



The effect of warm water bathing in bed on vital signs and oxygen saturation in adult patients on mechanical ventilation

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ABSTRAK

Latar Belakang: Penyakit dan rawat inap umumnya memerlukan modifikasi dalam praktik personal hygiene. Selama menjalani rawat inap dan terutama di ruang Intensive Care Unit (ICU), pasien mengalami situasi yang melibatkan kebutuhan akan personal hygiene, prosedur yang dilakukan pada mereka karena keterbatasan yang timbul sebagai dampak dari kondisi sakit. Mandi di tempat tidur adalah intervensi yang harus dilakukan pada pasien kritis dengan tujuan pemenuhan kebutuhan personal hygiene pada pasien kritis, namun perlu dilakukan pemantauan dan kontrol yang ketat untuk menghindari efek samping, seperti ketidakstabilan status hemodinamik.

Tujuan: Untuk mengetahui pengaruh mandi di tempat tidur dengan air hangat terhadap tanda-tanda vital dan saturasi oksigen pada pasien dewasa yang terpasang ventilator mekanik.

Metode: Penelitian ini merupakan penelitian quasi eksperimental yang melibatkan 18 sampel yang ditetapkan dengan teknik total sampling berdasarkan kriteria inklusi: Pasien yang terpasang ventilator mekanik, berusia 18 tahun atau lebih, stabil dalam hemodinamik dan kriteria eksklusi: Terpasang obat untuk jantung, pasien dengan cedera kepala, mendapatkan terapi obat untuk menurunkan suhu tubuh.

Hasil: Hasil uji paired t-test menunjukkan ada pengaruh antara mandi di tempat tidur dengan air hangat terhadap tekanan darah sistole ($p = 0,042$; $p < 0,005$), pernapasan ($p = 0.009$), dan denyut nadi ($p = 0.025$). Tidak ada pengaruh antara mandi di tempat tidur dengan air hangat terhadap tekanan darah diastole ($p = 0,063$), suhu tubuh ($p = 0.862$) dan saturasi oksigen ($p = 0.120$).

Kesimpulan: Mandi di tempat tidur berpengaruh terhadap tekanan darah sistolik, pernapasan, denyut nadi dan tidak berpengaruh terhadap tekanan darah diastolik, suhu tubuh, dan saturasi oksigen. Namun selama pemberian mandi di tempat tidur harus selalu memperhatikan akan perubahan yang terjadi terhadap tanda-tanda vital dan saturasi oksigen.

KATA KUNCI: mandi; tanda-tanda vital; saturasi oksigen; pasien kritis

ABSTRACT

Background: Illness and hospitalization generally require modifications in personal hygiene practices. During hospitalization and especially in the Intensive Care Unit (ICU), patients experience situations involving the need for personal hygiene, procedures performed on them due to limitations arising as a result of the ill condition. Bed bathing is an intervention that must be performed in critical patients with the aim of meeting personal hygiene needs in critical patients, but it is necessary to carry out close monitoring and control to avoid side effects, such as hemodynamic status instability.

Objectives:: To determine the effect of bathing in bed with warm water on vital signs and oxygen saturation in adult patients attached with mechanical ventilators.

Methods:: This study is a quasi-experimental study involving 18 samples determined by total sampling technique based on inclusion criteria: Patients attached to mechanical ventilators, aged 18 years or older, stable in hemodynamics and exclusion criteria: Attached drugs for the heart, patients with head injuries, receiving drug therapy to lower body temperature.

Results: The paired *t*-test results showed an effect between bathing in bed with warm water on systole blood pressure ($p = 0.042$; $p < 0.005$), breathing ($p = 0.009$), and pulse rate ($p = 0.025$). There was no effect between bathing in bed with warm water on diastole blood pressure ($p = 0.063$), body temperature ($p = 0.862$) and oxygen saturation ($p = 0.120$).

Conclusions : Bed bathing affects systolic blood pressure, breathing, pulse rate and has no effect on diastolic blood pressure, body temperature, and oxygen saturation. However, during bathing in bed should always pay attention to changes that occur in vital signs and oxygen saturation.

