THE EFFECT OF NUTRITION EDUCATION THROUGH HYDROPONIC FARMING TRAINING ON MOTHERS' KNOWLEDGE IN SAMBIREJO VILLAGE

Afif Fadhilah Irsyad[1], Humairah Medina Liza Lubis[2*]

[1]Faculty of Medicine, Muhammadiyah University of North Sumatra

[*Email Korespondensi: afiffadhilah02@gmail.com]

Abstract: The Effect of Nutrition Education through Hydroponic Farming Training on Mothers' Knowledge in Sambirejo Village *Balanced nutrition is essential for supporting child growth and maintaining family health. However, limited maternal knowledge and access to nutritious food may contribute to inadequate dietary practices. Nutrition education combined with hydroponic farming training may provide both knowledge and practical skills to support healthy food choices. This study aimed to evaluate the effect of nutrition education through hydroponic farming training on mothers' knowledge in Sambirejo Village This study employed a one group pretest-posttest pre-experimental design involving 40 mothers selected using purposive sampling in Sambirejo Village from September to December 2023. Data were collected using a structured questionnaire and analyzed using the Wilcoxon signed-rank test. Before the intervention, 18 respondents (45%) had good knowledge, 16 (40%) had fair knowledge, and 6 (15%) had poor knowledge. After the intervention, 36 respondents (90%) had good knowledge, 3 (7.5%) had fair knowledge, and 1 (2.5%) had poor knowledge. The Wilcoxon test showed a statistically significant difference between pretest and posttest knowledge scores ($p < 0.001$). Nutrition education through hydroponic farming training significantly improved mothers' knowledge regarding balanced nutrition in Sambirejo Village.*

Keywords: *Food Security; Health Education; Hydroponics; Mothers; Nutritional Status.*

Abstrak: Pengaruh Pendidikan Gizi Melalui Pelatihan Bertani Hidroponik Terhadap Pengetahuan Para Ibu di Desa Sambirejo. Gizi seimbang merupakan salah satu faktor penting dalam mendukung pertumbuhan anak dan menjaga kesehatan keluarga. Namun, keterbatasan pengetahuan ibu dan akses terhadap pangan bergizi dapat berkontribusi terhadap pola konsumsi yang kurang tepat. Edukasi gizi yang dikombinasikan dengan pelatihan budidaya hidroponik dapat memberikan pengetahuan sekaligus keterampilan praktis dalam mendukung pemenuhan pangan bergizi. Penelitian ini bertujuan untuk mengevaluasi pengaruh edukasi gizi melalui pelatihan budidaya hidroponik terhadap pengetahuan ibu di Desa Sambirejo. Penelitian ini menggunakan desain pra-eksperimental *one-group pretest-posttest* dengan melibatkan 40 ibu yang dipilih menggunakan *purposive sampling* di Desa Sambirejo pada September hingga Desember 2023. Data dikumpulkan menggunakan kuesioner dan dianalisis menggunakan uji *Wilcoxon signed-rank*. Sebelum intervensi, sebanyak 18 responden (45%) memiliki pengetahuan baik, 16 responden (40%) memiliki pengetahuan cukup, dan 6 responden (15%) memiliki pengetahuan kurang. Setelah intervensi, 36 responden (90%) memiliki pengetahuan baik, 3 responden (7,5%) memiliki pengetahuan cukup, dan 1 responden (2,5%) memiliki pengetahuan kurang. Uji Wilcoxon menunjukkan terdapat perbedaan yang bermakna antara skor pengetahuan sebelum dan sesudah intervensi ($p < 0,001$). Edukasi gizi melalui pelatihan budidaya hidroponik secara signifikan meningkatkan pengetahuan ibu mengenai gizi seimbang di Desa Sambirejo.

Kata Kunci: Edukasi Kesehatan; Hidroponik; Ibu; Keamanan Pangan; Status Gizi.

INTRODUCTION

Public health, particularly in rural areas, is strongly influenced by household dietary practices and maternal knowledge of nutrition. Balanced nutrition plays an essential role in supporting physical growth, cognitive development, and overall health, particularly among children. However, nutritional problems such as stunting and undernutrition remain important public health concerns in Indonesia. In Serdang Bedagai Regency, the prevalence of stunting among children under five years was 23.9% in 2022, which was higher than the prevalence reported for North Sumatra Province (21.7%) based on the Indonesian Toddler Nutrition Status Survey (SSGI) (Kementerian Kesehatan RI, 2022; Mediacenter, 2024). Although subsequent local interventions contributed to a decline in stunting prevalence, nutritional problems remain a concern and require sustained community-based efforts.

