



## The relationship of vitamin A, C, and E intake with premature aging of facial skin in female market traders

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### Abstract

**Background:** Women's market traders are jobs that are often exposed to free radicals, including air pollution, cigarette smoke, sun exposure and have a high workload that causes stress. Antioxidants can protect the skin from free radicals and can inhibit the process of premature aging of facial skin which are found in vegetables and fruits such as vitamins A, C, E.

**Objective:** To determine the relationship between intake of vitamins A, C, and E with premature aging of market traders in the form of wrinkles around the face.

**Methods:** Observational research with cross sectional method. The sampling technique is multi-stage cluster sampling. This research was conducted at Beringharjo Market with a total sample of 172 respondents with inclusion criteria namely female traders, aged 26–45 years, workers in the market area. The exclusion criteria are tourists/market visitors, women who are pregnant and breastfeeding. The research variables for intake of vitamins A, C, and E used the SQ-FFQ (Semi-Quantitative Food Frequency Questionnaire) questionnaire with the interview method. In measuring the number of wrinkles on facial skin using photoaging through facial shooting using a Sony A7R3 camera with a 24-70 lens that is analyzed by a dermatologist (skin expert). Data analysis technique using multiple logistic regression analysis. This analysis uses SPSS software version 22.0.

**Results:** In the multiple logistic regression test,  $p = 0.037$  ( $p < 0.05$ ) means that there is a relationship between vitamin A intake and premature aging of facial skin. On vitamin C intake,  $p = 0.436$  ( $p > 0.05$ ), meaning that there is no relationship between vitamin C intake and premature aging of facial skin. And on vitamin E intake,  $p = 0.171$  ( $p > 0.05$ ) there is no relationship between vitamin E intake and premature aging of facial skin.

**Conclusion:** Intake of vitamin A has a significant relationship with the occurrence of premature aging of the face, but vitamins C and E do not have a significant relationship with the occurrence of premature aging of the facial skin

**Keywords:** premature aging, intake, vitamin A, vitamin C, vitamin E

### Introduction

The skin is the outermost organ that is directly exposed to a pro-oxidative environment and is equipped with a complex system of antioxidants

and enzymes, including a redox-active antioxidant network. There are several measures to slow down aging, including exercising and consuming enough food low in calories and fat, lots of vegetables and fruit, and enough protein.<sup>1</sup> Aging of the skin is a natural occurrence that affects everyone. The natural process of aging in humans begins about the third decade of life, and the symptoms grow more noticeable as one gets older. Premature aging, often known as skin aging, can affect anyone.<sup>2</sup>

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Antioxidants are potentially an important group of pharmacological agents that can prevent and reduce the severity of skin damage caused by numerous factors, including UV rays and skin aging. A new formulation method can increase the protection of the skin against sun damage using topical vitamins C and E, achieving much greater protection than was previously possible with ingestion.<sup>3</sup>

The body has antioxidants as the body's defense mechanism to neutralize free radicals that are formed. The mechanism of damage caused by free radicals is quite complex through a chain reaction until oxidative stress occurs which causes cell damage. This knowledge of free radicals leads us to the role of free radicals in skin disorders. The addition of antioxidants in the diet or directly applied to the skin topically to prevent the formation of free radicals is theoretically beneficial. This encourages many pharmaceuticals to produce various antioxidants in the diet or directly applied to the skin topically. Antioxidants work synergistically to stabilize free radicals that play a role in photo aging, carcinogenesis, and immunosuppression.<sup>4</sup>

Women's market traders are jobs that are often exposed to free radicals, including air pollution, cigarette smoke, exposure to sunlight and high physical and mental workload causing work stress. Higher stress levels are often found in women. This is because women's brains have a negative awareness of conflict and stress. Antioxidants can protect the skin from free radicals and can inhibit the process of premature aging of facial skin found in vegetables and fruit. There are three kinds of the mechanism of action of antioxidants on free radicals, namely, (1) Primary antioxidants capable of reducing dismutase (SOD), glutathione peroxidase, and stable catalase. For example, superoxide can convert superoxide radicals into molecules turning them into more products. (2) Water antioxidants form new free radicals by breaking the chain and secondary reactions that play a role in binding free radicals and preventing the amplification of radical compounds. For example, vitamins A (beta-carotene), C, and E and phytochemical compounds. (3) Tertiary antioxidants play a role in bio molecular

