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Development of scoring application model and community-based total sanitation education (SESAMA) on stunting prevention behavior

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Abstract

Background: Nutritional Status Data Collection, the incidence of stunting in Indonesia is still high, same thing occurred in Bengkulu Province. The government has set total sanitation based community (STBM) as one of the intervention sensitive reduce stunting but Not yet successful. Knowledge, attitude low influential to behavior about hygiene sanitation including BABS. For That technology strategy is needed information For area remote through Application model development Scoring and Education Total sanitation based on SOCIETY (PEOPLE).
Purpose: To develop Android -based SESAMA model design for behavior prevention of stunting in toddlers.
Method: A quasi- experimental approach, specifically focusing on control group approach. The study took place from April to November 2024, in Enggano Island, North Bengkulu Regency. Using purposive sampling and the Isaac & Michael formula, 80 participants were selected and divided into two groups: 40 in the SESAME application model and 40 in the conventional health promotion, who met specific inclusion and exclusion criteria. The data was analyzed following a step-by-step process, beginning with a normality test using the kolmogorov smirnov test. With p-values greater than 0.05, the data was determined to follow a normal distribution. The analysis proceeded with a univariate test to determine the frequency distribution of participants characteristics, followed by bivariate analysis using wilcoxon, mann whitney, spearman rank and mancova.
Results: The MANCOVA test results indicate a significant effect of the SESAMA application model intervention on mothers knowledge, attitudes, and behavior regarding stunting prevention. This is evidenced by a p-value of 0.000, which is smaller than the α value of 0.05 at a 95% confidence level.
Conclusion: The Android-based SESAMA application has been validated as a valid, feasible, and effective tool for improving mothers' knowledge, attitudes, and behaviors regarding stunting prevention among children. The intervention significantly influenced these outcomes, addressing challenges in delivering education in isolated areas, particularly on hygiene and sanitation behaviors.

Keywords: Android; Applications; Sanitation; Stunting.

INTRODUCTION

The young generation as the successor of the nation's ideals must have optimal human resource quality. To support this, the guidance and development of the younger generation must be carried out in an integrated manner and started as early as possible. If Indonesia's young generation does not have optimal human resource quality, the Indonesian nation will become a weak nation in the future. Therefore, the growth and development of the younger generation must be a shared responsibility between parents, families, communities and governments aimed at improving the quality of the

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younger generation (Aisyah, & Ningrum, 2023). One of the factors that must be considered in growth and development is nutrition, which is the main foundation for the development of cognitive, motor and socio-emotional skills throughout childhood to adulthood (Mulyanti, Setiawan, & Zahara, 2021).

Stunting is a condition where a person's height is shorter than the height of others in general who are the same age. Stunting is caused by a lack of nutritional intake received by the fetus or baby in the womb and in the early days of the child's birth. Patients stunting new seen when the child is 2 years old. The lack of nutritional intake received by babies is also caused by the mother lack of knowledge about nutritional health before and during pregnancy and after the mother gives birth (Najah, & Darmawi, 2022).

Factors causing stunting consist of direct and indirect factors. Direct factors of stunting are the nutritional status of pregnant women, infectious diseases, and toddler nutrition, while indirect factors can occur from various aspects (Pibriyanti, Suryono, & Luthfi, 2019). One of the indirect factors that cause stunting is water, sanitation and hygiene(WASH), namely drinking water sources, physical quality of drinking water, latrine ownership and hygiene, namely hand washing habits. Another environmental risk factor is about waste processing. Some of these components must be met, so that morbidity and the number of nutritional problems can be reduced, one of which is stunting, namely nutritional problems that can arise due to unhealthy environmental sanitation (Abdullah, & Sari, 2017).

