



Original Article

Effectiveness of the personal hygiene module in increasing the knowledge of pregnant women with anemia on the dangers of worm infection

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ARTICLE INFORMATION

Received: September 26, 2024

Revised: November 29, 2024

Accepted: December 02, 2024

KEYWORDS

Anemia; Personal Hygiene; Pregnant Women

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ABSTRACT

Background: Worm infections are a common cause of anemia in pregnant women, particularly in areas with poor sanitation. While many studies have examined anemia in pregnancy, few have specifically explored the effectiveness of personal hygiene education in increasing pregnant women's knowledge of the dangers of worm infection.

Purpose: This study aimed to evaluate the effectiveness of a personal hygiene module in increasing the knowledge of pregnant women with anemia about the dangers of worm infection.

Methods: This quasi-experimental study, which involved 30 pregnant women with anemia, was conducted in the coastal area of North Konawe Regency, Southeast Sulawesi Province. A purposive sampling technique was used, and data were analyzed using the paired t-test.

Result: The average knowledge score before education was 29.27, significantly increasing to 52.40 after implementing the personal hygiene module ($p = 0.000$).

Conclusions: The personal hygiene module effectively improves the knowledge of pregnant women with anemia regarding the dangers of worm infection.

INTRODUCTION

Pregnant women require increased iron intake to support fetal development, placental growth, and maternal blood volume expansion.¹ During pregnancy, blood plasma increases by up to 30%, while red blood cells rise by 18%, yet hemoglobin levels only increase by 19%, leading to a high prevalence of anemia.^{2,3} The causes of anemia in pregnant women include inadequate knowledge, insufficient iron intake, chronic blood loss, malaria, and worm infections.⁴ Worm infections significantly contribute to anemia, particularly in tropical and subtropical regions. *Ascaris lumbricoides* affects approximately 800 million people, *Trichuris trichiura* 360 million, and hookworms 500 million worldwide. In Indonesia, worm infection prevalence ranges from 2.5% to 62%, with *Ascaris lumbricoides* at 30.7% and hookworms at 13.8%.¹⁰ Hookworm infection in pregnant women increases anemia risk and negatively impacts fetal development.¹¹

Anemia during pregnancy can lead to serious health consequences, including impaired cognitive and motor development in children, reduced physical performance in

adults, and cognitive decline in the elderly.¹² In pregnant women, anemia increases the risk of postpartum hemorrhage, miscarriage, premature birth,¹³ neonatal mortality, low birth weight (LBW), and fetal growth restrictions.¹⁴ Children born to anemic mothers may also experience memory disorders.¹⁵ Previous studies have shown that hookworm infections contribute to chronic iron loss, significantly increasing anemia risk in pregnant women.¹⁶ Studies indicate that hookworm infection raises the likelihood of anemia by 2.65 to 22.9 times, with key contributing factors being poor dietary intake, low economic status, and parasitic infections.^{17,18}

Prior research has primarily focused on observational or analytical approaches, examining the direct relationship between helminth infection and anemia or identifying risk factors such as diet and parasitic infections. However, few studies have explored interventional approaches to address this issue through education. This study introduces an innovative approach by developing and implementing a personal hygiene module to enhance pregnant women's knowledge of the dangers of worm infections. Unlike previous studies, which were mainly descriptive and analytical, this research focuses on prevention and empowerment through education. The aim is to assess the

<https://doi.org/10.30595/medisains.v23i1.24067>

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effectiveness of the personal hygiene module in increasing the knowledge of pregnant women with anemia about the dangers of worm infection.

METHOD

Study Design

This study used a quasi-experimental design with a pre-test and post-test in a single group without a control group.¹⁷

Setting an Respondent

The study was conducted from May to July 2024, involving 30 pregnant women with anemia. Inclusion criteria included pregnant women in the first, second, or third trimester diagnosed with anemia and willing to participate. Exclusion criteria were pregnant women without anemia or those unwilling to be respondents. The sampling technique used was purposive sampling.¹⁹

Variables, Instruments, and Measurements

This study's variable was pregnant women's knowledge of personal hygiene and the dangers of worm infections. Knowledge was measured using a structured questionnaire. The data collection process consisted of two stages: administering the questionnaire before and after the module was provided. The researcher used a specially designed Personal Hygiene Questionnaire to assess pregnant women's knowledge of personal hygiene and worm infections. This instrument was selected for its methodological rigour, ensuring a comprehensive evaluation of the participants' knowledge.

