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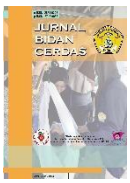

Implementation of The *draivCare* App on Maternal Health Services

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ABSTRACT

Background: Banggai Regency government collaborated with a local start-up, Draiv, to develop a health service app specialized for pregnant women, called draivCare. This study aims to evaluate the effect of draivCare utilization on maternal health services. **Methods**: This is a case-control method to identify the differentiation of ANC services utilization during the pregnancy period between groups. We use secondary data and conducting interview with midwives. A total 39 pregnant women who use draivCare app in their pregnancy were administered to the intervention(case) group, whereas 156 pregnant women who did not use draivCare app in their pregnancy belong to the control group. Antenatal care (ANC) frequency and components were the variables studied using chi-square. **Results**: The proportion of mother who received the fetal examination and the proportion of mothers who received tetanus toxoid immunization are significantly differ between groups. Despite the barriers such as android-based mobile phone ownership of the mothers, the communication between pregnant women and midwives is quite intense. **Conclusion**: The implementation of draivCare app has yet to affect pregnant women's health care quality and quantity significantly. However, the intense communication between pregnant women and midwives shows a potential effect of the app on improving antenatal care.

INTRODUCTION

The Banggai Regency is the second largest administrative territory in Central Sulawesi Province, with a population of approximately 362.275 people. Annually, there were 7.000 pregnant women, on average, residing in 27 community health services. In 2019, the percentages of maternal and infant health coverage indicators were high. Ninety-nine percent of pregnant women had their first visit to a health facility (K1), and 94,2% of them had visited a health facility at least four times (K4) during their pregnancy period. In the same year, the coverage of iron folic acid (IFA) supplementation was approximately 93%, the coverage of delivery by midwives or health workers was approximately 93,7%, and postpartum mothers with their neonatal visits to health facilities was 91,5%. Correspondingly, the maternal mortality ratio (MMR) also decreased from 148 maternal deaths in 2018 to 71 maternal death per 100.000 live births in 2019 (Dinas Kesehatan Kabupaten Banggai, 2019). These figures show the positive accomplishment of health program implementation in the Banggai Regency and how the health awareness of the community has increased.

Unfortunately, the Covid-19 pandemic has struck the world and caused problems

in all aspects of humans. The Government of Indonesia enforces restrictions on all community activities to stop the spread of Covid-19. The Banggai Regency health profile records a decline in health program coverage, such as K4, which reduces sharply to 86,9% and the increase in MMR to 263 maternal death per 100.000 live births (Dinas Kesehatan Kabupaten Banggai, 2020).

As a response to cope with the adversity caused by the pandemic and the potential use of mobile-based health application programs, or *mhealth* app, in prenatal health services, such as increases in the coverage and quality of health services (Amoakoh-Coleman et al., 2016), post-partum visits (Murthy et al., 2020; Olajubu, Fajemilehin, Olajubu, & Afolabi, 2020), and has a positive effect on maternal behavior (Eberle, Loehnert, & Stichling, 2021), including increases in the consumption of iron folic acid and exclusive breastfeeding(Ward et al., 2020), the local government then came in agreement with a local start-up, called *draiv*, to develop a mobile-based app that aims to provide health counselling for pregnant women in the Banggai Regency Area. The app, called *draivCare* (figure 1), was developed with two main features: health counselling with midwives via chat/messages, and ambulance call services for emergency cases.

The app was launched in 2022 and covered four community health centers (CHC) as pilot project locations: Kampung Baru, Biak,Nambo, and Simpong. By the time the study was conducted, the main feature of *the draivCare* app was messaging/chat, whereas the emergency ambulance service was still under development. The messaging/chat feature enables pregnant women to communicate or receive counselling with midwives whenever desired. As a long-term plan, the local government plans to implement this app to cover all areas of the Banggai Regency, which is divided into 27 CHCs. However, its implementation in a wider range of areas requires additional information. Information such as whether this *mhealth* app was effective in increasing the health services coverage, whether this app fit the user requirement, and what are the challenges faced in the implementation phase?. Therefore, this study aimed to identify such information for the evaluation of app implementation.

