Original Research

The Effect Water Consumption On Reduction Of Leukocyte And Nitrite Levels Of Pregnant Women's Urine

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ABSTRACT

Background: *The incidence of asymptomatic bacteria in the population of pregnant women is around 70%, and the assessment of mortality in the world is similar. One effort that can be made is by consuming water in sufficient quantities to help rinse and dilute urine. This study aimed to analyze differences in urine levels (leukocytes and nitrite) as an indicator of asymptomatic bacteria before and after being given treatment.*

Methods: *This study used a quasi-experimental design with a pre-post-test control group approach. A sample of 32 people was divided into two groups. The intervention group was given scheduled water consumption treatment, and the control group was given an educational intervention related to water consumption. The sample selection using a survey technique means that all pregnant women are tested for urine, and those who meet the inclusion criteria are selected as respondents. This research was conducted in the working area of the West Sorong Health Center, involving 32 respondents who were divided into 2 groups. Collecting data using observation sheets Analysis using the Chi-Square test*

Results: *There was a significant effect on the nitrite value (p-value 0.022) in pregnant women who consumed scheduled water, but it did not significantly affect the leukocyte value (p-value 0.904).*

Conclusion: *Pregnant women who consume water regularly (2 liters a day) will have lower levels of nitrite and leukocytes than pregnant women who do not consume water on a scheduled basis.*

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INTRODUCTION

Referring to the SDGs goal, to reduce morbidity and mortality of pregnant women, WHO 2016 recommends quality ANC services by developing 39 recommendations, one of which is a maternal and fetal assessment by examination of UTI (*asymptomatic bacteriuria*) in pregnant women (Meditory & Issn Online, 2018). The incidence of *asymptomatic bacteriuria* is about 70% in the population of pregnant women and contributes to a mortality rate of about 150 million per year in the world.

Premature delivery, low birth weight, intrauterine growth retardation, and IUFD have impacts on infants. Whereas in mothers, it can cause anemia, *preeclampsia*, kidney failure, and *septicemia* (Owens et al., 2019).

Screening is important so that early treatment can be given in an effort to reduce the risk of complications (Azami et al., 2019). A cohort study reported the incidence of congenital malformations, jaundice, and respiratory distress in a group of unscreened mothers (Owens et al., 2019). Pregnant women are prone to suffer from asymptomatic bacteriuria, this is because an increase in the hormone progesterone causes relaxation of the smooth muscles of the urinary tract, thereby increasing colonization of the urinary tract by organisms (Izuchukwu, Oranu, Bassey, & Orazulike, 2017). The increase in plasma volume also causes a decrease in urine concentration by up to 70%, which makes bacteria easy to grow (Salari, Salari, & Medicine, 2017).

Consumption of water in sufficient quantities can help rinse and dilute urine, thereby helping to eradicate bacteria from the urinary tract (Fakhrizal, 2018). In addition, by consuming water, it becomes a reserve in the large intestine so that it helps the digestive system and softens the stool so that it can handle constipation. A study conducted by Fitriana, Prasetyo, & Purwaka, (2018) showed that a lack of fluid consumption in pregnant women can increase the risk of constipation by 1.85 times (Fitriana et al., 2018).

In the United States, 900 people die each year due to the effects of constipation due to a lack of water consumption (Woodward S, 2017). In the population of pregnant women, constipation occurs in about 50% -60%, and pressure on the abdomen and hormonal changes are strongly suspected as triggering factors (Chuhareva, Bontsevich, Esayan, Shchurovskaya, & Lysenko, 2016). Management of constipation can be done with lactulose therapy, senna, and macrogol preparations. However, giving this treatment is not safe because it causes the risk of premature birth, hyponatremia, or hypokalemia, so doctors have decided not to prescribe it (Chuhareva et al., 2016).

