

The Influence of HAPA on Oral and Dental Health Measures for Pregnant Women to Prevent Low Birth Weight Study in Gunung Anyar Village, Surabaya Indonesia

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Article History

Received: 07.08.2025

Accepted: 03.09.2025

Published: 13.09.2025

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Abstract: Periodontal disease during pregnancy, such as gingivitis and periodontitis, can increase the risk of preterm birth and low birth weight (LBW). Recent research suggests that hormonal changes during pregnancy affect the periodontal tissue's response to local factors, worsening periodontal conditions, which can negatively impact pregnancy. Periodontal infection can trigger systemic inflammation, potentially leading to the spread of bacteria to the placenta and affecting fetal development. Oral health efforts in pregnant women have a significant impact on preventing low birth weight babies. One model that can be used to understand this action is the Health Action Process Approach (HAPA). This model emphasizes the importance of the transition from intention to actual action, encompassing two main phases: the motivational phase (involving intention formation) and the volitional phase (referring to planning and implementing the action). The urgency of the research is to analyze the influence of HAPA on the actions of pregnant women towards dental and oral health efforts in preventing the occurrence of LBW, so that in a certain period of time it will reduce the occurrence of stunting. Good oral health practices have the potential to contribute to the prevention of low birth weight (LBW), although postpartum self-monitoring results indicate that there was still 1 case of low birth weight (3.3%). This case is likely influenced by other multifactorial factors not entirely related to oral health, such as maternal nutritional status, gestational hypertension, or other medical history. HAPA is effectively used as a framework for behavioral interventions in The context of maternal dental health, particularly through strengthening volitional aspects such as action planning, self-monitoring, and action control, supports the sustainability of healthy behaviors after delivery.

Keywords: HAPA, Action, Oral and Dental Health Measures, Pregnant Women, Low Birth Weight.

Cite this Article

Ida. Chairanna. M, I.G.A. Kusuma. A, The Influence of HAPA on Oral and Dental Health Measures for Pregnant Women to Prevent Low Birth Weight Study in Gunung Anyar Village, Surabaya Indonesia (2025) *GRS Journal of Multidisciplinary Research and Studies*, Vol-2(Iss-9).51-57

Introduction

Periodontal disease remains still one of the most prevalent oral health disorders worldwide. The impact of periodontal disease can include pregnancy complications, including the birth of low birth weight babies¹. Periodontal disease is a disease found worldwide and affects up to 90% of the population, including pregnant women, either as gingivitis, the early stage of periodontal disease, or periodontitis, the most serious form of periodontal disease. Research before indicates that the prevalence of pregnancy gingivitis ranges from 30% to 100% of all pregnant women worldwide².

Periodontal disease during pregnancy, such as gingivitis and periodontitis, can increase the risk of preterm birth and low birth weight (LBW). Recent research suggests that hormonal changes during pregnancy affect the periodontal tissue's response to local factors, worsening periodontal conditions, which can negatively impact pregnancy. Periodontal infection can trigger systemic inflammation, potentially leading to the spread of bacteria to the placenta and affecting fetal development³.

Hormonal changes that occur during pregnancy can worsen periodontal conditions, increasing the risk of infection, which then triggers systemic inflammation and the production of inflammatory mediators such as prostaglandins and cytokines. These mediators can affect the placenta and cause impaired blood flow to the fetus, potentially leading to low birth weight. Other factors that exacerbate periodontal disease during pregnancy include poor oral hygiene, educational level, low dental health knowledge, and socioeconomic and behavioral factors^{4,5}.

The Health Action Process Approach (HAPA), developed by Ralf Schwarzer, is a model that facilitates understanding and changes in health behavior through two main phases: the motivational phase and the volitional phase. This model is highly relevant in encouraging preventive dental and oral health measures in pregnant women, which contribute to the prevention of low birth weight babies⁶.

Oral health efforts in pregnant women have a significant impact on preventing low birth weight babies. One model that can be used to

understand this action is the Health Action Process Approach (HAPA). This model emphasizes the importance of the transition from intention to actual action, encompassing two main phases: the motivational phase (involving intention formation) and the volitional phase (referring to planning and implementing the action)⁷. The urgency of the research is to analyze the influence of HAPA on the actions of pregnant women towards dental and oral health efforts in preventing the occurrence of LBW, so that in a certain period of time it will reduce the occurrence of stunting.

