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The impact of the PLASI App on DPT and polio immunization visits for children 0–9 months

Pengaruh Aplikasi PLASI terhadap Kunjungan Imunisasi DPT dan Polio pada Anak 0–9 Bulan

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ABSTRACT

***Background**: The World Health Organization (WHO), through the Immunization Agenda 2030, promotes digital innovation to improve vaccine coverage. Digital health interventions can enhance access to information and community participation, although disparities in technology access remain a challenge.*
***Objective:** To determine the effect of the PLASI application (Immunization Information Service Provider) on visits for Diphtheria, Pertussis, Tetanus, and Polio immunizations in children.*
***Methods:** PLASI, a digital application delivering immunization information through audio, visuals, and graphics, was evaluated using a quasi-experimental pretest–posttest control group design. The study involved 135 mothers with infants aged 0–9 months attending posyandu in Klari Village, Karawang (January–May 2024). Using purposive sampling, 80 respondents were selected and divided into intervention (PLASI users) and control (non-users) groups. Instruments included the PLASI application, pretest–posttest questionnaires assessing maternal knowledge, and immunization visit observation sheets.*
***Results:** McNemar test showed significant increases in DPT (p=0.020) and polio (p=0.020) immunization visits among PLASI users compared to the control group. However, limited technology access and sudden schedule changes were identified as barriers.*
***Conclusion:** The PLASI application is effective in improving immunization visits by enhancing access to information and community participation. Nevertheless, addressing existing barriers such as limited technology access and service constraints is necessary through targeted health education, stakeholder collaboration, and periodic evaluation. Strengthening these aspects will support the sustainability and adaptability of digital health interventions, particularly in areas with limited infrastructure.*

***Keywords:** application, DPT, PLASI, immunization visits, polio*

ABSTRAK

Latar Belakang: Organisasi Kesehatan Dunia (WHO) melalui Immunization Agenda 2030 mendorong inovasi digital untuk meningkatkan cakupan imunisasi. Intervensi digital dapat meningkatkan akses informasi dan partisipasi masyarakat, meskipun kesenjangan akses teknologi masih menjadi tantangan.
Tujuan: Mengetahui pengaruh aplikasi PLASI (Penyedia Layanan Informasi Imunisasi) terhadap kunjungan imunisasi Diphtheria, Pertussis, Tetanus, dan Polio pada anak.
Metode: Aplikasi PLASI, sebagai media digital yang menyajikan informasi imunisasi melalui audio, visual, dan grafik, diuji menggunakan desain quasi-experimental dengan pretest–posttest control group. Penelitian melibatkan 135 ibu di Desa Klari, Karawang,

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yang memiliki bayi usia 0–9 bulan dan mengikuti kegiatan posyandu pada Januari–Mei 2024. Dengan teknik purposive sampling, dipilih 80 responden yang dibagi menjadi kelompok intervensi (pengguna PLASI) dan kontrol (non-pengguna). Instrumen yang digunakan meliputi aplikasi PLASI, kuesioner pretest–posttest (pengetahuan ibu), dan lembar observasi kunjungan imunisasi.
Hasil: Uji McNemar menunjukkan adanya peningkatan signifikan pada kunjungan imunisasi DPT (p=0,020) dan polio (p=0,020) pada kelompok pengguna PLASI dibandingkan kelompok kontrol. Namun, terdapat kendala seperti keterbatasan akses teknologi di daerah terpencil dan perubahan jadwal yang mendadak.
Simpulan: Aplikasi PLASI efektif dalam meningkatkan kunjungan imunisasi melalui peningkatan akses informasi dan partisipasi masyarakat. Namun, diperlukan upaya untuk mengatasi hambatan yang ada, seperti keterbatasan teknologi dan kendala layanan, melalui edukasi kesehatan yang terarah, kolaborasi dengan pemangku kepentingan, serta evaluasi berkala agar intervensi digital dapat berkelanjutan dan adaptif, khususnya di wilayah dengan keterbatasan infrastruktur.