METHODS

The present study used a case-control method to identify the differences in ANC service utilization during pregnancy between groups. The study was conducted in the Banggai Regency area in June 2023. Data were collected from four community health centers (CHC): Kampung Baru, Biak,Nambo, and Simpong. All CHCs were located in the urban area of the Banggai Regency

The study population included pregnant women in their third trimester of pregnancy and postpartum women. These women should reside in the area of four CHC, as mentioned before. After data clearance, only 39 pregnant women who actively used the app during their pregnancy had complete data that were then submitted to the intervention group. As for the number in the control group, we used a 1:4 ratio, so there were 156 pregnant women who did not use the app in the control group. This study was approved by the ethics approval number 0034/KEPK-KPK/III/2023 of Health Polytechnic Palu. We collected secondary data from *the draivCare* data pool, midwives' cohort reports, and maternal and child health books (*buku KIA*) owned by pregnant women. We also conducted interviews with the midwives regarding app use.

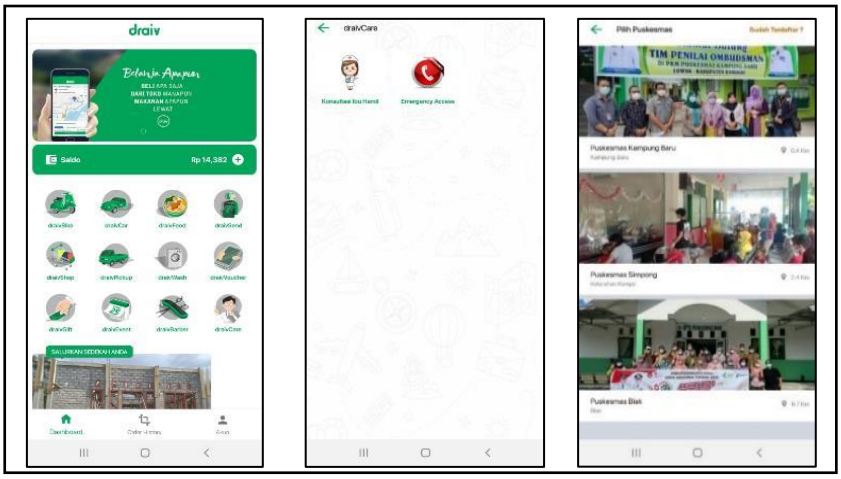

Figure 1. *draivCare* app interface

The dependent variables in this study were the frequency of ANC and the essential components of ANC services received by pregnant women. The components of ANC variables such as height, weight, blood pressure, upper arm circumference measurement, fundal height measurement, fetal presentation identification and fetal heart rate monitoring, laboratory examination, providing appropriate referral, health counselling, and Tetanus Toxoid (TT) immunization were categorized as Yes if the pregnant women received the service, and NO if otherwise. Regarding the consumption of iron folic acid (IFA) during pregnancy, the outcome was categorized as <90 and ≥90 tablets. The frequency of ANC was categorized based on the Indonesian Ministry of Health (MoH) recommendations for ANC visits in each trimester(Kementerian Kesehatan Republik Indonesia, 2020). Bivariate analysis was performed using chi-square to test the differences between intervention and control groups with significance level at $\alpha<0.05$.

RESULTS

The distribution of respondents in Table 1 shows that the mean age of mothers in the intervention group was younger (27.8 years old) than those in the control group (30 years old), with slightly heavier weights but with the same height and upper arm circumference. The majority of women in the intervention group were working mothers, whereas women in the control group were housewives. All the respondents from both groups were evenly distributed in each CHC.

Table 1. Distribution of respondents

Variables	Intervention group		Control group	
	n	%	n	%
Age*	27.8 (20-41)		30 (17-54)	
Weight**	66.05±13.9		61.89±12.3	
Height**	152.6±5.78		152.9±5.73	
Upper arm circumference**	27.98±3		27.78±3.4	
Working status				
Housewife	15	38.5	85	54.5
At school	0	0	2	1.3
Working	24	61.5	69	44.2
Current CHC				
Nambo	1	2.5	4	2.5
Simpong	14	36.0	56	36.0

Variables	Intervention group		Control group	
	n	%	n	%
Kampung Baru	23	59.0	92	59.0
Biak	1	2.5	4	2.5

** mean (min-max) value*
*** mean ± SD*

Table 2 depicts the proportion of women in both groups according to their ANC frequency visits and components of ANC. The proportion of the mother's weight, height, and blood pressure, UAC, lab, and appropriate referral are not shown in the tables because all mothers in both groups received the measurement.

