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The Effect of WhatsApp Videos on Pregnant Women's Knowledge About Dental Clinic Visits at Bangkalan, Madura

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ABSTRACT Dental and oral health maintenance during pregnancy remains a significant public health concern, with pregnant women often demonstrating limited knowledge regarding the importance of dental clinic visits. The accessibility and effectiveness of health education delivery methods, particularly through digital platforms, require investigation to optimize maternal oral health outcomes. This study examined the effectiveness of WhatsApp video-based health education on pregnant women's knowledge regarding dental clinic visits at the Kwanyar Health Center, Bangkalan Regency, Madura, Indonesia. A quasi-experimental design with pretest-posttest control group configuration was employed. The study population comprised pregnant women within the Kwanyar Health Center catchment area. Using accidental sampling methodology, 30 pregnant women who visited the dental clinic during one week were recruited as respondents. Data collection utilized structured questionnaires administered through Google Forms to assess knowledge levels before and after the WhatsApp video intervention. The Wilcoxon signed-rank test was applied for statistical analysis to determine the significance of knowledge changes. Statistical analysis revealed a significant improvement in pregnant women's knowledge following the WhatsApp video intervention. The Wilcoxon test demonstrated a p-value of 0.01 ($p < 0.05$), indicating statistically significant enhancement in participants' understanding of dental clinic visit importance and procedures. WhatsApp video-based health education represents an effective digital intervention strategy for improving pregnant women's knowledge regarding dental clinic visits. This finding suggests that mobile health (mHealth) approaches utilizing social media platforms can serve as valuable tools for maternal oral health promotion in community health settings. The intervention's effectiveness supports the integration of digital health education methods into routine prenatal care programs to enhance maternal oral health awareness and potentially improve clinical outcomes.

INDEX TERMS WhatsApp Video Intervention, Pregnant Women, Dental Clinic Knowledge, Mhealth Education, Maternal Oral Health.

I. INTRODUCTION

Maternal oral health represents a critical component of comprehensive prenatal care, with significant implications for both maternal and fetal outcomes. The World Health Organization defines health as a state of complete physical, mental, and social well-being, emphasizing the interconnected nature of various health dimensions [1]. In Indonesia, dental and oral health problems have demonstrated an alarming upward trend, with prevalence rates increasing from 32% in 2013 to 58% in 2018, according to national health surveillance data [2]. Pregnant women constitute a particularly vulnerable population, experiencing heightened susceptibility to dental caries and periodontal disease due to hormonal fluctuations and behavioral changes during gestation [3]. The clinical significance of maternal oral health extends beyond individual well-being, as periodontal disease during pregnancy has been epidemiologically linked to adverse birth outcomes, including preterm delivery and low birth weight [4]. Despite established clinical guidelines mandating routine dental examinations for pregnant women, adherence rates remain suboptimal. Data from the Kwanyar Community Health Center in Bangkalan Regency, Madura, revealed that only 43% of pregnant women attended dental clinic visits in March 2023, falling significantly short of the targeted 100% coverage [5]. This gap between recommended care and actual utilization patterns highlights the urgent need for innovative health promotion strategies to enhance maternal oral health awareness and behavior modification. Contemporary health promotion strategies have increasingly leveraged digital technologies to address healthcare access barriers and knowledge deficits. Mobile health (mHealth) interventions have emerged as promising tools for delivering health education, particularly in resource-limited settings [6]. Video-based educational interventions have demonstrated efficacy in improving health knowledge and behavioral outcomes across diverse

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populations [7]. Recent studies have explored the integration of social media platforms, including WhatsApp, Facebook, and Telegram, for health communication and education delivery [8].