Experimental Procedure

The initial stage involved preparing the necessary tools and materials, including a questionnaire on Personal Hygiene and the Dangers of Worm Infections in Pregnant Women with Anemia. Data collection began with administering the questionnaire to assess initial knowledge before providing the educational module. A second assessment was conducted after the module was given to evaluate changes in knowledge.

Data Analysis

A Paired Sample T-test was used to analyze differences in knowledge before and after the implementation of the personal hygiene module, evaluating its effectiveness in increasing knowledge among pregnant women with anemia.

Ethical Consideration

This research obtained ethical approval from the Health Research Ethics Committee of the Regional Board of the Indonesian Public Health Experts Association of Southeast Sulawesi Province, ethics number 342/KEPK-IAKMI/2024.

RESULTS

Table 1. explains that almost all respondents are aged 20-35 (80%). Most of the respondents' education is high school

(66.7%), and most of the respondents' jobs are housewives (70%). Table 2. shows that there is an increase in the average knowledge of pregnant women with anemia, where the average before education was 29.27, and the knowledge of pregnant women after education increased to 52.40 (p<0.001).

Table 1. Characteristic of Respondent (n=30)

Characteristic	Result
Age (years)	
< 20 years	6 (20%)
> 35 years	24 (80%)
Education	
Junior High School	7 (23,3%)
Senior High School	20 (66,7%)
College	3 (10%)
Occupation	
House Wife	21 (70%)
Self-employed	9 (30%)

Table 2. Effect of the Personal Hygiene Module on Pregnant Women's Knowledge (n=30)

Knowledge	Mean ± SD	Min - Max	p- value
Pre	29,27 ± 2,30	26 - 47	0,000
Post	52,40 ± 2,47	34 - 57	

DISCUSSION

The results of this study demonstrate that the personal hygiene module significantly improves the knowledge of pregnant women with anemia regarding the dangers of worm infections. Increased knowledge fosters a better mindset and encourages preventive behaviour. Providing educational modules on personal hygiene is crucial for raising awareness and promoting hygiene practices to prevent worm infections. Educational interventions help build trust in the knowledge provided and encourage behavioural change.²⁰

Maintaining good personal hygiene is essential for pregnant women to prevent worm infections, which can negatively impact health, including increasing the risk of anemia.²¹ This study aligns with previous findings that poor hygiene such as not washing hands before eating, after using the toilet or consuming contaminated food or water contributes to worm infections in pregnant women. Strengthening personal hygiene knowledge through educational modules can reduce exposure to worm infections, particularly hookworms, which cause chronic intestinal blood loss, lowering iron levels and increasing anemia risk.²² Improved hygiene behaviours can help reduce infection risk, enhance general health, and support physiological needs during pregnancy.

Worm infections damage the intestinal epithelium, trigger local inflammation, and hinder the absorption of essential nutrients such as iron and protein. Educational interventions empower pregnant women to adopt hygiene practices, such as washing hands, wearing shoes, and handling food safely, thereby preventing worm egg

transmission through skin contact or food intake. As a result, intestinal epithelium regeneration is less disrupted, nutrient absorption improves, and overall nutritional status is enhanced.²³ At the molecular level, worm infections increase pro-inflammatory cytokines such as IL-6 and TNF- α , which inhibit erythropoiesis (red blood cell production) and lower hemoglobin levels.

By preventing worm infections, educational modules help reduce systemic inflammation, allowing the body to focus metabolic energy on normal hematopoiesis, which is crucial for combating anemia in pregnancy.²⁴ This study supports previous research that emphasizes the effectiveness of health education through booklets and multimedia presentations in improving pregnant women's knowledge and attitudes.²⁵ Studies have shown that 13.3% of pregnant women with anemia experience hookworm infections, while other research indicates that 46.7% to 63% of anemic pregnant women suffer from worm infections.²⁶

Enhancing knowledge through educational interventions is expected to reduce worm infection rates, which could indirectly lower the prevalence of anemia in pregnant women. Since worm infections are a key risk factor for anemia, continuous education is necessary to ensure pregnant women adopt and maintain proper personal and environmental hygiene as an effective preventive measure.

CONCLUSIONS AND RECOMMENDATION

The personal hygiene module on the dangers of worm infections significantly improves the knowledge of pregnant women with anemia. This educational approach effectively raises awareness and promotes better hygiene practices to reduce the risk of worm infections contributing to anemia. For future research, it is recommended that the personal hygiene module be integrated into broader health education programs for pregnant women, particularly those at risk of anemia. Regular counselling and continuous support should also be reinforced to ensure sustained knowledge and long-term behavioural change in maintaining personal hygiene to prevent worm infections.

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