

Evaluation of Erythrocyte Osmotic Resistance in Various Hypercholesterolemic Blood Types

Azizova Naila Mirali qizi

Department of Medical and Biological Chemistry, Medical Biology, Biophysics and Medical Informatics, Tashkent State Medical University, Uzbekistan

Ashurova Marjona Yog'mir qizi

Department of Medical and Biological Chemistry, Medical Biology, Biophysics and Medical Informatics, Tashkent State Medical University, Uzbekistan

Received: 09 Feb 2026 | Received Revised Version: 22 Feb 2026 | Accepted: 10 Mar 2026 | Published: 01 Apr 2026

Volume 08 Issue 04 2026 | Crossref DOI: 10.37547/tajmspr/Volume08Issue04-02

Abstract

The aim of this work is to investigate the osmotic dilatation of human erythrocytes with various hypercholesterolemias. stress resistance It is the ability of the cell membrane to maintain its shape under various turgor conditions and to resist hemolysis. Cholesterol level increase erythrocyte membrane lipids the composition changes, that with together osmotic stability reduce possible.

Keywords: AB0 system, osmotic stability, blood plasma, cholesterol, urea, hypercholesterolemia, creatinine.

© 2026 Azizova Naila Mirali qizi, & Ashurova Marjona Yog'mir qizi. This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0). The authors retain copyright and allow others to share, adapt, or redistribute the work with proper attribution.

Cite This Article: Azizova Naila Mirali qizi, & Ashurova Marjona Yog'mir qizi. (2026). Evaluation of Erythrocyte Osmotic Resistance in Various Hypercholesterolemic Blood Types. The American Journal of Medical Sciences and Pharmaceutical Research, 8(04), 8–12. <https://doi.org/10.37547/tajmspr/Volume08Issue04-02>

1. Introduction

Historically, blood was divided into four main groups, but today, more than 300 antigenic determinants have been identified on the erythrocyte membrane, grouped into 36 systems [3]. Despite this, the AB0 and Rh (Rh) systems are still considered the most important systems in practical medicine [1.2].

Osmotic resistance (OR) of erythrocytes is the ability of the cell membrane to maintain its shape and resist hemolysis under various turgor conditions. Cholesterol level increase erythrocyte membrane lipids the composition changes, that with together osmotic stability reduce possible. Osmotic

resistance assessment erythrocytes membrane stability, KAS effect and lipid peroxidation level with directly is related. The refore different level hypercholesterolemia of patients OR changes in erythrocytes study clinical and pathophysiological importance has.

2. Methods

The study found that 50–60- year-olds from inspection past individuals participation reached. General cholesterol to the amount see the subjects were divided into 4 groups. divided into: control, light,

medium and heavy hypercholesterolemia. Erythrocytes osmotic resistance standard using hypotonic NaCl solutions

(0.50–0.20%) Hemolysis was detected. level spectrophotometric in a way evaluated. Results M±m in appearance expressed, statistical reliability Student t- test using was determined. Research for thirty-two males from patients taken blood erythrocytes received.

