

The Use of Booklet and “SIGAP ANAK” Application for Education on Early Detection of Pneumonia in Children Under Five

Ely Mawaddah^{1*}, Mira Utami Ningsih², Aan Dwi Sentana³, Novi Enis Rosuliana⁴, Dini Mariani⁵, Irwan Suriadi⁶

¹Nursing Departement, Poltekkes Kemenkes Mataram, Indonesia; ²Nursing Departement, Poltekkes Kemenkes Mataram, Indonesia; ³Nursing Departement, Poltekkes Kemenkes Mataram, Indonesia; ⁴Nursing Department, Poltekkes Kemenkes Tasikmalaya, Indonesia; ⁵Nursing Department, Poltekkes Kemenkes Tasikmalaya, Indonesia; ⁶Universitas Mataram, Indonesia

Abstract

Citation: Mawaddah E, Ningsih MU, Sentana AD, Rosuliana NE, Mariani D, Suriadi I. The Use of Booklet and “SIGAP ANAK” Application for Education on Early Detection of Pneumonia in Children Under Five. Open Access Maced J Med Sci. 2025 Dec 15; 13(4):203-207. https://doi.org/10.3889/oamjms.2025.11999

Keywords: Pneumonia; Children; Booklet; Application; Knowledge

*Correspondence: Ely Mawaddah, Nursing Departement, Poltekkes Kemenkes Mataram, Indonesia
E-mail: elymawaddah@gmail.com

Received: 01-Dec-2024

Revised: 06-Apr-2025

Accepted: 11-Sep-2025

Copyright: © 2025 Ely Mawaddah, Mira Utami Ningsih, Aan Dwi Sentana, Novi Enis Rosuliana, Dini Mariani, Irwan Suriadi.

License: This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0)

Funding: This research received financial support from the Ministry of Health of the Republic of Indonesia

Competing Interests: The authors have declared that no competing interests exist

BACKGROUND: Pneumonia is a leading cause of morbidity and mortality among children under the age of five around the world particularly in developing countries where access to healthcare is limited. Regular monitoring of children for symptoms is crucial for early detection of pneumonia. Education about pneumonia detection in parents and caregivers is crucial for prevention and lowering mortality rates.

METHOD: This study used a RnD (Research and Development) design, in which SIGAP ANAK application and booklet were developed as educational media for early detection of pneumonia. The population for this study consisted of mothers under the age of five at rural area and total of 120 mothers were divided into two groups and assigned randomly. Data collection was carried out using a questionnaire developed and evaluated for validity and reliability to determine the level of parental knowledge about pneumonia detection in children under five. Additionally, Wilcoxon and Mann-Whitney tests were used to analyze data.

RESULTS: The results showed that the control group average before receiving education using booklet was 16.78, while the average after education was 17.93. With the use of SIGAP ANAK application, the average knowledge before and after the intervention was 15.62 and 17.38 respectively. Based on the Wilcoxon test result, education using booklet and “SIGAP ANAK” application significantly affected knowledge about pneumonia p-value = 0.00 ($p < 0.05$). However, based on the Mann Whitney test result there was no difference between the intervention and control groups p-value = 0.149 ($p > 0.05$).

CONCLUSION: The SIGAP ANAK application and booklet can be used to provide education about early detection of pneumonia for mothers with children under five in rural area.

Introduction

Pneumonia remains a global health concern, particularly for children under five, and is the primary cause of infection-related mortality. In 2019, pneumonia was estimated to have caused 740,180 deaths among toddlers, accounting for 14% of all deaths in this age group [1]. It is characterized by inflammation of the lung parenchyma with consolidation of the alveolar space. Furthermore, the signs and clinical manifestations of pneumonia in children under five years old vary depending on the causal agent, children age, the systemic infection response, the number of lesions, as well as the degree of bronchial and bronchiolar blockage [2]. For example,

coughing, trouble breathing, sore throat, runny nose, fever, and sore throat ear are also some of the initial symptoms. Pneumonia sufferers also have fluid and pus in alveoli, which makes breathing harder and requires the use of accessory respiratory muscles to supply oxygen [3]

Rural areas have a strong contextual effect on pneumonia among children under five. Nutritional status, immunization status, length of nursing, environment (both indoor and outdoor), ventilation, density housing, fuel type, and smoking behaviors are all closely linked to pneumonia [4]. The presence of children in the kitchen when cooking increases the risk of pneumonia in children under five often found in rural areas. This causes rural communities to need to be

exposed education about early detection pneumonia. Early detection of pneumonia in children is crucial in improving outcomes and preventing complications. Recognizing the signs and symptoms such as high fever, rapid breathing, and chest pain early on can lead to prompt treatment and better recovery. Educating parents on the importance of seeking medical attention promptly when these symptoms arise can also play a key role in improving outcomes.

