Empowering Health Cadres Through Smartkelor Kids For Early Childhood Diabetes Prevention And Digital Economic Development Using Local Plants

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Abstract.
Diabetes Mellitus (DM) is a chronic metabolic disease characterized by high blood sugar levels resulting from impaired insulin production or function.(1) Although the prevalence of DM is more commonly reported in adults, the rise in obesity and unhealthy lifestyles among children puts them at risk of developing DM from an early age (2). Data from Indonesia show an upward trend in the incidence of diabetes among children, in line with global trends. Recent reports indicate that by 2025, the number of children with type 1 diabetes mellitus (type 1 DM) in Indonesia will approach 2,000 cases, with a consistent increase in new cases each year since 2022. This situation reflects the increasing burden of diabetes among children and adolescents, which requires special attention within the healthcare system (3). Recent studies confirm that the rise in Type 1 DM cases among children in Indonesia is influenced not only by biological factors but also by access to healthcare services and public awareness of the early symptoms of diabetes in children (4). Tanah Bumbu Regency has a relatively high number of DM patients based on local health administrative data. The high prevalence of DM in the general population and the increasing number of participants in noncommunicable disease screenings indicate potential risks that may also affect the pediatric population (Tanbu Health Office, 2025). Based on interviews and observations conducted in Binawara Village, it was found that cases of diabetes mellitus (DM) in children are still largely not identified early, either by parents or healthcare workers. Interview results indicate that most parents do not yet understand the risk factors for DM in children—such as high sugar intake, lack of physical activity, and family history—so early symptoms are often dismissed as normal conditions. Field observations also reveal limitations in routine DM screening for children; this situation has the potential to cause delays in diagnosis and treatment, which could ultimately increase the risk of long-term complications. Therefore, more structured promotive and preventive efforts are needed through improved health education and strengthening the role of community health centers and community health workers in the early detection of diabetes in children.
Keywords: *Diabetes, Smartkelor Kids and Digital economy.*

I. INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic disease characterized by high blood sugar levels due to impaired insulin production or function.(1)Although the prevalence of DM is more often reported in adults, the phenomenon of obesity and unhealthy lifestyles in children places them at risk of developing DM from an early age.(2)Data in Indonesia shows an increasing trend in the incidence of diabetes in children, which is in line with the global phenomenon. The latest report shows that by 2025 the number of children with type 1 diabetes mellitus (type 1 DM) in Indonesia has approached 2,000 cases, with a consistent increase in new cases every year since 2022. This condition reflects the increasing burden of diabetes in the child and adolescent age group, which requires special attention in the health care system.(3).The latest study confirms that the increase in cases of type 1 diabetes in children in Indonesia is not only influenced by biological factors, access to health services, and public awareness of the early symptoms of diabetes in children.(4)Tanah Bumbu Regency has a relatively high number of DM sufferers based on regional health administrative data. The high prevalence of DM in the general population and the increasing number of participants in non-communicable disease screening indicate a potential risk that can also impact the pediatric age group. (Dinkes Tanbu, 2025). Based on the results of interviews and observations conducted in Binawara Village, it was found that the incidence of Diabetes Mellitus (DM) in children is still not widely identified early, either by parents or health workers. The results of the interviews showed that most parents

do not understand the risk factors for DM in children, such as high sugar consumption patterns, lack of physical activity, and family history, so that initial complaints are often considered a normal condition. Field observations also show that the limitations of routine DM screening in children have the potential to cause delays in diagnosis and treatment, which ultimately can increase the risk of long-term complications. Therefore, more structured promotive and preventive efforts are needed through increased health education and strengthening the role of community health centers and cadres in early detection of DM in children.

