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RESEARCH **Open Access**

Does siPantau Bumil GIS-Based Able to Increase K6 Visits and Reduce Complication for High-Risk Pregnant Women?

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Abstract
K6 visits and obstetric complications scope is one indicator of maternal health program services. Scarcely have these indicator's achievements met the expected targets so innovation is needed to improve them. The method that can be used to increase the accomplishment is digitalization, through the use of applications to provide and improve the health services quality in monitoring pregnant women. The objective is to design and investigate the GIS (Geographical Information System) influence on pregnancy monitoring practice, especially on K6 visits and pregnant women's high-risk obstetric complications in Pekalongan City. This research uses the Research and Development (R&D) method with a quasi-experimental research design and posttest control group design. The population is pregnant women with high-risk factors at 32 weeks gestation in Pekalongan City. The total sample is 60 people, who were divided into two groups, namely 30 respondents in the intervention group and 30 respondents in the control group. In the intervention group, pregnant women were given monitoring through the Sipantau Bumil application and K6 visit notifications, while in the control group, the K6 visit schedule was written in the KIA book. Moreover, the data analysis used the Chi-Square test. The result is the siPantau Bumil application has increased K6 visits with a significance value of p-value=0.012 (p<0.005). In addition, it also reduces obstetric complications with a significance value of p-value=0.002 (p<0.005). The conclusion is the GIS-based pregnancy monitoring application can increase K6 visits and reduce obstetric complications.

Keywords: Sipantau Bumil Application, K6 Visit, Obstetric Complication.

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1. INTRODUCTION

The maternal mortality rate (MMR) in Indonesia is still relatively high. Until now, the MMR is still in the range of 305 per 100 thousand babies born alive, while the SDGs target that must be achieved by 2024 is 183 per 100 thousand babies born alive . The number of cases of maternal death recorded in the performance records of the Ministry of Health's Family Health Program shows that cases of maternal death are increasing every year. In 2020 the number of reported cases was 4,627 cases, while in 2021 the number of reported cases increased to 7,389 cases (Kementerian Kesehatan RI, 2022).

Maternal mortality in Central Java shows the same trend as maternal mortality in Indonesia. In 2019 the MMR was 76.9 per 100 thousand babies born alive, in 2020 it rose to 98.6 per 100 thousand babies born alive (Dinas Kesehatan Provinsi Jawa Tengah, 2022). In 2021, the MMR in Central Java will reach 199 per 100 thousand babies born alive (Dinas Kesehatan Provinsi Jawa Tengah, 2022) Maternal death cases in Pekalongan City have also increased since 2019 by 6 cases, then rose to 9 cases in 2020 and 11 cases in 2021 (Dinas Kesehatan Kota Pekalongan Tahun 2020)

The incidence of death that befalls a mother can be caused by risk factors experienced by the mother from the time of pregnancy to delivery, such as the 4 "too" criteria, namely too young the mother's age when pregnant/giving birth (mother's age < 20 years), too old the mother's age at the time of birth. pregnancy/giving birth (mother's age > 35 years), too many children (> 4 children born), and too close birth spacing (pregnancy interval < 2 years).

Maternal health service coverage as described in Q1 2019 to 2021 in Central Java tends to increase. However, there was a decrease in K4 achievements in 2020 compared to 2019, namely from 94.7 percent to 94.1 percent (Dinas Kesehatan Provinsi Jawa Tengah, 2022). K1 coverage from 2019 to 2022 in Pekalongan City has reached 100%, while K4 coverage from 2019 to 2021 respectively is 97.7%, 98.2% has decreased in 2021 to 95.9% and in 2022 to 97.5% (Dinas Kesehatan Kota Pekalongan, 2021).

K6 coverage will start from 2021 with a national target that must be achieved, namely 80%. The K6 coverage achievement for Central Java province in 2021 is 72% and in 2022 it is 82.94 (Dinas Kesehatan Provinsi Jawa Tengah, 2022). K6 coverage in Pekalongan City in 2021 is 77.5%, while in 2022 it will be 77.7%. This shows that K6 coverage in Pekalongan City is still below the set target (Dinas Kesehatan Kota Pekalongan, 2021).