KEYWORD: bath; vital signs; oxygen saturation; critical patient

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INTRODUCTION

Personal hygiene is an action to protect, maintain and improve skin hygiene and health (1,2). These actions are beneficial for physical well-being such as rest, sleep, eating and psychic well-being which can increase self-confidence and increase patient comfort (3). Patients who need *personal hygiene* are those who have limitations in moving (4). Various procedures for fulfilling *personal hygiene* include caring for hair, caring for nails, *oral hygiene*, *vulva hygiene* and bathing patients in bed (1).

Bathing is part of care (5), which embodies the nursing care intervention that patients consider most important

for their well-being (6). As an important treatment intervention, bathing has a real impact on patients (7). Taking a shower in bed can be a pleasant or stressful experience (8). For some bathing patients contribute to their well-being by meeting hygiene and comfort needs, while for others, bathing can be understood as an intervention that causes distress or fear. Many patients experience fear, anxiety, and frustration (8,9). Another effect of bathing is to speed up blood circulation (10). Bathing with warm water causes dilation of the superficial arterioles so that more blood flows to the skin (10). Bathing also provides a sense of freshness and well-

being of the patient, reduces the speed and depth of breathing by increasing tissue oxygenation, reduces body odor, improves muscle tone, and provides joint movement (2,11). The patient feels relaxed after bathing, stress is reduced, and self-image develops (2). In addition, the bathing process also allows the nurse to communicate with the patient (12).

Illness and hospitalization generally require modifications in *personal hygiene practices* (2). During hospitalization and especially in the *Intensive Care Unit* (ICU), patients experience situations involving the need for *personal hygiene*, procedures performed on them due to limitations arising as a result of the ill condition (2,13). In meeting *personal hygiene needs*, nurses play a key role in ensuring that patients' needs are met (14). In the ICU, nurses spend a lot of time doing patient personal hygiene care, especially serving bed baths (14,15). Bed bathing is an intervention that must be carried out with close monitoring and control, especially in critically ill patients, who need to avoid side effects, such as ventilator disconnection and hemodynamic status instability (16). During bathing or one hour after bathing many side effects can occur such as, desaturation, intracranial hypertension, disconnection

of mechanical ventilation, abnormal heartbeat, changes in blood pressure, oxygen saturation, pulmonary wedge pressure, ventricular fibrillation, and cardiac arrest (16).

In the context of critical patients, any changes can occur directly or indirectly in the patient, although small changes that can cause instability and deterioration of the general state of the patient, during receiving bed bathing interventions ranging from the act of turning over during a bed bath, combined with nursing interventions, can affect the oxygen saturation of the body and affect the patient's vital signs (16). Therefore, efficient planning of the procedure is required, taking into account the duration, water temperature, and changes in the patient's position.

MATERIALS AND METHODS

This study used a type of *quasi-experimental research* with a type of one group pretest-posttest design. This research was conducted at the ICU of K.R.M.T Wongsonegoro Hospital in March 2023. The population in this study was adult patients who were installed with mechanical ventilators in ICU Room 1 of RSD K.R.M.T Wongsonegoro Semarang City. The total population for 12 months from January to December 2022 in ICU room

1 of RSD K.R.M.T Wongsonegoro Semarang City is 215 people and the monthly average is 18 patients. The sampling technique used in this study is using *total sampling* technique. The data collection process was assisted by 2 enumerators, namely ICU nurses, with Ners education, experience in the ICU room >1 year. The population of visits during the study period was 18 people who met the inclusion criteria: Patients on mechanical ventilators, aged 18 years or older, stable in hemodynamics and exclusion criteria: Attached drugs for the heart, patients with head injuries, receiving drug therapy to lower body temperature.

The study was conducted using observation sheets used to record

patient initials, gender, age and results of vital signs measurements and saturate respondents' oxygen before and after the intervention of bathing in bed with warm water. The data was processed and analyzed using the IBM SPSS for Windows version program. 26. The data will be tested noemalitas first, after the data is normally distributed, a paired t-test will be carried out to analyze whether there is an influence or not.

