International Journal of Public Health Science (IJPHS)
Vol. 15, No. 3, September 2026, pp. 737~744
ISSN: 2252-8806, DOI: 10.11591/ijphs.v15i3.26921

Effectiveness of virtual postpartum education classes on maternal knowledge and health-seeking behavior in Kupang City: a pre–post study

Ignasensia Dua Mirong, Dewa Ayu Putu Mariana Kencanawati, Odi L. Namangdjabar, Hasri Yulianti, Martina Fenansia Diaz, Diyan Maria Kristin
Department of Midwifery, Poltekkes Kemenkes Kupang, Kupang, Indonesia

Article Info

Article history:

Received Dec 4, 2025
Revised Feb 7, 2026
Accepted Jul 12, 2026

Keywords:

Classes
Mothers
Neonates
Postpartum
Virtual
Visits

ABSTRACT

Postpartum maternal health services are routinely administered to postpartum mothers four times daily. In reaction to the COVID-19 pandemic, modifications have transpired in healthcare services, encompassing postpartum maternal health. Virtual homecare services facilitate remote interaction with patients without utilizing healthcare services. This study aims to assess the impact of virtual postpartum maternal classes on knowledge, early detection skills, and treatment-seeking behaviors. This study employs a quantitative methodology utilizing a quasi-experimental pretest-posttest design. A virtual postpartum mothers' class program was conducted every two weeks for three months. The total population consists of 109 individuals, while the purposive sample comprises 32 individuals. Data acquisition through questionnaires (pre-tests and post-tests). Conduct an analysis of the data utilizing the Wilcoxon signed ranks test. The study's findings demonstrate a substantial impact of virtual postpartum mother class mentoring on knowledge levels ($p = 0.000$), early detection of complications by postpartum mothers ($p = 0.001$), and treatment-seeking behavior ($p = 0.001$). The introduction of virtual postpartum maternal classes significantly enhances postpartum mothers' knowledge, their capacity to identify postpartum complications, and their propensity to seek treatment.

Corresponding Author:

Dewa Ayu Putu Mariana Kencanawati
Department of Midwifery, Poltekkes Kemenkes Kupang
Kupang, East Nusa Tenggara, Indonesia
Email: ayuwati94@gmail.com

1. INTRODUCTION

The issue of maternal and neonatal mortality constituted a significant global public health challenge, with stagnation in progress reported in recent years, particularly in low- and middle-income countries [1]. Globally, approximately 290,000 maternal deaths and 2.3 million neonatal deaths occurred annually before the pandemic, with most being preventable [2]. The COVID-19 pandemic severely exacerbated this issue by disrupting essential health services, including critical postnatal and neonatal care [3]. Lockdowns, fear of infection, and strained healthcare systems led to a sharp decrease in facility visits and a reduction in the quality and frequency of postnatal care across the globe [4]. This international crisis necessitated the rapid adoption of alternative service delivery models, such as telehealth, to maintain continuity of care for vulnerable populations. The global imperative was to find efficacious virtual solutions to bridge the care gap created by the pandemic.

In Indonesia, high rates of maternal and neonatal mortality persisted, placing the country among those with the most substantial burden in Southeast Asia [1]. The COVID-19 pandemic further compromised the nation's maternal and neonatal health services [5], [6]. In regions like Kupang City, where access to specialized health facilities was often challenging even before the pandemic, the service disruption was potentially more severe [7]. Primary health centers/Puskesmas and midwives faced significant challenges, including the fear of contagion, inadequate personal protective equipment (PPE), and an increased workload, which collectively reduced the effectiveness and reach of essential in-person postnatal and neonatal home visits [8]. Consequently, many mothers in Kupang were required to manage the critical postpartum and neonatal periods at home with minimal direct clinical supervision, highlighting a profound need for localized, accessible, and safe care alternatives [9].