In Pekalongan City, the coverage for handling obstetric complications is still relatively high every year, in 2019 it was 117.2%, in 2020 it was 118.6%, in 2021 it was 119% and in 2022 it increased sharply to 146.4%. This increase in the number of coverage for obstetric complications shows that there is an increase in cases of obstetric complications from the estimated target (Dinas Kesehatan Kota Pekalongan, 2021).

It is predicted that around 74% of deaths that befall a mother can be prevented, if the quality of health services provided to the mother is superior and adequate in determining early diagnosis of obstetric complications or high risks and there is easy affordability of obtaining health services (Farhati, Sekarwana, & Husin, 2018). Obstetric complications must be handled/treated appropriately in order to reduce the death rate in pregnant, giving birth or postpartum women (Kementerian Kesehatan RI, 2020).

The use of applications for early detection of pregnancy risks (DDILAN) has been researched to increase pregnant women's knowledge and attitudes about pregnancy risks (Ismayanty et al., 2019). The Wellingbom 2.0 application has been proven to increase the husband's ability to detect high-risk pregnancies early (Pratamaningtyas & Titisari, 2022). The use of the M-Health application has been proven to increase knowledge, attitudes, and behavior to prevent dangerous signs of pregnancy in pregnant women, and can reduce complaints of nausea and vomiting in pregnant women (Puspitasari, 2019).

From this description, it was found that there was a gap in achievement data between K1-K4 and K6 coverage. The difference in achievement between K1 and K4 coverage in 2022 is 2.5%, while the difference in achievement between K1 and K6 coverage in 2022 is 22.3%. The achievement gap between K1-K4 and K6 coverage indicates a discontinuity in visits between K1-K4 and K6. Thus, it can be interpreted that if there is no gap between K1-K4 and K6, then all pregnant women have made their first visit to receive a pregnancy check-up and continue until the sixth visit in the 3rd trimester, pregnant women have been monitored regularly by health workers.

The pregnant woman's application designed by Suparni (2021) in Pekalongan City illustrates the effectiveness of using the application on maternal knowledge in detecting pregnancy risks. Of the several applications that have been designed, researched and implemented for pregnant women, they are still screening and providing education (Fatkhudin, & Zuhana, 2021). Therefore, researchers are interested in conducting research by creating the "SIPantau Bumil Based GIS" application which can provide information on the location of pregnant women, types of risks for pregnant women, K6 visit schedules for pregnant women, types of obstetric complications, education and care that can be given to pregnant women so that makes it easier for midwives to monitor pregnant women, which will increase the coverage of K6 visits and reduce obstetric complications. The access for users of the siPantau Bumil application consists of pregnant women, midwives/Puskesmas, and health services. The health service as the health service regulator is involved as a user in using this application so that it can quickly find out the whereabouts of pregnant women and the types of risk factors in areas throughout Pekalongan City and evaluate the performance of community health centers in monitoring pregnant women.

2. RESEARCH METHOD

This research uses Research and Development (R&D) methods to increase active monitoring for high-risk pregnant women and efforts to reduce the risk of obstetric complications. In the application developed, there is a visit reminder feature, birth interpretation as well as providing information and education through narrative descriptions and images.

Research procedures in the R&D category consist of five procedures to produce final products so they are ready to be applied in providing health services. The stages used are the adoption of a modified Borg and Gall model (Sugiyono, 2022). This research was carried out in Pekalongan City in 2023.

The population in this study were pregnant women with high-risk factors with a gestational age of 32 weeks residing in Pekalongan City. The population in this study was 60 people. The sample size in this study was calculated using the Lemeshow formula, resulting in a sample size of 60 respondents divided into a treatment group of 30 respondents and a control group of 30 respondents.

The independent variable in this research is the GIS-based siBumil application. Dependent variables were K6 visits and obstetric complications. Confounding variables in this study are age, education, employment, income, attitude, and husband's support.