As technology has advanced, people all around the world, including mothers with children under five in rural area, have started using gadgets. The need for current and useful media is driving the development of sophisticated device technology. In general, devices have been used as tools to find information, facilitate knowledge acquisition, and ease job tasks. The use of applications via gadgets can be used as an educational medium to increase mother's knowledge in early detection of pneumonia [5].

Based on the above discussion, this study aimed to develop SIGAP ANAK, an Android app compared to traditional booklet media, this application helps parents understand pneumonia and can identify early symptoms of the disease, such as rapid breathing, which is one of the signs of early pneumonia. The expected outcomes include the development of SIGAP ANAK application and booklet rated for accessibility in terms of appearance, comfort, convenience, and benefits based on mother knowledge.

Materials and Methods

This study used an R&D (Research and Development) design, in which SIGAP ANAK application and booklet were developed with information about pneumonia and early detection. The SIGAP ANAK application is user-friendly and accessible to individuals of all education levels and backgrounds. The layout is clear and easy to navigate, with features including pneumonia education, pneumonia detection, respiratory count, interactive information and finding the nearest health care facility. This feature includes colorful illustrations and diagrams to help explain complex medical concepts in a simple and easy to understand. The app is compatible with Android devices, ensuring that it is easily accessible to a wide range of users. In addition, the app will be updated regularly with the latest information and research on childhood pneumonia, ensuring that users have access to the most up-to-date resources available. The SIGAP ANAK app will guide parents to find the nearest health care facility if they experience rapid breathing.

The dependent variable was the mother's knowledge of pneumonia and detection, while the independent variables were booklet and "SIGAP ANAK" application. The study population comprised all mothers with children under five at rural areas who owned an Android smartphone and were literate. A

total of 120 children took part in the study, and the sample was selected using random assignment. Before the application and booklet are used, a trial usage test and expert consultation are carried out to improve the instrument.

A questionnaire was developed and then subjected to validity and reliability testing. The data collected include age, education, previous experience, media exposure, and childhood history. The questionnaire also assessed knowledge of mothers with children under five years about pneumonia and early detection before and after being given education using the SIGAP ANAK application and booklet. After the data was collected, data analysis was carried out using the Wilcoxon and Mann-Whitney tests. The Poltekkes Kemenkes Mataram ethics commission granted ethical approval. Before being involved in the research, the researcher had obtained approval from the respondents to be involved in this research.

Results

A total of 120 mothers with children under five participated in this study. Table 1 shows the respondents characteristics. Based on the results, there were no significant differences between the intervention and control groups in any of the demographic variables. Regarding the age range, a significant portion of respondents were between 26–35 years old. The majority also had high school degrees, and have never received information about pneumonia through an Android application. In terms of history, the results showed significant improvement after receiving intervention.

Table 1: Characteristics Respondents in Control group (n=60) and in Intervention group (n=60)

No	Variables	Category	Intervention group		Control group	
			Amount	Percentage	Amount	Percentage
1	Age	12-16 Years	1	1.7	0	0
		17-25 Years	13	21.7	16	26.7
		26-35 Years	32	53.3	28	46.7
		36-45 Years	10	16.7	13	21.7
		46-55 Years	2	3.3	2	3.3
		56-65 Years	1	1.7	1	1.7
		>65 Years	1	1.7	0	0
2	Education	Elementary School	11	18.3	8	13.3
		JUNIOR HIGH SCHOOL	16	26.7	15	25
		SENIOR HIGH SCHOOL	28	46.7	28	46.7
		College	5	8.3	9	15
3	History Information	Once	15	25	21	35
		Never	45	75	39	65
		There isn't any social media	45	75	38	63.3
4	Media Information	Booklet	9	15	17	28.3
		Other	2	3.3	1	1.7
		Doctor/Lecture	2	3.3	3	5
		Once	2	3.3	1	1.7
5	History Pneumonia	Once	3	5	5	8.3
		Never	57	95	55	91.7

A Kolmogorov-Smirnov normality test was performed to assess the distribution of data in each group. The results showed that mother's knowledge was not normally distributed. Furthermore, the homogeneity test results showed that the data were homogeneous. As shown in Table 2, there was a

difference in the mother's average knowledge score in each group before and after the intervention. However, there was no significant difference in the average scores of knowledges before intervention.