Materials and Method

This study is a quantitative study and research design includes Participatory Observation. The research was conducted in Gunung Anyar Village, Jl. Gunung Anyar Timur No. 64, Gunung Anyar District, Surabaya City, East Java, Indonesia. The study was conducted from May to September 2025. The sample for this study will be pregnant women making their first antenatal care (ANC) visit (K1) to the Dental Clinic of Gunung Anyar Community Health Center, Surabaya, from May to August 2025, with a minimum sample size of 30 pregnant women.

The objectives are to conduct the first antenatal care (ANC) visit (K1), analyze self-efficacy regarding pregnant women's actions during the first antenatal care (ANC) visit (K1) for dental examinations, analyze outcome expectations regarding pregnant women's actions during the first antenatal care (ANC) visit (K1) for dental examinations, analyze risk perceptions regarding Pregnant women's actions during their first antenatal care (ANC) visit (K1) include dental examinations, identifying self-monitoring/action control for pregnant women until delivery.

At the end of the study, it is hoped that participants will participate in preventing low birth weight (LBW) so that within a certain period of time, stunting will be reduced.

Development of an Android-Based System Application

The Android-based system application is a system for monitoring pregnant women's visits to the dental clinic (K1). This system aims to assist pregnant women and cadres in monitoring pregnancy issues using some of the features included in the research questionnaire.

In the preparation stage was:

1. The researcher coordinated with the Head of the Gunung Anyar Village, Surabaya.
2. Then, they met with the Head of the Gunung Anyar Community Health Center (Dr. Lucas Wisnuaji), the dental health officer (Dr. Aulia), and one of the Heads of the Gunung Anyar Village Cadres (Mrs. Erna).
3. Together with the research team, they discussed strategies for collecting data on visits to the dental clinic for pregnant women (K1), observing and recording postpartum mothers related to low birth weight (LBW), and using the Android-based application.

Research Implementation

1. The researcher and team identified and recorded the actions of pregnant women making their first antenatal care visit (K1) at the Gunung Anyar Community Health Center, Surabaya.
2. Collaborating with Community Health Center Midwives to conduct self-monitoring of postpartum mothers through Posyandu activities regarding the condition of their babies (normal/low birth weight).
3. During the research, the research team presented the following resource persons:
 - Head of the Gunung Anyar Community Health Center, Surabaya
 - Regional Midwife of the Gunung Anyar Village Community Health Center, Surabaya
 - Use of the Android-based System Application II. (Unusa)

Results

This study sampled 30 pregnant women in Gunung Anyar Village, Surabaya. Table 1 shows the characteristics of the respondents (pregnant women). Based on gender, 30 (100%) were female and 0 (0%) male. In terms of age, 19 (63%) were between 26-35 years old. The majority of respondents had a high school education, 22 (73%). The majority were housewives (housewives), with 25 people in each group (83%).

Table 1. Characteristics of Pregnant Women at the First Antenatal Care Visit (K1) in Gunung Anyar Village, Surabaya, 2025

Characteristic	Total	
	n	%
Occupation		
Housewife	25	83%
Self-Employed	2	7%
Civil Servant	2	7%
Entrepreneur	1	3%
Age (Year)		
17-25	6	20%
26-35	19	63%
36-45	5	17%
Educational		
Elementary School	0	0%
Junior Highschool	2	7%
Highschool	22	73%
Diploma	0	0%
Bachelor	6	20%

Table 2. Distribution of Self-Efficacy, Outcome Expectancies, and Risk Perception Regarding Pregnancy Intentions in Gunung Anyar Village, Surabaya, 2025

Variable	Intention Regarding Pregnant Woman			
	Before		After	
	Yes	No	Yes	No

		n	%	n	%	n	%	n	%
Self-Efficacy	Good	0	0.0%	4	13.4%	0	0.0%	29	M7
	Fair	6	20.0%	19	63.3%	0	0.0%	1	3.3%
	Poor	0	0.0%	1	3.3%	0	0.0%	0	0.0%
Outcome Expectancies	Good	0	0.0%	1	3.3%	0	0.0%	30	100.0%
	Fair	6	20.0%	23	76.7%	0	0.0%	0	0.0%
	Poor	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Risk Perception	Good	0	0%	1	3.3%	0	0.0%	29	96.7%
	Fair	6	20.0%	23	76.7%	0	0.0%	1	3.3%
	Poor	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Table 2 shows that after training for pregnant women, there was an increase in pregnant women's intention to visit a dental clinic (K1) across all independent variables (Self-Efficacy, Outcome Expectancies, and Risk Perception).

