

A Hospital Based Prospective Study to Association of Mortality with the Serum HDL Levels in Patients of Sepsis in Intensive Care Unit

Manish Kumar Singhal¹, Arun Gaur^{2*}

¹Assistant Professor, ^{2*}Professor & Head, Department of Medicine, Government (RVRS) Medical College & Associate Groups of Mahatma Gandhi Hospital, Bhilwara, Rajasthan, India.

ABSTRACT

Background: Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection. Mechanisms of low HDL in severe sepsis are multifactorial and limited study are available in India. So with reference to current situation analysis and limited number of studies related to association of the mortality with the high density lipoprotein level in the patients with sepsis in the ICU, the present study will be undertaken on the association of the mortality with the high density lipoprotein level in the patients with sepsis in the ICU.

Materials & Methods: This is a prospective cohort study done on 40 patients with sepsis and septic shock admitted in intensive care unit in M.G. Hospital, Bhilwara. Patient's included in study are based on initial assessment by qSOFA scoring system. Those patient in which qSOFA score more than 2 are included in the study group and at time of admission patient clinical history noted and detail clinical examination was done. All patient's were followed prospectively during their entire course of stay in hospital. Serum HDL was done on the day of admission and repeat on day 5.

Results: Our study showed that the mean value of SOFA score was 22.55 ± 6.310 in $<10\text{mg/dl}$ HDL and 10.93 ± 7.163 in $\geq 10\text{ mg/dl}$ HDL. In survivors the mean value of SOFA score

was 13.88 ± 5.612 and 26.55 ± 3.063 in non-survivors patients in $<10\text{mg/dl}$ HDL, which was statistical significant ($P < 0.0001^{***}$). In survivors the mean value of SOFA score was 9.864 ± 6.232 and 28.67 ± 1.22 in non-survivors patients in $\geq 10\text{mg/dl}$ HDL, which was statistical significant ($P < 0.0001^{***}$).

Conclusion: We concluded that HDL cholesterol on day of admission can be viewed as a significant predictor of mortality in patients with severe sepsis in medical ICU patients.


Keywords: HDL, Survivors, Non-survivors, SOFA Score, ICU.

*Correspondence to:

Dr. Arun Gaur,
Professor & Head,
Department of Medicine,
Government (RVRS) Medical College & Associate Groups of
Mahatma Gandhi Hospital, Bhilwara, Rajasthan, India.

Article History:

Received: 28-07-2020, Revised: 24-08-2020, Accepted: 19-09-2020

Access this article online	
Website: www.ijmrp.com	Quick Response code 
DOI: 10.21276/ijmrp.2020.6.5.016	

INTRODUCTION

Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection. Septic shock is a subset of sepsis in which underlying circulatory and cellular/metabolic abnormalities are profound enough to substantially increase mortality.¹

The incidence of sepsis and the number of sepsis related deaths are increasing. Gram positive bacterial and fungal organisms are increasingly common causes of sepsis.

In 1993 Levine DM et al was the first to explain the protective effect of HDL-C against bacterial endotoxin. They showed, transgenic mice with high HDL-C had high levels of endotoxin bound to HDL-C, low levels of cytokine response and improved survival compared with mice having low HDL-C level.² Sequential Organ Failure Assessment score (SOFA score) is used to track a person's status during the stay in ICU. It is used to determine the extent of a person's organ dysfunction or rate of failure.

Patients with suspected infection who are likely to have a prolonged ICU stay or to die in the hospital can be promptly identified at the bedside with Quick Sequential Organ Failure Assessment (qSOFA)

- Respiratory rate $\geq 22/\text{min}$
- Altered mentation
- Systolic blood pressure $\leq 100\text{mmHg}$

The presence of at least two of these criteria strongly predicts the likelihood of poor outcome.

Mechanisms of low HDL in severe sepsis are multifactorial and limited study are available in India. So with reference to current situation analysis and limited number of studies related to association of the mortality with the high density lipoprotein level in the patients with sepsis in the ICU, the present study will be undertaken on the association of the mortality with the high density lipoprotein level in the patients with sepsis in the ICU.

