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Mobile Health Innovation in Child Care: Evaluating the Primaku Android Application for Enhancing Mothers' Knowledge of Child Growth

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ABSTRACT

Abstract-*Inadequate maternal knowledge regarding early child growth and development can hinder the detection of developmental delays and red flags during toddlerhood. This study evaluates the effectiveness of an Android-based mobile health (mHealth) application, "PrimaKu," in enhancing mothers' knowledge of toddler growth and development compared to conventional printed leaflets. A quasi-experimental study with a pretest-posttest control group design was conducted involving 108 mothers of toddlers in the operational area of Colomadu I Primary Health Center. Respondents were randomly allocated into an experimental group (n = 54), receiving educational intervention via the PrimaKu Android application, and a control group (n = 54), receiving printed leaflets. Data were collected using validated demographic and knowledge questionnaires (V = 0.91, Cronbach's α = 0.859) and analyzed using the Wilcoxon Signed-Rank and Independent Samples t-test. Baseline knowledge scores showed no significant difference between the groups (p = 0.202). Post-intervention results demonstrated significant knowledge improvements in both the experimental group (pre-test: 43.59 ± 8.51 to post-test: 65.87 ± 6.62, p = 0.000) and control group (pre-test: 45.53 ± 8.92 to post-test: 58.70 ± 7.38, p = 0.000). However, the experimental group achieved a significantly higher mean knowledge increase (22.28 ± 9.01) compared to the control group (13.28 ± 8.70, p = 0.000). Integrating mHealth technology via Android applications provides an interactive, accessible, and significantly more effective medium than printed leaflets for maternal health education, offering strong potential to support early childhood developmental monitoring.*

Keywords*: Android application, Child development, Health education, Maternal knowledge, mHealth*

I. INTRODUCTION

Period between one and five years of age (toddlerhood) is a highly crucial golden period in a child's growth and development process (Ministry of Health of the Republic of Indonesia, 2016). Optimizing this phase requires quality nutrition and appropriate stimulation as fundamental prerequisites (Ariani, 2017). Each child possesses a unique and varied developmental pace, leading to significant differences in milestone achievements among peers of the same age. This condition necessitates adequate parental literacy regarding toddler nutrition and developmental indicators, including the ability to detect red flags early (Indonesian Pediatric Society [IDAI], 2013). Early detection of developmental delays is strongly influenced by parents' knowledge levels, which in turn are shaped by education level and accessibility to health information (Katharina & Iit, 2016; Sugeng et al., 2019).

Child growth and development rates are governed by various interactive factors, ranging from genetic aspects, nutritional status, and environment to psychomotor stimulation (Lindawati, 2012). The combination of malnutrition and inadequate stimulation is identified as a primary risk factor triggering cognitive, motor, and social behavior disorders (Rahmidini, 2020). Severe malnutrition occurring from pregnancy until the child reaches two years of age potentially leads to permanent cognitive decline, unlike physical delays which can still be remediated (Kostanjevec et al., 2012; Yunita, 2021). Empirical evidence has established a linear relationship between optimal nutritional status, proper stimulation, and successful child development (Hairunis et al., 2018; McNamara et al., 2019). Nevertheless, family awareness regarding growth and development monitoring remains frequently constrained by limited knowledge and lack of access to practical monitoring media.

Globally, World Health Organization (2018) data indicate that developmental issues remain dominated by severe malnutrition (7.3%), overweight (5.9%), and stunting (21.9%) (WHO, 2019). In Indonesia, the prevalence of severe malnutrition rose from 3.50% in 2017 to 3.80% in 2018 (Ministry of Health RI, 2018). Conventional health education aims to alter community behavior through

knowledge enhancement (Waryana, 2016). However, educational effectiveness relies heavily on the choice of delivery media. In the era of digital transformation, the rapid penetration of wireless devices and Android-based operating systems creates vast opportunities for utilizing mobile health (mHealth) as an interactive educational medium (Hege et al., 2013). Health informatics approaches overcome the limitations of conventional printed media (such as leaflets) by delivering audiovisual features, data interactivity, and unrestricted spatial-temporal accessibility (Putri, 2017).

Specifically, integrating information technology into toddler growth monitoring as implemented in the "PrimaKu" Android application enables the translation of clinical monitoring instruments into an intuitive digital interface. Previous studies demonstrate that Android-based systems effectively facilitate independent early detection of growth and development by parents (Saurina et al., 2015). Deploying mHealth applications enhances not only the efficiency of health message delivery but also real-time growth data logging. Therefore, this study aims to evaluate the effectiveness of the PrimaKu Android application as an informatics-based intervention tool to improve mothers' knowledge of toddler growth and development.