In Sambirejo Village, efforts to improve maternal knowledge of nutrition are important because mothers play a central role in determining food selection and dietary practices within the household (Maratis et al., 2023). However, access to nutritious food may also be affected by economic conditions and the availability of food sources. Therefore, community-based nutrition education that provides practical approaches to improving access to nutritious foods may be particularly relevant in rural communities (Siregar and Sukartini, 2022).

Hydroponic farming is a soilless cultivation technique in which plants are grown using nutrient solutions that provide essential mineral elements required for plant growth. This cultivation method can improve the efficiency of water and nutrient use and is particularly relevant in areas with limited agricultural land. Hydroponic systems can therefore provide an alternative approach for producing fresh vegetables while supporting household food security (Fathidarehnijeh et al., 2024).

Hydroponic farming training not only provides technical skills in gardening but also serves as an effective educational tool to increase knowledge about the importance of a balanced diet (Syamsia et al., 2021). Through nutrition education using practical approaches, the aim is to provide homemakers with a deeper understanding of the benefits of consuming fresh vegetables and the importance of a healthy diet for the family (Tuhuteru et al., 2021). Additionally, this training program has the potential to raise public awareness of the importance of food self-sufficiency, which supports food security at the village level (Ummah, 2022).

Although nutrition education programs have been widely implemented to improve maternal knowledge and promote healthy dietary practices, many interventions primarily focus on delivering nutritional information. This study distinguishes itself by integrating nutrition education with practical hydroponic farming training, providing mothers with both knowledge of balanced nutrition and practical skills to produce fresh vegetables at the household level. This integrated approach is particularly relevant in rural communities where access to nutritious food and agricultural land may be limited. Therefore, the study contributes an applied, community-based approach that connects nutrition education with household food production.

This study aimed to evaluate the effect of nutrition education through hydroponic farming training on mothers' knowledge of balanced nutrition in Sambirejo Village by comparing knowledge levels before and after the intervention. The findings are expected to contribute to the development of practical and sustainable community-based nutrition education programs.

METHOD

This study employed a quantitative pre-experimental design using a one-group pretest-posttest approach. The study was conducted in

Sambirejo Village from September to December 2023 and involved 40 mothers with children under five years of age selected using purposive sampling. Participants were eligible if they were mothers residing in Sambirejo Village, had children under five years of age, were willing to participate, and completed both the pretest and posttest. Participants who did not complete the study were excluded.

The intervention consisted of nutrition education integrated with hydroponic farming training. The educational materials covered balanced nutrition, adequate nutritional intake, healthy food selection, and the role of vegetables and fruits in meeting nutritional needs. The hydroponic training included basic principles, planting procedures, nutrient management, plant maintenance, and harvesting. The intervention was delivered through presentations, discussions, question and answer sessions, and practical demonstrations using educational materials and hydroponic equipment. Knowledge was assessed using a structured questionnaire, with correct answers scored 1 and incorrect answers scored 0. Knowledge levels were categorized as good (76-100%), fair (56-75%), and poor (≤55%). The questionnaire was assessed for validity using corrected item-total correlation and for reliability using Cronbach's alpha.

Data were analyzed using SPSS version 26. Descriptive statistics were used to describe participant characteristics and knowledge levels before and after the intervention. Data distribution was assessed using the Shapiro-Wilk test. Because the data were not normally distributed, differences in knowledge scores before and after the intervention were analyzed using the Wilcoxon signed-rank test. Statistical significance was set at $p < 0.05$. Ethical approval was obtained from the relevant Health Research Ethics Committee, and informed consent was obtained from all participants before data collection.

RESULTS

Table 1. Characteristics of Study Participants (n = 40)

Characteristic	Frequency (n)	Percentage (%)
Mother's highest level of education		
High school	35	87.5
College	5	12.5
Total	40	100.0
Mother's occupation		
Housewife	36	90.0
Private-sector employee	4	10.0
Total	40	100.0

Table 1 presents the characteristics of the 40 mothers who participated in the study. Most participants had completed high school education, accounting for 35 respondents (87.5%), while 5 respondents (12.5%) had completed college education. Regarding occupation, the majority of participants were housewives (36 respondents; 90%), while 4 respondents (10%) were private sector employees. These characteristics describe the demographic profile of the mothers included in the study.