3. RESULTS AND DISCUSSION

Table 1. Characteristics of Respondents

Characteristics Respondent	Intervention		Control		Total	
	n	%	N	%	n	%
Age						
Risk	9	30,0	12	40,0	21	35,0
No Risk	21	70,0	18	60,0	39	65,0
Education						
Basic	15	50,0	14	46,7	29	48,3
Middle	11	36,7	9	30,0	20	33,3
College	4	13,3	7	23,3	11	18,3
Work						
Housewife	17	56,7	20	66,7	37	61,7
Work	13	43,3	10	33,3	23	38,3
Income						
< UMK	8	26,7	14	46,7	22	36,7
≥UMK	22	73,3	16	53,3	38	63,3
Husband's support						
Doesn’t support	10	33,3	9	30,0	19	31,7
Support	20	66,7	21	70,3	41	68,3
Mother’s attitude						
Don’t agree	6	20,0	14	46,7	20	33,3
Agree	24	80,0	16	53,3	40	66,7

Table 1 the age of respondents in the intervention group was in the no-risk category, namely 21 people (70%), in the control group the mother's age was mostly in the no-risk category, the number was 18 (60%). Overall, 39 (65%) respondents fell into the no-risk age category. The education level of respondents in the intervention group included 15 people (50%), in the control group the number of respondents with basic education was 14 (46.7%). Overall, 29 respondents fell into the basic education category (48.3%).

The work showed that the majority of respondents in the intervention group were in the IRT category. The number was 17 people (56.7%). In the control group, 20 respondents fell into the IRT category (66.7%). Overall, 37 respondents fell into the IRT category (61.7%). Income shows that the majority of respondents in the intervention group fall into the income category >= UMK. The number was 22 people (73.3%). In the control group, 16 respondents (53.3%) were in the income category >= UMK. Overall, 38 respondents fell into the income category >= UMK (63.3%).

Table 2. Overview of K6 Visits and Obstetric Complications

Description	Intervention		Control		Total	
	n	%	n	%	n	%
K6 Visits						
Not K6 Visits	5	16,7	14	46,7	19	31,7
K6 Visits	25	83,3	16	53,3	41	68,3
Obstetric Complications						
Complications	4	13,3	12	40,0	16	26,7
No complications	26	86,7	18	60,0	44	73,3

Table 2 shows that the majority of respondents made K6 visits. The number of respondents in the intervention group who made K6 visits was 25 respondents (83.3%). In the control group, the number of respondents who made K6 visits was 16 people (53.3%). Overall, 41 respondents (68.3%) visited both the intervention and control groups.

Most respondents did not experience obstetric complications. In the intervention group, 26 respondents (86.7%) did not experience obstetric complications. In the control group, 18 respondents (60%) did not experience obstetric complications. Overall, neither the intervention nor the control group experienced obstetric complications, as many as 44 people (73.3%).

Table 3. Influence of Respondent Characteristics on K6 Visits

Characteristics Respondent	K6 Visits						*p- Value*
	No K6 Visits		K6 Visits		Total		
	n	%	n	%	n	%	
Age							
Risk	9	42.9	12	57.1	21	100	0.172
No Risk	10	25.6	29	74.4	39	100	
Education							
Basic	13	44.8	16	55.2	29	100	
Middle	3	15	17	85	20	100	0,083
College	3	27.3	8	72.7	11	100	
Work							
Housewife	9	24.3	28	75.7	37	100	0.121
Work	10	14.6	13	85.4	23	100	
Income							
< UMK	12	54.5	10	45.5	22	100	0,004
≥ UMK	7	18.4	31	81.6	38	100	
Husbund's Support							
Doesm't support	13	68.4	6	31.6	19	100	0.000
Support	6	31.6	35	77.5	41	100	
Mother's Attitude							
Don't Agree	10	50	10	50	20	100	0.031
Agree	9	22.5	31	77.5	10	100	

Table 3 Effect of age on K6 visits the p-value of the chi-square test shows a figure of 0.172. Because the p-value is more than 0.05 (0.172>0.05), it can be concluded that age does not affect K6 visits. The effect of education on K6 visits the p-value of the chi square test shows a figure of 0.083. Because the p-value is more than 0.05 (0.083>0.05), it can be concluded that education has no effect on K6 visits. The effect of work on K6 visits the p-value of the chi-square test shows a figure of 0.121. Because the p-value is more than 0.05 (0.121>0.05), it can be concluded that work has no effect on K6 visits.