II. RESEARCH METHODS

This study employed a quasi-experimental design using a pretest-post test control group approach. The study population comprised all mothers of toddlers in the operational area of the Klodran Village Integrated Health Post (Posyandu), Colomadu Primary Health Center, totaling 200 individuals. The sample size was calculated using Vincent Bisquerra's formula, yielding a minimum required sample of 54 respondents per group (totaling 108 respondents). Participants were allocated into two groups via random assignment: an experimental group receiving educational intervention via an Android-based application, and a control group receiving leaflet media.The research instruments consisted of a demographic questionnaire and a self-developed knowledge questionnaire. Once collected, the data underwent editing, coding, scoring, processing, and sanitization. A Wilcoxon analysis was conducted to determine differences in attitude improvement scores, while a Mann-Whitney analysis was performed to compare the experimental and control groups. The educational media tools used in this study consisted of an Android-based application provided to the experimental group and a leaflet provided to the control group. The researchers assessed validity and reliability through expert judgment, evaluating the effectiveness of the application and the brochure's components and content. The expert assessment results were processed using Aiken's V (content validity coefficient), yielding a V-index of 0.91, determined based on the three raters and a maximum error rate of 5%.

The application content and animations were verified. This study was conducted from June to August 2025 at the Colomadu Community Health Center (Puskesmas). Data collected by the researcher consisted of secondary data, including annual reports, monthly reports, and records of women who gave birth at the Colomadu Community Health Center in 2014. The questionnaires used were developed by the researcher and comprised sections on demographics and knowledge. Validity and reliability testing were performed on 30 respondents in the working area of the Kartasura Community Health Center—a location distinct from the village where the intervention took place. The validity of the knowledge questionnaire was tested using the product-moment method; questions were considered valid if the calculated r-value (r-count) exceeded the critical r-value (r-table) and invalid if r-count was less than r-table. Reliability was subsequently tested using Cronbach's Alpha; the result for the knowledge variable was 0.859, leading to the conclusion that the knowledge variable instrument was reliable and suitable for use in the study. Following data collection, the data underwent editing, coding, scoring, processing, and cleaning. Data analysis included univariate analysis to obtain a descriptive overview of the variables, and bivariate analysis—specifically the Wilcoxon test to assess the difference in score improvements regarding attitudes, and the Mann-Whitney test to compare the experimental and control groups.

III. RESULT AND ANALYSIS

3.1 Result of Univariate Analysis

Univariate analysis examines respondent characteristics in terms of age, education, and occupation as follows:

Table 1. Respondent Characteristics Based on Age and Information Sources

Characteristics	Category	Frequency	Percentage (%)
Experimental Group			
Age	< 20 - 30 years	17	15. 7
	31 – 35 years	32	29. 6
	≥ 35 years	5	4.6
Education	Elementary School	5	4.6
	Junior High School-	40	37.0
	Senior High School		
	Bachelor	9	8.3
Occupation	Working	15	13.9
	Unemployed	39	36.1
Control Group			
Age	< 20 – 30 years	12	11.1
	31 – 35 years	31	28.7
	>35 years	11	10.2
Education	Elementary School -	4	3.7
	Junior High School	38	35.2
	Bachelor	12	11.1
Occupation	Employed	18	16.7
	Unemployed	36	33.3

test:*)0.05 of significance

Table 1 shows that the characteristics of respondents in both groups show a uniform distribution of data for each group, indicated by p-values > 0.05 indicating that education, age, and occupation; It can be concluded that there is no difference between subjects and the subjects are controls.

3.2 Bivariate Analysis

3.2.1 Kolmogorov-Smirnov Test

The Kolmogorov-Smirnov test was utilized to evaluate data normality due to the sample size exceeding 50 respondents, using a significance level of 5% (α= 0.05). The following table presents the normality test results for the knowledge level scores:

Table 2. Normality test results for knowledge level

Group	Knowledge	Mean	SD	*p value*
Experiment and Control	Pre-test	44,51	8,729	0,000
	Post-test	62,29	7,848	0,014
	Difference	17,78	9,905	0,452

[b]Normality data Kolmogorov-Smirnov *0,05 of significant

Based on table 2, *p*-value <0.05 was obtained it is concluded that the data are not normally distributed, therefore, the Wilcoxon test was subsequently performed

3.2.2 Wilcoxon Test Results of Mothers' Knowledge Level on Child Growth and Development in Experimental Group and Control Group