A lack of timely postnatal and neonatal home visits significantly increased the risks of preventable complications, such as postpartum hemorrhage, maternal infections, and undetected neonatal growth restriction or infections, all of which contributed to the rise in mortality and morbidity [10]. Virtual maternal classes (VMCs) paired with virtual home visits (VHVs) emerged globally as an innovative, safe, and potentially effective state of the art solution to mitigate these dangers during the pandemic [3]. VMCs offered essential education, while VHVs allowed healthcare providers to remotely monitor maternal and neonatal health indicators, provide breastfeeding support, and foster patient-provider rapport [11]. The urgency of this research lay in the immediate need to validate the Efficacy of this virtual care model VMCs combined with VHVs specifically in the challenging, resource-constrained, and high-risk context of Kupang City during the height of the COVID-19 crisis.

The postpartum mothers' class is part of the promotive and preventive efforts in maternal health services recommended by the Indonesian Ministry of Health as a continuation of antenatal and delivery services. This program aims to improve mothers' knowledge and skills during the postpartum period, including maternal and newborn care, breastfeeding, recognizing danger signs, and utilizing appropriate health services. In line with the policy of health service transformation and digitalization, the implementation of the postpartum mothers' class has begun to be developed in the form of a virtual class to expand access to maternal health education, especially in areas with geographical limitations and limited access to health services.

Globally and nationally, various studies have shown that digital-based postpartum health education, such as online classes, mobile applications, and interactive media, is effective in improving postpartum mothers' knowledge and attitudes. According to [12], [13] in Indonesia, several studies have reported that digital education by health workers can improve mothers' understanding of postpartum care and complication prevention. In [14], however, most of these studies still focus on improving knowledge and are descriptive or based on short-term interventions.

Gap analysis shows that empirical evidence regarding the effectiveness of virtual postpartum mother classes health care seeking behavior research is still limited, particularly with structured quantitative designs conducted in eastern Indonesia. Furthermore, there are still few studies evaluating virtual postpartum class interventions conducted periodically over a specific period. Therefore, this study aims to evaluate the effectiveness of the virtual postpartum mother class towards improving maternal knowledge and health service seeking behavior in Kupang City through a pre-post study design. This manuscript aimed to fill a critical gap in evidence by rigorously assessing the efficacy of the integrated virtual care model (VMCs and VHVs) in a geographically specific, high-need context during an unprecedented public health emergency [12]. The findings were expected to provide robust, localized evidence of a viable, pandemic-responsive strategy for postnatal and neonatal care [7]. The successful demonstration of this virtual model's efficacy offered a crucial Implication for policymakers and healthcare managers: it validated a sustainable, replicable, and low-cost model for delivering essential maternal and neonatal services in remote or resource-limited settings, both during future crises and as a permanent augmentation to traditional in-person care [13].

Postpartum education is a key component of maternal health services in Indonesia and is recommended by the Ministry of Health as a continuation of antenatal and childbirth care [15]. In line with national health system transformation and the expansion of digital health services, postpartum education has increasingly been delivered through virtual postpartum classes to improve access, particularly in geographically constrained areas [16]. Recent studies indicate that digital postpartum education can effectively improve maternal knowledge and attitudes toward postpartum and newborn care. However, existing evidence in Indonesia remains limited, as most studies focus primarily on knowledge outcomes, apply short-term or descriptive designs, and rarely assess health-seeking behavior as a key outcome. Moreover, empirical evidence from eastern Indonesia, including Kupang City, is scarce. This study addresses these gaps by evaluating the effectiveness of a structured virtual postpartum education class.

2. METHOD

2.1. Study design

This study employs a quantitative research methodology. The employed research methodology is a quasi-experimental design featuring a pretest-posttest format without a control group. This research design lacks a comparison group control, yet the initial assessment pre-test enables the researcher to evaluate the changes that occur post-treatment. Researchers are employing virtual interventions, whereby all postpartum mothers will participate in virtual postpartum classes, and their efficacy will be assessed by evaluating enhancements in knowledge, early detection of complications, and the pursuit of treatment for any complications encountered [14].

