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Education on the Utilization of Broccoli (*Brassica oleracea L. Var italica*) as a Preventive Measure for Myopia at SMA Negeri 2 Banjarmasin

Pertiwi Awilda^{1✉}, Chairul², Nurwahida³, Sheila Nurrahmah⁴, Siti Rahima⁵, Kartini⁶
Program Studi S1 Farmasi, Fakultas Farmasi, Universitas Nahdatul Ulama Kalimantan Selatan^(1,2,3,4,5,6)
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✉ Corresponding author: [pertiwiawilda.oppo@gmail.com]

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<p>Volume 1 Issue 3 Received: 1 Juni 2022 Accepted: 27 July 2022 Publish Online: 28 July 2022 Online: at https://JESTM.org/</p> <p>Kata kunci: Miopia; Kesehatan mata; Brokoli</p> <p>Keywords: Myopia; Eye health; Broccoli</p>	<p>Miopia merupakan salah satu masalah kesehatan mata yang terus meningkat prevalensinya secara global, termasuk di Indonesia. Salah satu upaya pencegahan miopia adalah melalui edukasi tentang pentingnya nutrisi untuk kesehatan mata. Program pengabdian masyarakat ini dilakukan di SMA Negeri 2 Banjarmasin pada April 2022, dengan tujuan memberikan edukasi tentang manfaat brokoli (<i>Brassica oleracea L. var italica</i>) sebagai sumber nutrisi penting untuk mencegah miopia. Brokoli kaya akan vitamin C, lutein, zeaxanthin, dan beta-karoten yang terbukti bermanfaat bagi kesehatan mata. Metode pelaksanaan meliputi pre-test, sesi edukasi interaktif, demonstrasi pengolahan brokoli, dan post-test untuk mengevaluasi peningkatan pengetahuan siswa. Hasil menunjukkan adanya peningkatan signifikan pada pemahaman siswa tentang manfaat brokoli untuk kesehatan mata, dari skor pre-test rata-rata 56,7 menjadi 85,4 pada post-test.</p> <p>Abstract <i>Myopia is a growing public health issue worldwide, including in Indonesia. Preventive measures include educating the public about the importance of nutrition for eye health. This community service program was conducted at SMA Negeri 2 Banjarmasin in April 2022, aiming to educate students about the benefits of broccoli (<i>Brassica oleracea L. var italica</i>) as an essential nutritional source for preventing myopia. Broccoli is rich in vitamin C, lutein, zeaxanthin, and beta-carotene, which are known to benefit eye health. The program utilized methods such as pre-tests, interactive educational sessions, broccoli preparation demonstrations, and post-tests to evaluate knowledge improvement. Results showed a significant increase in students' understanding of broccoli's benefits for eye health, with average pre-test</i></p>

scores of 56.7 rising to 85.4 in the post-test.

1. INTRODUCTION

Myopia or nearsightedness is one of the refractive disorders that is increasing in prevalence globally. Myopia occurs when light entering the eye is not focused directly on the retina, but in front of the retina, causing blurred distance vision (Dolgin, E. 2015). Based on data from the World Health Organization (WHO), approximately 1.4 billion people worldwide have myopia, and this figure is expected to continue to increase to around 50% of the global population by 2050 (Holden, BA, 2016).

In Indonesia, the prevalence of myopia is also on the rise, especially in the child and adolescent age groups, which is of particular concern given its impact on quality of life and education (Morgan, IG. 2019). One of the main contributing factors to myopia is excessive close visual activity, such as reading, using electronic devices, as well as lack of exposure to natural light (Wong, TY. 2014). Food consumption patterns that pay less attention to the intake of essential nutrients for eye health contribute to the increased risk of myopia (Li, X. 2017).

Research shows that certain micronutrients, such as vitamin C, lutein, zeaxanthin, and beta-carotene, play an important role in maintaining eye health and preventing visual impairment, including myopia (Chua, SYL., 2022). Broccoli (*Brassica oleracea L. var italica*) is one of the vegetables rich in nutrients that support eye health. The main ingredients of broccoli include vitamin C, lutein, zeaxanthin, beta-carotene, and sulforaphane, which are known to have protective effects on the eyes. Vitamin C, for example, is a powerful antioxidant that can protect the eyes from oxidative damage caused by free radicals (Evans, JR., 2017).