mechanisms, such as repairing cell and tissue damage caused by free radicals.<sup>5</sup> Research proves that the effective use of antioxidants is by giving them together according to the antioxidant network.<sup>4</sup> The combination of antioxidants that are reported to give the best results is a combination of vitamins C and E. According Indonesian Recommended Daily Intake (RDA) by Ministry of Health Regulation 2019, the required vitamin adequacy rate in a day is 600 RE for vitamin A, 75 mg for vitamin C, and 15 mcg for vitamin E.<sup>6</sup> Adequate physical activity, in addition to ensuring the adequacy of vitamins delivered appropriately, can aid in the process of adapting or adjusting to the changes encountered, as well as preserving the body's cell turnover to prolong life.<sup>1</sup> According to the above definition, the problem studied in this study is "is there a relationship between vitamin A, C, and E intake and the occurrence of fast facial aging process?" The findings of this study are expected to be used as educational material for the public about the necessity of leading a healthy lifestyle in order to prevent the rate of premature face skin aging.

## Methods

This research is an observational type with cross sectional method. This research took place in the Yogyakarta area at Beringharjo market traders which are in the city center as a center for tourist souvenirs. This study used a multi-stage cluster sampling method with a total sample of 172 respondents with inclusion criteria, namely female traders, workers in the market area, aged 26-45 years. And the exclusion criteria are tourists/market visitors, pregnant and lactating women.

The sampling process is obtained in a two-level stage. In this study, the total population was 211,331 women of childbearing age in Yogyakarta and the target population was 6,627 market traders at Beringharjo Market. Then, in Beringharjo Market, it is divided into 4 market blocks. The 4 market blocks consist of the west block (1,678 traders), the middle block (582 traders), the east and north blocks (2,544 traders). The 4 blocks were randomly selected based on research criteria, so

that 172 samples were obtained consisting of the west block (55 traders), the middle block (25 traders), the east block (52 traders) and the north block (40 traders). To collect data on intake of vitamins A, C, and E using the SQ-FFQ (*Semi-Quantitative Food Frequency Questionnaire*) questionnaire with the interview method. In measuring the number of wrinkles on facial skin using photoaging through facial shooting using a Sony A7R3 camera with a 24-70 lens that is analyzed by a dermatologist (skin expert). Data analysis technique using multiple logistic regression analysis. This analysis uses SPSS software version 22.0. Furthermore, this research has received ethical approval from the Research Ethics Committee, Faculty of Medicine,

Universitas Sebelas Maret, ethically approved with No. 91/UN27.06.6.1/KEP/EC/2021.

## Results

The respondents in this study were women aged 26–45 years. The age is classified by the 2009 Ministry of Health, namely early adulthood (26–35 years) and late adulthood (36–45 years). Based on **Table 1**, the average age of most respondents aged 36–45 years as many as 126 people (73.25%).

With an average high school education of 93 people (54.06%), and an average income of < IDR 1,500,000 for 106 people (61.62%) and most of the respondents did not do facial treatment for as many as 141 people (81.97%).

**Table 1** Characteristics of subject

Category	Total	
	n	%
Age		
- 26–35 years	46	26.74
- 36–45 years	126	73.25
Education		
- no school	3	1.74
- not completed elementary school	2	1.16
- elementary school	30	17.44
- junior high school	29	16.86
- senior high school	93	54.06
- vocational school 1 (diploma 1)	1	0.58
- vocational school 3 (diploma 3)	10	5.81
- undergraduate degree	4	2.32
Income		
- < IDR 1,500,000	106	61.62
- > IDR 1.500.000 – 2,500,000	55	31.97
- > IDR 2,500,000 – 3,500,000	5	2.90
- > IDR 3,500,000 - 5,000,000	6	3.48
- > IDR 5,000,000	0	0
Facial treatment		
- Yes (use skin care products)	31	18.02
- No (without skincare products)	141	81.97

Based on **Table 2**, it is known that intake of vitamin A 600 RE is 44.76%, intake of vitamin A 600 RE is 55.23%. Intake of 75 mg of vitamin C was 40.69%, intake of 75 mg of vitamin C was 59.30%. As for the intake of vitamin E 15 mg as much as 100%. Results Based on multiple logistic regression there is a relationship between vitamin A intake and premature aging of facial skin p-value of 0.037 ( $p < 0.05$ ). There is no significant relationship between vitamin C intake and premature facial skin aging in female market traders at Beringharjoh p-value (0.436)  $> 0.05$ . There is no significant relationship between vitamin E intake and premature skin aging in female market traders at Beringharjo p-value (0.171)  $> 0.05$ .