2.2. Population and sample

The study population comprised all postpartum mothers at three PONED health centers in Kupang City over the final three months of the study period, totaling 72 individuals. The sampling technique employed was purposive sampling, targeting postpartum mothers at the three PONED health centers across Kupang City. The sample selection adhered to specific inclusion criteria: postpartum period 3–42 days, residency in the local area, ownership of an Android smartphone, and prior interaction with healthcare professionals. Exclusion criteria encompassed postpartum mothers with a history of comorbid or chronic conditions, as well as those who declined participation in the sample. Subsequent to the study, only 32 postpartum mothers consented to engage in the virtual postpartum class activities.

2.3. Data collection

The intervention provided in this study was a virtual postpartum class for mothers using the Zoom platform for three months. The class presenters were lecturers in the midwifery department of the Kupang Ministry of Health Polytechnic. The postpartum class was held twice a month, resulting in six virtual postpartum class sessions. Evaluations were conducted before and after the intervention pre- and post-intervention. This study employed questionnaires as the data collection tools and methods. The questionnaire comprised several sections. This questionnaire was administered online to 30 postpartum mothers in the Pasir Panjang Public Health Center region. The reliability test yielded a Cronbach's alpha score of 0.71, while the validity test indicated that the computed R values for each question exceeded the R table value of 0.361, thereby confirming the validity of these statements. Upon completion of all questionnaire items, the instrument was evaluated and deemed valid and reliable. The questionnaire will serve as a measurement instrument for pre- and post-tests in this study.

2.4. Ethical clearance

Ethical approval for this study was granted by the Research Ethics Commission of the Kupang Ministry of Health Polytechnic, reference number: LB.02.03/1/0120/2021, dated December 17, 2021. All participants in the study received a prior explanation before their consent was solicited for involvement in this research. Participants were not coerced to continue their involvement in the study and received data credit of Rp. 50,000 as a token of appreciation for their participation.

2.5. Data analysis

The data analysis in this study utilized SPSS software version 16, encompassing univariate analysis through frequency distribution tables and the calculation of the mean, mode, and median of the measured variables. The Shapiro-Wilk test was employed for normality assessment due to the sample size being under 50, with a significance threshold of <0.05 for all variables, signifying non-normal distribution of the data. The bivariate analysis employed is the Wilcoxon signed rank test for ordinal data, processed using the SPSS software version 15, with a significance level of α=0.05. If $\alpha < 0.05$, then H1 is accepted, indicating an effect of the virtual postpartum mother class on the knowledge, skills, and treatment-seeking behavior of postpartum mothers.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Characteristics of respondents

A total of 32 respondents participated in this study. Their demographic characteristics are presented in Table 1. Most participants were aged 26–30 years (31.3%), had completed high school as their highest level of education (59.4%), and had a parity of two (37.5%).

3.1.2. Engagement of postpartum mothers in the virtual postpartum mother's class

This will outline the engagement of postpartum mothers in the virtual postpartum and infant care classes. The virtual postpartum maternal classes occurred four times. Postpartum mothers are classified as

inactive if they attend only one session of the mother class activities, less active if they attend two sessions, and active if they attend three to four sessions, as shown in Table 2. Table 2 indicates that a majority of postpartum mothers (53.1%) participate actively in virtual postpartum mother class activities.

3.1.3. Differences in postpartum mothers' knowledge regarding postpartum care and early detection of complications after attending virtual postpartum classes

The knowledge variable measures the mother's knowledge before and after attending the virtual postpartum mother's class. The results are as shown in Table 3. The data indicates that the average value rose by 0.72, with the Wilcoxon signed-rank test yielding $\alpha = 0.000$, signifying an impact of the virtual postpartum class on postpartum mothers' knowledge regarding the early detection of postpartum complications.

