

SUSTAINABILITY SCHOOL-BASED NUTRITION EDUCATION FOR NON-COMMUNICABLE DISEASE PREVENTION IN SMA SWASTA UTAMA MEDAN

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Abstract

Non-communicable diseases (NCDs) are a growing public health concern globally and in Indonesia, strongly associated with poor nutrition and unhealthy lifestyles. Schools are effective platforms for health promotion through sustainable nutrition education. The program was conducted at SMA Swasta Utama, Medan (March–July 2025) with 10 teachers and 36 students, involving preparatory coordination, development of educational tools, and delivery of nutrition education through lectures and multimedia discussions. Knowledge improvement was assessed using pretest–posttest with the Wilcoxon paired test, while teachers also received training in anthropometry, blood pressure monitoring, biochemical testing, and the Productivity Risk Self-Assessment Tool (PRISAT), supported by the provision of self-monitoring equipment. Results showed significant knowledge improvements in both groups, with clear shifts from poor to moderate and good categories ($p < 0.05$). Teachers achieved greater gains than students, reflecting their role as facilitators and role models in health education. PRISAT screening revealed most teachers were low risk, though some were categorized as high risk, underscoring the importance of early detection. This program demonstrates the effectiveness of integrating nutrition education and health monitoring to strengthen school-based NCD prevention.

Keywords: Balanced Nutrition, Non-Communicable Diseases, Nutrition Education, PRISAT, School-Based Intervention

INTRODUCTION

The rising prevalence of non-communicable diseases (NCDs), such as obesity, hypertension, diabetes, and cardiovascular diseases, has become a critical global public health challenge, with Indonesia experiencing a parallel upward trend (Omotayo et al., 2024). These conditions are now the leading causes of mortality and morbidity worldwide, largely driven by modifiable behavioral factors including poor dietary habits, physical inactivity, and sedentary lifestyles (Akseer et al., 2020). In urban areas especially, where processed food accessibility and limited physical activity are common, the urgency to address behavioral health becomes paramount, particularly among adolescents and school staff who are increasingly affected (Loo

et al., 2021; Omotayo et al., 2024).

Recent research underscores the importance of early intervention targeting youth populations to combat NCD risk factors through health education, dietary regulation, and structured physical activity (Siswati et al., 2022). Adolescents' dietary behaviors are undergoing drastic shifts toward unhealthy consumption patterns, often driven by convenience and peer influence, contributing to rising obesity rates and associated complications (Akseer et al., 2020; Suryani et al., 2019). Addressing these behaviors early in life through targeted interventions is not only feasible but essential in reducing long-term disease risk.

Schools offer a strategic platform for such interventions. By targeting both students and teaching staff, school-based programs can foster a supportive environment for behavior change, ensuring a more holistic approach to health promotion (Mintarsih et al., 2024). This dual emphasis is vital, considering that educators themselves often face similar health risks and can serve as role models for healthful living. The context of SMA Swasta Utama in Medan reflects the national concern, where health assessments have revealed a concerning prevalence of overweight, obesity, and metabolic risk factors among both students and teachers. These issues are further exacerbated by urbanization and a marked increase in sedentary behaviors (Siswati et al., 2022).

Health literacy is increasingly recognized as a determinant of health behavior. Empowering school communities with knowledge and tools to understand and manage health can significantly improve health outcomes (Kinoshita et al., 2023). Budrevičiūtė et al. (2020) highlight that effective NCD prevention strategies must involve educational initiatives combined with practical skills development, enabling individuals to make informed lifestyle choices. These insights align with school-based, community-driven service models that aim to integrate both theoretical education and hands-on training to promote lasting behavioral change.

Furthermore, interventions delivered in school settings can contribute meaningfully to national public health strategies, especially in middle-income countries such as Indonesia, where systemic efforts are needed to reduce the growing NCD burden (Mintarsih et al., 2024). Programs that incorporate sustainable frameworks and capacity building are more likely to lead to long-term improvements in health knowledge and practice. The urgency of implementing such approaches is supported by recent literature, which emphasizes the transformative potential of health education in reshaping behavior and preventing disease (Arena et al., 2015; Wellappuli & Gunawardana, 2015).