The Head of the Health Cadre, Jauhar Latifah, Binawara Village, stated that several fundamental problems still arise in the implementation of health cadre organization activities. These problems include limited knowledge of cadres, especially regarding Diabetes Mellitus (DM), who have not kept up with the latest information and innovations. As well as the unstable economic conditions of the village community. Health knowledge while improving entrepreneurial skills based on local potential.(8)The proposed program is in the form of implementing digital literacy technology by utilizing the wealth of local plants.(9), particularly moringa, as a basis for developing agribusiness-based digital businesses. Through digital literacy training, health cadres and their families are equipped with the skills to process, package, and market moringa products and other local plants.(10)Furthermore, this approach not only contributes to health promotion and prevention efforts, particularly in reducing the risk of diabetes in rural youth through the consumption of low-sugar functional foods, but also opens up new economic opportunities beyond conventional agricultural patterns.(11). Product innovations in the form of low-sugar moringa biscuits, sugar-free moringa pudding/jelly with Stevia, and halal-labeled moringa drinks are expected to become new sources of income while increasing the cash flow of village health cadres. Furthermore, this activity provides strategic benefits for university lecturers and students in accordance with the achievement of the 8 Key Performance Indicators (IKU) of Higher Education set by the government. For lecturers, this activity provides experience in off-campus activities (IKU 3) and allows lecturers' research results related to digital literacy and public health to be directly utilized by the community in solving real-life problems (IKU 5). Meanwhile, for students, this program provides a learning platform and off-campus experience (IKU 2) that can be converted into the Independent Learning Campus (MBKM) scheme with a load of 6 credits, consisting of Entrepreneurship Courses (2 credits) and Community Service Lectures (4 credits)].

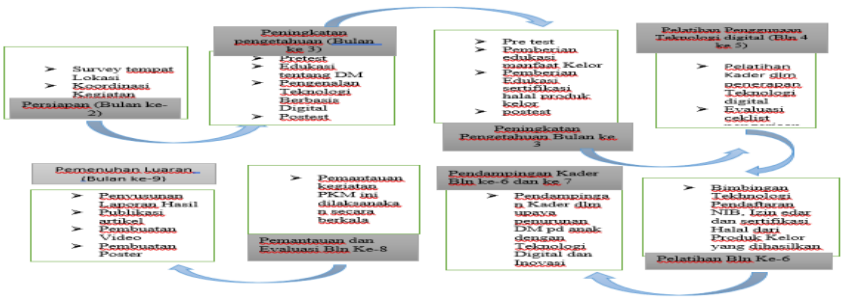
II. METHOD

This Community Service (PkM) activity was carried out atBinawara Village, Kusan Hulu Districtwith the aim of empowering health cadres through programsSmartKelor Kidsas an effort to prevent diabetes in children early and strengthen the digital economy based on the use of local plants (moringa). The method of implementing the activity is designed in stages and systematically as follows:

A. Time and Place: PkM activities are carried out for 8 (eight) months, taking place in the Binawara Village Health Cadre hall and community assistance locations that have been agreed upon with partners.

B. Target Audience: The target audience for this activity is the 30 Binawara Village Health Cadres, who act as agents of change in the early prevention of childhood diabetes and drivers of the local plant-based digital economy.

C. Method of Community Service:The methods of service in this activity are:



1. Preparation Stage

a) Field Survey: At this stage, the proposing team conducted a direct survey in Binawara Village to identify children's health conditions, community consumption patterns, the potential of Moringa plants, and the readiness of cadres in implementing the SmartKelor program.*Kids. The survey was conducted through observation and discussions with cadres and community leaders to explore the problems faced.*

b)Coordination and Licensing:The proposal team coordinated with the university regarding the issuance of the community service assignment letter. Afterward, permits were obtained from the village government and the local health cadre leader. Further coordination was conducted with partners to agree on the schedule, implementation techniques, and cadre commitment to participate in all activities. At this stage, the participation of health cadres as partners is realized in granting permission to carry out activities, determining the time of activities, and gathering cadres who are committed to following the program until completion.

2. Core Activity Stage

The core stage of the activity is carried out through10 meetings over 6 months, which has been agreed upon with partners at the coordination stage.

a)Improving Cadre Knowledge: Knowledge-building activities are divided into two main focuses, namely: 1) Early prevention education for diabetes in children, including recognition of risk factors, healthy eating patterns, and active lifestyles for children. 2) Introduction to the programSmartKelor Kids, namely a technology-based reminder and education innovation that utilizes the Moringa plant as a functional food for preventing diabetes. The activity began withpre-testto measure the initial knowledge of the cadres. Next, material is provided by competent speakers using presentation media (PowerPoint) and interactive discussions. This stage is carried out atfirst and second monthswith allocation**3 meetings**.