Table 1. Characteristic of responden

Variable	F	%
Age		
20-25	8	25.0
26-30	10	31.3
31-35	7	21.9
36-40	5	15.6
>40	2	6.3
Total	32	100
Education level		
Elementary school	1	3.1
Junior high school	0	0
High school	19	59.4
Bachelor	12	37.5
Total	32	100
Parity		
1	11	34.4
2	12	37.5
3	6	18.8
4	3	9.4
Total	32	100

Table 2. Engagement of postpartum mothers in the virtual postpartum mother's class

Variable	F	%
Active	17	53.1
Less active	9	28.1
Not active	6	18.8
Total	32	100

Table 3. Changes in postpartum maternal knowledge before and after virtual postpartum classes

Assessment	N	Mean	Min	Max	Standard deviation	Wilcoxon signed-rank test p-value
Pre-test	32	1.78	8	1	0.491	0.000
Post-test	32	2.50	4	20	0.718	

3.1.4. Differences in postpartum mothers' ability to detect postpartum complications after attending virtual antenatal classes

The variable of postpartum mothers' ability to recognize their complications was obtained by the researcher from the postpartum and newborn screening data filled out by postpartum mothers in a screening format. The category was considered capable if the mother filled out every item on the screening sheet and knew the next steps she should take based on the recommendations on that format. The results of the mother's ability to recognize postpartum complications and low birth weight experienced by her are shown in Table 4. Based on Table 4, it is known that the average score obtained is 0.37, with the Wilcoxon Sign Rank test result being $\alpha = 0.001$, which means there is a significant difference in the ability of postpartum mothers to recognize the complications they experience after attending the virtual antenatal class.

3.1.5. Differences in the treatment-seeking behavior for postpartum complications after attending virtual antenatal classes

Based on Table 5, the average score is 0.38. The Wilcoxon signed-rank test yields a p-value of 0.001. This result indicates a significant difference in treatment-seeking behavior for postpartum complications after attending the virtual antenatal class.

Table 4. Differences in postpartum mothers' ability to detect postpartum complications after attending virtual antenatal classes

Assessment	N	Mean	Min	Max	Standard deviation	Wilcoxon signed-rank test p-value
Pre-test	32	1.38	19	13	0.492	0.001
Post-test	32	1.75	8	24	0.440	

Table 5. Differences in the treatment-seeking behavior for postpartum complications after attending virtual antenatal classes

Assessment	N	Mean	Min	Max	Standard deviation	Wilcoxon signed-rank test p-value
Pre-test	32	2.81	2	8	0.896	0.001
Post-test	32	3.19	0	11	0.693	

3.2. Discussion

The findings of this study demonstrate that participation in structured virtual postpartum education classes was associated not only with improved maternal knowledge but also with positive changes in health-seeking behavior during the postpartum period. The observed increase in knowledge appears to have translated into greater maternal awareness of postpartum danger signs, appropriate timing of postnatal care visits, and utilization of available health services. This suggests that improved access to timely, structured, and interactive postpartum education through virtual platforms can facilitate behavioral change by enhancing mothers' understanding, confidence, and perceived benefits of seeking professional health care.

Based on a behavioral perspective, the intervention likely influenced key determinants of health behavior, including knowledge, perceived susceptibility, and self-efficacy, which are essential for translating information into action. The biweekly delivery model over three months provided repeated exposure and reinforcement of key messages, supporting sustained behavior change rather than short-term knowledge gains alone. These findings indicate that virtual postpartum education has the potential to function as an effective behavior change intervention, particularly in settings with limited access to face-to-face services, and underscore its relevance for strengthening postpartum care utilization in eastern Indonesia.

