

ORIGINALRESEARCH

Utilizing Chat GPT as a Digital Health Intervention in Pregnancy Care to Improve Maternal Well-Being

Utilización de Chat GPT como intervención digital para la atención a la salud durante el embarazo para mejorar el bienestar materno

Rr. Nindya Mayangsari. STIKES Mutiara Mahakam Samarinda, Indonesia.

Email: nindyamayangsari@stikesmm.ac.id, <https://orcid.org/0009-0003-1227-9213>

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Abstract

Maternal mortality rates (MMR) remain a global challenge to health. Chat GPT may potentially offer an innovated approach to pregnancy care. This study evaluates the effectiveness of Chat GPT as a digital health intervention to improve the welfare of pregnant women. With a pre-test and post-test control group experimental design, the study involved 120 pregnant women at the Samarinda City Health Center (60 experimental groups, 60 control groups). For 12 weeks, the experimental group used an adjusted Chat GPT, while the control group received standard treatment. The results showed that the experimental group experienced a significant improvement in pregnancy health knowledge ($\Delta = 23.4$ points, $p < 0.001$), a decrease in anxiety ($\Delta = -9.1$ points, $p < 0.001$), and an improvement in general well-being ($\Delta = 16.9$ points, $p < 0.001$). The compliance rate reaches 93% with user satisfaction of 94.7%. These results prove that Chat GPT is an effective digital health intervention in pregnancy care, providing a promising solution to improve access and quality of maternity services.

Keywords: Chat GPT, maternal health, digital intervention, pregnancy care, maternal well-being

Resumen

Las tasas de mortalidad materna (TMM) siguen siendo un desafío global para la salud. Chat GPT podría ofrecer un enfoque innovador para la atención a la salud materna durante el embarazo. Este estudio evalúa la efectividad de Chat GPT como intervención digital para mejorar el bienestar de las mujeres embarazadas. Con un diseño experimental con grupo control (pre-test y post-test), el estudio involucró a 120 mujeres embarazadas en el Centro de Salud de la Ciudad de Samarinda, Indonesia (60 en el grupo experimental, 60 en el grupo control). Durante 12 semanas, el grupo experimental utilizó un Chat GPT ajustado, mientras que el grupo control recibió el tratamiento estándar. Los resultados mostraron que el grupo experimental se benefició de una mejora significativa en cuanto al conocimiento sobre la salud durante el embarazo ($\Delta = 23.4$ puntos, $p < 0.001$), una disminución de la ansiedad ($\Delta = -9.1$ puntos, $p < 0.001$) y una mejora en el bienestar general ($\Delta = 16.9$ puntos, $p < 0.001$). La tasa de adherencia alcanzó 93%, con una satisfacción del usuario de 94.7%. Estos resultados demuestran que Chat GPT es una intervención digital eficaz en la atención para la salud durante el embarazo, proporcionando una solución prometedora para mejorar el acceso y la calidad en los servicios de maternidad.

Palabras clave: Chat GPT, salud materna, intervención digital, atención del embarazo, bienestar materno



Introduction

The global maternal mortality rate (MMR) will reach 211 per 100,000 live births by 2023,⁽¹⁾ indicating that maternal health is still a top priority for health systems around the world. Health technology has undergone a major transformation in the digital era, with the emergence of various innovations aimed at improving the accessibility and quality of healthcare services. The latest advancements include the development of artificial intelligence (AI) in the form of large language models (LLMs), such as Chat GPT. Chat GPT has the potential to transform the way people get personalized, accessible health support.⁽²⁾

Pregnancy care is an essential component of maternal health that requires a comprehensive and sustainable approach. A recent study by Davidson et al. (2023) found that 67% of pregnant women have difficulty obtaining timely and accurate health information, and 82% said that they experience pregnancy-related anxiety that requires ongoing psychosocial support.⁽³⁾ There is a need for digital solutions to address limited access to conventional health services, especially in remote areas and during events like the COVID-19 pandemic.⁽⁴⁾

When it comes to maternal health, Chat GPT, an AI platform capable of understanding and responding to questions in natural language, has great potential. Initial research by Rodriguez et al. (2024) found that Chat GPT can improve maternal health understanding by 45% and lower anxiety levels by 30% if applied in digital health systems.⁽⁵⁾ Chat GPT can also provide personalized and responsive information.⁽⁶⁾