3. Results and Discussion

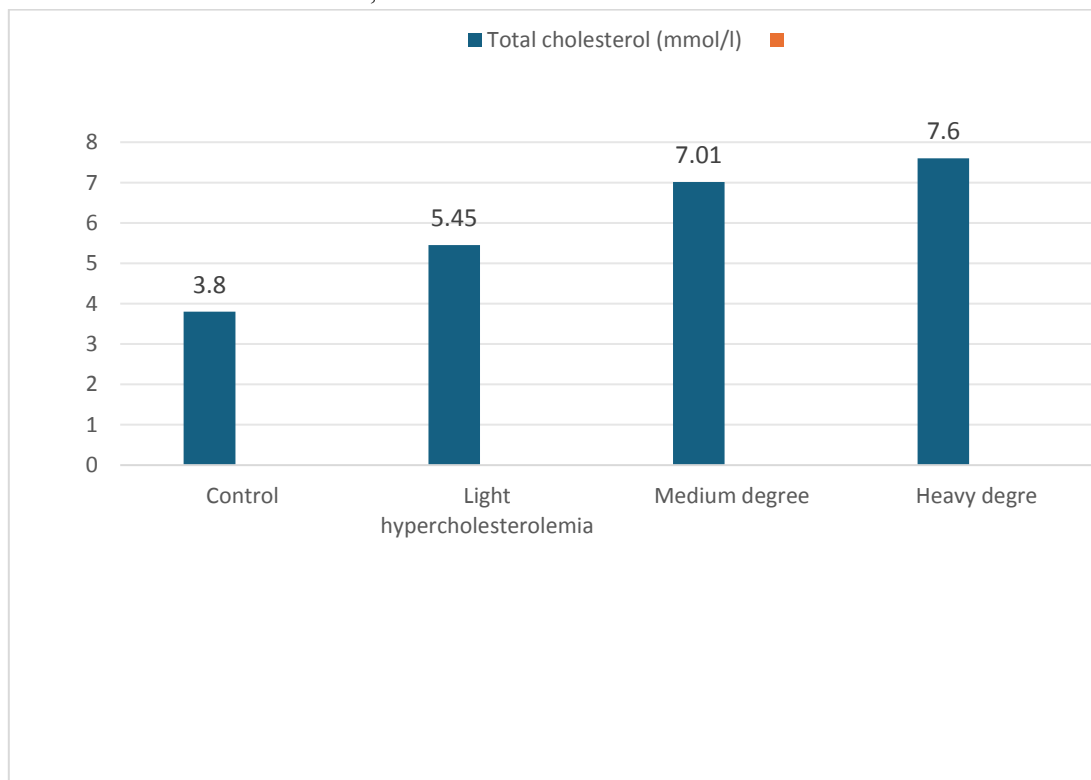
Erythrocytes separated cholesterol level according to control in the group in patients’ general cholesterol amount 3.8 ± 0.1 mmol/ l did.

Table 1.

Total blood cholesterol levels by group

Groups	n	General cholesterol (mmol /l)
Control	8	3.8 ± 0.1
Light hypercholesterolemia	8	5.45 ± 0.3
Medium degree	8	7.01 ± 0.4
Heavy degree	8	≥ 7.6

Light hypercholesterolemia in the group start hemolysis hardness a little increased show. decreased and MCF value a little decreased, this membrane



Pic-1. General cholesterol (mmol/l) level according to groups spread

This is the case out of the norm high lipid content initial compensation with is explained. Medium degree MCF

value in hypercholesterolemia noticeable increased, this erythrocyte osmotic to stress relatively sensitivity indicates

Table 2
Osmotic resistance of erythrocytes in blood with various hypercholesterolemias

Groups	General cholesterol (mmol /l)	Elementary hemolysis NaCl (%)	Complete hemolysis NaCl (%)	MCF (H ₅₀ , %)	Osmotic resistance
Control	3.8 ± 0.1	0.5 ± 0.02	0.29 ± 0.03	0.4 ± 0.03	In moderation
Light hypercholesterolemia	5.45 ± 0.3	0.43 ± 0.02*	0.29 ± 0.02*	0.35 ± 0.01*	↑ increased
Medium degree	7.01 ± 0.4	0.44 ± 0.02**	0.29 ± 0.03**	0.37 ± 0.03**	Noticeable ↑
Heavy degree	≥7.6	0.5 ± 0.04*	0.35 ± 0.01*	0.40 ± 0.02*	↓ decreased