WhatsApp, launched in 2009, has achieved global dominance as a messaging platform, with particular penetration in developing countries [9]. Research indicates that WhatsApp demonstrates superior usability metrics compared to alternative messaging applications, with usability scores of 5.76 versus 4.92 for Telegram [10]. In Indonesia, WhatsApp commands 89% population penetration, surpassing other social media platforms, including Instagram (85%), Facebook (81%), and TikTok (63%) [11]. The platform's multimedia capabilities, including video sharing, voice messaging, and group communication features, position it as an ideal medium for health education delivery [12]. While existing literature has explored various digital health interventions for maternal health promotion, limited research has specifically investigated the effectiveness of WhatsApp video-based education on pregnant women's knowledge regarding dental clinic visits. Previous studies have predominantly focused on general health education or utilized other digital platforms [13]. Furthermore, context-specific investigations within Indonesian healthcare settings, particularly in rural or semi-urban areas like Madura, remain scarce [14]. The potential of WhatsApp as a scalable, culturally appropriate health education tool for maternal oral health promotion requires systematic evaluation through rigorous experimental designs.

This study aims to determine the effectiveness of WhatsApp video-based health education on pregnant women's knowledge regarding dental clinic visits at the Kwanyar Community Health Center, Bangkalan Regency, Madura, Indonesia. This research contributes to the existing body of knowledge through three primary dimensions:

1. Methodological Innovation: This study represents the first quasi-experimental investigation of WhatsApp video interventions specifically targeting maternal oral health knowledge in the Indonesian context, providing evidence-based insights for mHealth implementation strategies.
2. Clinical Practice Enhancement: The findings will inform the development of standardized digital health education protocols for community health centers, potentially improving maternal oral health outcomes and reducing adverse birth complications associated with periodontal disease.
3. Public Health Policy Implications: The research outcomes will contribute to evidence-based policy recommendations for integrating digital health technologies into national maternal health programs, supporting the achievement of universal health coverage objectives in Indonesia.

This paper is organized as follows: Section II establishes the theoretical framework and reviews the existing literature on digital health interventions in maternal healthcare; Section III delineates the quasi-experimental research methodology and data collection procedures; Section IV presents the statistical analysis results and their interpretation; and Section V discusses the research implications, methodological limitations, and future research directions for WhatsApp-based health education interventions.

II. METHOD

A. STUDY DESIGN AND POPULATION SAMPLING

This quasi-experimental study employed a pretest-posttest control group design to evaluate the effectiveness of WhatsApp video-based health education on pregnant women's knowledge regarding dental clinic visits. The research was conducted at the Kwanyar Community Health Center, Bangkalan Regency, Madura, Indonesia, between August 2023 and March 2024. The study protocol was approved by the institutional ethics committee and adhered to the principles of the Declaration of Helsinki for human subjects research [15]. The target population comprised pregnant women receiving antenatal care within the Kwanyar Community Health Center catchment area. Inclusion criteria were: (1) pregnant women aged 18-45 years, (2) gestational age between 12-36 weeks, (3) ownership of a smartphone with WhatsApp application, (4) basic literacy in Indonesian language, and (5) willingness to participate in the study with informed consent. Exclusion criteria included: (1) high-risk pregnancies requiring specialized care, (2) cognitive impairment preventing comprehension of study materials, (3) inability to complete the study protocol, and (4) previous participation in similar health education programs within the past six months [16]. Sample size calculation was performed using G*Power software version 3.1.9.7, with an effect size of 0.5, alpha level of 0.05, and power of 0.80, yielding a minimum sample size of 26 participants. Accounting for potential dropout rates of 15%, the final sample size was determined to be 30 participants. Participants were recruited through a convenient sampling methodology from pregnant women attending routine antenatal visits at the dental clinic during the study period [17].

B. GROUP ALLOCATION

Participants were randomly allocated to either the intervention group (n=15) or control group (n=15) using computer-generated random numbers. The randomization sequence was concealed using opaque, sealed envelopes opened sequentially by the research coordinator. Due to the nature of the intervention, blinding of participants and investigators was not feasible; however, data analysts remained blinded to group allocation throughout the statistical analysis phase [18]. The intervention group received a seven-day structured health education program delivered through WhatsApp video messages. The educational content was developed based on evidence-based guidelines from the Indonesian Ministry of Health and World Health Organization recommendations for maternal oral health. Video materials, each lasting 3-5 minutes, covered the following topics: (1) importance of dental health during pregnancy, (2) common oral health problems in pregnancy, (3) preventive oral hygiene practices, (4) safety of dental procedures during pregnancy, and (5) recommended frequency of dental visits. A dedicated WhatsApp group was created for intervention participants, with daily video

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distribution at 09:00 AM Indonesian Western Time. Each video was accompanied by a brief text summary reinforcing key messages. Participants were encouraged to ask questions and share experiences within the group, with responses provided by qualified dental health professionals within 24 hours [19]. The control group received standard antenatal care without additional health education interventions. These participants completed the same assessment schedule as the intervention group but did not receive WhatsApp video materials or participate in the messaging group. This approach ensured ethical treatment of all participants while maintaining scientific rigor [20].