Kata kunci: aplikasi, DPT, PLASI, kunjungan imunisasi, polio

INTRODUCTION

Immunization programs are a crucial health initiative to reduce morbidity, disability, and mortality from preventable diseases. In 1977, the Immunization Development Program (PPI) was launched as an initial step to reduce morbidity and mortality among children under five due to vaccine-preventable diseases (PD3I). Since 1980, routine immunization has continued and expanded to include seven types of vaccines: BCG, DPT, Polio, Measles, Hepatitis B (HB), TT, and DT.[1]

The World Health Organization (WHO) claims that, worldwide, by 2023, there will be 14.5 million children who have not received any vaccinations, or children without a dose.[2] On the other hand, the number of children in Indonesia who have not received complete immunization from 2018 to 2023 is 1,879,820.[3] Immunization to prevent diphtheria is carried out with the DPT vaccine, which must be given to infants. DPT stands for Diphtheria, Pertussis, and Tetanus, which is a vaccine consisting of purified diphtheria and tetanus toxoids, and attenuated pertussis bacteria. This vaccine is effective in preventing diphtheria and pertussis infections, also known as the 100-day cough. The Regional Review Meeting on Immunization of the World Health Organization (WHO)/SEARO recommended the integration of the Hib vaccine into the national immunization program to reduce morbidity, mortality, and disability in infants and toddlers due to pneumonia and meningitis. Thanks to technological advances, the DPT, Hepatitis B, and Hib vaccines can now be combined in a single dose (DPT-HB-Hib), which reduces the number of injections required for infants.[4]

Based on the results of a preliminary study, researchers collected data from January to April 2024 at the Integrated Health Post (Posyandu) in Klari Village, Klari District, Karawang Regency. Of the 135 infants who were to be immunized, 109 infants (80.7%) had received DPT and polio immunizations, with details of 62 infants (56.88%) receiving DPT 1 and polio 1, 31 infants (28.44%) receiving DPT 2 and polio 2, and 16 infants (14.67%) receiving DPT 3 and polio 3. The remaining 26 infants (19.25%) had not received DPT and polio immunizations.

Researchers also interviewed parents visiting integrated health posts (Posyandu) in Klari Village, which comprises four hamlets: Kopo, Ciwadas, Jatisari, and Krajan, as well as 12 housing complexes and several villages. The interviews revealed that nine of the 15 mothers reported being unaware of the DPT and polio immunization schedules, while six mothers reported learning from the village midwife and community health workers. The Klari Community Health Center noted a discrepancy between demand and reports.

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Based on digital reporting from the Karawang Health Office, it can be concluded that problems in administering DPT and polio immunizations include a lack of effectiveness and efficiency in information delivery, education, provision, and immunization services. The WHO, in its "Immunization Agenda 2030," recommends increasing immunization coverage by implementing innovative methods, including the use of digital tools.[5]

Health systems and immunization programs can utilize various digital data systems that have proven effective in improving the quality, efficiency, and equity of immunization systems. The development of tailored software enhances reporting efficiency for health workers. Digital technology is transforming immunization services, becoming a critical tool for increasing coverage, efficiency, and equity in vaccine distribution.[6]

In response to this problem, researchers developed an innovation in the form of the PLASI (Immunization Information Service Provider) application, which is designed to make it easier for parents to access information regarding immunization completeness, vaccine availability, and to help evaluate the success of increasing immunization coverage in infants and toddlers. The PLASI application, an abbreviation for Immunization Information Service Provider, is an information and notification system based on data from private clinics affiliated with Imunicare Biofarma in Karawang. This innovation allows all targets to gain access to information on the availability of immunization services, as well as helping stakeholders and parents find out about supplies and receive education about immunization services. The purpose of this study was to determine the effect of the PLASI application (Immunization Information Service Provider) on visits for Diphtheria, Pertussis, Tetanus, and Polio immunizations in children at the integrated health post (Posyandu) in Klari Village, Klari District, Karawang Regency.

METHODS

Study design

This study used a quasi-experimental design with a pretest-posttest control group design approach. The study aimed to analyze the effect of the PLASI application on DPT and polio immunization visits in mothers with children aged 0–9 months. This study was conducted at the Integrated Health Service Post (Posyandu) in Klari Village, Klari District, Karawang Regency, from May 20 to June 20, 2024.