Given this context, the community-based intervention at SMA Swasta Utama was designed to address the dual burden of non-communicable disease (NCD) risk among students and teachers through a sustainability-oriented school-based nutrition education program. The primary objective was to improve knowledge of balanced nutrition while empowering participants to monitor health risks. The originality of this initiative lies in its integration of sustainable health education into the school curriculum together with the development of self-monitoring skills. As noted by Parekh et al. (2020), such multifaceted and context-sensitive interventions hold great promise in transforming schools into catalysts for long-term health improvement.

IMPLEMENTATION METHOD

This community service program adopted a school-based nutrition education model aimed at preventing non-communicable diseases (NCDs) among teachers and students at SMA Swasta Utama, Medan. The approach was grounded in the sustainability school-based nutrition education framework, which emphasizes continuous knowledge transfer, skill development, and the creation of supportive environments to foster long-term healthy behaviors. The intervention design combined structured health education with practical skill-building sessions, ensuring that participants could both understand and apply the concepts in their daily lives (Suwannawong et al., 2023).

This community service program was conducted over a five-month period (March–July 2025) and engaged 10 teachers and 36 students from grades 11 and 12 at SMA Swasta Utama, Medan. The initiative commenced with a preparatory phase involving coordination with the school principal, teachers, and university students to develop educational instruments, training modules, facilities, guidelines, and evaluation tools. Subsequently, nutrition education sessions on balanced diet guidelines for the prevention of NCDs were delivered separately to teachers and students through lectures and discussions supported by PowerPoint media. Knowledge acquisition was assessed using pretest and posttest evaluations, with differences in mean scores analyzed using the Wilcoxon paired test. Knowledge levels were further categorized according to Khomsan (2021) into poor (<60), moderate (60–80), and good (>80).

Teachers were also trained and mentored in conducting nutritional and health assessments, including anthropometric measurements, blood pressure monitoring, and capillary blood biochemical analyses (hemoglobin, total cholesterol, blood glucose, and uric acid), in addition to training in the use of the PRISAT screening tool. All participating teachers performed self-screening for NCD risk, with PRISAT scores classified into low risk (0–5) and high risk (6–16) as defined by Rosmiati et al., (2022). To support sustainability, the partner school was equipped with self-assessment instruments such as a microtoise for height measurement, a metline for waist circumference assessment, a bio-impedance analyzer (BIA) for body weight and composition, a digital sphygmomanometer for blood pressure, and portable capillary blood testing devices for hemoglobin, glucose, cholesterol, and uric acid.

Throughout the program, the implementation team provided continuous mentoring, monitoring, and periodic evaluation to ensure the achievement of objectives. The school principal coordinated the activities and facilitated necessary resources, while the partner actively engaged in all stages of implementation. Each training session was followed by evaluation, and program continuity was further strengthened through a dedicated WhatsApp group, which enabled follow-up communication, progress monitoring, and efficient problem-solving.

RESULTS AND DISCUSSION

The implementation of a sustainable school-based nutrition education initiative aimed at preventing non-communicable diseases (NCDs) represents a significant intersection between health and education. This initiative aligns with Sustainable Development Goal 4 (SDG 4), which emphasizes equitable and high-quality education as a foundation for sustainable development (Park et al., 2023). By integrating nutrition education with health self-monitoring tools, the program was designed to foster lasting behavioral changes among teachers and students, thereby contributing to broader public health goals in reducing NCD risks. Such evolving educational approaches, particularly those addressing diet and nutrition, are critical for contemporary health challenges, including obesity, diabetes, and cardiovascular diseases (Suwannawong et al., 2023; Tay et al., 2021).