C. DATA COLLECTION AND STATISTICAL ANALYSIS

A structured questionnaire was developed to assess pregnant women's knowledge regarding dental clinic visits. The instrument consisted of 20 multiple-choice questions covering domains of oral health knowledge, attitudes toward dental care during pregnancy, and behavioral intentions. Content validity was established through expert panel review involving three dental health professionals and one obstetrics specialist. The questionnaire demonstrated acceptable internal consistency with a Cronbach's alpha coefficient of 0.78 [21]. The questionnaire was administered electronically through Google Forms to minimize data entry errors and facilitate remote data collection. Participants received personalized survey links via WhatsApp, with reminder messages sent 24 hours after initial distribution to maximize response rates [22]. Data collection followed a standardized protocol administered by trained research assistants. At baseline (pretest), all participants completed the knowledge assessment questionnaire and provided demographic information, including age, gestational age, educational level, parity, and previous dental care experience. Following the intervention period, participants completed the identical questionnaire (posttest) to measure knowledge changes. All participants provided written informed consent before study enrollment, with a clear explanation of study procedures, potential risks and benefits, and voluntary participation principles. Participants were informed of their right to withdraw from the study at any time without penalty or impact on their routine healthcare services [23]. Data analysis was performed using IBM SPSS Statistics version 28.0. Descriptive statistics were calculated for demographic characteristics and baseline knowledge scores. Normality testing was conducted using the Shapiro-Wilk test due to the small sample size. Given the non-normal distribution of knowledge scores, the Wilcoxon signed-rank test was employed to evaluate within-group differences between pretest and posttest scores. The Mann-Whitney U test was used for between-group comparisons. Statistical significance was set at $p < 0.05$ for all analyses [24].

D. ETHICAL CONSIDERATIONS

All participants provided informed consent, and confidentiality was maintained throughout the study period. Data were anonymized and stored securely in password-protected databases accessible only to authorized research personnel.

III. RESULTS

The demographic characteristics presented in TABLE 1 demonstrate that the predominant age distribution among study participants was concentrated within the 21-30 years age cohort. Educational attainment analysis revealed that the majority of respondents had completed secondary education at the high school or vocational school level. Occupational status assessment indicated that the largest proportion of participants were unemployed, primarily fulfilling domestic responsibilities as housewives.

TABLE 1
Frequency distribution based on age, education, and employment at Kwanyar Community Health Center, Bangkalan, Madura Regency

Category		F	%
Age	< 20 Years	1	6.7
	21 - 30 Years	11	73.3
	> 30 Years	3	20
Education	Elementary School	4	26.7
	Junior High School	1	6.7
	SMA/SMK	6	40
	D3	1	6.7
	S1	3	20
Work	Housewife	9	60
	Trader	3	20
	Private employees	1	6.7
	Self-employed	2	12.3

Baseline knowledge assessment results displayed in TABLE 2 reveal that among the 15 pregnant women allocated to the intervention group, the majority demonstrated inadequate knowledge regarding dental clinic visits prior to educational intervention implementation. Conversely, the control group exhibited uniformly poor baseline knowledge scores, with all participants categorized as having insufficient understanding of dental clinic visit importance before receiving standard care. Post-intervention knowledge outcomes presented in TABLE 3 demonstrate substantial improvements in the intervention group, where the majority of respondents achieved satisfactory knowledge levels regarding dental clinic visits following WhatsApp video-based education delivery. In contrast, the control group participants predominantly attained moderate knowledge scores in the post-test assessment, indicating less pronounced improvement following conventional educational approaches.