Data source and sampling procedure

The study population was 135 mothers with children aged 0–9 months. The study sample was determined using a purposive sampling technique, with calculations based on the comparative analytical formula for two independent proportions:

$$n_1 = n_2 = \frac{Z\alpha\sqrt{2pq}+Z\beta\sqrt{p1q1+p2q2)^2}}{p1-p2^2}$$

Where:
n_1 = sample size of the intervention group
n_2 = sample size of the control group
Zα=1.96 (95% confidence level)
Zβ=0.84 (80% statistical power)
p2=0.5, therefore q2=0.5
p1=0.8, therefore q1=0.2
p= (P1 + P2)/2 = 0.65
q=1−p=0.35
Substitute into the formula:

$$=\frac{1.96\sqrt{2(0.65)}(0.35)+0.84\sqrt{(0.8)}(0.2)+(0.5)(0.5))^2}{(0.8-0.5)^2} = \frac{3.41}{0.09} = 37.9 = 38$$

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From these calculations, the minimum sample size was 38 respondents per group. To anticipate potential dropouts, the sample size was increased to 40 respondents per group. Thus, the total sample in this study was 80 respondents, equally divided into an intervention group (40 mothers) who were given the PLASI application. The control group (40 mothers) was not given the PLASI application. The inclusion criteria were mothers who were physically and mentally healthy, could read and write, and had used an Android smartphone. The exclusion criteria were not being present at the time of the study, not being able to operate an Android smartphone, babies not being recorded in the Klari village Posyandu database, and babies suffering from diseases that hinder immunization.

Variables of the study

The independent variable in this study was the use of the PLASI (Immunization Information Service Provider) application, categorized into intervention (PLASI users) and control (non-users). The dependent variables were immunization visit outcomes, specifically visits for Diphtheria, Pertussis, Tetanus (DPT), and Polio immunizations.

Measurement and instruments

The instruments used in this study included the PLASI application as an intervention medium that provides information related to immunization, pretest and posttest questionnaires used to measure the level of knowledge and behavior of immunization visits, and observation sheets that function to record DPT and polio immunization visits.

Figure 1. Barcode Scan URL Icon

In Figure 1, click the PLASI Profile icon menu, then the immunization info icon will appear on the screen as in Figure 2.

Figure 2. Menu display

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Figure 3. Immunization Display Icon

Figures 2 and 3 explain the various types of immunizations, including definitions, dosages, benefits, and possible side effects. To obtain more information about a vaccine, users can click on the name or image of the available vaccine. Doing so will bring up a screen providing a detailed explanation of each type of immunization.

Data collection

Data collection techniques were carried out through several stages, beginning with respondent identification according to the predetermined inclusion and exclusion criteria, followed by providing informed consent to respondents who were willing to participate by signing the consent form. The intervention stage was carried out by providing the PLASI application to the intervention group throughout the study period. After the intervention was completed, a posttest was conducted to measure changes in knowledge and behavior of immunization visits.

Ethical considerations

This study obtained ethical approval from the Health Research Ethics Committee with the number No.20/KEPK/SDHB/B/V/2024. Research permission was also obtained from the Karawang Regency Health Office. All respondents provided informed consent prior to participation, and confidentiality of the data was maintained throughout the study.

Data analysis

Data analysis was carried out using the McNemar test, after the results of the normality test showed that the data were not normally distributed, with the aim of determining significant differences between the pretest and posttest results in the two research groups.

RESULT

Univariate Analysis

Table 1. Respondent Characteristics

Characteristics	Polio Immunization Visit							
	Before				After			
	Visiting		Not Visiting		Visiting		Not Visiting	
	n	%	n	%	n	%	n	%
	Intervention							
Age								
< 20 Years	3	7.5	4	10.0	4	10.0	3	7.5
20-35 Years	16	40.0	7	17.5	22	55.0	1	2.5
> 35 Years	8	20.0	2	5.0	9	22.5	1	2.5
Total	27	67.5	13	32.5	35	87.5	5	12.5
Parity								
Primipara	10	25.0	8	20.0	15	37.5	3	7.5
Multipara	17	42.5	5	12.5	20	50.0	2	5.0