Table 3. Wilcoxon test results for knowledge level between experimental and control groups

Group	N	Pre test	Post Test	Difference	**P Value**
		Mean	SD	Mean	SD	
Experiment	54	43.59	8.513	65.87	6.616	0,000
Control	54	45.53	8.924	58.70	7.376	0,000

Based on the findings, The results indicate a difference in mothers' knowledge regarding child growth and development in the experimental group before and after using the Android application. Statistical analysis regarding the difference in mothers' knowledge before and after using the Android application yielded a p-value of 0.000, which is below the 0.05 significance level; similarly, a difference in knowledge was observed in the control group before and after using the leaflet. This significant difference in mothers' knowledge regarding child growth and development—both before and after using the leaflet—is evidenced by a p-value of 0.000, which is below the 0.05 significance level. These findings demonstrate a difference in knowledge across both groups, with the Android application intervention group showing a greater increase (22.28) compared to the leaflet intervention group, which showed an increase of 13.27.

3.2.3 Mann-Whitney Test Knowledge in the Experimental and Control Groups Before Intervention

Table 4. Mann-Whitney test results for experimental and control groups before intervention

Group	N	Mean	SD	*p-value*
Experiment	54	43.59	8.513	0.202
Control	54	45.43	8.924	

Based on Table 4, there is no difference in knowledge between the experimental and control groups before the intervention using Android apps or the leaflet on child growth and development, as shown by the statistical test, the absence of difference between the experimental and control groups before the intervention (Android app use or leaflet) is indicated by a ρ-value of 0.202, which is above the 0.05 significance level.

3.2.4 Mann-Whitney test on knowledge in the experimental and control groups following the intervention.

Table 5. Mann-Whitney test results for the experimental and control groups after the intervention.

Group	N	Mean	SD	*p- value*
Experiment	54	65,87	6.616	0,000
Control	54	58,70	7.376	

Based on Table 5, a difference in knowledge was observed between the experimental and control groups following the intervention involving the use of an Android application and a leaflet regarding child growth and development; statistical analysis of the difference in knowledge between the groups after the intervention yielded a p-value of 0.000, which is below the significance level of 0.05.

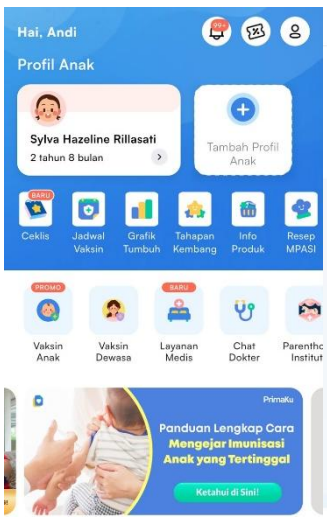
3.2.5 Comparison of the Effects of Using an Android-Based Application versus Leaflets on Mothers' Knowledge Levels Regarding Toddler Growth and Development

Table 6. Results of the independent samples t-test in the experimental and control groups

Group	N	Mean	SD	*p- value*
Experimental	54	22.28	9.010	0,000
Control	54	13.28	8.695	

Based on Table 6, the results show a difference in the increase of the average knowledge gap between the experimental group and the control group, where the average knowledge increase in the experimental group is higher, amounting to 22.28 compared to 13.28 in the control group. It can be stated that there is a significant or real difference in knowledge levels between the experimental and control groups.

3.3 The Effect of an Android-Based Application on Mothers' Knowledge Regarding Toddler Growth and Development



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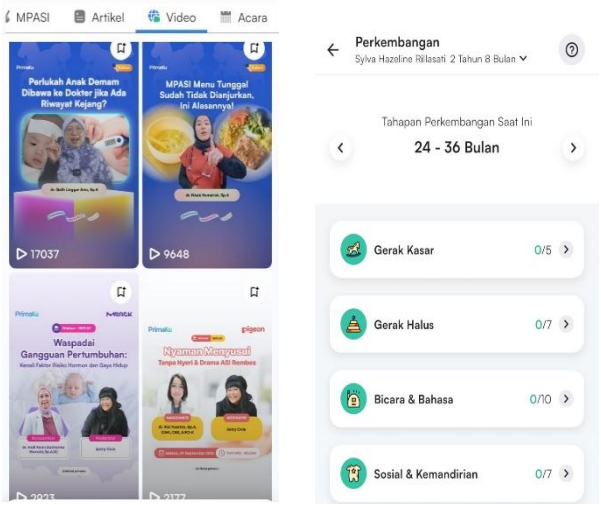

PrimaKu is a mobile health (mHealth) application designed for comprehensive child growth and development monitoring in Indonesia, developed in official partnership with the Indonesian Pediatric Society (IDAI). Serving as a digital transformation of the national Child Health Passport (Buku KIA) and Growth Chart (KMS), the platform enables real-time tracking of child anthropometric parameters including weight, height/length, and head circumference—mapped against standard WHO and CDC growth curves to facilitate the early detection of growth faltering and stunting.