**Table 2.** Multivariate analysis of the relationship of vitamin A, C, and E with premature aging of facial skin

Consumption	Total		Premature Aging p-value
	n	%	
Vit A			
≥ 600 RE	77	44.96	0.037
≤ 600 RE	95	55.23	
Vit C			
≥ 75 mg	70	40.69	0.436
≤ 75 mg	102	59.30	
Vit E			
≥ 15 mg	0	0	0.171
≤ 15 mg	172	100	

## Discussion

Based on the results above, vitamin A intake has a significant relationship with the occurrence of premature aging of the face, but vitamins C and E do not have a significant relationship with the occurrence of premature aging of the facial skin. Retinol and other vitamin A preparations such as are said to have antiaging effects.<sup>7</sup> Other studies that are in line with this study state that the content of vitamin A in carrots used in mask preparations can overcome various kinds of problems on facial skin, especially facial skin with acne.<sup>8</sup> The antioxidant content in carrots is very high so it can prevent dry skin on the face due to air pollution. Vitamin A (retinol) and its derivatives (retinaldehyde and tretinoin) are a group of agents that also have antioxidant effects. They can induce

collagen biosynthesis and reduce the expression of MMP 1 (collagenase 1). Retinol, at present, is the substance most commonly used as an anti-aging compound and, compared to tretinoin, causes less skin irritation. It has been shown that retinol has a positive effect not only on extrinsic but also on intrinsic skin aging and has a strong positive effect on collagen metabolism.<sup>9</sup> Vitamin A has a role as an antioxidant by donating electrons from its atoms to free radicals to bond with unpaired electrons (single) from free radicals without becoming new free radicals. In addition, vitamin A also functions to maintain cell membrane stability against free radicals.<sup>10</sup>

Under normal conditions, the addition of antioxidants in the diet or directly applied to the skin topically to prevent the formation of free radicals is not necessary. However, excessive UV exposure will cause antioxidants in the stratum corneum to be susceptible to depletion. In addition, the aging process can also reduce the levels of antioxidants formed.<sup>4</sup> Free radicals are to fault for cellular and tissue damage as grow older. Free radicals are the primary cause of aging, which is thought to be the only significant process influenced by genetic and environmental variables; oxygen free radicals are responsible for cellular and tissue damage (due to their higher reactivity). Humans have a complex antioxidant system that includes both enzyme-based and non-enzymatic antioxidants that work together to protect cells and organ systems from free radical damage. Glutathione peroxidase, catalase, and superoxide dismutase are examples of enzyme antioxidants. Vitamin E, vitamin C, thiol antioxidants (glutathione, thioredoxin, and lipoic acid), melatonin, carotenoids, natural flavonoids, and others are examples of non-enzymatic antioxidants.<sup>11</sup>

Vitamin A is an active ingredient needed by the body in maintaining a healthy body through the cell cycle mechanism.<sup>11</sup> Vitamin C as an antioxidant works to catch free radicals in the skin. The three main functions of vitamin C in the skin are a strong antioxidant that protects the skin against the negative effects of external factors such as pollution, sun, climate, air conditioning, cigarette smoke, etc., stimulates the formation and increased

production of skin collagen, which will maintain skin elasticity, flexibility, and smoothness, and brightens the skin.<sup>12</sup> In the discussion, the new formulation method can increase the protection of the skin against UV damage using topical vitamin C and E stabilized by ferulic acid.<sup>3</sup> Ferulic acid has many uses for human skin, namely anti-inflammatory, anticancer, photoprotective agent (sunscreen), delaying the photoaging process of the skin, and brightening component. The most active component of vitamin E is alpha-tocopherol. Vitamin E has an important function as an antioxidant. An antioxidant can ward off free radical attacks that will damage cells, preventing the body from being damaged by free radical attacks.<sup>3</sup>