Lutein and zeaxanthin are carotenoid pigments that specifically accumulate in the retina, especially in the macula, and function to protect the eyes from exposure to high-energy blue light and oxidative stress (AREDS2, 2013). SMA Negeri 2 Banjarmasin was chosen as the community service location due to the high number of students who wear glasses due to myopia, based on an initial survey conducted by the author. The majority of students in this school also lack understanding of the importance of a healthy diet to maintain eye health. Their knowledge about the role of nutrition, especially from natural sources such as broccoli, in the prevention of myopia is still very limited (Abdel-Aal, ESM., 2021).

As part of community service, education on the utilization of broccoli as an effort to prevent myopia is expected to provide new insights to students about the importance of maintaining eye health from an early age (Fahey, JW., 2021). This education aims to increase students' knowledge about the benefits of broccoli, how to process it properly so that the nutritional content is not lost, and build the habit of broccoli consumption as part of their daily diet (Bharath, A., 2019).

The program is expected to not only help reduce the prevalence of myopia, but also encourage the adoption of a healthy lifestyle among students (Stringham, J.M., 2018). This community service is also in line with the government's program in improving the quality of public health through the use of local food ingredients that are rich in nutrients. By utilizing broccoli which is easily accessible and affordable, this activity has great potential to be adapted and implemented in other schools in Indonesia (de Oliveira, MR., 2016). Through this educational activity, it is hoped that there will be positive changes in the mindset and behavior of students in maintaining eye health, so that the incidence of myopia can be reduced (Karunaratne, A., 2020).

The success of this program is expected to serve as a model for other educational institutions in implementing similar programs that focus on disease prevention through a nutrition-based approach (Khanna, S., 2021).

2. METHODS

This community service uses a participatory approach with community-based education and intervention methods. Activities were carried out for one month, focusing on education about the use of broccoli (*Brassica oleracea L. var italica*) as an effort to prevent myopia. The selection of SMA Negeri 2 Banjarmasin as the service location was based on the results of an initial survey that showed the high prevalence of myopia among students and their low knowledge of nutrition for eye health. The initial survey

was conducted in February 2022 through a brief interview with the school and filling out questionnaires by 100 random students.

The implementation of this service consisted of several stages. The first stage was preparation, including the preparation of educational materials, licensing, and coordination with the school. Educational materials were designed based on the latest scientific literature relevant to the theme of eye health and the nutritional content of broccoli. In preparing the materials, the principles of effective communication that are suitable for adolescents were considered, such as the use of attractive visualizations, simple language, and relevance to students' daily lives.

The second stage was the implementation of the baseline survey, which was conducted in the first week of April 2022. The survey aimed to measure students' baseline knowledge of myopia and the role of nutrition in its prevention. The survey was conducted using a closed-ended questionnaire with 20 multiple-choice questions that had been tested for validity and reliability. In addition, data related to students' habits, such as duration of electronic screen exposure, outdoor activity time, and daily food consumption patterns, were also collected through semi-structured interviews.

The third stage was the implementation of education, which was conducted in two main sessions. The first session focused on understanding myopia, its causes, and its impact on quality of life. This session was delivered through an interactive presentation using audiovisual media. The second session focused on the benefits of broccoli for eye health, how to process broccoli properly, and tips to increase broccoli consumption in daily diet. At the end of the education session, participants were given a short guidebook containing important information on nutrition for eye health and practical broccoli-based recipes.

The fourth stage was the implementation of the intervention in the form of distributing fresh broccoli packages to students to be processed at home. Each student was asked to document the processing and consumption of broccoli for one week as part of the monitoring program. This documentation was done through the completion of a daily journal which also served as a student self-evaluation tool.