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Characteristics	Polio Immunization Visit							
	Before				After			
	Visiting		Not Visiting		Visiting		Not Visiting	
	n	%	n	%	n	%	n	%
Total	27	67.5	13	32.5	35	87.5	5	12.5
Education								
Elementary School	0	0.0	0	0.0	0	0.0	0	0.0
Junior High School	2	5.0	5	12.5	4	10.0	3	7.5
Senior High School	9	22.5	5	12.5	12	30.0	2	5.0
Diploma	11	27.5	3	7.5	14	35.0	0	0.0
Bachelor	5	12.5	0	0.0	5	12.5	0	0.0
Total	27	67.5	13	32.5	35	87.5	5	12.5
Occupation								
Housewife	12	30.0	5	12.5	15	37.5	2	5.0
Laborer	1	2.5	2	5.0	2	5.0	1	2.5
Farmer	1	2.5	3	7.5	2	5.0	2	5.0
Self-employed	4	10.0	2	5.0	6	15.0	0	0.0
Private	7	17.5	1	2.5	8	20.0	0	0.0
Civil Servant/Military/Police	2	5.0	0	0.0	2	5.0	0	0.0
Total	27	67.5	13	32.5	35	87.5	5	12.5
	Control							
Age								
< 20 Years	2	5.0	6	15.0	2	5.0	6	15.0
20-35 Years	14	35.0	9	22.5	15	37.5	8	20.0
> 35 Years	7	17.5	2	5.0	7	17.5	2	5.0
Total	23	57.5	17	42.5	24	60.0	16	40.0
Parity								
Primipara	10	25.0	7	17.5	10	25.0	7	17.5
Multipara	13	32.5	10	25.0	14	35.0	9	22.5
Total	23	57.5	17	42.5	24	60.0	16	40.0
Education								
Elementary School	0	0.0	0	0.0	0	0.0	0	0.0
Junior High School	2	5.0	4	10.0	2	5.0	4	10.0
Senior High School	9	22.5	8	20.0	9	22.5	8	20.0
Diploma	8	20.0	2	5.0	8	20.0	2	5.0
Bachelor	4	10.0	3	7.5	5	12.5	2	5.0
Total	23	57.5	17	42.5	24	60.0	16	40.0
Occupation								
Housewife	8	20.0	5	12.5	8	20.0	5	12.5
Laborer	0	0.0	2	5.0	0	0.0	2	5.0
Farmer	1	2.5	3	7.5	1	2.5	3	7.5
Self-employed	4	10.0	6	15.0	4	10.0	6	15.0
Private	7	17.5	1	2.5	8	20.0	0	0.0
Civil Servants/TNI/Polri	3	7.5	0	0.0	3	7.5	0	0.0
Total	23	57.5	17	42.5	24	60.0	16	40.0

In Table 1, based on age characteristics, respondents in the intervention group aged 20–35 years numbered 16 people (40.0%) before the intervention and increased to 22 people (55.0%) after the intervention. Meanwhile, in the control group, respondents aged 20–35 years numbered 14 people (35.0%) before the intervention and 15 people (37.5%) after the intervention. Based on parity characteristics, the intervention group was dominated by multiparous respondents, with 17 people (42.5%) before the intervention, increasing to 20 people (50.0%) after the intervention. In the control group, the number of multiparous

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respondents was 13 people (32.5%) before the intervention and 14 people (35.0%) after the intervention.

Regarding educational characteristics, respondents in the intervention group whose highest level of education was a diploma totaled 11 people (27.5%) before the intervention and increased to 14 people (35.0%) after the intervention. Meanwhile, in the control group, respondents whose highest level of education was senior high school totaled 9 people (22.5%) both before and after the intervention. Based on occupational characteristics, respondents in the intervention group who were housewives numbered 12 people (30.0%) before the intervention and increased to 15 people (37.5%) after the intervention. In the control group, the number of respondents who were housewives was 8 people (20.0%), both before and after the intervention.

Table 2. Distribution of Visit Frequency DPT Immunization in Children in the Group Before Being Given the PLASI Application and the Group Not Given the PLASI Application (Immunization Information Service Provider)

DPT Immunization Visit	The group was given the PLASI Application		Groups not given the PLASI Application	
	n	%	n	%
Not increasing	13	32.5	17	42.5
Increase	27	67.5	23	57.5
Total	40	100	40	100

Table 2 shows that in the group using the PLASI app, 27 people (67.5%) experienced an increase in DPT immunization visits, while 13 people (32.5%) did not experience an increase. Conversely, in the group without the PLASI app, 23 people (57.5%) continued to make immunization visits.