The effect of income on K6 visits the p-value of the chi-square test shows a figure of 0.004. Because the p-value is less than 0.05 (0.004<0.05), it can be concluded that income has an effect on K6 visits. The effect of the husband's support on K6 visits the p-value of the chi-square test shows a figure of 0.000. Because the p-value is less than 0.05 (0.000<0.05), it can be concluded that the husband's support influences K6 visits. Influence of the mother's attitude towards k6 visits the p-value of the chi-square test shows a figure of 0.031. Because the p-value is less than 0.05 (0.031<0.05), it can be concluded that attitude influences K6 visits.

Table 4. Influence of Characteristics on Obstetric Complications

	Obstetric Complications						*p-value*
	Complications		No Complications		Total		
	N	%	N	%	n	%	
Age							
Risk	9	42.9	12	57.1	21	100	0.037
No Risk	7	17.9	32	82.1	39	100	
Education							
Basic	11	37.9	18	62.1	29	100	09.1
Middle	3	15	17	85	20	100	
College	2	18.2	9	81.8	11	100	
Work							
Housewife	7	18.9	30	81.1	37	100	0.085
Work	9	39.1	14	60.9	23	100	
Income							
< UMK	12	54.5	10	45.5	22	100	0.004
≥ UMK	4	18.4	34	81.6	38	100	
Husband's Support							
Doesn't Support	13	64.4	6	31.6	19	100	0.000
Support	3	7.3	38	92.7	41	100	
Mother's Attitude							
Don't Agree	14	46.7	16	53.3	30	100	0.012
Agree	5	16.7	25	83.3	30	100	

Table 4 shows the effect of age on obstetric complications the p-value of the chi-square test shows a figure of 0.037. Because the p-value is less than 0.05 (0.037<0.05), it can be concluded that age affects obstetric complications. The effect of education on obstetric complications the p-value of the chi-square test shows a figure of 0.159. Because the p-value is more than 0.05 (0.159>0.05), it can be concluded that education has no effect on obstetric complications. The effect of work on obstetric complications The p-value of the chi-square test shows a figure of 0.085. Because the p-value is more than 0.05 (0.085>0.05), it can be concluded that work does not affect obstetric complications.

The effect of income on obstetric complications The p-value of the chi-square test shows a figure of 0.004. Because the p-value is less than 0.05 (0.004<0.05), it can be concluded that income affects obstetric complications. The effect of husband's support on obstetric complications. The p-value of the chi-square test shows a figure of 0.000. Because the p-value is less than 0.05 (0.000<0.05), it can be concluded that the husband's support affects obstetric complications. The effect of mother's attitude on obstetric complications The p-value of the chi-square test shows a figure of 0.000. Because the p-value is less than 0.05 (0.000<0.05) it can be concluded that attitude influences obstetric complications.

Table 5. Effect of the GIS-based siPantau Bumil application on K6 visits.

Group	**K6 Visits**						***p-value***
	No K6 Visits		**K6 Visits**		**Total**		
	n	**%**	**n**	**%**	**n**	**%**	
Control	14	46.7	16	53.3	30	100	0.012
Intervention	5	16.7	25	83.3	30	100	

Table 5 shows that the intervention group had more K6 visits compared to the control group. Of the 30 respondents in the intervention group, 25 respondents (83.3%) had K6 visits, while in the control group, only 16 respondents (53.3%) had K6 visits. 5 respondents in the intervention group did not make K6 visits (16.7%), while in the control group there were 14 people (46.7%). This shows that the intervention group had more K6 visits compared to the control group.

The p-value of the chi-square test shows a figure of 0.012. Because the p-value is less than 0.05 (0.012<0.05), it can be concluded that the GIS-based surveillance application for pregnant women affects K6 visits.

Table 6. Effect of the GIS-Based SiPantau Pregnancy Application on Obstetric Complications.