Based on POGI recommendations, water consumption in the first trimester is 2180 mL/day, while in the second and third trimesters it is 2300 mL/day. Research conducted at RSUD DR. M. Yunus, 2019 shows that the average respondent already has a drinking habit, but his habit of not meeting the daily target is sometimes a lot or sometimes a little (Lina & Lestari, 2019). In addition, there is still a belief in the community that consuming a lot of water will slow down the healing process of perineal wounds (Rochima Hadi, 2017).

Based on previous research, it has been shown that pregnant women have a habit of drinking enough water and tend to be good. This is influenced by the adequacy of the information obtained (Rochima Hadi, 2017). Education related to efforts to maintain body health during pregnancy must be carried out as long as the mother makes antenatal care visits according to standards (Nurhidayati & Suprayitno, 2020). Research that directly analyzes the effect of water consumption on urine content has never been done, so this research is an initial study with the hope that it can be an initial reference for further research. Previous studies have concentrated on the effect of water consumption on the prevalence of constipation.

A preliminary study conducted in January 2021 showed that, on average, the public health center in Sorong City had not screened for *asymptomatic bacteriuria*. The importance of drinking water, the lack of awareness, the existence of negative beliefs, the magnitude of the impact, the lack of a daily consumption target, and the need for early treatment of *asymptomatic bacteriuria* using natural ingredients are the reasons for

the urgency of this study. Research related to water consumption has been widely published in national and international journals, but research related to the provision of scheduled water consumption interventions for the treatment of asymptomatic bacteriuria specifically in pregnant women has never been done. For this reason, the purpose of this study was to analyze the effect of the scheduled water consumption method on the treatment of asymptomatic bacteriuria in pregnant women.

MATERIALS AND METHOD

This research design is quasi-experimental with a pretest-posttest control group design technique (Mieke.H.Satari, 2011). The study population was all pregnant women at the West Sorong Health Center. The research sample consisted of 32 respondents who were divided into the intervention group and the control group and who met the inclusion criteria, including pregnant women who were positive for symptomatic bacteria. The intervention group was given a schedule for drinking water consumption of 2 liters per day for 28 days, while the control group was given education about the importance of drinking water.

Researchers initially conducted urine examinations for all pregnant women, and if they were found positive for symptomatic bacteria, they were taken as research subjects. The data collection technique uses daily observation sheets to measure scheduled water consumption, for that reason, validity and reliability tests are not carried out because the instrument used is not a questionnaire. This research was conducted in the working area of the West Sorong Health Center for 1.5 months, starting from July 5 to August 16, 2022, according to the Posyandu schedule.

Univariate data analysis was used to describe the characteristics of respondents, including age, pregnancy, and gestational age, as well as the assessment of leukocyte and nitrite levels as indicators of the incidence of asymptomatic bacteria before and after the intervention, which was given to both groups. Meanwhile, bivariate analysis was used to analyze the effect of scheduled drinking water consumption in the intervention and control groups, using a paired T-test of the data. This research has received ethical approval from the ethics committee of the Health Polytechnic of the Ministry of Health of Sorong with the number DM.03.05/6/002/2022.

RESULTS

This research is a quasi-experimental pre-post test with a control group design. The population of this study was normal pregnant women, and the sample of the study was normal pregnant women in the East Sorong Health Center Work Area. The research sample consisted of 2 groups: the treatment group, which consisted of pregnant women who received an intervention in the form of drinking 2000 ml of water per day for 28 days (16 people), and the control group, which consisted of pregnant women who did not drink 2000 ml of water per day (16 people).

Measurement of bacteriurine in pregnant women using a dipstick Ronche Combur test 10 indicators. Bacteriurine predictors in pregnant women were assessed using two indicators, namely the results of leukocyte and nitrite examinations. The presence of leukocytes in the urine is a predictor of inflammation in the urinary tract, while the presence of nitrite is a predictor of gram-negative bacteria.