The application incorporates age-specific developmental screening modules covering gross motor, fine motor, language, and social-emotional milestones. Additionally, PrimaKu features an automated immunization tracking and booking system, a pediatric teleconsultation service, evidence-based nutritional guidelines including complementary feeding (MPASI) recipes, and a parental community module. These integrated functionalities establish PrimaKu as a pivotal digital health tool for early intervention and parental health literacy enhancement. The messages are packaged in an Android app that is easy to hear, see, and understand, portable anywhere. With this Android application, mothers are easier to understand the content about child growth and development; the messages are easier to receive and remember. Android applications about growth and development already existed previously, but the difference lies in in the content of the application. Where, in the previous application it only contained about anthropometric calculations of child growth, did not include explanations about the growth and development of toddlers, as well as developmental disorders in toddlers. Whereas in this application it contains comprehensively so that mothers or prospective mothers can know about toddler growth and development, thus increasing mothers' knowledge about growth and development. With the advantages of the Android application, health counseling on the growth and development of toddlers becomes easier to do and easier for users because nowadays many people or mothers have used smartphones in daily life. Therefore, the use of the Android application is guaranteed to be more effective than the leaflet method. This research result reinforces the previous research conducted by Saurina who stated that Android-based applications can be used to detect early growth and development of toddlers (Saurina et al., 2015).

Some advantages of using technology with Android applications include easy physical portability and computational power that can be used while they are moved. For example, Personal Digital Assistant (PDA), Smartphone, and mobile phones (Tam & Model, 2017). The advantages next: Android Multitasking: able to open several applications at once without having to close any. Ease of notifications: whenever there is an SMS, E-mail, or even the latest articles from RSS readers, there will always be a notification on the home screen of the Android phone, not to forget the blinking LED indicator so SMS, E-mail, or misscalls will ,not be missed. Easy access to thousands of Android ap,ps via the Google Android App Market, if you enjoy installing apps or games, via the Google Android App Market you can download apps for free. And you can install modified ROMs: not satisfied with th,e standard Android appearance, there are many ROM customs you can use on Android.

Media used as a comparison for the control group is a leaflet. The content of this Leaflet is not . different from the Android-based application about the definition of growth and development of children, factors affecting growth and development of children, characteristics of well-growing children, problems experienced during growth and development, mother's actions to achieve good growth and development of children. The message is packaged in a leaflet that is easy to view, read, and understand. Leaflet was chosen as a medium because it is easy to store, economical, and can serve as a reminder for the targets, in this case the control group.

Therefore, one of the efforts to increase knowledge is to provide counseling using leaflets (Melina et al., 2014). Android-based application media and leaflet media were both used in this study to see which more effectively increases mothers' knowledge between the Android-based application and the leaflet. In the study results, both can increase mothers' knowledge, but Android-based applications increase knowledge higher compared to leaflets, so Android-based applications are highly recommended as a medium to increase knowledge.

VI. CONCLUSION

Based on the research findings and discussion, it can be concluded that health education intervention utilizing mobile health (mHealth) technology via the "PrimaKu" Android application is significantly more effective than conventional printed leaflets in enhancing mothers' knowledge regarding toddler growth and development. Although both educational media demonstrated statistically significant improvements in maternal knowledge pre-to-post intervention ($p = 0.000$), the experimental group utilizing the PrimaKu application achieved a substantially higher mean knowledge score increase (22.28 ± 9.01) compared to the control group receiving leaflets (13.28 ± 8.70) with a p-value of 0.000.

The superiority of the PrimaKu application stems from its comprehensive, interactive, and portable content delivery,

accessible anytime via smartphones. Features such as WHO/CDC standard anthropometric tracking, age-specific developmental milestone screening, immunization logging, and nutritional guidance are practically integrated into a single mobile platform. Consequently, integrating Android-based mHealth applications is highly recommended for public health education at primary healthcare centers (Puskesmas) and Integrated Health Posts (Posyandu) to empower parental health literacy and facilitate early detection of childhood developmental delays.