RESULTS AND DISCUSSION

RESULTS

The results of the data obtained on vital signs and oxygen saturation before and after the intervention of bathing in bed with warm water as follo

Table 1. Vital signs and oxygen saturation before and after the intervention of bathing in bed with warm water (n = 18)

Variable	Before				After			
	Mean	Std Deviation	Min	Max	Mean	Std Deviation	Min	Max
Vital Sign								
Systolic blood pressure	122.39	19.51	91	154	129.33	26.07	86	178
Diastolic blood pressure	76.56	12.8	51	100	81.56	15.51	51	112
Breathing	22.22	15.51	20	25	23.83	2.17	20	27
Temperature	36.36	0.17	36.0	36.6	36.37	0.16	36.0	36.6
Pulse	94.28	8.69	80	114	99.17	11.64	74	115
Oxygen Saturation SpO2	98.06	1.54	94	100	98.56	1.14	96	100

Table 1 showed the mean value of systole blood pressure before intervention was 122.39 mmHg and the average value of systole blood pressure after intervention was 129.33 mmHg. The average value of diastole blood pressure before intervention was 76.56 mmHg and the average value of diastole blood pressure after intervention was 81.56 mmHg. The average respiratory value before the intervention was 22.22 x / minute and the average respiratory value after the

intervention was 23.83 x / minute. The average value of body temperature before intervention was 36.36°C and the average value of body temperature after intervention was 36.3°C. The average pulse value before intervention was 94 x / minute and the average pulse value after intervention was 99 x / minute. The average value of oxygen saturation before intervention was 98.06% and the average value of oxygen saturation after intervention was 98.56%

Table 2. The influence of vital signs and oxygen saturation before and after the intervention of bathing in bed with warm water

Variable	Pre-test	Post-test	<i>p</i> value
	Mean ± SD	Mean ± SD	
Vital Sign			
Systolic blood pressure	122.39 ± 19.51	129.33 ± 26.07	0.042
Diastolic blood pressure	76.56 ± 12.8	81.56 ± 15.51	0.063
Breathing	22.22 ± 15.51	23.83 ± 2.17	0.009
Temperature	36.36 ± 0.17	36.37 ± 0.16	0.862
Pulse	94.28 ± 8.69	99.17 ± 11.64	0.025
Oxygen saturation			
SpO2	98.06 ± 1.58	98.56 ± 1.14	0.120

Table 2 shows the results of statistical tests using *paired t test* obtained the average value of systole blood pressure before the intervention was 122.39 mmHg and the average value after the intervention was 129.33 mmHg with a value of $p = 0.042$ ($p < 0.05$), which means there is a significant effect between bathing in

bed with warm water on cystole blood pressure.

The average value of diastole blood pressure before the intervention was 76.56 mmHg and the average value after the intervention was 81.56 mmHg with a p value = 0.063 ($p > 0.05$), which means that there is a close to significant effect between bathing in

bed with warm water on diastole blood pressure. The average respiratory value before the intervention was 22.22 x / minute and the average respiratory value after the intervention was 23.83 x / minute with a p value = 0.009 ($p < 0.05$) which means there is a significant effect between bathing in bed with warm water on breathing. The average temperature value before the intervention was 36.36°C and the average body temperature after the intervention was 36.37°C with p value = 0.862 ($p > 0.05$), which means there was no significant effect between bathing in bed with warm water on temperature.

DISCUSSION

The results showed that there was an effect between bathing in bed with warm water on systolic blood pressure with a value of $p = 0.042$ ($p < 0.05$). A warm bath can cause dilation of blood vessels, decrease blood viscosity and decrease muscle tension resulting in improved blood circulation that can affect blood pressure (17). Blood circulation also increases with wiping and rubbing movements during bathing, which causes an increase in pulse rate and blood pressure values then causes dilation of blood vessels (2,10). The modification of bathing in patients and the occurrence of changes in systolic

The average pulse rate before the intervention was 94 x / minute and the average pulse rate after the intervention was 99.17 x / minute with a p value = 0.025, which means there is a significant influence between bathing in bed with warm water on the pulse.