Table 2. Mothers' Knowledge Level Before and After the Intervention

Knowledge Level	Before Intervention n (%)	After Intervention n (%)	Difference n (%)
Good	18 (45.0)	36 (90.0)	+18 (+45.0)
Fair	16 (40.0)	3 (7.5)	−13 (−32.5)
Poor	6 (15.0)	1 (2.5)	−5 (−12.5)

Knowledge Level	Before Intervention n (%)	After Intervention n (%)	Difference n (%)
Total	40 (100)	40 (100)	0 (0)

Knowledge categories: good (76–100%), fair (56–75%), poor (≤55%). Wilcoxon signed-rank test: p < 0.001.

Table 2 shows an improvement in maternal knowledge following the nutrition education and hydroponic farming training. Before the intervention, 18 mothers (45.0%) had good knowledge, 16 (40.0%) had fair knowledge, and 6 (15.0%) had poor knowledge. After the intervention, the proportion of mothers with good knowledge increased to 36 (90.0%), while those with fair and poor knowledge decreased to 3 (7.5%) and 1 (2.5%), respectively. The Wilcoxon signed-rank test demonstrated a statistically significant difference in maternal knowledge before and after the intervention ($p < 0.001$).

Table 3. Wilcoxon Signed-Rank Test of Knowledge Scores Before and After the Intervention

Knowledge Assessment	n	Median	Range (Min–Max)	Z	p-value	Effect Size (r)
Pretest	40	65	45–80	−5.14	<0.001	0.81
Posttest	40	85	55–100			

Table 3 shows the differences in maternal knowledge scores before and after the nutrition education and hydroponic farming training. The median knowledge score increased from 65 in the pretest to 85 in the posttest, indicating an improvement in maternal knowledge following the intervention. The Wilcoxon signed-rank test demonstrated a statistically significant difference between pretest and posttest knowledge scores ($Z = -5.14$; $p < 0.001$). The calculated effect size was 0.81, indicating a large effect of the intervention on maternal knowledge.

DISCUSSION

Before the intervention, 6 respondents (15%) had poor knowledge, 16 respondents (40%) had fair knowledge, and 18 respondents (45%) had good knowledge (Table 2). This distribution indicates that although nearly half of the mothers already had good knowledge regarding nutrition, a substantial proportion still had limited knowledge that could affect their understanding of appropriate nutritional practices for children (Prasetyo et al., 2023). Maternal knowledge is an important component of nutrition related decision making because mothers commonly determine food selection, preparation, and provision within the household. Limited knowledge may therefore become a barrier to implementing appropriate dietary practices.

Following the nutrition education and hydroponic farming training, the proportion of respondents with good knowledge increased from 18 (45%) to 36 (90%), representing an increase of 45 percentage points (Table 2). At the same time, the proportion with fair knowledge decreased from 16 (40%) to 3 (7.5%), while the proportion with poor knowledge decreased from 6 (15%) to 1 (2.5%). Thus, the intervention was accompanied by a marked shift from lower knowledge categories toward the good knowledge category. The Wilcoxon signed-rank test also demonstrated a statistically significant difference between pretest and posttest knowledge scores ($Z = -5.14$; $p < 0.001$), with a large effect size ($r = 0.81$) (Table 3). These findings indicate that the intervention was associated with a substantial improvement in maternal knowledge (Permatasari et al., 2021).

The magnitude of improvement observed in this study is comparable with findings from other maternal nutrition education programs, although direct comparisons should be interpreted cautiously because different studies used different instruments, scoring systems, and intervention formats. Fauzah et al. reported that the proportion of mothers with good knowledge regarding balanced nutrition increased from 2.1% to 75.3% after nutrition counseling among 97 mothers in Cirebon Girang. This represents a 73.2-percentage-point increase, which was larger than the 45-percentage-point increase in the good-knowledge category observed in the present study. Nevertheless, both studies demonstrated a significant improvement in maternal knowledge following nutrition education (Fauzah et al., 2023). Similarly, Jannah et al. reported an increase in the mean maternal nutrition knowledge score from 18.5 to 19.63 following nutrition education combined with demonstrations, with a statistically significant difference between pretest and posttest scores (Jannah et al., 2022). These findings support the potential effectiveness of combining nutritional information with an educational approach that allows participants to engage with practical examples.