Group	Obstetric Complications						*p-value*
	No Complications		Complications		Total		
	n	%	n	%	n	%	
Control	18	60	12	40	30	100	0.020
Intervension	26	86.7	4	13.3	30	100	

Table 6 shows that more people in the intervention group did not experience obstetric complications compared to the control group. Of the 30 respondents in the intervention group, 26 respondents (86.7%) did not experience obstetric complications, while in the control group, 18 people (60%) did not experience obstetric complications. Respondents in the intervention group who experienced obstetric complications were 4 respondents (13.3%), while in the control group, there were 12 people (40%). This shows that more respondents in the intervention group did not experience obstetric complications when compared to the control group.

The p-value of the chi-square test shows a figure of 0.020. Because the p-value is less than 0.05 (0.020 <0.05), it can be concluded that the SiPantau Bumil application has an effect on obstetric complications.

DISCUSSION

1. Influence of Characteristics on K6 Visits.

a. The Effect of Age on K6 Visits

The results showed that age had no influence on K6 visits. The p-value of the chi-square test shows a figure of 0.172. Because the p-value is more than 0.05 (0.172>0.05), it can be concluded that age has no influence on K6 visits.

Age has no effect on K6 visits because the respondents in this study were high-risk pregnant women so they were aware of the importance of pregnancy checks in order to maintain the health of themselves and the fetus they are carrying. The research results of Qomar et al., (2021) also found that age does not influence antenatal care visits. This makes it possible for pregnant women to feel that the health of the mother and fetus during pregnancy is considered important so that they continue to carry out visits according to schedule. Pregnancies in at-risk groups can be controlled with appropriate antenatal care. This is done by detecting risks and complications early so as to make it easier for health workers to provide safe pregnancy care and birth planning according to the level of risk experienced (Qomar et al, 2021).

b. The Influence of Education on K6 Visits

The results showed that education did not influence K6 visits. The p-value of the chi-square test shows a figure of 0.083. Because the p-value is more than 0.05 (0.083>0.05), it can be concluded that education has no influence on K6 visits.

A person's education is a predisposition that determines a person's health behavior. Predisposing factors are factors that facilitate or predispose someone's behavior to occur (Devy & Aji, 2023). These results are in line with research Lorensa that there is no relationship between education and antenatal care visits. Pregnant mothers not always highly educated behave positively, and so do pregnant women not always with low education behavior (Lorensa et al, 2021).

c. The Effect of Work on K6 Visits

The results showed that work had no influence on K6 visits. The p-value of the chi-square test shows a figure of 0.121. Because the p-value is more than 0.05 (0.121>0.05), it can be concluded that work has no effect on K6 visits.

The results of this study are in line with the research (Kiah, Kaltsum & Saleh, 2023) which shows that the mother's job does not affect K6 coverage. Work shows that most working and non-working mothers have complete antenatal visits. The statistical test results showed that there was no relationship between employment and antenatal visits at the Alak Health Center. The results of other research also show that there is no significant relationship between the respondent's job and the regularity of carrying out regular K6 inspection visits (Sari et al., 2021).

d. The Effect of Income on K6 Visits

The research results show that income influences K6 visits. The p-value of the chi-square test shows a figure of 0.004. Because the p-value is more than 0.05 (0.004<0.05), it can be concluded that income affects K6 visits.

The results of this research are in line with the research (Kiah, Kaltsum & Saleh, 2023) which shows that the income obtained from the family will influence K6 visits. According to (Kiah, Kaltsum & Saleh, 2023) mothers with high family incomes are three times more likely to make antenatal visits compared to families with lower incomes. This research is in line with what Kiah, Kaltsum, & Saleh, (2023) di family income with K6 antenatal visit at the Community Health Center Alak points out that most mothers with high family income have a complete visit. Results Statistics also show that there is a relationship between income and visits antenatal, where a mother with a high family income is a possibility make regular antenatal visits complete 3 times compared to mothers with a low family income. The results of other studies also state that there is a relationship between knowledge and family income in antenatal care visits (Kiah, Kaltsum, & Saleh, 2023). On the other hand, pregnant women's family income is low, they tend to allocate family finances to fulfill their family's basic needs (Oktava, 2019). Economic limitations can encourage pregnant women not to have routine check-ups because they cannot afford to pay (Zega, Tambunan, & Barus, 2023).

e. The Effecr Husband's Support on K6 Visits

The results showed that the husband's support had an influence on K6 visits. The p-value of the chi-square test shows a figure of 0.000. Because the p-value is less than 0.05 (0.000<0.05), it can be concluded that the husband's support influences K6 visits.