The average value of oxygen saturation before the intervention was 98.06% and the average value of oxygen saturation after the intervention was 98.56% with a p value = 0.120, which means that there was no significant effect between bathing in bed with warm water on oxygen saturation.

blood pressure are likely due to physiological events caused by movement, rubbing and replacement of linen, actions performed during bathing in bed inevitably affect the stability of systolic blood pressure values (17). Previous studies on changes in vital signs before, during, and after bathing in bed in critically ill patients on systolic blood pressure in the female group with p value = 0.001, as well as in the male group with p value = 0.001 (17). Another study on the effect of bed bathing on vital signs and oxygen saturation in children connected to mechanical ventilation on systolic blood pressure with p value = 0.000 (2). Based on the results of this study and

previous studies, it can be concluded that there is an influence between bathing in bed with warm water on systolic blood pressure.

The results showed no effect between bathing in bed and diastolic blood pressure with a value of $p = 0.063$ ($p > 0.05$). The results of previous studies conducted on the female group with a p value = 0.123, as well as on the male group with a p value = 0.183 (17). The variation in the occurrence of changes in vital signs depends on water temperature factors. In addition to water temperature factors, there are several other factors that can cause no changes in vital signs related to patient movements by nursing staff, exposure to low temperatures in the ICU room, skin massage, changes in patient in certain positions, sedation, comorbidities that can affect vital signs such as hypertension and tachypnea or the use of vasoactive drugs (18, 19). Also explained a risk factor that can cause changes in vital signs is a bath time of more than 20 minutes (19). It can be concluded from this and previous studies that bathing in bed with warm water in adult patients on ventilators has no effect on diastolic blood pressure.

The results showed that there was an effect between bathing in bed with warm water on breathing with a p value

= 0.009 ($p < 0.05$). During the act of bathing in bed such as turning over during bathing and the temperature of the water used and combined with nursing interventions, can affect the respiratory rate and oxygen demand of the body (18). The modification of bathing in patients and the occurrence of changes in vital signs and oxygen saturation are likely due to physiological events caused by movement, rubbing and replacement of linens, actions performed during bathing in bed inevitably affect the patient's hemodynamic and respiratory stability (16). The results of previous studies examined the effect of bathing on breathing in the female group with p value = 0.001, as well as in the male group with p value = 0.001 (17). Another study on the effect of bathing on breathing with p value = 0.000 (2). Based on the results of this study and previous studies that bathing in bed with warm water in adult patients who are attached to ventilators affects breathing.

The results showed no effect between bathing in bed and body temperature with a value of $p = 0.862$ ($p > 0.05$). Previous research also examined the effect of bathing on body temperature in a group of women with a value of $p = 0.060$. The unexplained layer of subcutaneous fat, which tends

to be thicker in adults than in younger people, can also cause body temperature in adults to not change significantly (11). The variation in the occurrence of changes in vital signs depends on water temperature factors. In addition to water temperature factors, there are several other factors that can cause no changes in vital signs related to patient movements by nursing staff, exposure to low temperatures in the ICU room, skin massage, changes in patient in certain positions, sedation, comorbidities that can affect vital signs such as hypertension and tachypnea or the use of vasoactive drugs (18, 19). Also explained is a risk factor that can cause changes in vital signs is bath time of more than 20 minutes (19). It can be concluded from the results of this study and previous studies that bathing in bed with warm water in adult patients who are attached to ventilators has no effect on body temperature.

The results showed that there was an influence between bathing in bed with warm water on pulse rate with a value of $p = 0.025$ ($p < 0.05$). The significant increase in average pulse rate after bathing is due to an increase in metabolic rate and cardiac output due to heat (18). Warming yourself with a warm bath has also been linked to improved pulse rate recovery, decreased muscle stiffness, decreased

cortisol levels, increased oxygen consumption, changes in electrocardiographic waves and increased temperature (18). Warm water causes vasodilation, increases blood flow to the surface of the skin and decreases blood flow to internal organs. When the sympathetic nervous system is stimulated, the heart rate and respiratory rate increase and allow adequate blood and oxygen flow to vital organs (18). The results of previous studies on the effect of bathing in bed on pulse rate in the female group with p value = 0.027, as well as in the male group with p value = 0.019 (17). Another study on the effect of bathing on pulse rate with p value = 0.000 (2). It can be concluded the results of this study and previous studies that there is an effect between bathing in bed with warm water on the pulse.