The preparatory stage of the program involved collaboration between the community service team, school leadership, teachers, and students, ensuring that the initiative was contextually relevant and sustainable. This stage included the preparation of educational resources, training manuals, evaluation tools, and health monitoring equipment. By applying participatory methodologies, the program fostered collaborative engagement and ownership among stakeholders—an approach that has been shown to enhance sustainability and impact of school-based health programs (Assilian et al., 2024; Goto, 2024). Such engagement not only strengthens local relevance but also supports co-creation in health education, which improves program effectiveness and cultural adaptability (Edalati et al., 2023; Upreti & Devkota, 2022).



Figure 1. Nutrition Education for Teachers and Students of SMA Swasta Utama

The interactive nutrition education sessions were delivered separately to teachers and students through lectures and discussions supported by PowerPoint presentations (Figure 1). This constructivist approach, characterized by interactive dialogue, fosters deeper learning and retention of knowledge (Makrakis & Kostoulas-Makrakis, 2023). The program's effectiveness was evaluated through pretest and posttest assessments, producing significant improvements with p-values of 0.000 for teachers and 0.000 for students. These findings demonstrate that the nutrition education component of this community service program effectively enhanced participants' knowledge of balanced nutrition guidelines for the prevention of NCDs.

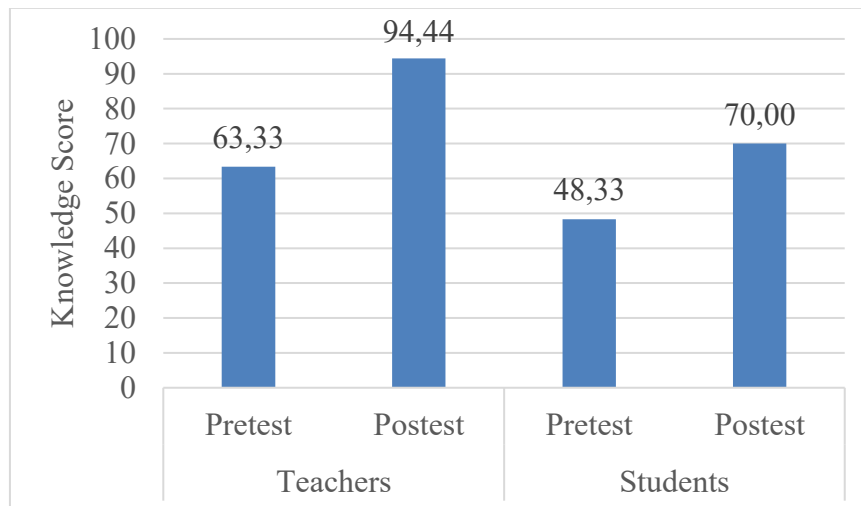


Figure 2. Comparison of Knowledge Scores Before and After Nutrition Education

Before the nutrition education sessions, mean knowledge scores among teachers and students were markedly lower, indicating limited baseline understanding of balanced nutrition (Figure 2). This gap underscores the imperative to embed comprehensive nutrition education within school curricula. Consistent evidence shows that well-designed school programs yield significant gains in students' nutrition knowledge and diet-related practices, particularly when they employ interactive, learner-centred methods (Al-Jawaldeh, 2023; Asakura et al., 2021; Rector et al., 2021). Moreover, aligning content with contemporary 24-hour movement and dietary guidance and leveraging participatory, context-sensitive pedagogy further strengthens engagement and retention (Loo et al., 2021; Makrakis & Kostoulas-Makrakis, 2023). Recent work in school and adolescent settings across Asia likewise highlights that integrated, community-engaged models can improve health literacy and support healthier behaviours, reinforcing the need for sustained implementation in educational environments (Mintarsih et al., 2024; Suwannawong et al., 2023).

After the nutrition education sessions, the data revealed that teachers demonstrated greater improvements in knowledge scores compared to students. This difference may be attributed to factors such as teachers' prior baseline knowledge or their higher level of engagement with the educational content. Previous studies have shown that teachers who receive targeted nutrition training are better equipped to transfer this knowledge to their students, thereby enhancing the overall effectiveness of school-based nutrition programs (Rachman et al., 2021). Moreover, the role of teachers as facilitators of nutrition education is particularly critical, as they can act as role models and advocates for healthy eating practices within the school environment (Aries et al., 2018).

