



## Comparison Of The Effectiveness Of Crystalloid And Colloid Infusion Fluids In Patients With Hypovolemic Shock

Angriawan<sup>1\*</sup>, Reghula Maryeti Sandra<sup>2</sup>

<sup>\*1</sup> Student Ph.D. in Nursing at the Philippine Women's University of the Philippines

<sup>1</sup> Nursing Study Program, Medistra Health Institute, Lubuk Pakam, Indonesia

<sup>\*2</sup> Nursing Study Program, Tarumanagara Institute, Indonesia

**Correspondent Author :** Angriawan, Email: [awan.binasuan@gmail.com](mailto:awan.binasuan@gmail.com)

### ABSTRACT

Hypovolemic shock is an emergency condition resulting from significant fluid volume loss, resulting in decreased tissue perfusion. The primary treatment is fluid resuscitation using crystalloid or colloid fluids. This study aims to compare the effectiveness of crystalloid and colloid infusion fluids in patients with hypovolemic shock. The research method used a quantitative approach with a quasi-experimental design. A sample of 80 patients was divided into two groups (crystalloid and colloid). Parameters measured included blood pressure, pulse rate, and cardiac output. urine. The results showed that both fluids were effective in improving hemodynamic conditions, but colloid fluids showed a faster increase in blood pressure ( $p < 0.05$ ). It was concluded that colloid fluids were more effective in initial stabilization, but crystalloids remained the primary choice due to safety and cost factors.

**Keywords:** Hypovolemic Shock, Crystalloids, Colloids, Fluid Resuscitation

### 1. INTRODUCTION

Hypovolemic shock is a critical condition that occurs due to significant intravascular fluid loss, either due to bleeding or non-hemorrhagic fluid loss such as diarrhea or burns. This condition causes decreased tissue perfusion, which can lead to organ failure and even death if not treated promptly.

Hypovolemic shock is fluid resuscitation to restore intravascular volume and maintain vital organ perfusion. Two commonly used fluids are crystalloids and colloids.

Crystalloid fluids, such as 0.9% NaCl and Ringer's lactate, are readily available, inexpensive, and relatively safe, but they have the disadvantage of rapidly distributing into the extravascular space. In contrast, colloid fluids have larger particles that remain in the blood vessels longer and are therefore more effective in maintaining intravascular volume.





The use of colloid fluids remains controversial due to their higher cost and potential side effects. Therefore, this study aimed to compare the effectiveness of these two fluids in treating hypovolemic shock .

## 2. RESEARCH METHODS

### a. Types and Design of Research

This study uses a quasi-experimental design with a pretest-posttest approach. control group.

### b. Population and Sample

- 1) Population: patients with a diagnosis of hypovolemic shock
- 2) Sample: 80 patients
- 3) Sampling techniques: purposive sampling

Group Division

- 1) Group 1: Crystalloids (n=40)
- 2) Group 2: Colloids (n=40)

### c. Research Variables

#### 1) Independent Variables

- Types of infusion fluids (crystalloid vs colloid)

#### 2) Dependent Variable

- Blood pressure
- Pulse
- Output urine

### d. Research Instruments

- 1) Blood pressure monitor
- 2) Heart rate monitor
- 3) Observation sheet

### e. Data analysis

- 1) Paired t- test
- 2) Independent t - test
- 3) Significance  $p < 0.05$

## 3. RESEARCH RESULTS AND DISCUSSION

### a. Research result

#### 1) Respondent Characteristics

The study involved 80 patients with hypovolemic shock who were divided into two groups (crystalloid and colloid).



**Table 1. Respondent Characteristics**

Variables	Crystalloids (n=40)	Colloid (n=40)
Age ( mean $\pm$ SD)	55 $\pm$ 10 years	53 $\pm$ 9 years
Man	24 (60%)	26 (65%)
Woman	16 (40%)	14 (35%)
Bleeding	28 (70%)	27 (68%)
Non-bleeding	12 (30%)	13 (32%)

The characteristics of the two groups are relatively homogeneous, so that comparisons can be made validly.