The improvement observed in the present study may also be explained by the practical component of the intervention. The program did not rely solely on verbal delivery of nutritional information but combined nutrition education with hydroponic farming training. From an adult learning perspective, adults tend to learn more effectively when new information is relevant to their existing needs, connected to real-life problems, and accompanied by opportunities for active participation and application. Experiential learning allows participants to connect theoretical information with direct experience, thereby strengthening the relationship between knowledge and practical application. Recent literature on adult learning emphasizes experiential learning and active participation as important approaches for adult education (Dillard and Collins, 2024). In the context of this study, mothers were not only introduced to the concept of balanced nutrition but also exposed to a practical method of producing vegetables through hydroponic cultivation. This combination may have made the educational material more concrete and relevant to participants' daily lives than a lecture-based approach alone.

The practical component may be particularly important because hydroponic farming provides an opportunity to connect nutrition education with household food production. Community-based hydroponic education programs have similarly reported improvements in participants' understanding of hydroponic cultivation and the health benefits of hydroponically grown vegetables. Nurmahmudah et al. reported increases in participants' understanding of hydroponic farming and the health benefits of hydroponic vegetables after a community empowerment program (Nurmahmudah et al., 2024). Other community programs have also demonstrated improvements in knowledge and skills following hydroponic training involving demonstrations and direct practice (Nurbaity, 2024). Therefore, the practical nature of hydroponic training may provide an additional learning stimulus beyond the delivery of nutritional information alone.

Participant characteristics may also have contributed to the findings. In the present study, most respondents had completed upper secondary education (87.5%), while 12.5% had completed college education (Table 1). A relatively high level of formal education may facilitate the ability to receive, understand, and process health information. However, formal education should not be considered the sole explanation for the observed improvement because the intervention itself was followed by a substantial change in knowledge scores. The

findings suggest that nutrition education can still provide additional knowledge even among mothers who already possess relatively adequate formal educational backgrounds (Prasetyo et al., 2023). Previous evidence also indicates that maternal education and nutrition education are important factors associated with maternal nutrition knowledge and child nutrition outcomes.

The findings have practical implications for community-based public health programs at the village level. Nutrition education could be integrated into existing community health activities, such as Integrated Health Post or other village-based health promotion programs, and complemented with practical household food-production activities. Hydroponic cultivation may be particularly relevant where household land is limited because it can provide an alternative method for producing vegetables in small spaces. Community-based hydroponic programs have demonstrated potential to improve knowledge, skills, and the utilization of limited household space for food production (Nurmahmudah et al., 2024). Such integration could strengthen nutrition promotion by moving beyond information delivery toward practical community empowerment.

However, the findings should be interpreted within the limitations of the study design. The study used a one-group pretest-posttest design without a control group; therefore, the observed improvement cannot be attributed exclusively to the intervention because other factors, such as exposure to information from outside the program or repeated exposure to the questionnaire, may also have contributed to the change. In addition, the study assessed knowledge rather than dietary behavior, actual vegetable consumption, or child nutritional status (Prasetyo et al., 2023). Therefore, the improvement in knowledge should not be interpreted as direct evidence of improved dietary practices or nutritional status. Future studies should consider longer follow-up periods and assess whether improvements in knowledge are translated into changes in household food practices, vegetable consumption, and child nutritional outcomes.

CONCLUSION

Nutrition education through hydroponic farming training was associated with a statistically significant improvement in mothers' knowledge regarding balanced nutrition in Sambirejo Village. The proportion of mothers with good knowledge increased from 45% before the intervention to 90% after the intervention, with a significant difference between pretest and posttest knowledge scores ($p < 0.001$). However, because this study used a one-group pretest-posttest design without a control group and assessed knowledge only, the findings should be interpreted cautiously and cannot be generalized to behavioral changes, practical skills, or infant nutritional outcomes.

STUDY LIMITATIONS

This study has several limitations. The absence of a control group limits the ability to attribute the improvement in knowledge solely to the intervention, as testing and Hawthorne effects cannot be excluded. The immediate posttest assessment and the small purposively selected sample of 40 mothers from a single village limit the assessment of long-term knowledge retention and the generalizability of the findings. In addition, only knowledge was measured, while attitudes, behaviours, practical skills, and infant nutritional outcomes were not assessed.

RECOMMENDATIONS

Future studies should use controlled designs with larger and more representative samples and longer follow-up periods to assess the sustained effects of the intervention. Further research should also evaluate attitudes, behaviours, practical hydroponic skills, vegetable consumption, and infant nutritional outcomes. At the community level, nutrition education combined with hydroponic activities may be considered as a complementary approach to village-

based health promotion, pending confirmation from larger controlled studies.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest related to the conduct, analysis, or publication of this study.

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