The results showed no effect between bathing in bed with warm water on oxygen saturation with a value of $p = 0.120$ ($p > 0.05$). In critically ill patients who are attached mechanical ventilators tend to have high FiO_2 . FiO_2 is one factor that can affect oxygen saturation (11). Depending on water temperature factors, the water temperature used must be consistent and the same for each patient (18,19). In addition to water there are several factors that can affect oxygen

saturation such as: associated with the movement of the patient by nursing staff, exposure to low ICU temperatures, massaging the skin, placing the patient in a certain position, sedation, or use of vasoactive drugs (18,19). Previous research on the oxy-hemodynamic effects of bathing in

CONCLUSION AND RECOMMENDATION

Based on the results and discussion of research referring to research on the effect of bathing in bed with warm water on vital signs and oxygen saturation in adult patients attached to mechanical ventilators, it can be concluded that there is an influence between bathing in bed on systole blood pressure $p = 0.042$, breathing $p = 0.009$, and pulse rate $p = 0.025$. There was no effect between bathing in bed with warm water on diastole blood pressure $p = 0.063$, body temperature $p = 0.862$ and oxygen saturation $p = 0.120$.

REFERENCES

1. Fitriawati, N., Juliadi, A., & Ariady, D. (2019). Personal Hygiene oleh Perawat dan Kepuasan Pasien di Ruang Rawat Inap Rumah Sakit DR. R Soeharsono Banjarmasin." *2-Trik: Tunas-Tunas Riset Kesehatan* 9(4): 330–36.

different beds on oxygen saturation with p value = 1,000 (20). It can be concluded from the results of this and previous studies that bathing in bed with warm water in adult patients who are attached with ventilators has no effect on oxygen saturation.

The intervention of bathing in bed with warm water is still given because it aims to meet the need for personal hygiene, but during the intervention the nurse must still pay attention to the patient's vital signs and oxygen saturation.

It is expected that researchers can then use a study design that uses a control group and an intervention group to see a comparison of the effect of bathing in bed on vital signs and oxygen saturation and use the appropriate number of samples, which are at least 30 respondents.

DOI:

<https://doi.org/10.33846/2trik9407>

2. Kizil, H., & Sendir, M. (2018). The Effects of Bed Bathing on Vital Signs and Oxygen Saturation in Children Who Are Connected to Mechanical Ventilation. *Dimensions of Critical Care Nursing*, 37(5), 272–278.

- DOI:
<https://doi.org/10.1097/DCC.0000000000000312>
3. Imardiani, I. (2017). Pengaruh Memandikan Dengan Metode Tradisional Yang Diberi Chloroxylenol Terhadap Tingkat Kenyamanan Pasien Di Ruang Hccu Rsup Dr. Hasan Sadikin Bandung. *Masker Medika*, 5(2), 336-344. Retrieved from <http://jmm.ikestmp.ac.id/index.php/maskermedika/article/view/14>
 4. Roslianti, E., Apipudin, A., Hendriyana, Y., Fitriani, A., & Hidayat, N. (2020). Relationship Of Personal Hygiene by Nurses With Patient Satisfaction In Intensive Care Unit at Ciamis Hospital. *Journal VNU.S*. 2(2).49-54. DOI : <https://doi.org/10.52221/jvnus>
 5. Feo, R., & Kitson, A. (2016). Promoting patient-centred fundamental care in acute healthcare systems. In *International Journal of Nursing Studies* (Vol. 57, pp. 1–11). Elsevier Ltd. DOI : <https://doi.org/10.1016/j.ijnurstu.2016.01.006>
 6. Zwakhalen, S. M. G., Hamers, J. P. H., Metzelthin, S. F., Ettema, R., Heinen, M., de Man-Van Ginkel, J. M., Vermeulen, H., Huisman-de Waal, G., & Schuurmans, M. J. (2018). Basic nursing care: The most provided, the least evidence based – A discussion paper. *Journal of Clinical Nursing*, 27(11–12), 2496–2505.
DOI:
<https://doi.org/10.1111/jocn.14296>
 7. Groven, F. M. V., Zwakhalen, S. M. G., Odekerken-Schröder, G., Tan, F., & Hamers, J. P. H. (2020). Comfort during the bed bath—A randomised crossover trial on the effect of washing without water versus water and soap in nursing students. *Journal of Clinical Nursing*. DOI :<https://doi.org/10.1111/jocn.15610>
 8. El-Soussi, A. H., & Asfour, H. I. (2016). Examining bed-bath practices of critically ill patients. *Journal of Nursing Education and Practice*, 6(12).
DOI:
<https://doi.org/10.5430/jnep.v6n12p1>
 9. Jangland, E., Mirza, N., Conroy, T., Merriman, C., Suzui, E., Nishimura, A., & Ewens, A. (2018). Nursing students' understanding of the Fundamentals of Care: A cross-sectional study in five countries. *Journal of Clinical Nursing*, 27(11–12), 2460–2472. DOI : <https://doi.org/10.1111/jocn.14352>
 10. Isil Ar, & Duygu Gözen. (2016). Effects of Underrunning Water