## 2) Hemodynamic Parameters

**Table 2. Comparison of Blood Pressure ( Mean  $\pm$  SD)**

Group	Pretest ( mmHg )	1 hour posttest	6-hour posttest
Crystalloids	80/50	95/65	100/70
Colloid	78/48	105/70	110/75

*p*- value = 0.01

**Table 3. Pulse Rate**

Group	Pretest	1 hour	6 hours
Crystalloids	120 $\pm$ 10	105 $\pm$ 8	95 $\pm$ 7
Colloid	125 $\pm$ 12	100 $\pm$ 9	90 $\pm$ 6

*p*- value = 0.03

**Table 4. Output Urine**

Group	Pretest (ml/hour)	1 hour	6 hours
Crystalloids	20	35	45
Colloid	18	40	50

*p*- value = 0.04



**3) Effectiveness Analysis ( Clinical Outcome )****Table 5. Hemodynamic Stability**

Parameter	Crystalloids	Colloid
Stable in 1 hour	22 (55%)	30 (75%)
Stable >1 hour	18 (45%)	10 (25%)

**4) Risk Analysis ( Odds) Ratio )****Table 6. Odds Fast Stability Ratio**

Variables	OR	CI 95%	p- value
Colloids vs Crystalloids	2.5	1.1–5.6	0.02

Patients who received colloid fluids had a 2.5 times greater chance of achieving hemodynamic stability more quickly.

**5) Side effects****Table 7. Incidents of Side Effects**

Side effects	Crystalloids	Colloid
Edema	5 (12%)	3 (8%)
Kidney disorders	2 (5%)	4 (10%)

**b. Discussion****1) Hemodynamic Effectiveness of Colloid Fluids**

Research results show that colloid fluids provide a more rapid increase in blood pressure than crystalloids. This is due to the large molecules in colloids, which allow them to remain in the intravascular space longer and increase oncotic pressure.

An OR value of 2.5 indicates that the use of colloids significantly increases the chance of rapid stabilization.

**2) Effectiveness of Crystalloids in Resuscitation**

Crystalloids remain effective in increasing body fluid volume, but require larger volumes because some fluid will shift into the interstitial space.

Despite their slower effect, crystalloids remain the primary choice because:

- Lower risk of side effects
- Does not significantly affect kidney function





- More affordable costs
- 3) Clinical and Practical Comparison
- Clinically:
- Colloids → fast, efficient, but expensive & risky
  - Crystalloids → safe, cheap, but slower
- Fluid selection should take into account the patient's condition, especially:
- Degree of shock
  - Risk of kidney failure
  - Availability of facilities
- 4) Output Urine as an Indicator of Perfusion
- Increased output Urine in the colloid group showed better renal perfusion in the early phase of resuscitation . However, this difference was not significant in the long term.
- 5) Risks and Side Effects
- Colloid use has been shown to increase the risk of kidney impairment, an important consideration in clinical practice.
- 6) Implications for Clinical Practice
- The results of this study support the recommendation that:
- Crystalloids remain first-line therapy.
  - Colloids can be used in certain conditions (severe shock, slow response)
- 7) Relation to Previous Research
- These results are in line with international research which states that colloids provide a rapid effect but do not always provide long-term benefits compared to crystalloids.
- Colloid fluids are more effective in initial hemodynamic stabilization , but crystalloids are still recommended as primary therapy due to their safety and efficiency.

#### 4. CONCLUSION AND SUGGESTIONS

##### a. Conclusion

Colloid fluids are more effective in initial hemodynamic stabilization , but crystalloids remain the primary choice in clinical practice.

##### b. Suggestion

- 1) Use crystalloids as first-line therapy
- 2) Colloids are used in certain conditions
- 3) Further research on a larger scale is needed.