Table 2. The frequency of ANC and its components

	Intervention		Control		
Variables	**n**	**%**	**n**	**%**	***p-value***
1st Trimester					
< 2	37	94.8	153	98.0	0.262
≥ 2	2	5.2	3	2.0	
2nd Trimester					
Never	20	51.3	87	55.8	0.614
≥ 1	19	48.7	69	44.2	
3rd Trimester					
< 3	34	87.2	129	82.7	0.632
≥ 3	5	12.8	27	17.3	
Fundal Height Measurement					
Yes	19	48.7	69	44.2	0.614
No	20	51.3	87	55.8	
Fetal presentation and heart rate monitoring					
Yes	34	87.2	154	98.7	0.004
No	5	12.8	2	1.3	
TT Immunization					
Yes	15	38.5	94	60.3	0.014
No	24	61.5	62	39.7	
IFA supplementation					
<90 tablets	15	38.5	68	43.6	0.592
≥90 tablets	24	61.5	88	56.4	
Health counseling					
Yes	19	48.7	69	44.2	0.719
No	20	51.3	87	55.8	

DISCUSSION

The growth of technology these days prompts its utilization in all aspects of human life including the health sector. Mobile-based health application program, or *mhealth* app, was one form of technology utilization. Although the primary purpose is to increase the health service inclusivity to all people, these apps also offer various features according to their targeted health problems to solve. Studies show various results regarding the effectiveness of *mhealth apps* in health promotive and prevention (Kassa & Matlakala, 2022; Wang, Xue, Huang, Huang, & Zhang, 2017).

By the time of study was conducted, the main feature of *draivCare* app was messaging/chat, while the emergency ambulance service was still under development. The messaging/chat feature enabled pregnant women to communicate

or have counseling with midwives whenever desired. Upon registering in the app, pregnant women should complete the essential data needed such as number of identity card, address, husband's name, and contact number.

The Indonesia MoH recommended at least 6 ANC visits for normal pregnancy allocated at least twice in the first trimester, once in the second trimester, and at least three visits in the third trimester(Kementerian Kesehatan Republik Indonesia, 2020). However, the majority of respondents of both groups in this study failed to comply with the recommendation. This finding is contrary to the ANC coverage report, let alone the national medium-term development plan target(Kementerian Kesehatan Republik Indonesia, 2024). Various factors can determine the obedience of mothers to visit health care facilities(Denny, Laksono, Matahari, & Kurniawan, 2022; Trisnawati, Weraman, & Manongga, 2020), in particular since the pandemic status at the national level has only terminated in June 2023, maternal anxiety about the pandemic, pregnancy condition, delivery history, restriction of health service time due to social distancing policy, and husband's support (Aurelia, Diah, & Care, 2022; Syahriani, Mufdlilah, & Sulistyaningsih, 2022) can be taken as a consideration in this study.

The quality of ANC at each visit is as important as the number of visits. As stated by Omotosho A. et al. (2022), the implementation of high-quality-based practice of ANC is needed to prevent unfavorable maternal and neonatal outcomes(Omotosho, Sodeinde, Abolurin, Adekoya, & Abiodun, 2022) such as stillbirth(UNICEF, 2023). In this study, there were only two ANC components that significantly differed, with a higher proportion in the control group: the proportion of mothers who received the fetal examination, and the proportion of mothers who received tetanus toxoid immunization. A number of ANC contacts affect the quality of ANC received by pregnant women(Mandiwa & Namondwe, 2024), but considering that the ANC frequency in all periods of pregnancy did not differ between groups, other factors should be considered as reasons for the differentiation. Factors such as individual beliefs about vaccines(Wardaya, Martini, Sutiningsih, & Hestiningsih, 2024), condition and TT immunization status of pregnant women when visiting the health service(Kementerian Kesehatan Republik Indonesia, 2014), and completeness of pregnancy report.

Based on these results, the effect of the *draivCare* app on maternal health service coverage in this study is yet to be perceptible. This finding is not in accordance with a previous study stating that chat/messaging-featured *mhealth* can increase antenatal care services and visits(Oliveira-Ciabati et al., 2017), still, some studies failed to identify the positive influence of *mhealth* on maternal-neonatal outcomes and maternal knowledge(Sondaal et al., 2016). However, the use of the *draivCare* app displays a potential effect on improving antenatal care, as shown by the intensity of consultation between mothers and midwives regarding antenatal care, problems, and symptoms they experienced during pregnancy (figure 2). The other variable worth noticing is the consumption of IFA, which was 5% higher in the intervention group. Although statistically insignificant, this could be a sign of knowledge transfer from midwives to mothers via *mhealth*. This condition was also discovered by a systematic review, which concluded that although there is currently no strong favorable consensus regarding mhealth and ANC, there is potential for it to improve ANC, particularly in low- and middle-income nations (Kante & Målqvist, 2025).

The potential of *draivCare* in the future in maternal health service programs should be supported by improvements in some areas to boost the intention to use from future users. Among Indonesians, the behavioral intention to use *mhealth* is affected by perceived information quality and usefulness(Amanda & Layman, 2022), so are performance expectancy and price value(Kwee, Istijanto, & Widjojo, 2022). Thus, local

governments should act according to the needs of future users to ensure program development and sustainability.