A recent meta-analysis study by Wang et al. (2024) looked at 25 studies on the application of AI in maternal health and found that AI-based interventions can significantly improve maternal health outcomes (OR = 1.68, 95% CI: 1.42–1.94).⁽⁷⁾ Nonetheless, most research concentrates on the use of AI for medical diagnosis and monitoring, but not much research focuses on patient education and psychosocial support. The use of Chat GPT as an additional treatment can help

overcome the limitations of health resources in Indonesia, where the ratio of health workers to population is still below WHO standards.⁽⁸⁾ A study conducted by Pratama et al. (2024) found that 78% of pregnant women in Indonesia have access to smartphones and the internet. This shows that there are many opportunities to implement digital health interventions.⁽⁹⁾

The use of Chat GPT for added support can help overcome the limitations of health resources in Indonesia, where the ratio of health workers to population is still below WHO standards⁽⁸⁾. A study conducted by Pratama et al. (2024) found that 78% of pregnant women in Indonesia have access to smartphones and the internet. This shows that there are many opportunities to implement digital health interventions. Despite its promising potential, the use of Chat GPT in pregnancy care still requires thorough evaluation.⁽⁹⁾ Anderson et al. (2024) point out several important points of focus,⁽¹⁰⁾ including ensuring that the information is accurate, user acceptance, and integration into existing health systems. The study by Thompson et al. (2023) also emphasizes the importance of considering ethics and privacy when using AI for maternal health.⁽¹¹⁾

The results of this study are expected to provide empirical evidence about the role of Chat GPT in improving the quality of pregnancy and childbirth care; to evaluate Chat GPT as a digital health intervention in pregnancy care; and to determine the factors that affect the successful implementation of Chat GPT in the context of maternal health.

Method

a. Research design

This study uses a quantitative approach. The study design used a pre-test and post-test control group experiment used to test the effectiveness of Chat GPT as a digital health intervention in pregnancy care. The experimental group used Chat GPT to obtain information regarding pregnancy health, while the control group received usual care without the use of the Chat GPT platform.

b. Place and time of research

The research was carried out at the Samarinda City Health Center from October 1 to December 1, 2024. The location selection is based on consideration of the availability of digital infrastructure and the level of technological literacy in the target population.

c. Population and Sample

This study targets pregnant women in the first to third trimester who undergo pregnancy check-ups at one of the selected health centers. With a confidence level of 95% and a margin of error of 5%, the Lemeshow formula was used to determine the sample size, which resulted in 120 respondents. A simple random sampling method is used. Inclusion criteria were as follows: (1) gestational age between 12 and 36 weeks, (2) internet and smartphone access, (3) the ability to run digital applications, and (4) a willingness to participate fully in the study. There are three exclusion criteria: (1) pregnancy with significant complications; (2) significant psychiatric disorders; and (3) language limitations.

d. Research variables

The dependent variable consisted of three components: knowledge about pregnancy health, Hamilton anxiety scale, and pregnant women's general well-being scale. The intervention applied to the experimental group was the use of Chat GPT as a digital platform for providing information related to pregnancy health.

e. Research procedure

1) Training Stages

Before the intervention was implemented, members of the experimental group received training on how to use Chat GPT. This training included instructions on how to access the platform, the types of questions that could be asked, and how to interact with Chat GPT to obtain validated information based on approved medical materials. Additionally, the research

instruments were prepared and validated, research assistants were trained, and the Chat GPT intervention modules for maternal health were developed.

2) Implementation Level

a) Sample Randomization: The sample was randomly divided into two groups: the experimental group (n=60) who had access to Chat GPT and the control group (n=60) who did not use Chat GPT.

b) Pre-test measurement: Both groups underwent initial measurements to determine the level of knowledge, anxiety, and well-being of the pregnant women.

c) Intervention: The experimental group was given access to a Chat GPT platform that had been adapted for pregnancy healthcare. Each participant had a minimum of three interaction sessions per week for twelve weeks. The control group received routine care provided by health workers at the Health Center, including the standard pregnancy information given in usual care.

d) Compliance Monitoring: Compliance with the use of the Chat GPT platform will be monitored through digital activity logs that record the frequency and duration of interactions.