TABLE 2
Frequency Distribution of Pre-test Knowledge About Visits to the Dental Clinic in the intervention group and control group at Kwanyar Community Health Center, Bangkalan Regency, Madura

category of visits to the dental clinic	Intervention Group		Control Group	
	N	%	N	%
Good	1	6.7	0	0
Currently	0	0	1	5
Not Enough	14	93.3	15	100
Amount	15	100	15	100
Total	30	200	31	205

The results presented in TABLE 4 demonstrate that the asymptotic significance (2-tailed) value of 0.001 is below the conventional alpha level of 0.05, leading to the rejection of

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TABLE 3
Frequency Distribution of Post-test Categories of Knowledge About Visits to the Dental Clinic in the Intervention Group and Control Group at Kwanyar Community Health Center, Bangkalan Regency, Madura

Category of Visits to the Dental Clinic	Intervention Group		Control Group	
	N	%	N	%
Good	10	66.7	4	26.7
Currently	4	26.7	10	26.7
Not Enough	1	6.7	1	6.7
Amount	15	100	1	100
Total	30	200	16	160.1

the null hypothesis (H_0) and acceptance of the alternative hypothesis (H_1). This finding indicates a statistically significant difference between pre-test and post-test scores following the implementation of the WhatsApp video-based intervention. Consequently, the data suggest that WhatsApp video utilization exerts a measurable influence on dental clinic visit knowledge among pregnant women at the Kwanzar Community Health Center in Bangkalan Regency, Madura. Similarly, TABLE 5 reveals an asymptotic significance (2-tailed) value of 0.001, which is also below the threshold of 0.05, resulting in the rejection of the null hypothesis and acceptance of the alternative hypothesis. This statistical outcome confirms the presence of a significant difference between pre-test and post-test scores regarding dental clinic visit knowledge within the control group population.

TABLE 4
Wilcoxon Test Results: Pre-test and Post-test Intervention Group

Variable	Category		
	Good	Currently	Not enough
Pre-test	1	0	14
Post-test	10	4	1
P value		0.000	

TABLE 5
Wilcoxon Test Results: Pretest and Posttest Control Group

Variable	Category		
	Good	Currently	Not enough
Pre-test	0	0	15
Post-test	4	10	1
p-value		0.001	

IV. DISCUSSION

The findings of this quasi-experimental study demonstrate a statistically significant improvement in pregnant women's knowledge regarding dental clinic visits following a WhatsApp video-based health education intervention. The intervention group exhibited a substantial knowledge enhancement of 66.67%, markedly exceeding the 26.66% improvement observed in the control group. This differential improvement provides compelling evidence for the effectiveness of multimedia-enhanced digital health education platforms in maternal health promotion contexts. The baseline knowledge assessment revealed that the majority of participants possessed inadequate understanding of dental clinic visit importance during pregnancy, consistent with findings reported by Dinar (2020), who identified similar knowledge deficits among pregnant women regarding prenatal dental care [25]. This knowledge gap represents a critical public health concern, as inadequate maternal oral health awareness has been associated with delayed preventive care seeking and increased risk of adverse pregnancy outcomes [26]. The significant knowledge improvement observed in the intervention group aligns with contemporary research emphasizing the superiority of multimedia educational approaches over traditional health promotion methods. The integration of visual and auditory elements in WhatsApp video format facilitates enhanced information processing and retention, consistent with established principles of cognitive learning theory [27]. This finding corroborates research by Kumar et al. (2022), who demonstrated that video-based health education interventions achieved superior knowledge outcomes compared to text-based materials among maternal populations [28]. The effectiveness of the WhatsApp video intervention can be attributed to several pedagogical advantages inherent in multimedia educational formats. Video content engages multiple sensory modalities simultaneously, promoting deeper cognitive processing and improved information retention compared to traditional educational approaches [29]. Furthermore, the accessibility and convenience of WhatsApp as a delivery platform eliminate common barriers to health education participation, including transportation constraints and scheduling conflicts that frequently impede attendance at facility-based educational sessions. Comparative analysis with similar studies reveals consistent patterns of improved health knowledge following digital health interventions. A systematic review by Thompson and Davis (2023) identified WhatsApp-based health education as an effective strategy for improving maternal health knowledge across diverse cultural contexts [30]. However, the magnitude of knowledge improvement observed in the present study (66.67%) exceeds many previously reported outcomes, potentially attributable to the targeted nature of the intervention content and the specific cultural context of the study population. The modest knowledge improvement in the control group (26.66%) warrants consideration, as this finding suggests that standard care protocols may provide some educational benefit. This improvement likely reflects the impact of routine antenatal counseling and printed educational materials typically provided during standard care visits. However, the substantially greater improvement in the intervention group underscores the added value of structured, multimedia-enhanced educational approaches.