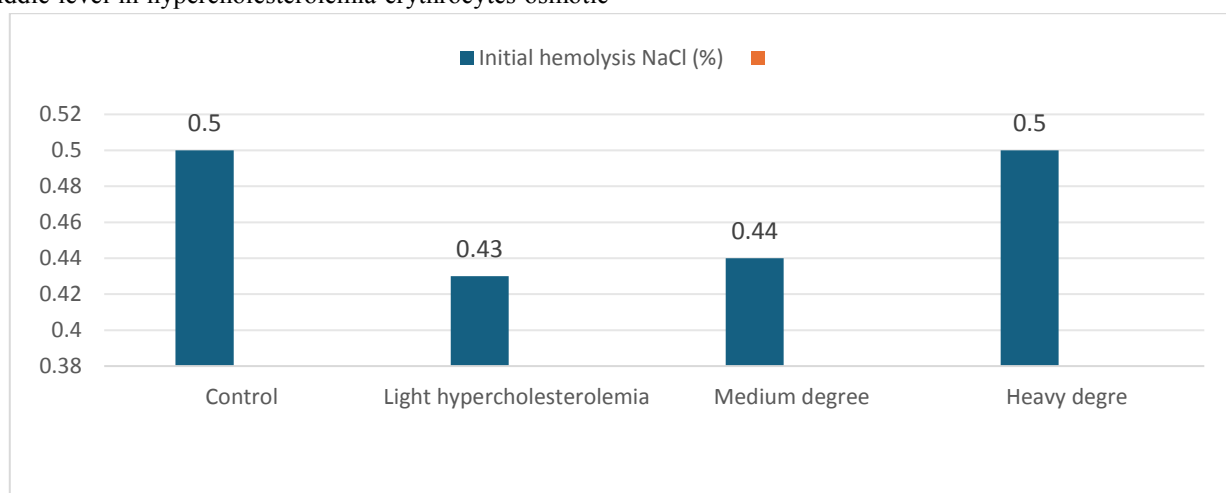
Notes:

*p < 0.05, **p < 0.01 – control with noticeable difference

- ↑ increased – osmotic resistance out of the norm high.
- ↓ decreased – osmotic stability decreased.

Heavy hypercholesterolemia in the group complete hemolysis increase and osmotic resistance decrease membrane structure serious broken shows. With this together, high cholesterol erythrocyte lipid peroxidation in the membrane and under the influence of KAS increased to be possible. Received to the information based on, light and middle level in hypercholesterolemia erythrocytes osmotic

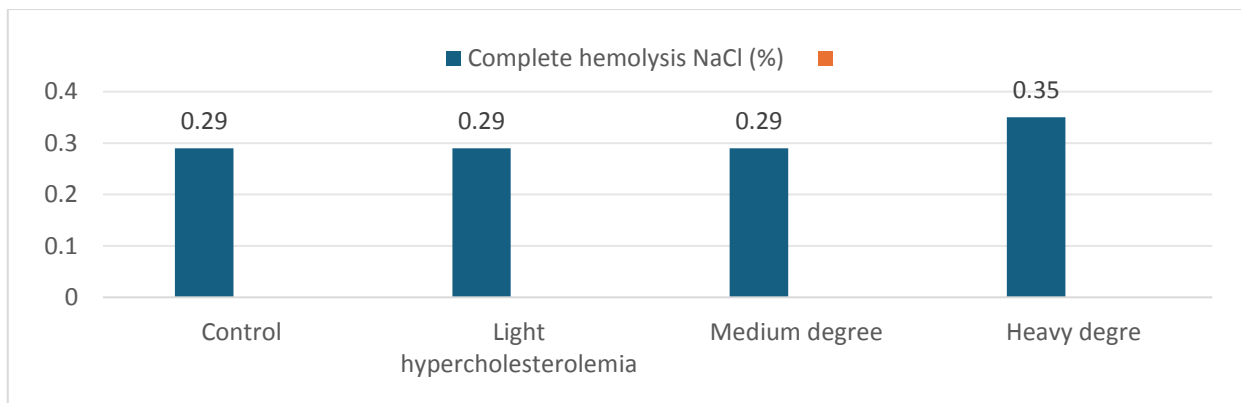
resistance increased This situation was observed. Hemolysis beginning and complete hemolysis for necessary of the NaCl concentration decrease with Especially in the middle level H₅₀ (MCF) index in hypercholesterolemia reliable at the level decrease erythrocyte membrane stability high that showed.



Pic-2. Initial hemolysis NaCl (%)

Erythrocyte membrane main structural from parts one was cholesterol his/her mechanic and osmotic features Cholesterol normative or a little increased amount membrane liquid reducing the number of erythrocytes osmotic to the effects endurance increases. However, cholesterol too much outside increase membrane elasticity reducing the number of erythrocytes hemolysis tendency

strengthens. Light and middle level in hypercholesterolemia erythrocytes osmotic resistance reliable at the level increases. Average level hypercholesterolemia erythrocyte membrane for the highest stability status with is characterized by. Severe in hypercholesterolemia erythrocyte membrane structural violation as a result osmotic resistance decreases.