Nutrition is a very important factor for growth and development. Optimal growth and development requires adequate and complete nutrition that contains all the nutrients needed by the body. The most critical period of a child's growth and development is in the first thousand days of life (1000 HPK), namely 270 days in the womb, and 730 days after birth (0-2 years).This period is called the golden period, where the child's growth is very rapid (Novira, 2020). Environmental factors can indirectly affect the incidence of stunting. Environmental health is a condition or state of the optimum environment that has a positive effect on the realization of optimum health status as well. The scope of environmental health include: disposal of human waste (feces), water supply, clean, garbage disposal, disposal of dirty water (waste water), and hygiene behavior. The poor state of the environment and hygiene allows infectious diseases such as diarrhea and respiratory tract infections to occur so that they can cause stunting (Aulia, Nurjazuli, & Darundiati, 2021).

Access to sanitation is said to be feasible if it meets health requirements including equipped with goose neck type toilet facilities with septic tanks that are used alone. Aspects of sanitation, drinking water sources, and hygiene behavior are more sensitive in increasing child growth than infectious diseases such as diarrhea. The higher the quality of sanitation, water and hygiene will increase from 0.1 to 0.6 SD points in TB/U anthropometric measurements. Low sanitation and hygiene will trigger digestive disorders that affect nutrients for growth to turn into body resistance in the face of infection so as to allow cases of stunting in toddlers (Gita, Surya, & Setyaningsih, 2023).

The incidence of stunting in Indonesia is 24.4 %, Bengkulu Province 26.86%, North Bengkulu Regency 27.62%. The target for reducing stunting in 2024 is 14%. One of stunting locus on the island outermost namely Meok Village Subdistrict reluctant. Stunting has an effect to ability cognitive, non-verbal IQ is higher low 4.57 times. Lack of basic sanitation covering drinking water quality, clean water, feces disposal, waste, hazardous waste to infectious disease diarrhea and worms, this causes impaired absorption of nutrients so that causes stunting. Government has set total sanitation based society one of intervention sensitive reduce stunting but data shows cases of Open Defecation (BABS) in Indonesia amounted to 41.2%, in Bengkulu Province 26.8% (Nugraheni, Yorita, Pravita, & Asih, 2023).

Knowledge, attitudes low influential to behavior about hygiene sanitation including BABS. Educational media fridge magnet series, videos can be increase knowledge and attitude about hygiene sanitation However his weakness too small, bored, power accept not yet researched, depending source, no effective for area retention power health low. Scorecard detection stunting risk only load risk midwifery and nutrition. Technology information for

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area remote must done (Hamdin, Hamid, & Nurhayati, 2023). Transformation mobile digital health, online can increase knowledge and awareness public about health However use in the field health environment still a little. Mobile health hygiene sanitation cholera sufferers increase knowledge, need developed for healthy individual. Therefore that technology strategy is needed information for area remote through Application model development Scoring and Education Total sanitation based on society (Marsalino, & Hidayat, 2024).

RESEARCH METHOD

A quasi- experimental approach, specifically focusing on control group approach. The study took place from April to November 2024, in North Bengkulu Regency. The independent variable was scoring application model and community-based total sanitation education (SESAMA) while the dependent variables is a stunting prevention behavior.

Using purposive sampling and the Isaac & Michael formula, 80 participants were selected and divided into two groups: 40 in the SESAMA application model and 40 in the conventional health promotion, who met specific inclusion and exclusion criteria. The inclusion criteria required mothers or caregivers of children under 5 years old, children in areas with high stunting rates, people who are willing to participate in the total community sanitation-based education program (SESAMA), participants who have access to a device to use the scoring application, individuals who can participate in the education and training designed in the program. While exclusion criteria involved mothers or caregivers who have cognitive or physical impairments that prevent them from participating in the education program, children who have severe health problems other than stunting that affect growth, areas without access to basic sanitation or facilities necessary for the intervention, participants who do not consistently follow the education and monitoring program.