The data presented in Figure 3 demonstrate substantial shifts in knowledge categories among teachers and students following participation in the nutrition education program. Prior to the intervention, most participants were classified as having poor knowledge; however, post-intervention results revealed a marked improvement, with significant increases in both the moderate and good categories. This outcome underscores the effectiveness of the education sessions, which combined lectures and discussions supported by multimedia, in enhancing participants' understanding of balanced nutrition for the prevention of NCDs. The knowledge

gains observed highlight the potential of early school-based health interventions to foster long-term behavioral change and healthier lifestyle practices. Consistent with earlier studies, structured nutrition education has been shown to significantly improve knowledge and dietary behaviors among both students and teachers (Gemily et al., 2020; Jovanović et al., 2023). Notably, teachers exhibited greater improvements than students, which may be attributed to their prior baseline knowledge or greater engagement with the educational content. This finding reinforces their crucial role as facilitators and role models in promoting health literacy and healthy behaviors within the school environment (Scherr et al., 2020). To sustain these gains, integrating nutrition education into the existing curriculum is essential for reinforcing key concepts over time (Bassi et al., 2021; Claramita et al., 2021; Joshi et al., 2021). Furthermore, continuous support and adequate resources for teachers are necessary to build their confidence and competence in delivering nutrition education effectively.

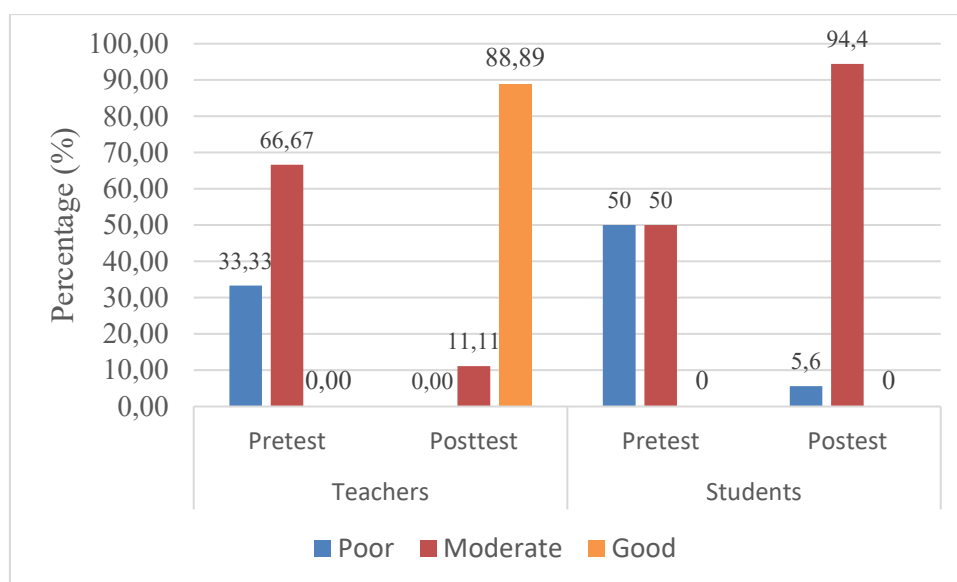


Figure 3. Change in the Distribution of Teachers' and Students' Knowledge Levels Before and After Nutrition Education

Beyond knowledge transfer, the program introduced PRISAT (Productivity Risk Self-Assessment Tool) training for teachers as a strategy for early detection of NCD risks. PRISAT proved effective as a low-cost screening tool for identifying risk factors such as obesity, hypertension, and impaired glucose regulation (Rosmiati et al., 2022). Screening results revealed that 14.29% of teachers were classified as high risk, while the majority were in the low-risk category (Figure 4). These findings echo broader public health concerns, underscoring the need for early intervention among school staff who not only face personal health risks but also serve as key actors in shaping student health behaviors (Bhattacharya et al., 2023). This outcome reflects global evidence on the need for workplace-based health monitoring and interventions, especially among educators who face lifestyle-related risks that could undermine productivity. Regular use of tools like PRISAT can inform tailored interventions, ranging from dietary modifications to increased physical activity, and contribute to workplace health policies (Hadian et al., 2021).

