



## *An Educational Outreach on The Health Benefits of Vitamin C and A Demonstration of Its Testing Methods at MAN 3 Pontianak*

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### **Article History:**

Received: May 21, 2025

Revised: June 06, 2025

Accepted: June 29, 2025

Published: July 01, 2025

**Keywords:** Educational, MAN 3 Pontianak, Knowledge, Student, Vitamin C

**Abstract:** The impact of neglecting vitamin intake, particularly vitamin C, extends beyond diminished immune function to include a reduction in metabolic processes, which can subsequently impair learning concentration and lead to declines in academic performance and nutritional status among students. Vitamin C is an essential micronutrient crucial for human health, serving as a potent antioxidant and bolstering the immune system. This study aims to provide education on various sources of vitamin C and its health benefits, as well as demonstrate vitamin C identification among students at MAN 3 Pontianak. This research is a descriptive design with a one-group pretest-posttest framework, involving 30 respondents. The findings reveal that out of 30 students (100%), the majority were aged 16 years, comprising 22 individuals (73.3%). The predominant gender among respondents was female, with 20 individuals (66.7%), while male respondents numbered 10 (33.3%). Prior to the educational intervention, student knowledge was categorized as good for 17 individuals (56.7%), adequate for 12 individuals (40%), and poor for 1 individual (3.3%). Following the educational intervention, all 30 students (100%) were classified as having good knowledge. This indicates a significant enhancement in the overall knowledge of vitamin C sources and their health benefits among students at MAN 3 Pontianak after the educational program.

## **1. INTRODUCTION**

One way to enhance an individual's knowledge is through education. Knowledge constitutes a fundamental element in the development of individual behavior. Various factors can influence the level of knowledge, with education being a primary determinant (Hutabarat & Yuniarti, 2024; Qurrota A'yuna et al., 2022).

Knowledge is the outcome of the process of comprehension, which ensues following an individual's observation of a specific object. This observation occurs through the human senses namely, sight, hearing, smell, taste, and touch. The majority of human knowledge is acquired through the senses of sight and hearing (Maifitrianti et al., 2023; Turuallo et al., 2022)

An individual's knowledge may be influenced by various factors, including education, information/mass media, gender, economic status, social relationships, age, occupation, and personal experience. The assessment of knowledge can be conducted through interviews or questionnaires that encompass the material to be evaluated. The depth of the measurement can be tailored to the level of knowledge intended to be attained (Aryani et al., 2022).

Knowledge can be acquired from various external sources, such as information from others, or from internal sources, like personal experience. The higher a person's knowledge, the better their ability to assess an object. The dissemination of educational content during adolescence should ideally be conducted through engaging media to ensure the material is effectively received and to mitigate the risk of adolescent disengagement (Dermawan et al., 2024).

Educational interventions via lectures are delivered orally with the aid of presentation tools such as PowerPoint slides. Lectures facilitate bidirectional communication in a face-to-face setting, allowing the educator to directly assess the responses of the subjects. The advantages of lectures include the ability to reach a large audience and the opportunity for in-depth discussion of the conveyed information (Arza et al., 2021) (Rohmah et al., 2019).

Vitamin C is a quintessential micronutrient with a critical role in human physiology. As a potent antioxidant, vitamin C is indispensable in the synthesis of collagen and carnitine, and it plays a pivotal role in fortifying the immune system. Additionally, vitamin C functions as an effective antimicrobial agent, combating a diverse array of pathogenic microorganisms responsible for infections (Geubrina Putri et al., 2020; Hamdan & St. Nurhafizah, 2022; Hutabarat & Yuniarti, 2024).

The only means of acquiring vitamin C is through dietary intake. Vitamin C serves a crucial function as a key factor in enzymes that aid in the production of collagens and carnitine, and it stands as the primary antioxidant that is water-soluble within the body (Raman et al., 2023). Knowledge plays a crucial role in the selection of vitamin C supplements by individuals, as it can significantly influence personal behavior. Additionally, other factors such as educational background, income level, and prior experience with vitamin C also impact these decisions. Studies on vitamin C content in foods are also crucial for nutritional labeling, food databases, and establishing dietary reference intakes (Qurrota A'yuna et al., 2022; Raman et al., 2023). This study aims to provide educational demonstration on vitamin c and its health benefits for students at MAN 3 Pontianak.

## 2. METHODOLOGY

This study employs a descriptive research design with a one-group pretest-posttest framework. The research was conducted at MAN 3 Pontianak, with sampling occurring among students at this institution in July 2024. The sample comprised 30 students, selected through purposive sampling, which involves choosing participants based on specific criteria. Data on respondents' knowledge was collected using a questionnaire. Data collection processes included editing, coding, entry, and tabulation. Descriptive analysis was utilized to assess the data, focusing on the percentage of knowledge levels based on sociodemographic factors (age, gender) and overall knowledge levels, categorized as good ( $>75\%$ ), adequate (56-75%), and poor ( $<56\%$ ) (Aryani et al., 2022).