Table 2: Distribution of knowledge among Respondents in the Intervention and Control group (n=120)

No	Group	n	Mean	Min-Max	SD	p-value
1.	Control group					
	Before	60	16.78	10-20	1,833	0.000
	After	60	17.93	15-20	1,339	
2.	Intervention group					
	Before	60	15.62	5-19	3,076	0.00
	After	60	17.38	12-19	1,658	

Information: p-value < 0.05.

As shown in Table 2, The Wilcoxon test results also showed that application had a significant effect. Table 3 compares knowledge of the intervention and control groups. The statistical tests using Mann Whitney show that there was no significant difference in knowledge between the two groups. Children with pneumonia can acquire education using media booklets and the SIGAP ANAK application.

Table 3: Analysis of Difference in Knowledge between Intervention and Control group (n=120)

No	Group	N	Mean Rank	p-value
1.	Control group	60	56.03	0, 149
	Intervention group	60	64.98	

Information: p-value < 0.05.

Discussion

This study was conducted to compare the use of an Android application called "SIGAP ANAK" and booklet for knowledge of pneumonia and early detection in mothers of children under five at rural areas. Pneumonia is the leading cause of morbidity and mortality in children under five worldwide [6]. Although the disease causes a significant portion of children's deaths in underdeveloped nations, the burden is also significant in wealthy nations, amounting to a substantial health maintenance cost [7]. An estimated 120 million cases of pneumonia occur worldwide each year, with up to 1.3 million fatalities [8]. Approximately 80% of pediatric mortality in underdeveloped nations, including Indonesia, is caused by pneumonia in children under the age of two. Therefore, pneumonia in children under five years needs to be prevented to reduce morbidity rates.

The results showed that the characteristics of respondents in the control group were homogeneous. Most mothers with children under five years old were in the age range of 26-35 years with a senior high school education level. The mother's education level greatly influenced the acceptance of the intervention provided. The results showed that maternal age and education level were related to knowledge [9]. Most respondents had never received education about pneumonia before. This shows that education is very important in reducing morbidity and mortality rates in children.

The high morbidity and mortality are caused by

pneumonia, which is frequently ignored or not treated. This condition requires serious attention in the form of education for both patients and caregivers. Parents must be educated to abstain from smoking and wash hands regularly when nursing children. Additionally, all attending physician children must emphasize influenza and pneumococcal immunization. Parents need to be educated on the symptoms of breathing difficulties and when to seek medical assistance. Children pneumonia morbidity can only be decreased by an approach team [5].

Fever and tachypnea were the most frequent clinical symptoms observed in most children. When children showed symptoms of respiratory distress, mothers often did not pay attention. Given that nasopharyngeal infections (common colds) often precede childhood pneumonia cases and only require supportive care at home, this could be interpreted as a failure to recognize rapid or difficult breathing. Therefore, it is important to educate mothers about early detection of pneumonia. The use of media in providing education will have an impact on accelerating the acceptance of the information provided. Media education may assist mothers with contemporary images and messages about pneumonia.

The most frequent signs of pneumonia include coughing, difficulty breathing, and fever. Children with pneumonia typically breathe quickly, and the lower chest may draw in or retract during inhalation. The etiology of pneumonia in children can be characterized according to organism, age, or pathogen [10]. In general, neonates are at risk of contracting harmful microorganisms on the road, including streptococcus group B, Klebsiella, Escherichia coli, and Listeria monocytogenes.[11], [12], [13]. Late-onset newborn pneumonia can be caused by Streptococcus pneumoniae, Streptococcus pyogenes, or Staphylococcus aureus [10].