REFERENCES

1. **Ariani, A. P.** (2017). *Aplikasi Metodologi Penelitian Kebidanan dan Kesehatan Reproduksi*. Nuha Medika.
2. **Dinas Kesehatan Kabupaten Sleman.** (2018). *Profil Kesehatan Kabupaten Sleman Tahun 2018*. Dinas Kesehatan Kabupaten Sleman.
3. Hairunis, M. N., Salimo, H., & Dewi, Y. L. R. (2018). Hubungan status gizi dan stimulasi tumbuh kembang dengan perkembangan balita. Sari Pediatri, 20(3), 146–151.
4. **Hege, I., Kononowicz, A. A., & Tolks, D.** (2013). Mobile learning in medical education. *GMS Journal for Medical Education*, 30(2), Doc18.
5. **Ikatan Dokter Anak Indonesia [IDAI].** (2013). *Mengenal Tanda Bahaya (Red Flags) Tumbuh Kembang Anak*. Badan Penerbit Ikatan Dokter Anak Indonesia.
6. **Katharina, T., & Iit, P.** (2016). Tingkat pendidikan orang tua dan pengetahuan tentang tumbuh kembang anak usia dini. *Jurnal Keperawatan Indonesia*, 19(2), 101–108.
7. **Kementerian Kesehatan Republik Indonesia.** (2016). *Pedoman Pelaksanaan Stimulasi, Deteksi dan Intervensi Dini Tumbuh Kembang Anak Di Tingkat Pelayanan Kesehatan Dasar*. Kementerian Kesehatan RI.
8. **Kementerian Kesehatan Republik Indonesia.** (2018). *Hasil Utama Riset Kesehatan Dasar (RISKESDAS) 2018*. Badan Penelitian dan Pengembangan Kesehatan.
9. **Kostanjevec, K., Parmar, P., & Santos, R.** (2012). The long-term impact of early childhood malnutrition on cognitive development. *Journal of Tropical Pediatrics*, 58(4), 289–295.
10. **Lindawati, L.** (2012). Faktor-faktor yang mempengaruhi perkembangan motorik kasar pada anak usia balita. *Jurnal Kesehatan Masyarakat*, 8(1), 45–52.
11. **McNamara, J., Townsend, M. L., & Herbert, J. S.** (2019). Complex environmental interactions in early child development: The role of parental stimulation. *Child: Care, Health and Development*, 45(4), 512–520.
12. **Melina, F., Suryani, E., & Rahmawati, A.** (2014). Efektivitas media leaflet terhadap peningkatan pengetahuan ibu tentang gizi balita. *Jurnal Kebidanan dan Keperawatan*, 10(2), 115–123.
13. **Pei, L., Ren, L., & Yan, H.** (2014). A survey of child growth and nutrition in rural western China: The role of maternal education. *BMC Public Health*, 14(1), 1–10.
14. **Putri, D. M. P.** (2017). *Keperawatan Maternitas dan Anak: Aplikasi Edukasi Kesehatan*. Pustaka Baru Press.
15. **Rahmidini, A.** (2020). Pengaruh status gizi dan stimulasi orang tua terhadap perkembangan anak usia dini. *Jurnal Ilmu Kesehatan Masyarakat*, 11(1), 34–42.
16. **Saurina, N., Pujianto, A., & Wardani, R.** (2015). Aplikasi deteksi dini tumbuh kembang anak usia 0-5 tahun berbasis Android. *Jurnal Teknologi Informasi dan Ilmu Komputer (JTIIK)*, 2(1), 35–42.
17. **Sugeng, H. M., Tarigan, R., & Sari, N. M.** (2019). Gambaran tingkat pengetahuan ibu tentang tumbuh kembang anak. *Jurnal Medika Cendekia*, 6(2), 88–95.
18. **Tam, C. W., & Model, A.** (2017). Mobile health applications: Portability, functionality, and user experience. *Journal of Medical Systems*, 41(8), 120.
19. **Waryana, W.** (2016). *Promosi Kesehatan, Pengetahuan, Sikap, dan Perilaku Masyarakat*. Rhaistya.
20. **World Health Organization.** (2019). *Levels and trends in child malnutrition: UNICEF / WHO / World Bank Group joint child malnutrition estimates key findings of the 2019 edition*. World Health Organization.
21. **Yunita, R.** (2021). Hubungan status gizi kurang dengan hambatan perkembangan kognitif pada balita. *Jurnal Kesehatan Kebidanan*, 10(1), 15–22.