3.2.1. Knowledge

The research findings demonstrate a substantial enhancement in postpartum mothers' understanding of early complication detection and postpartum care following participation in four sessions of the virtual antenatal class (p-value: 0.00). The mean knowledge of postpartum mothers rose by 0.72 points. The research findings indicate a 0.72-point enhancement in postpartum mothers' understanding of postpartum complications following participation in virtual postpartum classes. This corresponds with research by Lestari *et al*. [17] in 2022, which indicated a 60% enhancement in the average knowledge of postpartum mothers following educational intervention. Moreover, community service conducted by Pramiyana and Diantini [18] demonstrated a 40.1-point enhancement in postpartum mothers' understanding of postpartum complications following their engagement in virtual-based education. Both studies demonstrate that technology-driven education regarding postpartum complications effectively enhances public and postpartum mothers' comprehension of maternal health maintenance during the postpartum phase. This conclusion is corroborated by Lestari *et al*. [19], which indicates that postpartum mothers utilizing the SEMASA application for virtual education can markedly enhance their understanding of postpartum care. Chaudhary *et al*. [20] reported that postpartum mothers' knowledge regarding postpartum complications increased by 8.07 points, and knowledge concerning newborn complications rose by 3.39 points following a virtual educational intervention conducted by healthcare professionals. The research findings demonstrate a substantial enhancement in postpartum mothers' understanding of early complication detection and postpartum care following participation in four sessions of the virtual antenatal class (p-value: 0.00). The mean knowledge of postpartum mothers grew by 0.72 points.

Research findings and prior studies consistently demonstrate that educating mothers about postpartum care and complications for both themselves and their newborns can markedly enhance their understanding of care, facilitate early detection of postpartum issues, and improve newborn care practices. Nonetheless, its success necessitates the support of various factors, including device ownership, internet connectivity, and the pregnant mother's capacity to access information regarding postpartum healthcare virtually.

3.2.2. The mother's ability to recognize postpartum and newborn complications and seek healthcare

During the COVID-19 pandemic, postpartum checkups could not be performed as routinely as under normal conditions. Therefore, it is very important for postpartum mothers to be able to detect postpartum and newborn complications they are experiencing and take appropriate action to address these complications.

Researchers prepared a user-friendly screening sheet for postpartum mothers, using a screening format that was given to every postpartum mother. Instructions for using this application are always disseminated during virtual postpartum mother's class activities. Additionally, the material in the postpartum mother's class also provides information on postpartum and newborn care, postpartum danger signs and complications, and postpartum exercises, which can give mothers knowledge about postpartum and newborn complications.

The research results show a significant difference in postpartum mothers' ability to recognize postpartum complications and low birth weight infants after attending virtual postpartum classes (p-value 0.0001), and there was an increase in the average ability of postpartum mothers to detect complications, which increased by 0.37 points. This shows that even during the pandemic, virtual postpartum classes with adequate support were quite effective for postpartum mothers to recognize their own and their babies' health problems and take appropriate action to address these complications.

These research findings are consistent with Farland [21], which states that there was a 38% increase in the ability to detect postpartum complications early in postpartum mothers who attended postpartum classes at healthcare facilities. Anggraini *et al*. [3] stated that there was a significant decrease (p-value < 0.00001) in the incidence of postpartum hemorrhage after receiving telemedicine intervention and remote monitoring, especially in areas with limited resources. Postpartum hemorrhage can also be well detected by midwives and nurses who have been trained in the early detection of postpartum complications, with a detection rate of 93.1%, and 91.2% of postpartum mothers identified as being at risk received adequate healthcare [22].

3.2.3. Health seeking behaviour

The research results show that the majority of respondents who attended virtual postpartum mother classes were able to make the decision to contact healthcare professionals/seek medical assistance if they experienced complications during the postpartum period (p-value: 0.0001, an increase of 0.38 points). Some previous studies have stated that virtual education using mHealth combined with social support can improve mothers' ability to provide postpartum care and newborn care by 2.11 points [23]. Education using telephone or virtual methods can significantly improve postpartum mothers' ability to care for their babies (p-value: 0.0038) [24]. Other research states that social support through WhatsApp groups is very effective in meeting the information needs of postpartum mothers regarding postpartum care [25]. This statement is consistent with that of Saad *et al*. [26], who reported that virtual care can improve adherence to obstetric care by providing emotional support and fostering trust between patients and healthcare providers. Thus, based on the results of this study and previous research, it is shown that virtual education for postpartum mothers can offer new hope in efforts to improve the knowledge, attitudes, and abilities of pregnant women in recognizing postpartum complications and performing postpartum care according to the recommendations of healthcare professionals.