Viruses are the primary cause of pneumonia in older infants and toddlers aged 30 days to 2 years [13]. Respiratory viruses are also the most prevalent among children aged two to five years old [14], [15]. A rise in cases of S pneumoniae and H influenzae type B was observed in the age group [16], [17]. Mycoplasma pneumonia frequently occurs in children aged 5 to 13 years [18], [19] but S pneumoniae remains the most common organism found [13]. Children are frequently at risk for the same infections as adults. Therefore, it is important to evaluate tuberculosis (TB) among immigrants from high-prevalence areas and children who have had known exposure. Children with chronic diseases are also susceptible to specific pathogens. For example, S. aureus and Pseudomonas aeruginosa are common causes of secondary pneumonia in cystic fibrosis [20]. Patients with sickle cells are at risk of being infected by encapsulated organisms [21]. Children who experience disturbance in body immunity must be evaluated for *Pneumocystis jirovecii*, *cytomegalovirus*, and fungal species when no other organisms are identified. Unvaccinated children are

also at risk of being infected by pathogens preventable with vaccines [22].

Based on the results, almost half of mothers delayed seeking health services for children. Many resided in rural areas and initially sought treatment at home rather than at healthcare facilities. Factors contributing to the delay in seeking healthcare for children include less supportive government, poor decisions, self-medication using traditional drugs, and lack of information. Therefore, the government and stakeholders must focus on overcoming the reasons for the delay in seeking healthcare services for children with pneumonia [23]. There is a need to raise mother or nanny awareness by providing proper health education. Efforts should focus on fostering proactive health-seeking behaviors from an early age and encouraging mothers and caregivers to obtain health insurance [24].

Based on the results, booklet media can be used to promote understanding among mothers [25]. Along with advancements in technology, Indonesian society has widely adopted the usage of gadgets, specifically mothers with children under the age of five. Sophisticated gadget technology is rapidly developing, and there will be an increased demand for practical and current media. Furthermore, gadgets have been used as tools for finding information, obtaining expertise, and performing tasks. This can be used to help detect and prevent pneumonia in children under the age of five. The SIGAP ANAK application is an alternative media that may be used for providing guidance and education to mothers of children under the age of five to detect pneumonia and avoid delays in seeking treatment.

The results of the study showed that there was no difference between the use of booklets and the SIGAP ANAK application in improving the knowledge of mothers with children under five years of age in early detection of pneumonia. Booklets can also be used to improve mothers' knowledge in preventing pneumonia [26]. Childhood pneumonia is associated with poverty and results from under-optimal child care and seeking practices that compound the lack of access to health care especially in rural areas so that programs to improve the knowledge of mothers with children under five years of age in rural areas either through booklets or the SIGAP ANAK application can be used.

Currently the SIGAP ANAK Application provides information on common symptoms such as cough, fever, and difficulty breathing, 'SIGAP ANAK' can empower parents and caregivers to seek medical help efficiently when their children show signs of pneumonia. This early intervention can prevent the disease from getting worse and reduce the risk of complications. In the future, the SIGAP ANAK application can be developed more widely through more informative features such as caring for children with pneumonia at home and some preventions related to pneumonia.

Conclusion

In conclusion, booklet and SIGAP ANAK application can be used as media to educate mothers with children under five on the prevention and early detection of pneumonia. This research can be developed with a wider number of respondents, in addition, the features in the application can be further developed through information in simpler and more informative language and continued with guidance for parents in caring for children with pneumonia.

Acknowledgements

The authors are grateful to children and families who participated in this study.