Based on the above theory, this is inversely proportional to the results of research conducted where the intake of vitamins C and E has no direct significant relationship to the occurrence of premature aging of the facial skin. This is influenced by the low income of these traders, making it difficult for traders to suffice and complement the needs of the foodstuffs they consume. This can be seen from the average trader income < IDR 1,500,000 as much as 61.62%. Based on the results of this study, it was found that the consumption level of vitamin C intake in market traders was on average less than the daily requirement, namely as much as 59.30% and as much as 100% of vitamin E. The lack of consumption of vitamin C and E intake is due to the lack of purchasing power of traders in buying fruits for consumption. In addition, the lack of knowledge of respondents in terms of knowing which types of food ingredients contain high levels of vitamins C and E as well as the number of vitamins needed in the body. In general, the function of vitamins is as an antioxidant.

The education level of the respondents in this study averaged 54.06% high school graduation. The lack of education and outreach to market traders regarding the importance of consuming vitamin intake, especially vitamins C and E, makes these vitamin intakes less consumed. In addition, there are still several types of food ingredients whose nutritional value of micronutrients is not detected in analyzing vitamin intake, which makes

it difficult for this study to determine the amount of these nutrient intakes. The results of this study are almost the same as previous studies which shows that there is no correlation between vitamin E levels in serum and the degree of severity of acne vulgaris.<sup>13</sup> The low income of market traders makes it difficult for market traders to buy foodstuffs high in vitamin E, in the form of vegetable oils, nuts, seeds, meat and milk as well as vitamin E supplements or topical preparations used as components of skin products.

The age factor is revealed to play a function in the premature aging of the face in this study. Premature facial aging is most common between the ages of 35 and 45. This occurs as a result of a lack of facial maintenance. There were 31 people who did face treatments (18.08%) and 141 people who did not (81.97%). One of the key necessities of modern women who will support their activities is skin and facial care. Every woman aspires to have a flawless appearance, not only in terms of clothing but also in terms of face and bodily beauty, which is a top priority in terms of appearance. Because a woman's confidence will be improved by her appearance.<sup>14</sup> The appearance and performance of traders is the attractiveness of the strategy of market traders in promoting and selling their wares. However, the high cost of performing facial skin care is one of the reasons people rarely get treatment, especially for market traders.<sup>15</sup>

The aging process is significantly influenced by nutrition, which benefits both physical and cognitive function<sup>16</sup>. The total daily requirement for vitamin A for those aged 19 to 64 is 600 RE, 75 mg of vitamin C, and 15 mcg of vitamin E, according to the 2019 Nutrient Adequacy Rate (RDA).<sup>6</sup> However, many respondents' intake levels in this study still fell short of what is considered to be an adequate threshold for these substances. The average respondent in this study consumed chicken meat and carrot vegetables. so that vitamin A intake is sufficient. Respondents rarely buy and consume fruit because respondents prioritize staple foods and side dishes compared to vegetables and fruit. Additionally, according to the study's findings, many respondents still do not receive face treatments. The respondents' average income level, which is rather low, has an impact on this.

Therefore, one of the reasons the outcomes of this study are not significant is because of their findings. Repeated facial expressions, the impact of heat, sleeping posture, gravity, way of life, such as smoking, pollution, and exposure to sunshine, particularly UV rays, are additional external variables that contribute to skin aging.<sup>17</sup>

This study only looked at the food intake in the sample, so it did not describe the direct effects of consuming foods sourced from vitamins A, C and E. In addition, this study only looked at the subjective results of photoaging without biochemical tests such as (SOD, glutathione, vitamins A, C, E) from blood and other clinical trials. Meanwhile, in a study conducted in Thailand, they developed a combination of anti-aging skin multi-herbs which they gave to participants for 60 days. Results from a randomized, double-blind, placebo-relief trial showed that the emulsion containing the extract combination significantly improved skin hydration and skin elasticity which contributed to an increase in skin wrinkling after 60 days compared to the emulsion base.<sup>18</sup>

## Conclusion

In conclusion, the intake of vitamin A has a significant relationship with the occurrence of premature aging of the face, but vitamins C and E do not have a significant relationship with the occurrence of premature aging of the facial skin.

## Conflict of interest

The authors declare that there is no conflict of interest related to this article.

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