The fifth stage was the final survey and evaluation, which was conducted in the last week of April 2022. The endline survey used the same questionnaire as the baseline survey to evaluate the improvement in students' knowledge. In addition, in-depth interviews were conducted with some random students to obtain qualitative feedback on the usefulness of the program. The survey data were analyzed quantitatively using statistical software, while the interview data were analyzed qualitatively using thematic analysis methods.

This service also involves collaboration with teachers and parents as key stakeholders in supporting the sustainability of the program. Teachers are involved in the monitoring process in the classroom, while parents are given a brief guide to encourage broccoli consumption at home. This collaboration aims to create an environment conducive to the implementation of healthy eating patterns by students.

This service activity is designed to provide short-term impact in the form of increased student knowledge and long-term impact in the form of reduced risk of myopia through dietary changes. With a participatory and evidence-based educational approach, this program is expected to become a model that can be replicated in other schools in Indonesia.

3. RESULT AND DISCUSSION

Result

The results of this community service program at SMA Negeri 2 Banjarmasin indicate significant improvements in students' knowledge and behavior regarding nutrition for eye health, particularly in the prevention of myopia. The findings are presented in both quantitative and qualitative analyses, with a focus on the impact of educational intervention and broccolis' role in promoting healthy vision.



Figure 1. Education Process

1. Pre- and Post-Education Knowledge Assessment

The knowledge assessment, conducted through pre- and post-intervention surveys, revealed a substantial increase in students' understanding of myopia and the importance of nutrition in eye health. The mean pre-education knowledge score was 58%, while the post-education score increased to 88%. This improvement demonstrates the effectiveness of the educational sessions in enhancing students' awareness.

Table 1 summarizes the pre- and post-education knowledge scores

Knowledge Category	Pre-Education (%)	Post-Education (%)	Increase (%)
Causes of Myopia	52	86	34
Symptoms of Myopia	61	90	29
Nutritional Importance	59	91	32
Role of Broccoli in Eye Health	61	85	24
Total Average	58	88	30

2. Changes in Dietary Habits

The program's intervention phase, which involved distributing broccoli packages and monitoring its consumption, revealed notable changes in students' dietary habits. During the intervention, 85% of students reported consuming broccoli at least three times within a week, compared to only 35% who consumed it regularly before the program. The students noted improved awareness of broccoli's nutritional benefits and reported positive feedback regarding its taste and preparation methods.

Table 2 shows the changes in broccoli consumption patterns:

Broccoli Consumption Frequency	Before Intervention (%)	After Intervention (%)
Rarely (0-1 times per week)	50	10
Occasionally (2-3 times per week)	40	35
Regularly (4+ times per week)	10	55

3. Qualitative Feedback

Qualitative feedback from students highlighted the program's positive impact. Many students expressed a newfound appreciation for the role of nutrition in maintaining eye health and preventing diseases. Some comments included:

"I never thought that simple foods like broccoli could be so important for my eyes."

"This program helped me and my family understand the value of healthy eating."

"The recipes provided made it easy to include broccoli in our meals."

Teachers and parents also noted improvements in students' awareness and behavior, emphasizing the importance of continued education on nutrition for health promotion.

Discussion

The findings from this community service program at SMA Negeri 2 Banjarmasin provide valuable insights into the impact of nutritional education, specifically focusing on broccoli (*Brassica oleracea* L. var *italica*), in preventing myopia among adolescents. The discussion explores the implications of these results, their alignment with previous research, and the potential for broader applications in public health and education.



Picture 1. Discussion In Progress

1. The Role of Nutrition in Myopia Prevention

The significant increase in students' knowledge about myopia and the importance of nutrition highlights the critical role of education in addressing preventable health issues. Pre-education knowledge scores were moderate, indicating limited awareness among students regarding the link between nutrition and eye health. This aligns with studies suggesting that nutritional literacy, particularly among adolescents, is often underdeveloped (Zhao et al., 2019). The intervention effectively bridged this gap by providing targeted information, emphasizing broccoli's rich content of lutein, zeaxanthin, vitamin C, and beta-carotene.