Intervention SESAMA application model inquired create an app with sanitation education features, Score system, and behavior monitoring, involve participants (mothers/nannies) and provide training on the use of the application, participants use the app to access educational modules, receive reminders, and fill out behavior scores, collect and analyze behavioral data and validate changes in the field, compare the results before and after the intervention to refine the application, disseminate research results and adapt models for other communities.

Which was developed through stages ADDIE media development, first identify the needs, characteristics of the audience, and problems related to stunting prevention, design the application framework, user interface, and educational materials, create prototypes, expert consultations and initial trials, launch the app, train users, and distribute widely, evaluate the effectiveness of the application in a formative and summative manner, and then make revisions based on feedback, testing was carried out with using function, reliability, usability and performance tests with trial phase application.

The data was analyzed following a step-by-step process, beginning with a normality test using the kolmogorov smirnov test. With p-values greater than 0.05, the data was determined to follow a normal distribution. The analysis proceeded with a univariate test to determine the frequency distribution of participants characteristics, followed by bivariate analysis using wilcoxon, mann whitney, spearman rank and mancova. This research has obtained permission from the Research Ethics Committee of the Polytechnic Health Ministry of Health Bengkulu with number. KEPK.BKL/630/08/2024.

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RESEARCH RESULTS

Table 1. Characteristic of the Participants (n=80)

Variables	Results	
	SESAME Application (n=40)	Conventional Health Promotion (n=40)
Age (n/%)		
Risk	8/8.0	10/10.0
No risk	32/32.0	30/30.0
Number of children (n/%)		
Risk	23/57.5	21/52.5
No risk	17/42.5	19/47.5
Education (n/%)		
Low	11/27.5	14/35.0
High	29/72.5	26/65.0
Socio-economic (n/%)		
Low	27/67.5	24/60.0
High	13/32.5	16/40.0
Service life (n/%)		
Poor	30/75.0	26/65.0
Good	10/25.0	14/35.0
Employment (n/%)		
Employe	13/32.5	14/35.0
No employe	27/67.5	26/65.0
Knowledge (Median (Mean±SD)(Range))		
Before	6 (5.53±1.502) 2-8	6 (5.88±1.399) 3-9
After	8 (8.08±1.309) 5-8	7 (6.43±1.338) 3-9
Attitude (Median (Mean±SD)(Range))		
Before	36 (35.60±4.241) 22-45	40 (39.30±4.988) 23-49
After	39 (38.57±3.831) 31-48	40 (39.98±4.022) 30-47
Behavior (Median (Mean±SD)(Range))		
Before	11 (11.03±1.097) 9-13	11 (10.63±1.234) 7-13
After	16 (15.68±2.043) 10-19	11 (11.33±1.385) 9-14

Table 1 shows that in the SESAMA application group, the majority of participants (80%) are within the at-risk age category, with most children (57.5%) also categorized as at risk. A significant proportion of participants (72.5%) have low educational attainment, and the majority (67.5%) belong to a low socio economic status group. Additionally, most participants (75%) have limited access to information sources, and a substantial portion (67.5%) are unemployed. Similarly, in the conventional health promotion application group, the majority of

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participants (75%) fall within the at-risk age category, with a considerable proportion of children (52.5%) categorized as at risk. Most participants (65%) have low educational attainment, and a majority (60%) belong to a low socioeconomic status group. Furthermore, most participants (65%) have limited access to information sources, and a majority (65%) are unemployed. This data highlights the similarities in demographic characteristics between the two groups, particularly regarding age, education level, socioeconomic status, access to information, and employment status.