The data that have been obtained were analyzed, including the analysis of the equality of respondents using the Chi-Square test, the different tests of leukocyte and nitrite values before (pre) and after (post) intervention using the Wilcoxon test, and the

analysis of the effect of giving water on the decrease in leukocyte and nitrite values using the Chi-Square. All analyzes were performed using SPSS 16 for Windows (α = 0.05). For more details, the characteristics of the respondents can be seen in Table 1 below:

Table 1. Respondent Characteristics

Characteristics	Intervention		Control		p-value
	n	%	n	%	
Age					
<20 years	2	12,5	1	6,2	0,717
20-35 years	13	81,2	13	81,2	
>35 years	1	6,2	2	12,5	
Gravida					
Primigravida	5	31,2	0	0	0,087
Multigravida	8	50	12	75	
Grandemultigravida	3	18,8	4	25	
Gestational Age					
Trimester 1	2	12,5	1	6,2	0,824
Trimester 2	9	56,2	10	62,5	
Trimester 3	5	31,2	5	31,2	

Table 1 shows that the majority of respondents in this study were in the age range of 20–35 years, the majority were multigravida mothers, and the majority had gestational ages in the 2nd trimester in both groups. A different characteristic test was conducted between the two groups, with the result that there was no significant difference between the two groups (p-value > 0.005), so the two groups could be compared.

Table 2. Indicators of *Asymptomatic Bacteria* in Pregnant Women before Treatment in the Intervention and Control Group

Urine Measurement Parameters		Intervention Group				Control Group			
		Pre		Post		Pre		Post	
		n	%	n	%	n	%	n	%
Leukocytes	0	0	0	1	6,25	2	12,5	2	12,5
	+1	5	31,25	2	12,5	2	12,5	2	12,5
	+2	3	18,75	5	31,25	4	25	4	25
	+3	8	50	8	50	8	50	8	50
	p-value	0,773				0,603			
Nitrite	Positive	7	43,75	2	12,5	1	6,25	1	6,25
	Negative	9	56,25	14	87,5	15	93,75	15	93,75
	p-value	0,025*				1			

In Table 2, leukocyte examination shows that in the treatment group there was an increase in the number of pregnant women with negative leukocyte results, from none (0%) to 1 (12.5%). In the treatment group, there was no increase in the number of pregnant women with negative leukocyte results. The difference test in the two groups

showed that there was no significant difference before and after treatment (p-value, leukocytes, 0.773 vs. nitrite, 0.603).

Table 2 shows of nitrite examination that in the treatment group the results of nitrite examination before treatment with a positive value of 7 people (43.75%), decreased to 2 people (12.5%). While in the control group, there was no change. The difference test between the two groups revealed a significant difference (*p-value* 0.025) before and after treatment in the group of pregnant women who consumed 2000 mL of water per day.

Table 3. The effect of 2000 ml/day water consumption on leukocyte values in pregnant women

Group	Leukocyte						*p-value*
	Increase		Decrease		Fixed		
	n	%	n	%	n	%	
Treatment	4	25	4	25	8	50	0,904
Control	4	25	3	18,8	9	56,2	
Nitrite							
Treatment	11	68,8	5	31,2			0,022*
Control	16	100	0	0			

Table 3 shows that in the treatment group, there were 4 people (25%) who experienced a decrease in the value of leukocytes, while in the control group, only 3 people (18.8%) experienced a decrease in the value of leukocytes. The results of the nitrite examination showed that in the treatment group there were 5 (31.2%) pregnant women with positive nitrite values that decreased to negative.

DISCUSSION

Based on the analysis that has been done, it shows that the consumption of 2000 ml/day of water in pregnant women has a significant effect on the nitrite value (*p-value 0.022*), but does not significantly affect the leukocyte value (*p-value 0.904*). The results of this study are based on several factors, the assumptions of the researchers include the characteristics of the respondents, monitoring during the intervention, and the amount of water consumed. Characteristics of respondents based on age, mostly between 20-35 years old in both the control group and the intervention group.