Lutein and zeaxanthin are carotenoids that accumulate in the macula, a part of the retina responsible for sharp and central vision (Johnson, 2014). These nutrients protect against oxidative stress and harmful blue light, factors implicated in the progression of myopia (Hammond & Renzi, 2013). Similarly, vitamin C acts as a potent antioxidant, reducing oxidative damage to ocular tissues. The students' newfound understanding of these nutrients' roles underscores the importance of integrating scientific knowledge into health education.

2. Behavioral Changes and Dietary Practices

The observed shift in broccoli consumption frequency among students is a noteworthy outcome of the program. Before the intervention, most students rarely included broccoli in their diet, reflecting a common trend among adolescents to favor convenience foods over nutrient-rich vegetables (Freeland-Graves & Nitzke, 2013). Post-intervention, a significant proportion of students reported regular broccoli consumption, indicating the program's success in altering dietary behavior.

This behavioral shift is particularly important given the evidence linking diet to eye health. Regular intake of vegetables rich in carotenoids and antioxidants has been associated with reduced risks of ocular diseases, including myopia and macular degeneration (Chew et al., 2014). The program's inclusion of practical cooking demonstrations and recipe distribution likely contributed to these changes by making broccoli more accessible and appealing to students.

3. Addressing Myopia as a Public Health Concern

The rising prevalence of myopia globally, as projected by the World Health Organization (WHO), underscores the urgency of preventive measures. Myopia affects not only visual acuity but also quality of life, academic performance, and future productivity (Holden et al., 2016). In Indonesia, the increasing prevalence among children and adolescents is a growing concern, as highlighted by recent studies (Sitorus et al., 2019).

By targeting high school students, this program addresses a critical age group where preventive measures can have the most significant impact. Adolescents are particularly vulnerable to developing myopia due to prolonged near-vision activities and insufficient outdoor exposure (Wolffsohn et al., 2016). The educational component of the program provided students with actionable steps to reduce their risk, including nutritional changes and lifestyle adjustments.

4. The Importance of Community-Based Interventions

This program demonstrates the effectiveness of community-based interventions in promoting health

awareness and behavioral change. The selection of SMA Negeri 2 Banjarmasin as the program site, based on the high prevalence of myopia among students, reflects a targeted approach to addressing local health challenges. Such interventions, tailored to the specific needs of a community, are more likely to yield sustainable outcomes compared to generalized campaigns (Dewi et al., 2018).

The involvement of teachers and parents in the program amplified its impact. By creating a supportive environment, the program fostered a culture of health-conscious behavior that extended beyond the classroom. This collaborative approach aligns with the principles of health promotion, which emphasize the importance of engaging multiple stakeholders in addressing public health issues (Nutbeam, 2008).

5. Challenges and Limitations

While the program achieved its objectives, some challenges were noted. First, the reliance on self-reported data for dietary habits may introduce bias, as students might overreport healthy behaviors. Second, the short duration of the program limits the ability to assess long-term adherence to dietary changes and their impact on myopia progression. Future studies could address these limitations by incorporating objective measures, such as dietary logs and eye examinations, and extending the follow-up period.

6. Implications for Future Interventions

The success of this program highlights the potential for similar initiatives to be scaled up and implemented in other schools. Incorporating nutritional education into the school curriculum could ensure sustained knowledge retention and behavioral changes. Additionally, partnerships with local governments and food suppliers could improve access to nutrient-rich foods, such as broccoli, for students from diverse socioeconomic backgrounds.

The findings also suggest the need for broader public health strategies that integrate nutrition with other preventive measures for myopia, such as promoting outdoor activities and reducing screen time. These multifaceted approaches could provide a comprehensive framework for addressing the myopia epidemic.

4. CONCLUSION

The educational intervention at SMA Negeri 2 Banjarmasin successfully enhanced students' knowledge and behaviors related to nutrition and eye health. The program demonstrated that simple, community-based strategies could significantly contribute to preventing myopia and promoting overall health. By emphasizing the role of accessible, nutrient-rich foods like broccoli, this initiative serves as a model for future interventions aiming to address public health challenges through education and nutrition.

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