According to (Aryanti, Karneli, & Sella, 2020) pregnant women will always carry out complete pregnancy checks if they receive good support from their husbands. Husband's support has a significant impact on the success of antenatal care because good support given

by a husband to his wife will affect the physical and psychological condition of pregnant women so that mothers will receive regular antenatal care. Husband's support, especially in the form of instrumental support as shown by always providing attention and affection, advising the wife to have a pregnancy check-up, accompanying her during the pregnancy check-up, and knowing and being alert to her wife's condition during pregnancy (Aryanti, Karneli, & Sella, 2020).

Family support is not the only support where there is also support from people around and health workers who are ready to support, and the pregnant mother herself is a decision maker who will decide whether to visit antenatal care or not (Cahyani, 2020). Husband's support plays an important role in influencing the psychology and enthusiasm of pregnant women. Support in the form of attitudes and actions such as assistance, attention, appreciation or concern for pregnant women will make a good contribution to pregnant women in utilizing ANC services regularly (Tassi et al, 2021).

f. The Influence of Mother's Attitudes on K6 Visits

The results showed that the mother's attitude towards the importance of pregnancy check-up visits had an influence on K6 visits. The p-value of the chi square test shows a figure of 0.000. Because the p-value is less than 0.05 (0.031<0.05), it can be concluded that attitude influences K6 visits.

The attitude of mothers who agree about the importance of pregnancy checks will influence the intensity and compliance of mothers in carrying out pregnancy checks. Mothers who believe that pregnancy checks are important and can maintain the health of the mother and her baby will make the mother always have her pregnancy checked regularly by health workers. Mother will always remember and ask for a schedule of when she has to make a return visit.

2. Influence of Characteristics on Obstetric Complications.

a. The Effect of Age on Obstetric Complications

The research results show that age has an influence on obstetric complications. This can be seen from the p-value of the chi-square test which shows a figure of 0.037. Because the p-value is less than 0.05 (0.037<0.05), it can be concluded that age has an effect on obstetric complications.

The risk of pregnancy arises in pregnant women who are less than 20 years old and when the mother is more than 35 years old, in young mothers, obstetric complications that appear in the form of bleeding at a young gestational age, birth of preterm babies, LBW, congenital abnormalities, easily being attacked by viruses or bacteria, low hemoglobin levels, poisoning in pregnancy (gestosis) and death (Sukma, & Sari, 2020). Younger women will tend to have broader knowledge than older women because times have changed a lot and technology is more advanced so it is very easy to access the information they want (Komariah & Nugroho, 2020).

b. The Effect of Education on Obstetric Complications

The research results showed that education had no influence on obstetric complications. This can be seen from the p-value of the chi square test which shows a figure of 0.159. Because the p-value is more than 0.05 (0.159>0.05), it can be concluded that education has no effect on obstetric complications.

The results of this study show that education has no effect on obstetric complications, this is because even though the respondents are in the basic education category, they receive good information about health so they will always maintain their health through routine

pregnancy check-ups. Education is an effort to develop personality and abilities inside and outside school (both formal and non-formal), lasting a lifetime (Nabila, Dewi, & Immawati, 2022).

Education will influence the mother's knowledge. Pregnant women who have high knowledge will certainly understand what is good for themselves and their fetus, for example, keeping their child at a distance to avoid high-risk pregnancies because the child is too close. Pregnant women who have low knowledge but do not experience high risk are supported by good health conditions where there are no problems or risk factors originating from within the mother (Fitrianingsih, Suindri, & Armini, 2019).