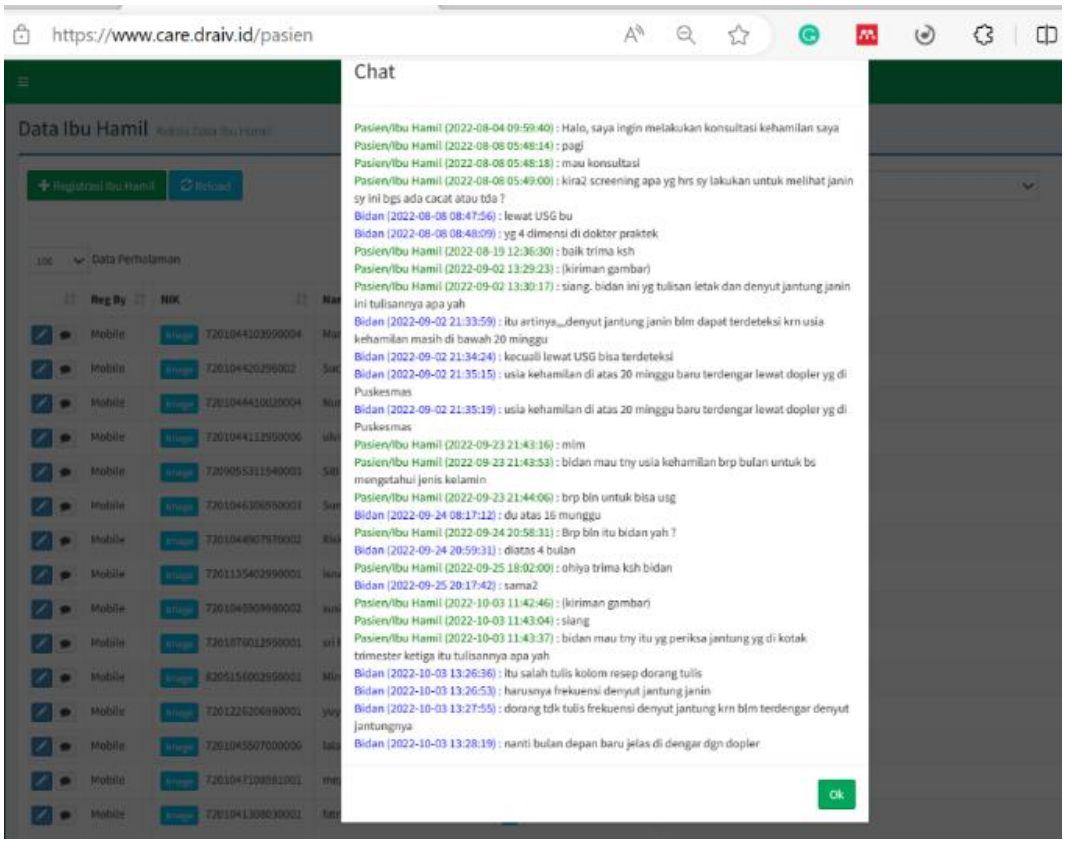

Figure 2. counselling chat between pregnant women and midwives via d*raivCare*

From the interview with midwives, although the app is easy to use, the main reason for refusal to use the app is that it is not a built-in app, needs separate installments, and not all pregnant women use Android or even have a mobile phone. Despite the fact that at the time of the study, the main feature is chat/messaging, the *draivCare* itself was an integrated part of an app called *draiv*, a local app that provides ride-hailing, taxi, food delivery, grocery, and pick-up services, not to mention the development of emergency ambulance service was on its way. Therefore, users can obtain combined benefits by installing an app. The involvement of the husband or other family members could enhance opportunities for *draivCare* app utilization by pregnant women. Moreover, from the provider's perspective, the administrator's availability and response time need to be improved (Patel et al., 2018).

CONCLUSION

The implementation of the *draivCare* app on maternal health services is yet to be perceptible. However, this app has the potential to improve maternal health and positive pregnancy outcomes, as evidenced by the intensity of communication between pregnant women and midwives. Thus, it could be a booster to the advanced development of the app, both in terms of features and scope of access. However, some improvements need to be made by the local government to ensure program's sustainability.

Author's Contribution Statement: Dian Kurniasari Yuwono: Conceptualization, Methodology, Writing. **Yustianty Monoarfa:** Data collecting, Data analysis, Writing-

editing. **Nitro Galenso:** Interview, Project administration. All authors have read and agreed to the manuscript.

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