This is an age that has a low potential for urinary tract infections, both symptomatic and asymptomatic. This is based on research conducted by Putri Vidiasari Darsono in 2016, which showed that the prevalence of urinary tract infections at the age of fewer than 40 years was lower (3.2%) compared to those aged over 65 years (20%) (Vidiasari Darsono, 2016). Based on characteristics of respondents based on gravida or number of children, a study conducted by Siti Maesaroh, (2011) showed that there was a significant relationship between parity and the incidence of UTI in pregnant women, where multiparous women had a 2.64 times greater risk of experiencing UTI compared to primiparas (S. Maesaroh Dan K. Fatmala, 2011).

In this study, most respondents were in the category of *multigravida* and *grand multipara*, both in the intervention group and the control group. So this strengthens the occurrence of urinary tract infections or the presence of bacteria in the urine. Pregnancy directly affects germs growing in urine at <105 CFU/mL9. Pregnant women with *preterm* pregnancies found the number of germs in their urine was 3 times greater than 105 CFU/mL (Anak Agung, 2018).

This means that pregnancy has a huge potential for urinary tract infections, both symptomatic and asymptomatic, regardless of the number of children or gravida. Characteristics of respondents Based on the trimester of pregnancy, there is no source that supports the assumption that increasing gestational age will increase the risk of urinary tract infections or *asymptomatic bacteria*. Most of the respondents in this study were in the second trimester, both in the intervention group and the control group.

Based on research conducted by Anak Agung, (2018) shows that pregnant women in the third trimester suffer more from UTIs than in the first and second trimesters. This result is contrary to the results obtained by the researcher, meaning that the trimester of pregnancy cannot be used as a guideline (Anak agung, 2018). Another assumption from the researcher is that the composition of the drinking water consumed by the respondents is not the same, based on the results of brief interviews with several respondents showing that some consume rainwater, gallon water, and PAM water.

This can affect the results of the examination, but the researcher did not examine the composition of each water consumed for reasons of limited time and funding. Generally, drinking water is water that is used for human consumption. The requirements for drinking water, according to the Ministry of Health of the Republic of Indonesia, are that it be tasteless, odorless, colorless, do not contain heavy metals and chemical compounds such as nitrate or nitrite (Sisca, (2016) quoted (Ita Emilia, 2019).

The maximum recommended level of nitrate and nitrite in drinking water is 0.06 mg/L (Government Regulation of the Republic of Indonesia Number 82, 2001). Excessive consumption of nitrite can cause *methemoglobinemia* and toxic effects (Soeparman, 2001, cited in (Ita Emilia, 2019). The research time, which was quite long (28 days), caused the researcher not to be able to monitor drinking water consumption adequately.

This can lead to the researcher's assumption that there is non-compliance in the intervention group's consumption of drinking water on a scheduled basis. This is also a limitation of the study. The leukocyte esterase and nitrite test in urine is an examination that can provide results quickly, relatively inexpensively, and easily compared to examination with urine culture (Gold standard) which is expensive and time-consuming (Li et al., 2020).

The urine dipstick test is able to detect leukocyte esterase as an indicator of pyuria and nitrite as an indicator of bacteriuria. Nitrate will turn into nitrite due to the presence of bacteria that produce nitrate reductase enzymes, including gram-negative bacteria such as Escherichia, Enterobacter, Citrobacter, Proteus, Klebsiella, and Pseudomonas (Li et al., 2020). This means that this test can be used as a substitute for the gold standard in diagnosing bacteria in urine and can be used by midwives at primary or primary health facilities.

CONCLUSION

There was no significant difference in leukocyte values before and after consuming scheduled water in the treatment and control groups (p-value leukocytes 0.773 vs. nitrite 0.603), but there was a significant difference in nitrite values before and after treatment in the treatment group (p-value 0.025). There is a significant effect on the value of nitrite (p-value 0.022) in pregnant women who consume scheduled water, but it has no significant effect on the leukocyte value (p-value 0.904).

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