This activity was conducted through an approach that combined educational outreach and hands-on demonstration of vitamin C testing. The media employed included an LCD projector, a laptop, informational leaflets, and a set of vitamin C testing instruments. This activity encompasses several stages of implementation:

### 1) Preparation

In this stage, all students signed the attendance sheet.

### 2) Activity Execution

The activity execution begins with a pre-test to assess the 30 students of MAN 3 Pontianak initial knowledge prior to the educational session. Following this, the material is presented through a lecture method, interspersed with a Q&A session, and then continues with a demonstration of vitamin C testing on beverage samples containing vitamin C. After the educational session, a post-test is conducted to gauge the students' final understanding (Fatkhil Haque & Yanuarto, 2023; Puspita Ratri et al., 2023).

The main activities in this community service project (PKM) were carried out in stages, as follows (Anggraini et al., 2023):

- a. The first activity involved conducting a pre-test to assess students' initial knowledge before they received education on vitamin C.
- b. The second activity was to educate students on the benefits of vitamin C and the methods for testing it. This aimed to increase their understanding of the advantages of vitamin C and how to test for its presence in everyday foods.

- c. The third activity was a simple demonstration of vitamin C testing. This hands-on session aimed to train students on how to perform a basic test to detect vitamin C in beverages they consume daily.
- d. The final activity was the post-test, designed to evaluate students' knowledge after the educational session.

Next, a demonstration of vitamin C testing was conducted using various types of packaged drink samples commonly found in the school canteen. The demonstration process was carried out in several stages, as outlined below:

- a. Preparation of Tools and Materials

The tools and materials prepared are as follows:

- Tools: Test tubes, dropper pipettes, Bunsen burner.
- Materials: Sachet drink samples of brands X, Y, and Z, distilled water, iodine solution, and Benedict's solution.

- b. Qualitative Testing of Vitamin C

- Iodine Reagent

Add 3 mL of the sample into the test tube, then add 3 drops of iodine solution. The sample contains vitamin C if the iodine reagent is added and the color of the iodine disappears. (Garna Nurhidayati et al., 2023).

- Benedict Reagent

The sample (X, Y and Z) is added to the test tube using a dropper pipette, with a total of 5 drops. Then, 15 drops of Benedict's reagent are added, and the mixture is heated over a low flame until it boils for 2 minutes. A brick-red precipitate indicates the presence of vitamin C. (Satria et al., 2021).

### **3) Last Activity**

The activity concludes with a final test aimed at assessing the extent of participants' understanding improvement following the educational session.

## **3. RESULT AND DISCUSSION**

### **3.1 Result**

This study was conducted to provide education on various sources of vitamin C and its health benefits to students at MAN 3 Pontianak using a questionnaire as the measurement tool. Data collection involved 30 students who consented to participate as respondents.

**Table 1.** Sociodemography of Student in MAN 3 Pontianak

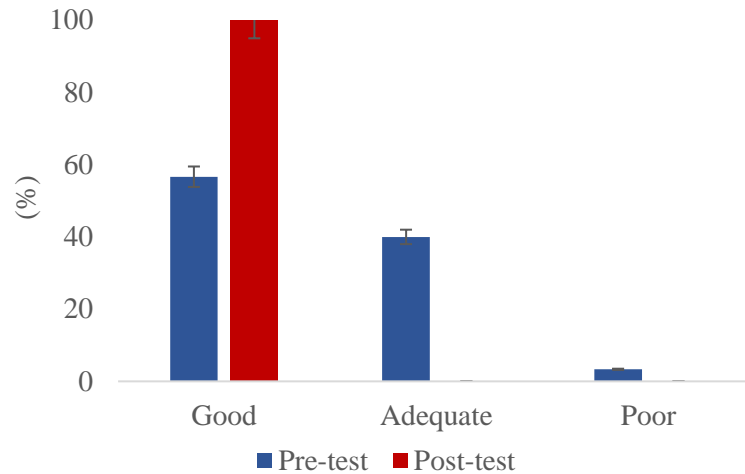
No.	Characteristic	N	%
<b>1</b>	<b>Age (In years)</b>		
	15	5	16.7
	16	22	73.3
	17	3	10.0
	<b>Total</b>	<b>30</b>	<b>100.0</b>
<b>2</b>	<b>Gender</b>		
	Men	10	33.3
	Women	20	66.7
	<b>Total</b>	<b>30</b>	<b>100.0</b>

According to Table 1, the sample comprised 30 students (100%), with a predominant age group of 16 years, accounting for 22 individuals (73.3%). The lowest age group among respondents was 15 years, comprising 5 individuals (16.7%). The majority of respondents were female, totaling 20 individuals (66.7%), while male respondents numbered 10 (33.3%).