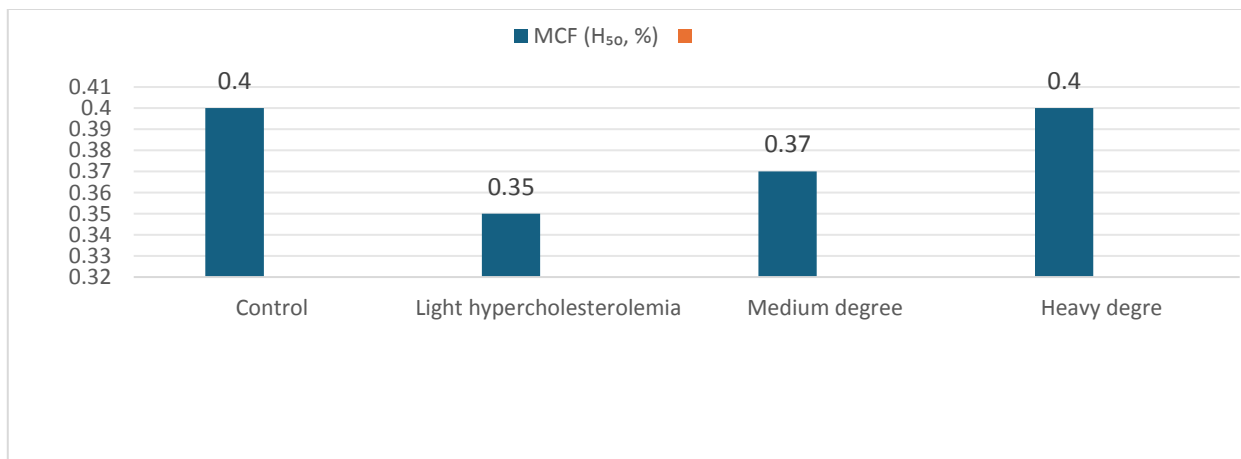


Pic-3. Complete hemolysis NaCl (%)

Heavy in hypercholesterolemia and reverse situation record was: hemolysis at higher NaCl concentration started and H₅₀ indicator increased.

Cholesterol amount increase erythrocyte membrane osmotic stability noticeable at the level changes. Light and middle hypercholesterolemia elementary in stages membrane a little hardened to be possible, but difficult at the level membrane elasticity decreases and hemolysis accelerates.

This is an erythrocyte. membrane structural disorder, lipids ratio change and cell deformation increase with explained.



Pic-4. MCF(H50,%)

This results hypercholesterolemia with related erythrocyte deformation, membrane injury and blood microcirculation violation of shows. Results SOD, Catalase and Glutathione such as antioxidant indicators with bound, erythrocytes oxidizing to stress sensitivity increases. Erythrocytes osmotic resistance cholesterol to the level related.

4. Conclusion

Light and middle hypercholesterolemia initial compensator to mechanisms has if, heavy hypercholesterolemia membrane stability reduces. These results erythrocytes deformation, oxidative stress and lipid peroxidation processes with related. Osmotic resistance price

hypercholesterolemia pathogenesis determination and erythrocytes function in evaluation important indicator is considered.

References

1. Daniels G., Reid M.E. Blood groups: the past 50 years. *Transfusion*. 2010; 50(2): 281-9.
DOI:10.1111/j.1537-2995.2009.02456.x
2. . Xu X., Xu F., Ying Y., Hong X., Liu Y., Chen S., He J., Zhu F., Hu W. AB0 antigen levels on platelets of normal and variant AB0 blood group individuals. *Platelets*. 2018; (26): 1-7.
DOI:10.1080/09537104.2018.1543863
3. Eastlund T. The histo-blood group AB0 system and tissue transplantation. *Transfusion*. 1998; (38): 975–88. DOI:10.1046/j.1537-2995.1998.381
4. Franchini M., Liumbruno G.M. AB0 blood group: old dogma, new perspectives. *Clinical Chemistry and Laboratory Medicine*. 2013; 51(8): 1545–53.
DOI:10.1515/cclm-2013-0168
5. Franchini M., Bonfanti C. Evolutionary aspects of AB0 blood group in humans. *Clinica Chimica Acta*. 2015; (444): 66–71. DOI:10.1016/j.cca.2015.02.016