3.2.4. Research limitation

This study has several limitations, including a very small sample size. This is because not all postpartum mothers at the Alak, Sikumana, and Bakunase Community Health Centers have Android phones, and not all mothers with Android phones can use the Zoom application as the main medium for virtual postpartum classes, resulting in a very small sample obtained by the researcher. Additionally, poor internet connectivity was also a challenge in this study. This was also stated by Anto-Ocrah *et al*. [27], namely, that the success of virtual education can yield maximum results if supported by digital literacy and internet connectivity.

4. CONCLUSION

Research findings indicate that most postpartum mothers attending virtual care classes improved their understanding of postpartum and newborn care, including complications and management strategies. These classes enabled mothers to successfully identify both postpartum and newborn complications. This illustrates a significant enhancement in their knowledge through active participation.

The results of this study open several opportunities for future research on virtual postpartum education. Further studies may employ randomized controlled trial designs or comparative studies to evaluate the effectiveness of virtual versus face-to-face or hybrid postpartum education models. Longitudinal research is also needed to assess the sustainability of behavior change beyond the immediate postpartum period, including long-term maternal and infant health outcomes. In addition, future research could explore the integration of virtual postpartum classes with mobile health applications, peer-support platforms, or community-based follow-up to enhance engagement and adherence. Qualitative or mixed-methods studies may provide deeper insights into mothers' experiences, barriers, and facilitators of behavior change, while implementation research could examine scalability, cost-effectiveness, and policy integration of virtual postpartum education across diverse settings in Indonesia. These research directions would contribute to strengthening the evidence base and informing the broader adoption of digital postpartum education programs.

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BIOGRAPHIES OF AUTHORS

Ignasensia Dua Mirong completed her master's degree in public health at Udayana University, Denpasar, in 2012. Since 2003, she has served as a senior lecturer, and in 2006, she became a permanent lecturer in the Department of Midwifery at the Ministry of Health Polytechnic of Kupang, East Nusa Tenggara, Indonesia. Her recent research, published in reputable national journals, focuses on maternal and child health, reproductive health, and public health. She can be contacted at email: inamirong1@gmail.com.

Dewa Ayu Putu Mariana Kencanawati is a doctoral candidate in Public Health Faculty at Universitas Indonesia. She is a midwife and working as a teacher in Government Midwifery School in Eastern Indonesia. Ayu is involved in a variety of scientific activities, including seminars, training, and writing articles for various scientific publications. She is currently concerned about malaria prevention and control in pregnant women, women's health, community empowerment, and sexuality. She can be contacted at email: ayuwati94@gmail.com.

Odi L. Namangdjabar is a lecturer in Midwifery Department, Ministry of Health, Kupang Health Polytechnic. She is a midwife and working as a teacher in Government Midwifery School in Eastern Indonesia. Her recent research, published in reputable national journals, focuses on maternal and child health, reproductive health, and public health. She can be contacted at email: odinamangdjabar222@gmail.com.

Hasri Yulianti completed her D4 Midwifery Education at the Makassar Health Polytechnic and her masters in Midwifery at the Faculty of Medicine, Hasanuddin University. Currently, she is a lecturer in the Department of Midwifery, Ministry of Health, Kupang Health Polytechnic. She can be contacted at email: hasriyulianti0612@gmail.com.

Martina Fenansia Diaz graduated with a master's degree in public health (KIA-Kespro) from Nusa Cendana University, Kupang in 2015. Currently, she is a lecturer at the Kupang Ministry of Health Polytechnic, Department of Midwifery. She can be contacted at email: martinadafan@gmail.com.

Diyan Maria Kristin graduated with a master's degree in public health [KIA-Kespro] from Nusa Cendana University, Kupang in 2015. Currently, she is a lecturer at the Kupang Ministry of Health Polytechnic, Department of Midwifery. She can be contacted at email: diyankrisin@gmail.com.