48 teachers and 682 students consisting of 312 male and 370 female.
2. **Characteristics of Respondents:** The table below shows the characteristics of respondents by age and Body Mass Index (BMI).

**Table 1. Characteristics of Respondents by Age and BMI in SMA Negeri 2 Sorong Regency**

| Characteristic | Control group | Experimental group | Total | % |
|---|---|---|---|---|
| **Age** (Years old) | | | | |
| 16 | 2 | 0 | 2 | 6,7 |
| 17 | 11 | 11 | 22 | 73,3 |
| 18 | 2 | 4 | 6 | 20 |
| BMI | | | | |
| Thin | 0 | 2 | 2 | 6,7 |
| Normal | 15 | 13 | 28 | 93,3 |

As seen on table 1, it can be seen that the most respondents were 17 years old (73.3%) and most had normal BMI (93.3%).

3. **Effects of Vitamin E Administration on Menstrual Disorders among Passive Smoker Adolescents SMA Negeri 2 Sorong Regency:**

**This study was conducted for 3 months with stages:** 1) data collection before treatment to identify the presence of family smoking and menstrual disorders, 2) providing intervention by giving 100 IU/day of vitamin E for 90 days (three menstrual cycles) and 3) data collection menstrual disorders for three months. Data can be seen in the following table:

**Table 2. Menstrual Disorder among Passive Smoker Adolescents**

| Menstrual Disorder | Control group | Experimental group | Total |
|---|---|---|---|
| Dysmenorrhea | 13 | 13 | 26 |
| Prolonged (> 4 days) | 5 | 7 | 12 |
| Too much bleeding (> 4 pads) | 10 | 11 | 21 |

Based on table 2, it can be seen that the most respondents experienced menstrual pain or dysmenorrhea disorders with 26 respondents, too much bleeding with 21 respondents and prolonged menstrual period with 12 respondents. This shows that almost all respondents experienced menstrual pain and a few had long periods.

**Table 3. Distribution of Menstrual Disorders After Treatment among Adolescents Who Have Family Members Smoking**

| Menstrual Disorder | Control Group | | Experiment Group | | P-value |
|---|---|---|---|---|---|
| | f | % | f | % | |
| Yes | 10 | 66.7 | 4 | 26.7 | 0,031 |
| No | 5 | 33.3 | 11 | 73.3 | |
| **Total** | **15** | **100** | **15** | **100** | |

Based on table 3, it shows that after treatment most control groups experienced menstrual disorders (66.7%) than those who did not (33.3%) while in the experiment group, most respondents did not experience most menstrual disorders (73.3%) as compared to those experienced disorders (26.7%). Furthermore, the hypothesis test using the Mann Whitney test obtained p value 0.031<0.05, which means that there is significant effect of giving vitamin E to menstrual disorders in adolescents who have smoking family members in SMA Negeri 2, Sorong Regency. The Vitamin E Administration reduced the occurence of menstrual disorders.

## Discussion

This study shows that the presence of smoking families has an impact on teenage menstrual disorders and most teenagers experience menstrual pain, more than four days of menstrual phase and more than four menstrual pads per day. Exposure to cigarette smoke can be either active or passive, and the type of cigarette smoke that is inhaled has a different origin. Active smokers inhaled smoker directly from the cigarette, while passive smokers will inhale from other people's tobacco smoke. Various studies have shown that passive smoking has the same risk as active smokers for coronary heart disease, stroke, emphysema, lung cancer, and chronic lung disease[15-17].

Cigarette smoke contains a number of ROS that can stimulate cell growth and proliferation, showing physiological functions in normal tissue. An excessive increase in Reactive Oxygen Species (ROS) will cause damage to DNA, lipid membranes, and proteins. Cigarette smoke also contains chemicals including oxidants, free radicals, and carcinogens[18]. Research conducted by Khorram, et al.[19] who used human endometrial epithelial cell culture reported that cigarette smoke can reduce endometrial proliferation via the nitric oxide pathway. Cigarette smoke has been linked to infertility, abnormal uterine bleeding, increased risk of endometrial cancer in premenopausal women and stimulates the production of nitric oxide in endometrial cells[19].