Analysis of Variables Influencing Action

In this study, there are three independent variables: Self-efficacy (SE), Outcome Expectancies (OE), and Risk Perception (RP), and one mediating variable: Intention. There is also one dependent

variable: Pregnant Women's Action to Perform the First Antenatal Care (K1) Dental and Oral Examination. To determine whether and how significant the direct influence of the independent variables on the dependent variable is, as well as the indirect influence of the independent variables through the mediating variable, Intention, on the dependent variable, Action, a Multiple Regression statistical test was used using the SmartPLS.4 application. The Multiple Regression Model Diagram is shown below.

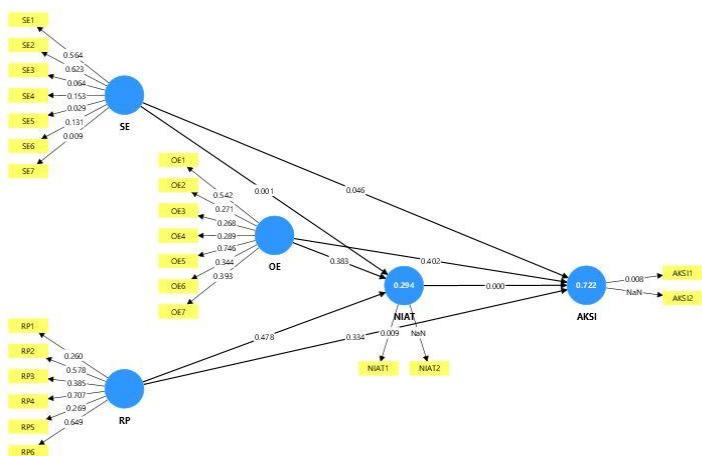


Figure 1. Multiple Regression Modeling

The Multiple Regression Model diagram below shows that only one independent variable and one mediating variable influence the dependent variable (Pregnancy Actions): Self-Efficacy, with a α -value of $0.046 < 0.05$, and the mediating variable (Intention), with a α -value of $0.001 < 0.05$. Conversely, the Outcome Expectation and Risk Perception variables influence the dependent variable

(Pregnancy Actions), as their α -values are greater than 0.05. The independent variable, Self-Efficacy, which influences the dependent variable, has a standardized coefficient of 0.388, with an effect on the dependent variable of 30.70%.

The following is a detailed analysis of the path coefficient output from the SmartPLS model above.

Table 3. The Influence of Intention, Self-Efficacy, Outcome Expectations, and Risk Perception on Pregnant Women's Actions in Gunung Anyar Village, Surabaya, in 2025

No.	Pathway	Path Coefficient (O)	Mean	SD	t statistics	p-values	Significancy
1	Intention -> Action	0.725	0.750	0.104	7.004	0.000	Significant
2	Self-Efficacy -> Intention	0.420	0.420	0.123	3.407	0.001	Significant

3	<i>Self-Efficacy -> Action</i>	0.141	0.125	0.071	1.995	0.046	Significant
4	<i>Outcome Expectation -> Intention</i>	0.224	0.048	0.256	0.872	0.383	Not Significant
5	<i>Outcome Expectation -> Action</i>	0.060	0.020	0.071	0.838	0.402	Not Significant
6	<i>Risk Perception -> Intention</i>	-0.153	-0.025	0.216	0.710	0.478	Not Significant
7	<i>Risk Perception -> Action</i>	-0.091	-0.004	0.094	0.967	0.334	Not Significant

Description:

T-Statistic > 1.96 (statistical table) for $\alpha = 0.05$

P-Value < 0.05 indicates significance

The path analysis in this study used the Structural Equation Modeling approach based on Partial Least Squares (SEM-PLS), which is a multivariate statistical method for examining the influence of independent variables on the dependent variable. The path estimation results are presented in the form of a Multiple Regression Model diagram above or also presented in Table 3.