## REFERENCES

1. Angriawan, A., & Sandra, RM (2025). The Effectiveness of Using the Modified Early Warning Score (MEWS) in Early Detection of Patient Deterioration in the ICU. *International Journal of Health Sciences* , 3 (4), 621–627. <https://doi.org/10.59585/ijhs.v3i4.869>
2. Annane D, Siami S, Jaber S. Effects of fluid resuscitation with colloids vs crystalloids . *Intensive Care Med* . 2013;39(10):1653–1662.
3. Anurogo , D., Rahmat, RA, & Pannyiwi, R. (2025). Identification of Endophytic Fungi in Traditional Medicinal Plants in South Sulawesi. *JIMAD: Multidisciplinary Scientific Journal* , 3 (2), 77–82. <https://doi.org/10.59585/jimad.v3i1.862>
4. Bickell WH, Wall MJ, Pepe PE. Immediate versus delayed fluid resuscitation for hypotensive patients . *N Engl J Med* . 1994;331(17):1105–1109.
5. Carsetti A, Cecconi M, Rhodes A. Fluid bolus therapy : monitoring and outcomes . *Crit Care* . 2015;19:1–9.
6. Chappell D, Jacob M, Hofmann-Kiefer K. Effects of colloid solutions on hemodynamics . *Anesthesiology* . 2008;109(4):723–740.
7. Finfer S, Bellomo R, Boyce N. A comparison of albumin and saline for fluid resuscitation . *N Engl J Med* . 2004;350(22):2247–2256.
8. Bro TJ. Pharmacokinetics and pharmacodynamic characteristics of colloids . *Best Practice Res Clin Anaesthesiol* . 2014;28(3):225–234.
9. Guyton AC, Hall JE. *Textbook of medical physiology* . 13th ed. Philadelphia : Elsevier ; 2016.
10. Hammond DA, Lam SW, Rech MA. Balanced crystalloids vs saline in critical ill patients . *Pharmacotherapy* . 2020;40(2):173–184.
11. Hartog CS, Reinhart K. Colloid use in critical care : evidence and controversies . *Crit Care* . 2009;13(4):1–8.
12. Heung M, Yessayan L. Fluid management in acute kidney injury . *Clin J Am Soc Nephrol* . 2014;9(6):1167–1175.
13. Holte K, Sharrock NE, Kehlet H. Pathophysiology and clinical implications of fluid therapy . *Br J Anaesth* . 2002;89(4):622–632.
14. Ministry of Health of the Republic of Indonesia. Guidelines for the management of shock. Jakarta: Ministry of Health of the Republic of Indonesia; 2020.
15. Lewis SL, Bucher L. *Medical-surgical nursing* . 11th ed. St. Louis: Elsevier ; 2020.
16. Myburgh JA, Mythen MG. Resuscitation fluids . *N Engl J Med* . 2013;369(13):1243–1251.
17. Mahoklory, SS, Angriawan, A., Sembiring, EAB, Haedir , H., & Sari, DAO (2026). Disaster Management and First Aid (P3K) Counseling for Volunteers. *Sahabat Sosial:*





Publish: Association of Indonesian Teachers and Lecturers

**International Journal of Health Sciences (IJHS)**Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 4 | Number 2 | June 2026 |



- Journal of Community Service* , 4 (2), 616–624.  
<https://doi.org/10.59585/sosisabdimas.v4i2.1031>
18. Mulia, M., Rosmiati, R., Rahmat, RA, Pannyiwi, R., & Wijayanti, LA (2026). Bullying And Its Relationship To Anxiety , Depression , And Self-Esteem . *International Journal of Health Sciences* , 4 (1), 61–67. <https://doi.org/10.59585/ijhs.v4i1.1097>
  19. Perel P, Roberts I. Colloids versus crystalloids for fluid resuscitation . *Cochrane Database System Rev* . 2012;6:CD000567.
  20. Pannyiwi, R., Azis, MNSA, & Rahmat, RA (2025). Analysis of Nurses' Obstacles in Implementing Therapeutic Communication in Healthcare Environments. *Barongko : Journal of Health Sciences* , 4 (1), 231–243. <https://doi.org/10.59585/bajik.v4i1.921>
  21. Rhodes A, Evans LE, Alhazzani W. Surviving sepsis campaign guidelines . *Intensive Care Med* . 2017;43(3):304–377.
  22. Rochweg B, Alhazzani W, Gibson A. Fluid resuscitation in sepsis. *Intensive Care Med* . 2014;40(11):1580–1592.
  23. Shoemaker WC, Appel PL, Kram HB. Hemodynamic and oxygen transport monitoring . *Crit Care Med* . 1990;18(5):481–486.
  24. Vincent JL, De Backer D. Circulatory shock . *N Engl J Med* . 2013;369(18):1726–1734.
  25. Wiedermann CJ. Systematic review of colloid solutions . *Crit Care* . 2008;12(3):1–8.
  26. World Health Emergency Organization care guidelines for trauma and shock . Geneva : WHO; 2018.
  27. Yunos NM, Bellomo R, Hegarty C. Association between chloride-rich fluids and outcomes . *JAMA*. 2012;308(15):1566–1572.