Table 3. Distribution of Frequency of DPT Immunization Visits in Children in the Group After Being Given the PLASI Application and the Group Not Given the PLASI Application (Immunization Information Service Provider)

DPT Immunization Visit	The group was given the PLASI Application		Groups not given the PLASI Application	
	n	%	n	%
Not visiting	5	12.5	16	40
Visiting	35	87.5	24	60
Total	40	100	40	100

Table 3 shows that after the implementation of the PLASI application, the majority of respondents in the group were recorded as having made DPT immunization visits, namely 35 people (87.5%). Meanwhile, in the group that did not use the PLASI application, the number of respondents who made immunization visits reached 24 people (60%). Based on this data, it can be concluded that the use of the PLASI application contributed to a more significant increase in immunization visits, namely 27.5% higher compared to the group without the application. This indicates that the PLASI application can be an effective tool in increasing immunization participation.

Table 4 shows that before the PLASI application was implemented, the majority of respondents in the group receiving the application had already attended polio immunization visits, namely 27 people (67.5%). Meanwhile, in the group not given the PLASI application, immunization visits were recorded at 23 people (57.5%). This data indicates that although the PLASI application helped increase visits, the impact was not very significant because both groups already had sufficient understanding and awareness of the importance of immunization before the intervention.

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Table 4. Distribution of Visit FrequencyPolio Immunization in Children in the Group Before Being Given the PLASI Application and the Group Not Given the PLASI Application (Immunization Information Service Provider)

Polio Immunization Visit	The group was given the PLASI Application		Groups not given the PLASI Application	
	n	%	n	%
Not visiting	13	32.5	17	42.5
Visiting	27	67.5	23	57.5
Total	40	100	40	100

Table 5. Distribution of Frequency of Polio Immunization Visits in Children in the Group After Being Given the PLASI Application and the Group Not Given the PLASI Application (Immunization Information Service Provider)

Polio Immunization Visit	The group was given the PLASI Application		Groups not given the PLASI Application	
	n	%	n	%
Not visiting	5	12.5	16	40
Visiting	35	87.5	24	60
Total	40	100	40	100

Table 5 shows that after the PLASI application was implemented, both groups experienced a more than 50% increase in polio immunization visits. However, the group that received the PLASI application showed a greater increase compared to the group that did not receive the PLASI application.

Bivariate Analysis

Table 6. The Effect of the PLASI (Immunization Information Service Provider) Application on DPT Immunization Visits in Children

Group	DPT Immunization Visit						p-value
	Visiting		Non Visiting		Total		
	n	%	n	%	n	%	
Intervention							
Before	27	43.5	13	72.2	40	50	
After	35	56.5	5	27.7	40	50	0.001
Total	62	77.5	18	22.5	80	100	
Control							
Before	23	48.9	17	51.5	40	50	
After	24	51.0	16	48.5	40	50	0.092
Total	47	58.8	33	41.3	80	100	

Description: Mc Nemar Test

According to Table 6, before the PLASI application was implemented, the intervention group showed the majority of DPT immunization visits, amounting to 27 people (43.5%). After the PLASI application was implemented, the number of visits in the intervention group increased to 35 people (56.5%) with a p-value of 0.001, indicating a significant impact of the PLASI application on polio immunization visits in children. In contrast, the control group experienced an increase in visits from 23 people to 24 people, with a p value of 0.092, indicating that there was no significant effect on polio immunization visits.

Table 7 shows that, before the PLASI application was implemented, the number of polio immunization visits in the intervention group was recorded at 27 people (43.5%). After the application was used, the number of visits increased to 35 people (56.5%) with a p-value of 0.001, indicating that the PLASI application had a significant impact on polio immunization visits in children.