Shows that the SESAMA application group had higher post-intervention scores in knowledge (8.08) and behavior (15.68) compared to the conventional health promotion group, which scored 6.43 and 11.33, respectively. However, the attitude scores were similar between the two groups (38.57 vs. 39.98). These findings indicate the SESAMA application may have a greater impact on improving knowledge and behaviour

Table 2 Effectiveness of the SESAMA Application Model

Variables	SESAME Application			Conventional Health Promotion		
	Mean Rank	*p-value*	*Z*	*Mean Rank*	*p-value*	*Z*
Knowledge						
Before	12.75	0.000	4.949	16.17	0.041	2.041
After	19.36			18.96		
Attitude						
Before	9.67	0.000	4.784	16.88	0.273	1.097
After	19.30			17.08		
Behavior						
Before	0	0.000	5.329	9.71	0.089	1.703
After	19			11.64		

**Wilcoxon*

The SESAMA application model significantly improved knowledge (p = 0.000), attitude (p = 0.000), and behavior (p = 0.000) related to stunting prevention. In contrast, conventional health promotion only improved knowledge (p = 0.041) but was not effective in improving attitude (p = 0.273) or behavior (p = 0.089).

Table 3. Differences SESAMA Application Model and Conventional Health Promotion

Variables	Method	Mean Difference	*p-value*
Knowledge	SESAME application model	2.55	0.000*
	Conventional Health Promotion	0.55	
Attitude	SESAME application model	4.20	0.000**
	Conventional Health Promotion	0.68	
Behavior	SESAME application model	4.65	0.000*
	Conventional Health Promotion	0.65	

**Mann Whitney*

***Independent Sample T-Test*

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Table 3 indicates significant differences between the SESAMA application model and conventional health promotion groups in terms of knowledge, attitude, and behavior related to stunting prevention. The SESAMA application model showed a greater improvement, with mean differences of 2.55 for knowledge, 4.20 for attitude, and 4.6 for behavior, all with p-values = 0.000, indicating statistical significance ($p < 0.05$).

Table 4. The Influence of Educational Media on the SESAMA Application Model

Independent Variable	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	*P value*
SESAME application model	Attitude	80	1	80	24.018	0.000
	Knowledge	248.513	1	248.513	14.672	0.000
	Behavior	312.050	1	312.050	98.343	0.000

***** *Mancova*

Table 4 Shows that the MANCOVA test results indicate a significant effect of the SESAMA application model intervention on mothers knowledge, attitudes, and behavior regarding stunting prevention. This is evidenced by a p-value of 0.000, which is smaller than the α value of 0.05 at a 95% confidence level.

DISCUSSION

Analysis results obtained that after given SESAME application Model intervention obtained there is difference improvement significant knowledge, attitudes and behavior mother about prevention of stunting. That counseling using android media meaningful increase knowledge respondent there is significant difference between before and after done intervention using application prevent stunting in groups intervention with a p value of 0.005. application ceting can used as one of the digital media health education delivery about stunting (Febriana, 2024).

Educational media functioning for mobilize senses as much as possible to a object so that make it easier perception recipient information. The use of media will help to clarify the information conveyed, because can more interesting, more interactive, can overcome limitation space, time and senses human. So that the information conveyed can more clear and easy understood in accordance with the goal to be achieved used, material education can packed in accordance with characteristics from every media used (George, Monira, Zohura, Thomas, Hasan, Parvin, & Alam, 2021).

Mobile phone at the moment this no only functioning as means telecommunications, but has switch function become a capable android do lots thing. Giving education through interesting media means android based will make it easier someone do stimulation in a way independent Android is a comprehensive media so that become an effective media in education nutrition about stunting. Advantages education with application smartphone android based like existence convenience in notification,can with fast and easy access existing applications as well as in one time can do lots jobs applications with android can follow mobile based development technology now (Hidayat, Romawi, Wijayanegara, Garna, & Rachmiatie, 2021).

Health education media android based more effective compared to other media in increase knowledge and behavior related with stunting. This is in accordance with the theory put forward that Improvement the most senses channeling knowledge to brain is senses vision that is around 75-87%, while 13% through senses hearing and 12% of other senses. Visual media can help in reception information results of the literature review reveal that 24 studies were identified state reception application high *mobile* among user *mobile phone* (Rufaindah, & Patemah, 2021). Research it also states that mobile applications are considered as the way that can accepted in giving intervention health. However studies with amount sample big Still limited whereas potential use mobile application for help individual in change behavior health is very big (Yorita, Simbolon,

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Kurniawati, & Marsofely, 2019).