**Figure 1.** Vitamin C Education at MAN 3 Pontianak**Table 2.** Frequency Distribution of Knowledge Level

Category	Pre-test		Post-test	
	N	%	N	%
<b>Good</b>	17	56.7	30	100.0
<b>Adequate</b>	12	40.0	0	0.0
<b>Poor</b>	1	3.3	0	0.0
<b>Total</b>	30	100	30	100

According to Table 2, prior to the educational intervention, the knowledge levels among students were categorized as follows: 17 students (56.7%) were classified as having good knowledge, 12 students (40%) as having adequate knowledge, and 1 student (3.3%) as having poor knowledge. Following the educational intervention, all 30 students (100%) were classified as having good knowledge.



**Figure 2.** Knowledge Levels of MAN 3 Pontianak Students Before and After the Educational Intervention

The results of the qualitative vitamin C test conducted on several samples are shown in Table 3.

**Table 3.** Qualitative result of vitamin C

Sample Code	Reagent	Result
X	Iodine	The iodine color faded (+)
Y	Iodine	The iodine color faded (+)
Z	Iodine	No faded of Iodine (-)
X	Benedict	Brick-red precipitate (+)
Y	Benedict	Brick-red precipitate (+)
Z	Benedict	No Brick-red precipitate (-)

Description: (+) positive; (-) negative



**Figure 3.** Demonstration of vitamin C testing

### 3.2 Discussion

The results indicate that educational interventions through oral lectures, utilizing PowerPoint slides as visual aids, positively impact the enhancement of students' knowledge at MAN 3 Pontianak. The lecture-based education facilitates bidirectional communication in a face-to-face setting, allowing the instructor to directly gauge the subjects' responses. The advantages of lectures include the capacity to reach a large audience and the opportunity for in-depth discussion, which enables respondents to absorb the presented knowledge more effectively (Indriasari et al., 2022) (Arza et al., 2021).

Age can influence an individual's understanding and mindset. During adolescence, individuals often exhibit heightened curiosity and are more susceptible to the influences of those around them (Prasasti & Rakhma, 2023).

Gender influences an individual's nutritional needs due to significant differences in growth and development patterns between males and females. Males typically require more energy than females because of differences in body composition and growth rates. In terms of age distribution, most adolescents are under 17 years old. Adolescence, spanning ages 10 to 18, is a critical developmental phase. During this time, age can impact an individual's understanding and thought patterns. Adolescents tend to exhibit a strong curiosity and are easily influenced by those around them. Their environment and perceptions of it shape their motivation, including health-related decision-making. Decision-making abilities in adolescence often lead to behaviors they find appealing and believe will support their growth and self-development (Prasasti & Rakhma, 2023).

As individuals age, their ability to understand and cognitive patterns develop, leading to an enhancement in the knowledge they acquire. However, a decline in memory typically begins around the ages of 35 to 45 and becomes more pronounced by age 60. Essentially, while a person will experience an increase in knowledge as they grow older, there comes a point where memory retention starts to diminish (Aryani et al., 2022)

According to the qualitative vitamin C test which was conducted by adding several drops of iodine. The results showed that the betadine, which was orange-brown in color, turned colorless in samples X and Y. This occurred because the iodine, when added drop by drop to the samples, caused the iodine color to change to colorless within approximately 3 minutes. This color change in iodine confirms that the samples tested positive for the presence of vitamin C (Geubrina Putri et al., 2020).

The iodine color (yellow) disappears because iodine acts as an oxidizing agent, while vitamin C functions as a reducing agent. Ascorbic acid is oxidized to dehydroascorbic acid, and iodine is reduced to iodide (Nasution et al., 2021).

The qualitative test results using Benedict's reagent indicated the presence of vitamin C in samples X and Y. The addition of Benedict's reagent initially produces a blue color, which then changes to brick-red upon heating. This occurs because Benedict's reagent reacts with aldehyde groups. Vitamin C possesses the ability to reduce various substances, including oxygen, nitrate, cytochrome A, cytochrome C, crotonyl-CoA, and methemoglobin (merHb). Therefore, when vitamin C reduces the oxygen present in Benedict's reagent, a positive result is formed (Satria et al., 2021). However, sample Z did not indicate the presence of vitamin C, as evidenced by the absence of a brick-red precipitate. This may be due to the sample being oxidized or containing too little vitamin C (Priatni et al., 2023).

#### 4. CONCLUSION

According to the conducted research, prior to the educational intervention, the students' knowledge was categorized as follows: 17 students (56.7%) were classified as having good knowledge, 12 students (40%) as having adequate knowledge, and 1 student (3.3%) as having poor knowledge. Following the educational intervention, all 30 students (100%) were classified as having good knowledge. This indicates a significant improvement in the overall knowledge of students at MAN 3 Pontianak regarding various sources of vitamin C and its health benefits.

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