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Table 7. The Influence of the PLASI (Immunization Information Service Provider) Application on Polio Immunization Visits in Children

Group	Polio Immunization Visit						p-value
	Visiting		Non Visiting		Total		
	n	%	n	%	n	%	
Intervention							
Before	27	43.5	13	72.2	40	50	
After	35	56.5	5	27.7	40	50	0.001
Total	62	77.5	18	22.5	80	100	
Control							
Before	23	48.9	17	51.5	40	50	
After	24	51.0	16	48.5	40	50	0.092
Total	47	58.8	33	41.3	80	100	

Description: Mc Nemar Test

Hypothesis

Table 8. The Effect of the PLASI (Immunization Information Service Provider) Application on Increasing DPT Immunization Visits in Children

Group	Increasing DPT Immunization Visits				p-value
	Increase		Not increasing		
	n	%	n	%	
Intervention Given the PLASI application	36	60	4	20	0.020
Control No PLASI application is provided	24	40	16	80	
Total	60	100	20	100	

Description: Mc Nemar Test

Table 8 shows that the increase in DPT immunization visits has a value of ρ=0.020 (ρ<0.05), which indicates a significant difference in the increase in visits between the group using the PLASI application and the group not using the PLASI application at the integrated health post (posyandu) in Klari Village, Klari District, Karawang Regency. Both groups experienced an increase, but the group using the PLASI application showed a more significant increase than the group not using the PLASI application. The PLASI (Immunization Information Service Provider) application affects increasing polio immunization visits for children at the integrated health post (posyandu) in Klari Village, Klari District, Karawang Regency.

Table 9. The Effect of the PLASI (Immunization Information Service Provider) Application on Increasing Polio Immunization Visits in Children

Group	Increasing Polio Immunization Visits				p-value
	Increase		Not increasing		
	n	%	n	%	
Intervention Given the PLASI application	36	60	4	20	0.020
Control No PLASI application is provided	24	40	16	80	
Total	60	100	20	10	

Description: Mc Nemar Test

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Table 9 shows that the increase in polio immunization visits has a value of ρ=0.020 (ρ<0.05), which indicates a significant difference in the increase in visits between the group that received the PLASI application and the group that did not receive the PLASI application at the integrated health post (posyandu) in Klari Village, Klari District, Karawang Regency. Although both groups experienced an increase, the group that received the PLASI application showed a greater increase than the group that did not receive the PLASI application.

DISCUSSION

This study found that the majority of respondents were mothers aged 20–35 years with a secondary education (high school), and most were unemployed. Most of the immunized infants were four months old. Children's immunization status was influenced by parents' knowledge of the DPT and polio immunization schedules. Lack of knowledge of the integrated health service post (Posyandu) schedule was the main reason for non-compliance with the immunization schedule for some respondents. Maternal age was shown to significantly influence knowledge and behavior, with older mothers tending to be more receptive to information.[7]

According to Novianda DG et al., information plays a crucial role in improving mothers' knowledge about immunization. Mothers who receive information from health workers, cadres, and health promotion media have better knowledge, which then shapes positive attitudes and behaviors toward immunization.[8] Sigit A also showed a significant relationship between parental knowledge, age, education, occupation, and income, and the completeness of basic immunizations in infants. Lack of knowledge and other characteristics can lead to incomplete basic immunizations.[9]

In this study, the intervention group received an understanding of the PLASI application and underwent follow-up. The control group received no information or follow-up. This application facilitates the delivery of immunization service information, improves service quality, and reaches all target groups. The system allows flexible information updates based on the provider and time.

According to Anggraeni D's findings, a similar app, Imunisasi-Q, has successfully improved the knowledge and attitudes of integrated health post (Posyandu) cadres, motivating parents to bring their children for immunizations. The app's primary goal is to optimize limited resources and keep pace with technological developments in society.[10]

The WhatsApp reminder feature in the PLASI app effectively increased immunization visit compliance. Nearly all respondents who received reminders attended their scheduled immunizations. Respondents stated that the app made it easier to remember immunization schedules, find out about vaccine availability, and make reservations. The app is also easy to use for parents unfamiliar with technology after just one instruction.