- Bathing and Immersion Tub Bathing on Vital Signs of Newborn Infants. *European Journal of Pediatrics*, 175(11), 1393–1880. DOI : <https://doi.org/10.1007/s00431-016-2785-8>
11. Pegram, A., Jacqueline Bloomfield, & Anne Jones. (2015). Clinical skills: bed bathing and personal hygiene needs of patients. *British Journal of Nursing*. DOI : <https://doi.org/10.12968/bjon.2007.16.6.23009>
 12. Tai, C.-H., Hsieh, T.-C., & Lee, R.-P. (2021). The Effect of Two Bed Bath Practices in Cost and Vital Signs of Critically Ill Patients. *International Journal of Environmental Research. Public Health*. DOI : <https://doi.org/10.3390/ijerph1810621>
 13. Coyer, F. M., O'Sullivan, J., & Cadman, N. (2011). The provision of patient personal hygiene in the intensive care unit: A descriptive exploratory study of bed-bathing practice. *Australian Critical Care*, 24(3), 198–209. DOI: <https://doi.org/10.1016/j.aucc.2010.08.001>
 14. Taşdemir, H. İ., & Efe, E. (2019). The effect of tub bathing and sponge bathing on neonatal comfort and physiological parameters in late preterm infants: A randomized controlled trial. *International Journal of Nursing Studies*, 99. DOI: <https://doi.org/10.1016/j.ijnurstu.2019.06.008>
 15. Azza H. El-Soussi, Hayam I. Asfour. (2016). Examining bed-bath practices of critically ill patients. *Journal of Nursing Education and Practice*, 6(12), 1-11. DOI: <http://dx.doi.org/10.5430/jnep.v6n12p1>
 16. Elliott M, Coventry A. Critical care: the eight vital signs of patient monitoring. *British Journal Nursing*. 24 giugno 2012; 21(10):621–5. DOI : <https://doi.org/10.12968/bjon.2012.21.10.621>
 17. Scozzo, L., Viti, A., Tritapepe, L., & Mannocci, A. (2022). Changes in vital signs before, during and after bed bathing in the critical ill patient: an observational study. *Clinica Terapeutica*, 173(5), 414–421. DOI : <https://doi.org/10.7417/CT.2022.2456>
 18. Oliveira, A. P. de, & Lima, D. V. M. de. (2010). Evaluation of bedbath in critically ill patients: impact of water temperature on the pulse oximetry variation. *Rev Esc Enferm USP*, 44(4), 1034–1074. www.ee.usp.br/reeusp/. DOI: 10.1590/s0080-62342010000400026

19. Ramos, J. F. R., Consuegra, R. V. G., & Urrego, K. A. G. (2016). *Modelo de adaptación de Roy en el baño en cama*. Av Enferm. <https://docs.bvsalud.org/biblioref/2020/09/950663/modelo-de-adaptacion-de-roy-en-el-bano-en-cama.pdf>. DOI : 10.15446/av.enferm.v34n3.48780
20. Toledo, L. V., Santos, B. X. dos, Salgado, P. de O., Souza, L. M. de, Brinati, L. M., Januário, C. de F., & Ercole, F. F. (2021). Oxyhemodynamic effects of different bed baths: a randomized crossover clinical trial. *Acta Paul Enferm*, 35:eAPE02116. DOI : <http://dx.doi.org/10.37689/actape/2022AO0211666>