Education has a significant influence on maternal mortality, where the level of education possessed by pregnant women influences whether or not maternal death occurs. The high maternal mortality rate is partly due to the very low level of education of mothers. Women who have a high level of education tend to pay more attention to the health of themselves and their families, while women with a low level of education result in a lack of understanding of the dangers that can befall pregnant women, especially in terms of pregnancy and childbirth emergencies (Karyati, 2021).

c. Effect of Work on Obstetric Complications

The results of the study showed that work had no influence on obstetric complications. The p value of the chi square test shows a figure of 0.085. Because the p value is more than 0.05 (0.085>0.05), it can be concluded that work has no effect on obstetric complications.

The results of this study are in line with research conducted by Murdiati and Jati (2017) which concluded that work has no effect on obstetric complications. This is because the work carried out by pregnant women is not a factor that directly influences behavior change (Murdiati & Jati, 2017).

d. The Effect of Income on Obstetric Complications

The research results show that income has an influence on obstetric complications. The p-value of the chi-square test shows a figure of 0.004. Because the p-value is less than 0.05 (0.004<0.05), it can be concluded that income has an effect on obstetric complications.

The results of this study are in line with the research (Fitrianingsih et al., 2019) which concluded that income influences obstetric complications. According to (Fitrianingsih et al., 2019) socio-economic conditions in the family will influence the nutritional needs of pregnant women and their families, including their efforts to carry out pregnancy care and examinations. Making a correct diagnosis early will be able to prevent obstetric complications resulting from high-risk pregnancies. Income problems that occur cause obstacles to obtaining health services, which can increase maternal morbidity and mortality. In communities that have high economic conditions, family health status also increases (Andini & Julia, 2022).

e. The Effect of Husband's Support on Obstetric Complications

The results showed that the husband's support influenced obstetric complications. The p-value of the chi-square test shows a figure of 0.000. Because the p-value is less than 0.05 (0.000<0.05), it can be concluded that the husband's support affects obstetric complications.

With the husband's role as a good partner for his wife in maintaining pregnancy, of course, he will be alert to the possibilities that will happen to his wife, including the possibility of obstetric complications. The husband's support will be able to reduce the possibility of complications occurring in the mother. Research conducted by Pramasanthi, (2016) concluded that husband's support influences obstetric complications. According to

Pramasanthi, (2016), if pregnant women and their partners are given the right information about the importance of pregnancy checks, it will have a significant impact on the mother's regularity in carrying out pregnancy checks compared to only the mother receiving counseling. The support given by the husband to the mother can give rise to inner calm and feelings of joy that give rise to a positive attitude towards oneself and the pregnancy (Farida, Kurniawati, & Juliningrum, 2019).

f. The Influence of Mother's Attitudes on Obstetric Complications

The research results show that attitude has an influence on Obstetric Complications. The p-value of the chi-square test shows a figure of 0.000. Because the p-value is less than 0.05 (0.000 <0.05), it can be concluded that attitude influences obstetric complications.

The influence of attitudes towards obstetric complications is due to the fact that the mother agrees with the importance of pregnancy checks as an effort to prevent the occurrence of obstetric complications.

3. The influence of the GIS-based Sipantau Bumil application on K6 visits

The results of the study showed that pregnant women who were given the application intervention had more K6 visits compared to pregnant women who were not given the intervention. In the intervention group, the number of pregnant women who underwent K6 visits was 25 respondents (83.3%) out of a total of 30 pregnant women who received the intervention. In the intervention group there were 5 respondents who did not make the K6 visit because 1 respondent had preterm labor, 2 respondents had made an appointment with the officer to make the K6 visit but it was not yet time to make an appointment for the K6 visit. The respondent was already in labor and 1 respondent did not have time. made a K6 visit because he was busy working. Meanwhile, in the control group, the number of mothers who made K6 visits was 16 (53.3%) out of a total of 30 mothers in that group.

The Chi Square Test results show that there is an influence of using the GIS-based Sipantau Bumil application on K6 visits. The p value is 0.012 from 0.05 (0.012<0.05), so it can be concluded that the GIS-based surveillance application for pregnant women has an effect on K6 visits.