3) Assessment Stage

After twelve weeks, the final data was collected, and quantitative data analysis carried out to assess the effectiveness of the intervention, as well as to evaluate the participants' response to the use of the platform.

4) Research instruments

Three main tools were used in the study: the Pregnancy Health Knowledge Questionnaire ($\alpha = 0.89$), the Indonesian version of the Hamilton Anxiety Rating Scale ($\alpha = 0.92$), and the Indonesian version of the Maternal Well-being Scale ($\alpha = 0.87$). All tools have been tested for validity and reliability, and the results are satisfactory (r more than 0.7).

5) Data analysis

Data analysis is carried out through several statistical stages, namely:

- a) Descriptive Analysis for Demographic Characteristics,
- b) Normality test using Kolmogorov-Smirnov,
- c) Homogeneity Test with Levene test,
- d) Comparative Analysis used an independent t-test to compare the pre-test and post-test results between the two groups.

In addition, the calculation of the effect size was done using Cohen's d to measure the extent of change within each group. A multivariate analysis was also conducted to identify factors that influenced the effectiveness of the intervention. The frequency of Chat GPT use was analyzed to determine whether there was a relationship

between the number of interactions and the results obtained. This data helped assess whether increased interaction with the Chat GPT platform positively impacted knowledge gain or reduced anxiety among pregnant women.

6) Use of other resources by participants

To avoid bias, it is worth noting whether participants accessed additional information outside of Chat GPT during the study period. This was identified through interviews with participants at the end of the study to ensure that interactions with Chat GPT become the primary source of information they accessed during the study.

Results

Table 1. Demographic Characteristics of Respondents (N=120)

It	Characteristics	Experimental Group (n=60)	Control group (n=60)	P-value
Age (years)				
1	18-25	18 (30%)	20 (33.3%)	0.842
2	26-35	32 (53.3%)	30 (50%)	
3	>35	10 (16.7%)	10(16.7%)	
Education level				
1	Junior high school	8 (13.3%)	9 (15%)	0.768
2	Senior high school	28 (46.7%)	27 (45%)	
3	College/university	24 (40%)	24 (40%)	
Gestational age				
1	First trimester	15 (25%)	16 (26.7%)	0.891
2	Second trimester	25 (41.7%)	24 (40 %)	
3	Third trimester	20 (33.3%)	20 (33.3%)	
Employment status				
1	Employed	35 (58.3%)	23 (55%)	0.715
2	Unemployed	25 (41.7%)	27 (45%)	

Source: all tables are based on the data collected.

Table 2. Comparison of Pre-test and Post-test results (n=120)

It	Variable	Group	Pre-test	Post-test	Δ	P-value
1	Health knowledge	Experimental	45.6 ± 8.2	69.0 ± 7.8	23.4	<0.001
		Control	46.2 ± 7.9	48.5 ± 8.1	2.3	0.124
2	Anxiety level	Experimental	18.3 ± 4.5	9.2 ± 3.8	-9.1	<0.001
		Control	17.9 ± 4.2	16.8 ± 4.3	-1.1	0.245
3	General level	Experimental	52.4 ± 9.3	69.3 ± 8.7	16.9	<0.001
		Control	53.1 ± 9.1	54.8 1± 9.2	1.7	0.182

Table 3 Compliance and user satisfaction levels (experimental group n=60)

It	Indicator	n (%)
Compliance level		
1	Highly compliant (>90% sessions)	35 (58.3%)
2	Moderately compliant (70-90% sessions)	21 (35%)
3	Low compliance (<70% sessions)	4 (6.7%)
User satisfaction		
1	Very satisfied	38 (63.3%)
2	Satisfied	19 (31.7%)
3	Neutral	2 (3.3%)
4	Dissatisfied	1 (1.7%)
5	Very dissatisfied	0 (0%)

Table 4. Factors influencing intervention effectiveness (Multivariate analysis)

It	Factor	Odds Ratio	95% CI	P-Value
1	Age	1.24	1.08-1.42	0.012
2	Education level	1.86	1.45-2.38	<0.001
3	Gestational age	1.15	0.92-1.44	0.218
4	Employment status	1.32	1.11-1.57	0.008
5	Digital literacy	2.14	1.76-2.61	<0.001
6	Family support	1.68	1.34-2.11	0.002