References

1. WHO resource page. Pneumonia in Children. Website: <https://www.who.int/news-room/fact-sheets/detail/pneumonia>. Accessed July 9, 2024.
2. Ball, J.W., Bindler, R.C., & Cowen, K. J. Child health nursing, partnering with children & families. (2nd ed). New Jersey: Pearson Education Inc;2010.
3. Harris, M., Clark, J., Coote, N., Fletcher, P., Harnden, A., McKean, M., & Thomson, A. British thoracic society guidelines for the management of community acquired pneumonia in children: update 2011. *Thorax*. 2011;66(2): 1-23. <https://doi.org/10.1136/thoraxjnl-2011-200598> PMID:21903691
4. World Health Organization/The United Nations Children's Fund (UNICEF). Ending Preventable Child Deaths from Pneumonia and Diarrhoea by 2025. <https://data.unicef.org/resources/ending-preventable-child-deaths-pneumonia-diarrhoea-2025/>. Accessed August 15, 2024.
5. Dwi, & Martini. (2022). The Effectiveness of M-Kia Applications on Mothers Toddlers on Early Detection and Prevention of Pneumonia in Demak Regency. <https://jws.rivierapublishing.id/index.php/jws/article/view/90>.
6. Kemenkes RI. Pneumonia pada Anak Bisa dicegah dan diobati. Website: <http://p2p.kemkes.go.id/pneumonia-pada-anak-bisa-dicegah-dan-diobati/>. Accessed August 20, 2024.
7. Gupta GR. Tackling pneumonia and diarrhoea: the deadliest diseases for the world's poorest children. *Lancet*. 2012 Jun 09;379(9832):2123-4. [https://doi.org/10.1016/S0140-6736\(12\)60907-6](https://doi.org/10.1016/S0140-6736(12)60907-6) PMID:22682449
8. Rudan I, Nair H, Marušić A, Campbell H. Reducing mortality from childhood pneumonia and diarrhoea: The leading priority is also the greatest opportunity. *J Glob Health*. 2013 Jun;3(1):010101. <https://doi.org/10.7189/jogh.03.010101>
9. Nursa'iidah, Sarah. Education, Employment and Age With Mother's Knowledge of Stunting. *Indonesian Journal of Health Development*. 2022; 4(1):9-18. <https://doi.org/10.52021/ijhd.v4i1.81>
10. Arif F. Updated Recommendations Of RcoG On Prevention Of Early Onset Neonatal Group B Streptococcus Infection. *J Ayub Med Coll Abbottabad*. 2018;30(3):490.
11. Chen JC, Jenkins-Marsh S, Flenady V, Ireland S, May M, Grimwood K, Liley HG. Early-onset group B streptococcal disease in a risk factor-based prevention setting: A 15-year population-based study. *Aust N Z J Obstet Gynaecol*. 2019 ;59(3):422-429. <https://doi.org/10.1111/ajo.12891> PMID:30203834
12. Al Hazzani AA, Bawazeer RAB, Shehata AI. Epidemiological characterization of serotype group B Streptococci neonatal infections associated with interleukin-6 level as a sensitive