Discussion

Influence of Intention on Action

Based on the results of the path analysis, it was found that pregnant women's intention had a very strong and significant influence on their first antenatal care (ANC) visit (K1) to Dental Clinic at the Community Health Center. This indicates more intention pregnant women's to have their dental and oral health checked, the more likely they are to take concrete action in the form of a dental health service visit during early pregnancy. Intention is a key predictor of health behavior in various behavioral theories. In this context, pregnant women with strong intentions have typically gone through the process of considering the benefits of a dental examination, overcoming barriers, and possessing sufficient self-efficacy to carry out the action.

Theory of Planned Behavior, intention is a key determinant in explaining primary behavior. Individuals with strong intentions to perform an action are more likely to follow through with concrete action. Intention acts as a mediator, bridging the influence of cognitive variables such as self-efficacy, outcome expectancies, and risk perception on actual behavior. Intention is formed from three main factors as attitude toward the behavior (attitude), subjective norms, and perceived behavioral control. If a pregnant woman has a positive attitude toward dental checkups, feels supported by her social environment (family, health workers), and feels capable (self-efficacy), then a strong intention will form and ultimately lead to the first antenatal care (ANC) visit (K1)⁸.

According to Schwarzer, R., & Hamilton, K. (2021), HAPA distinguishes between a motivational phase (intention formation) and a volitional phase (action implementation). In this model, a strong intention is crucial as a bridge between risk awareness and actual action. However, for intentions to be realized, ongoing planning and self-efficacy are required. In the context of pregnant

women, the intention to visit a dental clinic is influenced by their awareness of dental health risks during pregnancy and their belief (action self-efficacy) in being able to make the visit despite potential barriers (e.g., time constraints or fear)⁹.

Based on the results of the path analysis, it was found that the intention of pregnant women has a very strong and significant influence on the action of making a first antenatal care (K1) visit to the Dental Clinic at the Community Health Center. This indicates that the stronger the intention of pregnant women to have their dental and oral health checked, the more likely they are to take concrete action in the form of a dental health service visit during early pregnancy. Intention is a key predictor of health behavior in various behavioral theories. In this context, pregnant women with strong intentions have typically gone through the process of considering the benefits of attending the first antenatal care (ANC) visit (K1), overcoming barriers, and possessing sufficient self-efficacy to carry out the action¹⁰.

The Influence of Self-Efficacy on Action

The results of the data analysis above indicate that self-efficacy has a significant and quite strong influence on the intention of pregnant women. This is due to pregnant women's confidence in their ability to maintain dental and oral health during early pregnancy (K1). Intention is formed because pregnant women feel capable of overcoming obstacles, such as fear or lack of information.

Studies from Gholami, M., et al. (2021) mention that intention is influenced by pregnant women's confidence in managing oral health, and self-efficacy is a statistically significant predictor. Furthermore, according to Almohammed, R. A., & Almutairi, R. H. (2023), self-efficacy significantly influences pregnant women's intention to engage in dental care behaviors, especially when facing emotional barriers such as fear and anxiety. Self-efficacy is an important factor in shaping pregnant women's intention to maintain dental and oral health during early pregnancy. A mother's confidence in her ability to overcome challenges such as fear, lack of information, and limited access will strengthen her intention to act. Health promotion interventions should target increasing self-efficacy to strengthen pregnant women's internal motivation during their first antenatal care (ANC) visit^{11,12}.

Another research's show high self-efficacy reflects an individual's confidence in completing tasks or achieving goals, thus directly strengthening internal motivation to act. The strong effect of self-efficacy on intentions has been demonstrated in various cross-disciplinary studies, ranging from education and health to social

psychology. This study confirms that intention is influenced by pregnant women's self-confidence in managing their dental and oral health, and that self-efficacy is a statistically significant predictor. Self-efficacy demonstrated a significant influence on action. This significant influence indicates that an individual's belief in their own abilities plays a crucial role in motivating actual action. This suggests that pregnant women's belief in their own abilities plays a crucial role in encouraging them to make their first antenatal care (ANC) visit (K1)^{13,14}.