SmartKelor Kids Implementation Training and Local Product Development

At this stage, cadres are trained in using SmartKelor Kids as a medium for educating and monitoring children's health. They are also trained in processing moringa-based products (such as biscuits or healthy snacks for children) to prevent diabetes and increase economic value. The activity is complemented by:digital economy technical guidance. includes: Business Identification Number (NIB) Registration, Distribution Permit and Halal Certification Management, Digital Marketing Strategy through Social Media and Marketplaces. The training method is carried out in a hands-on manner.interactive and participatorywith lectures, group discussions, simulations, roleplays, video screenings, and hands-on practice. This stage is carried out inthird and fourth monthswith3 meetings.

C)Cadre Mentoring The proposal team provided direct assistance to cadres in implementing childhood diabetes prevention education for the community and implementing SmartKelor Kids for parents and children. This assistance was provided on an ongoing basis, with the team acting as a facilitator in helping resolve both technical and non-technical issues. The assistance phase was implemented atfifth and sixth monthswith4 meetingsAt this stage, cadres are expected to be able to: Providing independent health education to the community, Implementing SmartKelor Kids sustainably**,**Developing moringa products as a source of digital economy for cadre groups.

3. Evaluation of Program Implementation

Activity evaluation is conducted continuously through a monitoring process from the beginning to the end of the activity. The evaluation aims to assess the program's achievement according to the established plan.(8)with the following methods: a) Evaluation of increasing cadre knowledge is carried out through***pre-test***And***post-test***related to the material on preventing childhood diabetes and SmartKelor Kids. b) Evaluation of the training on the implementation of SmartKelor Kids and moringa products was carried out throughskills checklist, product quality (taste, packaging, and shape), and digital marketing capabilities. c) Evaluation of cadre mentoring is carried out through pre-tests and post-tests for the target community to assess the increase in understanding after education by the cadres.

4. Program Sustainability

Based on the evaluation results and input from health cadres, the data obtained will be processed to inform further program development. Partners are expected to continue actively implementing SmartKelor Kids for early childhood diabetes prevention and developing moringa-based businesses through digital platforms, even after the Community Empowerment Program (PKM) has concluded.

III. ACTIVITY RESULTS

Community service activities with the title "Empowering Cadres Through SmartKelor Kids for Early Prevention of Childhood Diabetes and Improving the Digital Economy based on local plants." This was carried out in Binawara Village, Kusan Hulu District. The partners selected for this activity were the Bunga Tanjung health cadres of Binawara Village, totaling 30 active health cadres in advancing health in the Binawara Village area in particular, the following are the characteristics of the Bunga Tanjung health cadres:

Table 1. Job biography of Bunga Tanjung health cadres

No	Work	Amount	presentation
1	Housewife	15	50%
2	Self-employed	3	10%
3	Farmer	12	40%

This community service activity was carried out at the Binawara village office and was carried out in five activity methods. Starting with an observation of existing problems in the village, the main problem was found to be Diabetes in Children which is still high in the village. On the other hand, the village has natural potential, namely Moringa Leaf plants, so this activity focuses on reducing Diabetes in Children by implementing digital-based SmartKelor technology and optimized with innovative management of Moringa Leaf products with high economic and nutritional value, the results of this activity are as follows:

1. Coordination between the head of the implementation team and the head of Binawara village and partners with an effort to coordinate the activity schedule for 8 (eight) months of implementation divided into five stages.
2. Increasing knowledge about Diabetes education in children

The next stage is providing education on Diabetes in Children to the Bunga Tanjung health cadres of Binawara Village, providing this education as an effort to increase the knowledge of health cadres about preventing Diabetes in Children and providing re-education to the Binawara Village community in overcoming Diabetes problems, at this stage it is divided into three sessions namely by providing a pretest related to Diabetes before being given material followed by providing material by experts and ending with a posttest to see the achievement of understanding by partners. This education utilizes audiovisual media in relation to Diabetes prevention, namely, audiovisual media such as videos and animations can be used to provide education and information to partners so that partners can easily understand it. The results of increasing community knowledge are as follows:

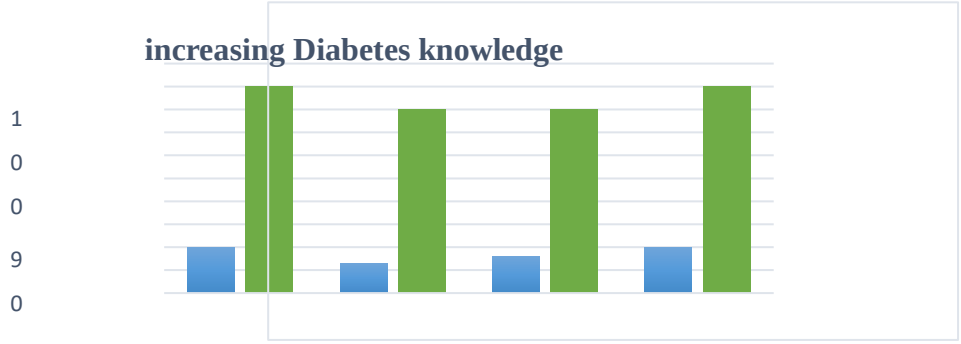


Fig 1. Results of increased knowledge of Diabetes.

3. Introduction of SmartKelor technology to cadres

TechnologySmartKelor Kids is the development and implementation of the research results of the proposing team which integrateschildren's health education, early detection of diabetes risk, and

empowerment of the digital economy based on local plants (especially moringa)**.**This technology usestwo-way communication systembetween the proposal team, health cadres, and the target community (parents with elementary school-aged children). Cadres serve as a liaison (extension) between the system and the community in the target area.

This SmartKelor digital technology is an implementation of the research the proposing team has done, this technology uses a two-way communication system. In providing this education, partners are given leaflets and ppt materials containing links in the SmartKelor application, the explanations given are: (1) On the front page of the login display, (2) The second display of Diabetes Prevention Information in Children, and Contact Information & Location of Darul Azhar Health College (3) a. About Diabetes in Children, b. Healthy Nutrition for Children, c. Moringa Leaf Processing, d. and Blood Sugar Monitoring.

4. Training and mentoring for diversification of processed Moringa leaf products

In the next implementation stage, partners were provided with material on the health benefits of Moringa leaves and their nutritional content. The local Moringa oleifera plant is a locally sourced innovation that supports the management of diabetes mellitus (DM) in children by lowering blood glucose levels.(15)Several studies have shown that M. oleifera contains flavonoids, polyphenols, vitamins, and antioxidants that play a role in reducing blood sugar levels.(16). in prediabetic subjects reported that administration of Moringa leaves significantly reduced fasting blood sugar levels, and as a complementary therapy plant.(17). In addition, research(18)In this activity, Moringa is processed into child-friendly products such as powder, biscuits, and Moringa leaf jelly. Moringa Jelly Composition: Moringa leaf powder, Konjac powder, jelly powder, low-calorie sugar (Stevia), water, nitric acid, food-grade sodium benzoate (according to BPOM). Nutritional Components: Energy ± 80-120 kcal, protein ± 2-4 g, carbohydrates ± 15-20 g, dietary fiber ± 3-5 g, Vit C ± 15-30 mg, Calcium ± 120-180 mg, Iron ± 2-4 mg. The economic benefits arising after this production are as a healthy food alternative to help control children's blood sugar levels. As well as being a solution for the formation of locally based micro-businesses, increasing community income, encouraging community economic independence, and optimizing the potential of local plants.

5. Halal certification mentoring training

The next activity after the Moringa Leaf innovation product was produced, the PkM team provided assistance with halal certification registration, which began with providing material on the requirements for halal product registration. The basic legal basis for halal product guarantees is contained in Law No. 1945 Article 29 paragraph (2). As it develops, labeling is no longer to indicate pork-based products, but to indicate that the product is a halal product by including a halal logo. The authorized institution to grant permission for the inclusion of halal labels is the Food and Drug Supervisory Agency (BPOM). Certification and labeling are two interrelated things. A halal certificate issued by the MUI is a requirement for including a halal logo or label on a product, so it is important for business actors in halal registration.