- parameter for the early diagnosis. *Saudi J Biol Sci.* 2018;25(7):1356-1364. <https://doi.org/10.1016/j.sjbs.2015.10.015> PMID:30505181 PMCID:PMC6252016
13. Verhoeven D. Influence of Immunological Maturity on Respiratory Syncytial Virus-Induced Morbidity in Young Children. *Viral Immunol.* 2019;32(2):76-83. <https://doi.org/10.1089/vim.2018.0121> PMID:30499759
14. GBD 2016 Lower Respiratory Infections Collaborators. Estimates of the global, regional, and national morbidity, mortality, and aetiologies of lower respiratory infections in 195 countries, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet Infect Dis.* 2018;18(11):1191-1210.
15. Omer SB, Sutanto A, Sarwo H, Linehan M, Djelantik IG, Mercer D, Moniaga V, Moulton LH, Widjaya A, Muljati P, Gessner BD, Steinhoff MC. Climatic, temporal, and geographic characteristics of respiratory syncytial virus disease in a tropical island population. *Epidemiol Infect.* 2008;136(10):1319-27. <https://doi.org/10.1017/S0950268807000015> PMID:18177515 PMCID:PMC2870725
16. Gessner BD, Sutanto A, Linehan M, Djelantik IG, Fletcher T, Gerudug IK, Ingerani, Mercer D, Moniaga V, Moulton LH, Moulton LH, Mulholland K, Nelson C, Soemohardjo S, Steinhoff M, Widjaya A, Stoeckel P, Maynard J, Arjoso S. Incidences of vaccine-preventable Haemophilus influenzae type b pneumonia and meningitis in Indonesian children: hamlet-randomised vaccine-probe trial. *Lancet.* 2005;365(9453):43-52. [https://doi.org/10.1016/S0140-6736\(04\)17664-2](https://doi.org/10.1016/S0140-6736(04)17664-2) PMID:15643700
17. Cutts FT, Zaman SM, Enwere G, Jaffar S, Levine OS, Okoko JB, Oluwalana C, Vaughan A, Obaro SK, Leach A, McAdam KP, Biney E, Saaka M, Onwuchekwa U, Yallop F, Pierce NF, Greenwood BM, Adegbola RA., Gambian Pneumococcal Vaccine Trial Group. Efficacy of nine-valent pneumococcal conjugate vaccine against pneumonia and invasive pneumococcal disease in The Gambia: randomised, double-blind, placebo-controlled trial. *Lancet.* 2005; 365(9465):1139-46. [https://doi.org/10.1016/S0140-6736\(05\)71876-6](https://doi.org/10.1016/S0140-6736(05)71876-6) PMID:15794968
18. Saraya T. Mycoplasma pneumoniae infection: Basics. *J Gen Fam Med.* 2017; 18(3):118-125. <https://doi.org/10.1002/jgf2.15> PMID:29264006 PMCID:PMC5689399
19. Akashi Y, Hayashi D, Suzuki H, Shiigai M, Kanemoto K, Notake S, Ishiodori T, Ishikawa H, Imai H. Clinical features and seasonal variations in the prevalence of macrolide-resistant Mycoplasma pneumoniae. *J Gen Fam Med.* 2018; 19(6):191-197. <https://doi.org/10.1002/jgf2.201> PMID:30464865 PMCID:PMC6238234
20. Dryahina K, Sovová K, Nemeč A, Španěl P. Differentiation of pulmonary bacterial pathogens in cystic fibrosis by volatile metabolites emitted by their in vitro cultures: Pseudomonas aeruginosa, Staphylococcus aureus, Stenotrophomonas maltophilia and the Burkholderia cepacia complex. *J Breath Res.* 2016;10(3):037102. <https://doi.org/10.1088/1752-7155/10/3/037102> PMID:27506232
21. Martí-Carvajal AJ, Conterno LO. Antibiotics for treating community-acquired pneumonia in people with sickle cell disease. *Cochrane Database Syst Rev.* 2016;11(11):CD005598. <https://doi.org/10.1002/14651858.CD005598.pub4> PMID:27841444 PMCID:PMC6530651
22. Stagno S, Brasfield DM, Brown MB, Cassell GH, Pifer LL, Whitley RJ, Tiller RE. Infant pneumonitis associated with cytomegalovirus, Chlamydia, Pneumocystis, and Ureaplasma: a prospective study. *Pediatrics.* 1981;68(3):322-9. <https://doi.org/10.1542/peds.68.3.322> PMID:6269042
23. Bantie, et al. The prevalence and root causes of delay in seeking healthcare among mothers of under five children with pneumonia in hospitals of Bahir Dar city, North West Ethiopia. *BMC Pediatrics.* 2019;19:482. <https://doi.org/10.1186/s12887-019-1869-9> PMID:31815630 PMCID:PMC6900847
24. Temsesgen Derejen, Wordofa Behanu, Tesfaye, T., Etafa W. Delay in seeking healthcare for pneumonia and associated factors among mothers/caregivers of children aged 2-59 months in public health facilities in Nekemte Town, Ethiopia. *BMC Pediatrics.* 2023; 23(1). DOI:10.1186/s12887-022-03825-x. <https://doi.org/10.1186/s12887-022-03825-x> PMID:36635692 PMCID:PMC9835356
25. Mamata Jena. Effectiveness of Information Booklet on Knowledge & Practice about Prevention of Pneumonia among Mothers of Under Five Children IOSR Journal of Nursing and Health Science (IOSR-JNHS). 2014; 3(1): 25-30. <https://doi.org/10.9790/1959-03122530>
26. Nagat, & Amal. Effect of educational program on mothers knowledge about prevention of pneumonia for their children under five years. 2017: https://www.researchgate.net/profile/Nagat-Farouk-Abolwafa/publication/335465300_Effect_of_Educational_Program_on_Mothers_Knowledge_about_Prevention_of_Pneumonia_for_their_Children_under_Five_Years/links/5d679ea3a6fdccf343fbdac6/Effect-of-Educational-Program-on-Mothers-Knowledge-about-Prevention-of-Pneumonia-for-their-Children-under-Five-Years.pdf