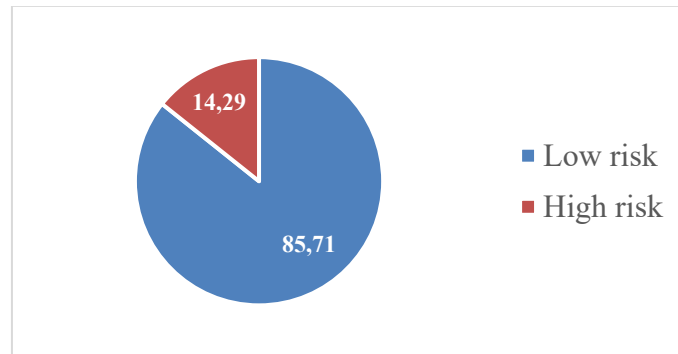


Figure 4. Distribution of PRISAT Screening Results Among Teachers

Teachers were also trained in anthropometry, blood pressure monitoring, and basic biochemical testing, and to ensure the continuity of these health practices, the program provided both teachers and students with self-monitoring equipment, including a microtoise, BIA, digital blood pressure monitors, and portable biochemical testing kits. The equipment was formally handed over by the head of the community service program to the vice principal for student affairs of SMA Swasta Utama, witnessed by representatives from the Institute for Research and Community Service (LPPM), Universitas Negeri Medan (Figure 5). These tools enabled independent health checks, embedding practical applications within the educational content. Coupled with digital platforms such as WhatsApp groups for monitoring and communication, the program incorporated modern technology to sustain engagement and facilitate problem-solving (Park et al., 2023). This hybrid model of combining education, self-assessment, and digital reinforcement demonstrates how school-based programs can maintain long-term relevance and adaptability.



Figure 5. Nutrition and Health Assessment Training and Equipment Handover

Overall, the initiative illustrates the transformative potential of integrating sustainable nutrition education with practical health screening tools in school environments. The marked improvements in knowledge among both teachers and students, alongside the successful implementation of PRISAT, highlight the value of a multifaceted approach that combines theory, practice, and technology. This aligns with international evidence showing that participatory and context-driven interventions significantly improve health literacy and support behavior change (Pava-Cárdenas et al., 2018; Makrakis & Kostoulas-Makrakis, 2023; Smith et

al., 2016; Song et al., 2010). This program not only improved health knowledge but also empowered teachers and students with the capacity to monitor and manage their health proactively. The results affirm the role of schools as critical platforms for NCD prevention and offer a replicable model for similar interventions in other contexts. Ongoing research is needed to assess the long-term impacts on dietary practices and health outcomes, but the present findings strongly support integrating sustainable, participatory, and evidence-based nutrition education into educational systems worldwide.

CONCLUSION

This community service program demonstrated that sustainable, school-based nutrition education significantly improved the knowledge of both teachers and students regarding balanced nutrition for the prevention of non-communicable diseases. Pretest–posttest assessments showed substantial shifts from poor to good knowledge categories, highlighting the effectiveness of interactive education methods. Teachers exhibited greater improvements than students, reinforcing their role as facilitators and role models in promoting healthy behaviors within the school environment. The integration of nutrition education with training in health assessment and the provision of self-monitoring equipment further empowered participants to adopt proactive health practices. The inclusion of PRISAT screening also identified individuals at risk, underscoring the importance of early detection in NCD prevention. Overall, this initiative provides a replicable model for integrating nutrition education and health monitoring into school settings, contributing to the broader agenda of sustainable health promotion.

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