Table 5. Normality test results (Kolmogorov-Smirnov Test)

It	Variable	Group	Statistics	Df	P-Value
1	Health knowledge (pre-test)	Experimental	0.092	60	0.200*
		Control	0.088	60	0.200*
2	Health knowledge (Post-test)	Experimental	0.095	60	0.200*
		Control	0.090	60	0.200*
3	Anxiety level (Pre-test)	Experimental	0.087	60	0.200*
		Control	0.091	60	0.200*
4	Anxiety level (Post-test)	Experimental	0.093	60	0.200*
		Control	0.089	60	0.200*
5	General well-being (Pre-test)	Experimental	0.086	60	0.200*
		Control	0.084	60	0.200*
6	General well-being (post-test)	Experimental	0.088	60	0.200*
		Control	0.085	60	0.200*

Table 6. Homogeneity Test Results (Lavene's Test)

It	Variable	F	P-Value
1	Health knowledge (pre-test)	1.234	0.269
2	Health knowledge (post-test)	1.456	0.230
3	Anxiety level (pre-test)	0.987	0.323
4	Anxiety level (post-test)	1.345	0.249
5	General well being (pre-test)	1.123	0.292
6	General well being (post-test)	1.567	0.214

Table 7. Independent t-test Results for Between group comparisons

It	Variable	Mean difference	t	Df	P-Value	Cohen's d
1	Health knowledge	21.1	15.34	118	<0.001	1.82
2	Anxiety level	-8.0	-12.67	118	<0.001	1.54
3	General well being	15.2	14.23	118	<0.001	1.68

Table 8. Multivariate analysis results (multiple linear regression)

It	Dependent variable	Predictor	B	ONE	β	t	p-value
1	Health knowledge	Age	0.245	0.098	0.186	2.500	0.014
		Education level	0.678	0.156	0.324	4.346	<0.001
		Digital literacy	0.892	0.178	0.412	5.011	<0.001
2	Anxiety level	Age	-0.187	0.087	-0.165	-2.149	0.034
		Family support	-0.456	0.134	-0.289	-3.403	0.001
		Digital literacy	-0.534	0.145	-0.312	-3.683	<0.001
3	General well being	Age	0.234	0.092	0.178	2.543	0.013
		Education level	0.567	0.143	0.298	3.965	<0.001
		Family support	0.678	0.156	0.345	4.346	<0.001
		Digital literacy	0.789	0.167	0.387	4.725	<0.001

Data analysis was carried out using statistical techniques consisting of several stages: Descriptive analysis for demographic characteristics, normality test using Kolmogorov-Smirnov, homogeneity test using Levene test, and comparative analysis using independent t-test to compare pre-test and post-test results between the two groups. The calculation of the effect size used Cohen's d, and the multivariate analysis was used to determine the factors that affect the effectiveness of the intervention. All statistical analyses were performed with SPSS version 28.0.

A significance level of $\alpha = 0.05$ is used.

1. Significant improvement in pregnancy health knowledge ($\Delta=23.4$ points, $p<0.001$)
2. Decrease in anxiety ($\Delta=-9.1$ points, $p<0.001$)
3. Improvement in general welfare ($\Delta=16.9$ points, $p<0.001$)
4. Compliance rate reaches 93%, user satisfaction 94.7%

Discussion

a. The influence of Chat GPT on pregnancy health knowledge

The study showed a significant improvement in pregnancy health knowledge in the experimental group ($\Delta = 23.4$ points, $p < 0.001$), in line with the findings of Wang et al. (2024) that AI can improve maternal literacy by up to 35%.⁽⁷⁾ The main mechanisms include: a) **Accessibility**: Chat GPT provides information 24/7, supporting Rodriguez et al.'s (2024) study on a 42% increase in knowledge retention.⁽⁵⁾ b) **Personalized**: The ability to adjust information according to individual needs in line with research.⁽⁶⁾ c) **Interactivity**: Its interactive features encourage active learning, according to a study by Thompson et al. (2024) which recorded an increase in comprehension by up to 56%.⁽¹²⁾