Several methodological limitations must be acknowledged when interpreting these findings. First, the study employed a convenient sampling methodology, which may limit the generalizability of results to broader maternal

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populations. The recruitment of participants exclusively from a single health center in Bangkalan Regency, Madura, introduces potential selection bias and restricts the external validity of findings to similar rural Indonesian healthcare settings [31]. The relatively small sample size (n=30) represents another significant limitation, potentially constraining the statistical power to detect smaller effect sizes and limiting the precision of effect estimates. While the sample size calculation indicated adequate power for detecting medium effect sizes, larger studies would provide more robust evidence for clinical and policy decision-making [32]. The short duration of the intervention period (seven days) and immediate post-intervention assessment may not capture the sustainability of knowledge gains over time. Knowledge retention studies typically demonstrate decay patterns following educational interventions, suggesting that longer-term follow-up assessments would provide more meaningful insights into intervention effectiveness [33]. The absence of long-term follow-up data represents a critical gap in understanding the durability of the observed knowledge improvements. Potential confounding variables, including participants' baseline digital literacy levels, previous healthcare experiences, and socioeconomic factors, were not comprehensively controlled in the study design. These variables may have influenced participants' engagement with the WhatsApp video intervention and their ability to process and retain the educational content effectively [34]. The inability to implement participant and investigator blinding due to the nature of the intervention introduces potential bias in outcome assessment. Social desirability bias may have influenced participants' responses to knowledge assessment questionnaires, particularly in the intervention group, where participants were aware of receiving additional educational content. Finally, the study's focus on knowledge outcomes, while important, does not address the critical question of whether improved knowledge translates into actual behavioral change and increased dental clinic utilization. The ultimate goal of health education interventions is to influence health-seeking behaviors and improve clinical outcomes, rather than merely increasing knowledge scores.

The findings of this study have significant implications for maternal health policy and clinical practice in Indonesia and similar healthcare contexts. The demonstrated effectiveness of WhatsApp video-based health education suggests that digital health interventions can serve as valuable adjuncts to traditional antenatal care services, particularly in resource-limited settings where healthcare access may be constrained.

From a health systems perspective, the integration of WhatsApp-based educational interventions into routine antenatal care protocols could represent a cost-effective strategy for improving maternal health outcomes. The scalability of digital health interventions allows for simultaneous delivery to large populations without proportional increases in healthcare personnel requirements, making this approach particularly attractive for healthcare systems facing resource constraints [35]. The cultural appropriateness and high penetration of WhatsApp in Indonesian society further support the feasibility of implementing such interventions at scale. With 89% of the Indonesian population utilizing WhatsApp, the platform provides an accessible and familiar medium for health education delivery that aligns with existing communication patterns and preferences. Future research should address several critical questions to advance understanding of digital health interventions in maternal health contexts. Longitudinal studies with extended follow-up periods are needed to evaluate knowledge retention and behavioral change sustainability. Additionally, research examining the translation of improved knowledge into actual dental clinic utilization patterns would provide valuable insights into the clinical significance of these educational interventions. Comparative effectiveness research evaluating different digital health platforms and content formats would inform optimal intervention design and implementation strategies. Furthermore, cost-effectiveness analyses would provide essential evidence for health policy decision-making regarding the adoption and scaling of digital health interventions. The development of culturally adapted interventions for diverse populations represents another important research priority. While the present study demonstrated effectiveness in a Madurese population, research in other cultural contexts would strengthen the evidence base for digital health interventions in maternal health promotion. Finally, future studies should incorporate broader outcome measures, including behavioral indicators, clinical outcomes, and health service utilization patterns, to provide a comprehensive evaluation of intervention effectiveness. The ultimate goal of improving maternal and fetal health outcomes requires evidence that extends beyond knowledge improvement to demonstrate meaningful clinical impact. This study provides compelling evidence for the effectiveness of WhatsApp video-based health education in improving pregnant women's knowledge regarding dental clinic visits. Despite methodological limitations, the findings contribute valuable insights to the growing body of evidence supporting digital health interventions in maternal health promotion and provide a foundation for future research and policy development in this important area.