Self-efficacy, or self-belief, is a person's belief that they can perform a specific action in a given situation. In this context, pregnant women who feel capable of overcoming obstacles such as fear, lack of information, or limited access to services will be more motivated to form a strong intention to make their first antenatal care (ANC) visit (K1) to the dental clinic. This is in line with the volitional model in the HAPA, which states that individuals with high self-efficacy are more likely to persist in the face of obstacles and take action despite risks. Self-efficacy is an important factor because intention is influenced not only by awareness of benefits or risks but also by perceptions of one's own ability to act, especially in the face of challenges or obstacles¹⁴. In the context of pregnant women, the intention to attend their first antenatal care (ANC) visit (K1) is influenced by their awareness of dental health risks during pregnancy and their perceived ability (action self-efficacy) to make the visit despite potential obstacles (e.g., time constraints or fear).

The Effect of Outcome Expectations on Intention to Take Action

Based on the data analysis from this study, it can be seen that Outcome Expectations (OE) have no effect on intention. This could be due to pregnant women having previous negative experiences at dental health facilities, fear of pain or discomfort, or lack of family support. According to Ajzen, I. (2020), outcome expectancies are not the sole determinant of intention; they are also influenced by subjective norms and perceived behavior. If the latter two factors are low, then outcome expectancies alone are insufficient to form intention. According to the HAPA model, outcome expectancies play a greater role in the initial motivational phase, but if they are not accompanied by strong self-efficacy, they do not result in concrete intentions¹⁵.

Outcome expectancies equate to the belief that a pregnant woman's dental check-up will yield benefits. For example, preventing dental problems or being safe for the fetus. Consistent with Bougoufi et al (2024), many studies have found that even though pregnant women believe in these benefits, they still do not always act. The primary cause: an intention-behavior gap mediated by structural, motivational, and volitional barriers (e.g., access, cost, fear, low self-efficacy, lack of planning). Conceptual evidence comes from the HAPA literature, studies on the intention-behavior gap, and a review of barriers to dental visits among pregnant women¹⁶.

Theoretically, these results can be explained by the Health Action Process Approach (HAPA) model developed by Schwarzer (2020). Within the HAPA framework, outcome expectancies function more as a determinant of the motivational phase, namely in the formation of intentions, and do not directly drive behavioral action. The lack of significance in this pathway indicates that belief in the benefits or outcomes of an action does not necessarily directly motivate individuals to act, especially if it is not accompanied by self-efficacy or a well-developed action plan¹⁴.

The Influence of Risk Perception on Action

The results of this study indicate that there is no influence of risk perception on action. This is because pregnant women respond to high risks by avoiding them, thus preventing them from forming intentions, let alone taking action to visit antenatal care (K1). When the perceived risk is perceived as too great, it can lead to anxiety, leading individuals to experience cognitive paralysis that inhibits the formation of intentions. This is in line with a study by Renner (2017), which showed that risk perception often only serves as a trigger for awareness, but is not strong enough to drive action without other supporting factors such as self-efficacy or an action plan¹⁷.

The results of this study indicate that self-efficacy has a significant influence on pregnant women's dental and oral health efforts, while outcome expectancies and risk perception do not significantly influence these actions. This finding aligns with the Health Action Process Approach (HAPA) framework, where self-efficacy plays a primary role in the volitional phase, particularly in establishing action control that directly drives actual behavior. Conversely, outcome expectancies and risk perception play a dominant role in the motivational phase, which is more related to intention formation, rather than direct action. Several recent HAPA meta-analyses support this finding, showing that the effect of risk perception on health behavior tends to be small and only significant when accompanied by increased self-efficacy and clear action planning⁶.

Regarding the impact on pregnancy outcomes, postpartum monitoring found only one case of low birth weight (2%) out of 50 participating mothers. This figure is lower than the national prevalence in 2023 ($\pm 6.2\%$). However, the presence of one case of low birth weight indicates that dental health efforts alone cannot fully prevent all cases of low birth weight, given that low birth weight is a multifactorial condition. Other factors such as anemia, gestational hypertension, nutritional status, intrauterine infection, pregnancy spacing, and obstetric complications also play a significant role in the risk of low birth weight^{18,19}.