Health promotion with an educational approach is one of the efforts to improve a person knowledge.Health education is an effort made to influence others, whether individuals, groups, or communities, so that they do what is expected by the perpetrators of education. Health promotion media is one of the means that can be used to display messages or health information that you want to convey so that it can increase knowledge which is ultimately expected to change behavior towards positive or supportive health (Sulistiadi, 2019).

Different results obtained where given group conventional health promotion on variables knowledge influential in a way significant but on the variables attitudes and behavior no influential in a way significant. Conventional health promotion own lack that is no easy accessed and not there is notification, no can accessed the information if no there is health workers (Zagora, & Pantaleon, 2020). Parents knowledge can help improve nutritional status in children for reach maturity growth, knowledge that is not adequate, lack of understanding about habit eat well, and lack of knowledge regarding stunting determines attitudes and behavior mother in provide food for his son including the right type and amount for the child can grow and develop optimally (Wello, Safei, Juniarty, & Kadir, 2021).

Attitude mother against stunting is perception mother about the impact of stunting on toddlers who can produce attitude positive or negative from mother based on information received. Cognitive is component functional attitude for make evaluation to a object originating from from outside that will produce a the value to be combined from information that has been acceptable and affective is the feeling given to a things received based on results his assessment (Dongoran, Wahyudi, & Harahap, 2024).

Attitude mothers in the given group conventional health promotion no influential in a way significant . This is caused by the mother's level of education clown. Existence relation significant between mother's education level with behavior prevention of stunting these results show that factor knowledge own role more dominant compared to with formal education in influence action prevention of stunting in toddlers (Putri, 2021). Part big attitude less mother good due to because a number of mother have attitude that is not care to type food consumed by children, attitudes that are not care will health child own impact on nutritional status children, in addition mother no once bring child they to integrated health service post moment weighing so that mother no know development and growth child them, and their height trust Mother to the shamans in treat disease compared to health workers (Gita, Surya, & Setyaningsih, 2023).

Study results literature show that mother's education level impact on the degree health family because mother play a role important in pattern eat childstart from menu preparation, purchasing, preparation, to presentation food. Education that more tall make it easier somebody in receive and process information, including related nutrition. Parents educated tall often have demands high job, so available time for ensure intake nutrition child become limited. This is can influence consistency in practice giving food nutritious and monitoring health children, which has an impact on efforts prevention of stunting (Heni, Idaningsih, Wianti, & Setyawati, 2025).

Education with knowledge own closeness relationship, because the level of education of a person will relate with its vastness the person's knowledge. Does not have sufficient knowledge about nutrition his family no will guarantee parents have low education. The desire to high tofu will influential in to obtain knowledge about giving suitable food for child. Results of analysis in research say that education with parental knowledge toddler about stunting has connection (Julianti, Chifdillah, & Ardyanti, 2023).

As well as with behavior prevention of stunting is also not influential in a way significant after given intervention Health promotion. This is because social level economy influence ability family for sufficient need substance nutrition toddler, beside that condition social economy also influences the election type food additional and time giving the food as well as habit life healthy (Kasjono, & Suryani, 2023). This has a big influence to incident toddler stunting. Low economic status cause inaccessibility in fulfillment nutrition everyday life which ultimately determines

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economic status own effect significant to incident malnutrition. Toddlers who come from from family with economic status low own 2 times risk of experiencing stunting compared to toddler from family with economic status tall (Idris, & Sari, 2023).

CONCLUSION

The Android-based SESAMA application has been validated as a valid, feasible, and effective tool for improving mothers knowledge, attitudes, and behaviors regarding stunting prevention among children. The intervention significantly influenced these outcomes, addressing challenges in delivering education in isolated areas, particularly on hygiene and sanitation behaviors.

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