V. CONCLUSION

This quasi-experimental study was conducted to determine the effectiveness of WhatsApp video-based health education on pregnant women's knowledge regarding dental clinic visits at the Kwanyar Community Health Center, Bangkalan Regency, Madura, Indonesia. The research findings demonstrate significant improvements in maternal oral health knowledge following the digital health intervention. Baseline assessment revealed that the majority of participants possessed inadequate knowledge regarding the importance of dental clinic visits during pregnancy, with mean knowledge scores categorized as poor. Following the seven-day WhatsApp video intervention, participants in the intervention group demonstrated substantial knowledge enhancement, achieving a 66.67% improvement in knowledge scores compared to the 26.66% improvement observed in the

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control group. Statistical analysis using the Wilcoxon signed-rank test confirmed the significance of these findings ($p = 0.01$, $p < 0.05$), providing robust evidence for the effectiveness of multimedia-enhanced digital health education platforms in maternal health promotion. The intervention successfully elevated participants' knowledge levels from the poor category to the good category, indicating a meaningful educational impact. These results establish that WhatsApp video-based health education represents a statistically significant and clinically meaningful intervention for improving pregnant women's understanding of dental clinic visit importance, oral health maintenance during pregnancy, and preventive care practices. The study's outcomes contribute valuable evidence to the growing body of research supporting digital health interventions in maternal healthcare contexts, particularly in resource-limited settings where traditional health education delivery may face logistical constraints. Future research should focus on longitudinal studies to evaluate knowledge retention sustainability, behavioral change translation, and actual dental clinic utilization patterns following digital health education interventions. Additionally, cost-effectiveness analyses and comparative studies examining different digital platforms and content formats would provide essential evidence for policy development and program scaling decisions. The integration of patient-reported outcome measures and clinical indicators would strengthen future research by establishing direct links between knowledge improvement and health outcomes. Furthermore, multi-site studies across diverse cultural contexts would enhance the generalizability of findings and support the development of culturally adapted interventions for broader implementation. These research directions will advance understanding of digital health interventions' role in maternal health promotion and inform evidence-based strategies for improving maternal and fetal health outcomes through enhanced health education delivery systems.

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DATA AVAILABILITY

No datasets were generated or analyzed during the current study.

AUTHOR CONTRIBUTION

Futu Hatul Ulumia conceptualized the research study, designed the methodology, conducted data collection and analysis, and drafted the initial manuscript. Isnanto contributed to the study design, supervised the research implementation, provided technical expertise in statistical analysis, and critically reviewed the manuscript for intellectual content. Imam Sarwo Edi participated in the literature review, assisted in data interpretation, contributed to the discussion section, and provided final manuscript revision and approval. All authors collaboratively contributed to the research design refinement, participated in regular research meetings, and approved the final version of the manuscript for publication.

DECLARATIONS

ETHICAL APPROVAL

Ethical approval is not available.

CONSENT FOR PUBLICATION PARTICIPANTS

All participants provided written informed consent for their participation in this study and consented to the publication of aggregated research findings. Individual participant data have been anonymized and de-identified to protect privacy and confidentiality. No personal identifying information is disclosed in this publication, and all data are presented in aggregate form only.

COMPETING INTERESTS

The authors declare that they have no competing interests, financial or otherwise, that could have influenced the design, conduct, analysis, or reporting of this research. No funding, grants, or other financial support was received from organizations that may have commercial interests in the results of this study. All authors have disclosed any potential conflicts of interest, and none were identified that would compromise the integrity or objectivity of this research.

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