IV. DISCUSSION

Technology and Innovation Products (Hard and Soft)

The implementation of PkM that the team has implemented applies technology and innovation to the problems that exist in partners, namely the Bunga Tanjung health cadres of Binawara Village, the existing technology is as follows:

1. **SmartKelor Technology**

This SmartKelor digital technology is an implementation of the research the proposing team has done, this technology uses a two-way communication system. In providing this education, partners are given leaflets and ppt materials containing links in the SmartKelor application, the explanations given are: (1) On the front page of the login display, (2) The second display of Diabetes Prevention Information in Children, and Contact Information & Location of Darul Azhar Health College (3) a. About Diabetes in Children, b. Healthy Nutrition for Children, c. Moringa Leaf Processing, d. and Blood Sugar Monitoring.

2. Innovation of Local Moringa Plants

The local plant Moringa oleifera (moringa) as a local resource-based innovation in supporting the management of Diabetes Mellitus (DM) in children through a mechanism for reducing blood glucose levels.(15)Several studies have shown that M. oleifera contains flavonoids, polyphenols, vitamins, and antioxidants that play a role in reducing blood sugar levels.(16). in prediabetic subjects reported that administration of Moringa leaves significantly reduced fasting blood sugar levels, and as a complementary therapy plant.(17). In addition, research(18)In this activity, Moringa is processed into child-friendly products such as powder, biscuits, and Moringa leaf jelly. Moringa Jelly Composition: Moringa leaf powder, Konjac powder, jelly powder, low-calorie sugar (Stevia), water, nitric acid, food-grade sodium benzoate (according to BPOM). Nutritional Components: Energy ± 80-120 kcal, protein ± 2-4 g, carbohydrates ± 15-20 g, dietary fiber ± 3-5 g, Vit C ± 15-30 mg, Calcium ± 120-180 mg, Iron ± 2-4 mg. The economic benefits arising after this production are as a healthy food alternative to help control children's blood sugar levels. As well as being a solution for the formation of locally based micro-businesses, increasing community income, encouraging community economic independence, and optimizing the potential of local plants.

Application of Technology and Innovation to the community (Relevance and Community Participation)

In implementing this PkM, the team provided the application of technology and innovation to partners as follows:

Introduction to Technology and Innovation to Partners	**Relevance of Technology and Innovation**	**Participation Public**	**Information**
Technological aspects			
Implementation of SmartKelor technology	Skill enhancement partnersse en from the skills in usageSma rtKelor application	Partners actively participated in the activities as seen from the attendance of more than 80% of the total partners and as seen from the skills checklist provided by the team. to partners	)% Implemented
Innovation Aspects			
Moringa Jelly	Skill enhancement partners in makeinn ovation of halal jelly products made from Moringa Leaves in In making this Jelly, partners are trained to manage finances. in the organization	Partners actively participated in successfully creating pineapple biscuit innovations.	100% Implemented

1. Impact (Benefits and Productivity)

In the implementation of this PkM in the application of technology and innovation, the benefits and productivity obtained by the Bunga Tanjung health cadres of Binawara Village are as follows:

2. Implementation of SmartKelor technology

a. There is an increase in knowledge of using technology from applications

b. There are skills in processing data based on the system

c. Improved management in the Diabetes database

d. Remote monitoring of the community in managing diabetes reduction.

3. Application of Moringa Jelly innovation

a. There is a superior product from the Bunga Tanjung health cadre of Binawara Village, namely Moringa Jelly.

b. There is an increase in the income of health cadres

c. Increased knowledge in partner cash management

d. Improvement of skills in marketing.

V. CONCLUSION

This community service activity has been carried out according to the planned method, which began with coordination between the implementation team leader and the Binawara village head and Bunga Tanjung health cadre partners, followed by the provision of materials to improve skills. After the provision of materials, the partners were then given training and mentoring in the application of SmartKelor and Jelly Kelor innovation technology. The results of the knowledge improvement can be concluded that there is an increase in knowledge and skills of partners in managing the reduction of Diabetes in Children, especially in Binawara village. In the future, it is hoped that the results of this activity can serve as an example for managing Diabetes problems in Indonesian Children, especially in Binawara Village, Kusan Hulu District.

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