The "GIS-Based siPantau Bumil" application is an application developed to increase the coverage of K6 visits. "GIS-Based Pregnancy Monitoring" which can provide information on the location of pregnant women, types of risks for pregnant women, K6 visit schedule for pregnant women, types of obstetric complications, education and care that can be given to pregnant women so that it will make it easier for midwives to carry out monitoring of pregnant women which has an impact. will increase coverage of K6 visits.

With the various features this application has, it has been statistically proven to have an effect on K6 visits for high-risk pregnant women in Pekalongan City. Where the results of the hypothesis test obtained a p-value <0.05. There is an influence of "GIS-based pregnant monitoring" on K6 visits because the use of this application is able to provide notification of the K6 visit schedule that must be carried out by pregnant women. If a pregnant mother has not had a K6 visit, the notification on the application will continue to flash so that the local midwife understands who the mothers are who have not had a K6 visit. Apart from that, it can also help officers to monitor whether pregnant women have had K6 visits via active WA chat carried out by officers/midwives for pregnant women. The siPantau Bumil application also provides educational features in the form of text and attractive images so that it can increase pregnant women's knowledge about health or ANC visits which is expected to increase pregnant women's awareness of the importance of regular ANC visits. Research by Ismayanty

et al., (2020) shows that providing a mobile application increases mothers' knowledge about pregnancy risk factors (Ismayanty et al., 2019).

4. The Effect of the GIS-Based SiPantau Pregnancy Application on Obstetric Complications

The results of the study showed that pregnant women who were given intervention in the form of the GIS-based Sipantau Bumil application did not experience obstetric complications more often than 26 respondents (86.7%). In the intervention group, there were 4 respondents who experienced obstetric complications. The types of complications experienced by these respondents were: Meanwhile, in the control group, 18 respondents (60%) did not experience obstetric complications.

The results of the Chi-Square Test show that there is an influence of using the GIS-based Sipantau Bumil application on obstetric complications. The p-value of 0.020 is less than 0.05 (0.020 <0.05), so it can be concluded that the GIS-based SiPantau Bumil application is against obstetric complications.

Obstetric complications are defined as pain in pregnant women, women giving birth, and postpartum women which can threaten the life of the mother and/or baby. In Pekalongan City, with high cases of obstetric complications, high mobility of pregnant women and the absence of village midwives who can monitor 24 hours in the village, of course, this requires intervention to improve monitoring and management of data collection related to the distribution of pregnant women so that pregnant women can be monitored well.

The results of this study indicate that the use of the GIS-based pregnancy monitoring application can influence obstetric complications, where in the intervention group the number of mothers who experienced obstetric complications was smaller compared to the control group. The influence of GIS-based Sipantau Pregnancy on reducing obstetric complications is due to several things, including this application can provide notifications for inspection visits, this application is equipped with educational features, the educational feature on the GIS-based Sipantau Pregnancy application provides some information on the problems of obstetric complications that can occur. The use of text, audio, and video self-care tutorials in the application makes it easier for respondents to get information easily because audio-visual media uses hearing and seeing elements or uses more than one sense (Indrawati, 2018).

Apart from that, this application also has a chat feature with a midwife, this chat feature allows pregnant women to get counseling with a midwife regarding the condition of their pregnancy. With this chat feature, mothers/patients can connect with health workers at any time. In certain conditions, if a pregnant woman experiences complaints that lead to obstetric complications, the mother can communicate with the local midwife so that the midwife will be able to immediately respond to the complaints experienced in the form of suggestions or immediate action to carry out obstetric management. Obstetric management that can be provided quickly by midwives to patients will be able to minimize the incidence of obstetric complications experienced by mothers. Thus, the use of the GIS-based siPantau Bumil application has an influence on obstetric complications.

4. CONCLUSION

The research results show that age, education, and employment have no effect on K6 visits, while income, husband's support, and attitude have an effect on K6 visits. The research results also showed that age, income, husband's support, and attitude had an influence on obstetric complications, while education and employment had no effect on obstetric complications. The research results show that the GIS-based pregnant monitoring application has an effect on increasing K6 visits and reducing obstetric complications.

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