The PLASI app's advantage lies in its notification feature, which reminds you of your child's immunization schedule and provides information on the type of immunization, the number of doses, vaccine availability, a list of practicing midwives, and side effects. This feature is very helpful for mothers in accessing immunization-related information. In line with Liani W's research, Liani W.'s research, shows that a website-based immunization schedule reminder information system with an SMS Gateway significantly improves the quality of immunization services at the Sungai Paku Village Integrated Health Post (Posyandu). However, limited vaccine supplies often prevent children from receiving the DPT vaccine on schedule, resulting in rescheduling of immunizations.[11]

Harsanti found that immunization status was closely related to the incidence of severe diphtheria, where patients with incomplete immunization or no immunization at all were at greater risk of experiencing severe diphtheria.[12] Arguni also reported that

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approximately 70% of deaths from diphtheria occurred in patients who did not receive complete basic immunization.[13]

This is in line with the research findings of Arini D et al., who revealed a correlation between diphtheria cases in Surabaya and DPT immunization status. Despite receiving three doses of the vaccine, some patients still experienced failure to develop immunity, influenced by factors such as vaccine dose, expiration date, completeness of the vaccine, maternal antibodies, and vaccine storage methods.

The study also addressed the polio immunization schedule, addressing the limited vaccine quota at integrated health posts (Posyandu), and parents' lack of understanding of the schedule. Some children were not registered due to relocation from other cities, which also hindered polio immunization coverage.[14] This is in line with Aliftya N's research, which shows a link between the utilization of polio immunization services and sociocultural factors. Parents' reluctance to immunize their children stems from the belief that immunization is haram (forbidden), even though it increases the risk of polio outbreaks. Lack of knowledge is a major factor in parents' reluctance to immunize their children.[15]

The PLASI app also features a teleconsultation feature that allows users to communicate directly with healthcare professionals, raising mothers' awareness of the importance of childhood immunization. Rini Marini recommended that healthcare workers strengthen their role as educators through immunization counseling to improve mothers' knowledge.[16,17] In addition, the PLASI application is also equipped with an immunization schedule editing feature that makes it easier for patients to rearrange the schedule if changes occur.

Table 2 shows that the PLASI application contributed to increased DPT immunization visits, although the impact was not very significant. Several factors that may influence the effectiveness of the PLASI application in increasing immunization visits include prior knowledge about immunization. Both groups already had sufficient knowledge and awareness about immunization before receiving the PLASI intervention, so the application's impact was not very significant. This is consistent with previous research that suggests that high levels of knowledge before the intervention can mitigate the additional effects of technology-based interventions.[18]

Furthermore, the short duration of the intervention limited the PLASI app's effectiveness in increasing immunization visits. Several studies have shown that health app-based interventions take longer to form new health habits in the community (Free C 2013).[19] The ability to understand and utilize an application is also another limiting factor. A study by Vaart RVD (2017) showed that the effectiveness of health apps is influenced by users' digital literacy and ease of access to the app's features.[20] Table 3 Although the group using the PLASI application showed a higher increase in DPT immunization visits compared to the group without the application, the high number of visits in the group without the application (60%) showed the influence of other factors such as a good level of public awareness, support from health workers, reminders from integrated health post cadres, easy access to health facilities, and the regular habit of parents taking their children for immunization.

The results of Table 4 also show that 32.5% of respondents in the application group and 42.5% in the non-application group still did not attend immunization visits. This was influenced by the short duration of the intervention, the ability to understand the application, and prior awareness. It should be noted that the implementation of this intervention also coincided with the simultaneous BIAS immunization activities in July 2024, so additional information from Posyandu cadres likely contributed to the increase in visit rates in both groups. Overall, the PLASI application has been proven to increase

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immunization visits, but its success is greatly influenced by various external factors beyond the application itself, such as initial knowledge, simultaneous immunization activities, digital literacy, and support from health workers and cadres.

CONCLUSION

There is an influence of the PLASI application on increasing DPT immunization visits and polio immunization visits at the integrated health post (Posyandu) in Klari Village, Klari District, Karawang Regency. Suggestions and recommendations in this study are that the PLASI Application (Immunization Information Service Provider) can synergize with government programs, especially in the distribution of DPT and polio immunization vaccines, it is hoped that the PLASI Application (Immunization Information Service Provider) will increase parents' awareness of bringing their children to be immunized so that immunization coverage, especially DPT and polio, reaches the target, it is hoped that the PLASI Application (Immunization Information Service Provider) can be recommended by the Health Office to be used in every Community Health Center or other health service facilities to achieve immunization coverage, especially DPT and polio immunizations.

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