Research conducted on mice given cigarette smoke for 8 weeks resulted in a reduction in the number of primordial follicles and loss of volume from the ovaries. Destruction of primordial follicles in mice is known from three types of PAHs: DMBA, 3-methylcholanthrene (3-MC), and BAP by destroying primordial follicles in laboratory animals and contributing to the onset of menopause in women who smoke[20,21]. The results showed there was an effect of vitamin E administration to menstrual disorders (dysmenorrhea, menstrual disruption and the number of menstrual disorders) among adolescents who had family members smoking in SMA Negeri 2 Sorong Regency.

According to Kontush, et al.[22] alfa-tocopherol in high concentrations will be a prooxidant which will increase the concentration of plasma and LDL peroxidation if the body is oxidized. The prooxidant effect of alfa-tocopherol on LDL is related to the production of α-tocopheroxyl radicals, can replace other soluble antioxidants, disrupt the balance of the natural antioxidant system and increase susceptibility to oxidative damage[23]. This study uses vitamin E at a dose of 100 IU/day.

Prooxidant activity is derived from chain propagation by α-tocopheroxyl radicals (Toc.) which directly oxidize lipids (PUFA) to form lipid radicals (L.). The antioxidant activity of α-tocopherol can be prevented by eliminating α-tocopheroxyl radicals (Toc.) Through direct recycling into α-tocopherol mediated by co-antioxidants such as ascorbic acid (vitamin C) because physiologically vitamin C is present in high concentrations of plasma. Thus, α-tocopherol will always function as an antioxidant if the concentration of co-antioxidants is high enough[22].

Furthermore, a study conducted by Chatterjee, et al.[24] Vit-E supplementation at a dose of 400 mg per day for 7 days significantly inhibits platelet clumping

and increases endurance capacity at each stage of the menstrual cycle in female athletes. Wardani[25] in her study showed that vitamin E can increase levels of the hormone estrogen and alveolar bone structure in female mice that do maximum physical exercise.

Another study supporting the this study conducted by Bataille, et al.[26] stated that the combination of pentoxifylline and alfatocopherol can increase pregnancy rates in patients with thin endometrium which is related to the function of the ovaries and endometrial thickness. This is supported by research conducted by Acharya, et al.[27] that the combination of administration of pentoxifylline and tocopherol can increase endometrial thickness in women with thin endometrium undergoing pregnancy therapy.

According to Kelly[13] smoker's body exposed to cigarette smoke will result in lipid peroxidation so it needs to increase the need for antioxidants such as alfa-tocopherol to reduce oxidative stress that occurs. The administration of alfa-tocopherol supplementation to smokers increases alfa-tocopherol in serum and LDL concentrations by two to three times (dose dependent) and concentrations in lung tissue by 20 percent.

Alfatokoperol as an antioxidant in cell membranes plays a role in preventing lipid peroxidation because it can capture peroxil lipid radicals (scavenging) in cells and cell organelles and the speed of alfa-tocopherol in capturing free radicals exceeds the speed of radicals themselves in reacting with adjacent fatty acid chains[29]. According to Nagama, et al.[30] Vitamin E is a fat-soluble antioxidant by breaking the chain of oxidative reactions so that it helps to maintain and can protect cell membranes from damage caused by ROS and reactive products from lipid peroxidation as well as to reduce oxidative stress.

This is consistent with research conducted by Armiyanti[31] proved the administration of red fruit oil to endothelial cells exposed to serum with severe malaria and normal neutrophils can inhibit the production of ROI (reactive oxygen intermediates) in endothelial cells thereby reducing oxidative stress. Oxidative stress that occurs due to ROS production by host phagocyte cells and endothelial cells as an immune response to infected erythrocytes and ROS formation through unstable hemoglobin. Red fruit oil is a potential source of antioxidants (α-tocopherol and β-carotene) and the highest antioxidant content is α-tocopherol. α-tocopherol is found in cell membranes and is hydrophobic so that it can inhibit the formation of superoxid radicals and change NADPH (nicotinamide adenine dinucleotide phosphate) oxidase in the membrane by inhibiting the formation of complex NADPH oxidase subunits thereby preventing oxidative stress and apoptosis in endothelial cells[32,33].

## Conclusion

There is an effect of giving vitamin E to menstrual disorders among adolescents who have smoking family members in Senior High School 2 Sorong Regency. The Vitamin E administration reduce the occurrence of menstrual disorder among female adolescents in Senior High School 2 Sorong Regency.

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