Low birth weight is influenced by various risk factors, including maternal nutritional status before and during pregnancy, anemia, gestational hypertension, preeclampsia, intrauterine infection, too short a pregnancy spacing, maternal age (<20 or >35 years), chronic diseases, and socioeconomic factors. Therefore, while behavioral dental health interventions can reduce one risk pathway (through improving periodontal health), they cannot be expected as strategy for preventing low birth weight¹⁹.

Several intervention studies have examined whether periodontal therapy during pregnancy can directly reduce the incidence of low birth weight (LBW). Recent meta-analyses suggest a positive effect, particularly if the intervention is implemented before the second trimester, but the results are inconsistent, with some studies finding no significant difference. One factor influencing effectiveness is the timing of the intervention. Treatment initiated in the second or third trimester tends to have a more limited impact on pregnancy outcomes, as the systemic inflammatory process associated with periodontitis may be present early in pregnancy²⁰.

These findings also reinforce the importance of the volitional approach in HAPA, namely action planning, coping planning, and action control, which bridges intentions into actual behavior. In this study, while risk perception and outcome expectancies did not significantly influence action, self-efficacy was shown to drive pregnant women's dental health behaviors. This supports the view that increasing maternal confidence in carrying out specific

behaviors (as brushing teeth correctly despite experiencing pregnancy nausea) is more effective in changing behavior than simply increasing risk awareness or outcome expectancies alone²¹.

The presence of one case of low birth weight after the intervention can be understood as the result of the interaction of various risk factors that cannot be fully controlled by dental health behavioral interventions alone. These data are important to report because they demonstrate a relatively positive impact of the program, but also emphasize the need for integrated cross-sector interventions, including maternal nutritional monitoring, iron and folic acid supplementation, hypertension and gestational diabetes control, and comprehensive education on pregnancy health²².

The implications of this study are the need to implement antenatal care (ANC) programs that combine the HAPA approach to dental health with clinical periodontal services, such as routine checkups, scaling and root planning (SRP), and the use of antiseptic mouthwashes proven safe for pregnant women. Furthermore, earlier intervention timing (pre-conception or first trimester) should be prioritized to maximize the impact on pregnancy outcomes. Dental health promotion programs initiated only in the second or third trimester are likely to have only a short-term behavioral impact without maximizing the contribution to LBW prevention^{21, 23}.

This study provides evidence that self-efficacy is an important predictor of oral health practices among pregnant women, while outcome expectancies and risk perception do not have a direct influence on these practices. Monitoring results showed a low prevalence of low birth weight (LBW), which may indicate that improved dental health behaviors contribute to the prevention of adverse pregnancy outcomes, although it cannot be relied upon as a sole factor.

Conclusion

1. Self-efficacy significantly influences the oral health practices of pregnant women. Pregnant women with high confidence in their ability to maintain their oral health are more consistent in carrying out preventive measures, such as brushing their teeth regularly, having dental checkups, and maintaining good oral hygiene during pregnancy.
2. Outcome expectancies do not significantly influence the oral health practices of pregnant women. This suggests that even though mothers have expectations of good outcomes, without strong self-efficacy, they do not always implement concrete actions.
3. Risk perception does not significantly influence the oral health measures taken by pregnant women. This indicates that even though mothers have a good risk perception, without strong self-efficacy, they do not always implement concrete actions.
4. Good oral health practices have the potential to contribute to the prevention of low birth weight (LBW), although postpartum self-monitoring results indicate that there was still 1 case of low birth weight (3.3%). This case is likely influenced by other multifactorial factors not entirely related to oral health, such as maternal nutritional status, gestational hypertension, or other medical history.
5. HAPA is effectively used as a framework for behavioral interventions in The context of maternal dental health,

particularly through strengthening volitional aspects such as action planning, self-monitoring, and action control, supports the sustainability of healthy behaviors after delivery.

It is recommended to expand the study population with a larger sample size and take into account other factors influencing LBW, such as nutritional status, comorbidities, and socioeconomic factors. Developing an intervention based on the Health Action Process Approach (HAPA) theory to measure the impact of increasing self-efficacy and action planning on preventing LBW.

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