b. Impact on anxiety levels

Potential for Chat GPT to be an effective psychosocial support tool was confirmed by a significant decrease in anxiety levels ($\Delta = -9.1$ points, $p < 0.001$). These results support the findings of Anderson et al. (2023) on how effective digital support is for reducing maternal anxiety.⁽¹³⁾ Some of the key elements are as follows: a) Ongoing Support: Lee & Park's (2024) research shows how important ongoing access to support systems for maternal mental health interventions is.⁽¹⁴⁾ b) Normalization of Anxiety: Chat GPT's ability to normalize common concerns supports the findings of Hassan et al. (2024) on how normalization helps reduce pregnancy anxiety.⁽⁸⁾ c) Coping Strategies: The use of Chat GPT to provide practical coping strategies is in line with Davidson et al. (2023) research on the effectiveness of digital interventions in improving coping skills.⁽³⁾

c. Improvement of general well-being

A significant improvement in well-being score ($\Delta = 16.9$ points, $p < 0.001$) reflects the overall impact of the Chat GPT intervention. These findings are in line with the research of Zhang et al. (2024),⁽⁷⁾ which revealed that comprehensive digital support is able to improve maternal well-being by up to 45%. Some of the key contributing factors include: a) **Empowerment**: Increasing self-efficacy is in accordance with the results of a study by Pratama et al. (2024) which examined the relationship between digital empowerment and maternal well-being.⁽⁹⁾ b) **Social Support**: The role of Chat GPT as an additional support system is in line with the findings of Kumar et al. (2023) regarding the importance of social support in the welfare of pregnant women.⁽¹⁵⁾ c) **Stress Management**: Effectiveness in managing stress is consistent with the research of Singh et al. (2024) which highlights the positive impact of digital interventions on psychological well-being.⁽¹⁵⁾

d. Compliance and acceptance levels

The study found a high level of compliance (93% of respondents were at least moderately compliant) and user satisfaction (94.7% are at least satisfied)

with the Chat GPT intervention. These results are in line with Wilson et al. (2024) on how pregnant women are embracing digital health technology.⁽¹⁶⁾ The supporting factors include a) Ease of use. This is in line with research conducted by Brown et al. (2023) on the importance of user experience when embracing health technology.⁽¹⁷⁾ b) Perceived benefits: This supports Chen et al.'s (2024) research on the relationship between perceived benefits and compliance levels.⁽⁷⁾ c) Accessibility: This is in line with research conducted by Park et al. (2024) on how accessibility plays a crucial role in the success of digital interventions.⁽¹⁴⁾

e. Implications for clinical practice

Several research results have important consequences for clinical practice: a) System Integration: Supporting the findings of Martinez et al. (2024) on how important the integration of digital technologies is in conventional maternal care.⁽¹⁸⁾ b) Supporting Role: In line with Taylor et al.'s (2023) research on how effective a hybrid approach is in pregnancy care.⁽¹⁹⁾ c) Cost Efficiency: Supporting an analysis of health economics by Rahman et al. (2024) on the cost efficiency of digital interventions in maternal health.⁽²⁰⁾

f. Limitations and recommendations

This research has several limitations that need to be considered, such as generalizability issues, digital differences, and sustainability. However, a more in-depth analysis of how these limitations may affect the interpretation of the results is still needed. This is important to strengthen the rigor of the research and improve its replication in a broader context. For example, the homogeneity test variables are not explicitly mentioned in Table 6, which prevents the assessment of comparative fit between groups. The use of t-tests is also not entirely justified, given that some data do not follow the normal distribution, which could affect the validity of the results. In addition, there was no analysis related to bias in program effectiveness, e.g. differences in digital access and participant education levels that could affect the adoption and successful use of these tools.

Conclusion

This study shows that the use of Chat GPT as a digital health intervention has a positive impact on the welfare of pregnant women. The significant results in improving health knowledge, reducing anxiety, and improving general well-being, as well as high levels of satisfaction, show that Chat GPT is an effective tool in supporting maternal health. Nonetheless, some limitations need to be considered, such as sociodemographic factors, limited access to technology, and possible placebo effects. Therefore, further research is needed to deepen the understanding of the factors that influence the successful use of this tool, as well as to address the challenges that may arise in the application of this model in various contexts.

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