MATERIALS & METHODS

This is a prospective cohort study done on 40 patients with sepsis and septic shock admitted in intensive care unit in M.G. Hospital, Bhilwara.

Patient's included in study are based on initial assessment by qSOFA scoring system. Those patient in which qSOFA score more than 2 are included in the study group and at time of admission patient clinical history noted and detail clinical examination was done. Patient's which fulfill inclusion criteria are further evaluation and investigations was sent on day of admission. All patient's were followed prospectively during their entire course of stay in hospital. Serum HDL was done on the day of admission and repeat on day 5. Detailed clinical examination was done along with relevant blood investigation were done required as per exclusion criteria:

- 1) Ultrasonography and Hb, serum calcium, serum phosphorous to rule out chronic kidney disease
- 2) HIV, ANA, Rheumatoid arthritis factor, Hba1c, TSH, T3, T4 to rule out diabetes mellitus, hypothyroidism, SLE and rheumatoid arthritis
- 3) Portal vein diameter, liver size and echotexture was studied rule out chronic liver disease

Patient's other investigation were also sent to identify the etiology of disease and for SOFA score calculation to estimate the risk of organ dysfunction and risk of death:

CBC, ESR, dengue serology, scrub typhus, HINI, malaria, blood culture and sensitivity, LFT, ABG, RFT. Mental status examination assessed by glassgow coma scale with systolic and diastolic

blood pressure measurement. Respiratory rate and Glassgow coma scale are to be ascertained at the onset.

Exclusion Criteria

- Patients on treatment or history of treatment with statins.
- Chronic liver disease, chronic kidney disease, thyroid dysfunction, diabetes mellitus.
- Patients with known chronic inflammatory condition like Human immunodeficiency virus disease, SLE (Systemic lupus erythematosus) and RA (Rheumatoid arthritis).
- Patients who were discharged against medical advice.

Principle of the Method

Serum HDL level are measured by different methods. In our hospital serum HDL level is measured by enzymatic method using phosphotungstic acid MGC/12 reagent, directly determination of serum HDLc and (high-density lipoproteins cholesterol) levels without the need for any pre-treatment or centrifugation of the sample.

The method depends on the properties of a detergent which solubilizes only the HDL so that the HDL-c is released to react with the cholesterol esterase, cholesterol oxidase and Chromogens to give color. The non-HDL lipoproteins LDL, VLDL and chylomicrons are inhibited from reacting with the enzymes due to absorption of the detergents on their surfaces. The intensity of the color formed is proportional to the HDL-c concentration in the sample.

Statistical Analysis

Appropriate statistical tests were used to find significant association. P-value<0.05 were considered.

Table 1: Shows baseline characteristics of survivors and non survivors.

	Total patients (Mean±SD)	Survivors (N=35)	Non-survivors (N=15)	P-value
Age (yrs)	55.72±10.91	54.65±11.30	53.92±10.33	>0.05
Gender	Male	33	27	1.000 NS
	Female	7	5	

Table 2: Comparison of SOFA score between HDL≤10mg/dl and HDL≥10mg/dl

HDL	SOFA score			P-value
	Total patients (Mean±SD)	Survivors (N=28)	Non-survivors (N=12)	
<10mg/dl	22.55±6.310	13.88±5.612	26.55±3.063	<0.0001***
≥10 mg/dl	10.93±7.163	9.864±6.232	28.67±1.22	<0.0001***

Table 3: Comparison of day of admission HDL and day 5 HDL cholesterol with outcome

	Total patients (Mean±SD)	Survivors (N=28)	Non-survivors (N=12)	P-value
HDL level at 1 day	18.56±8.721	24.33±7.243	8.537±2.682	<0.0001***
HDL level at 5 day	24.13±10.22	30.22±7.534	9.813±2.056	<0.0001***

RESULTS

Our study showed that the overall mean age of patients was 55.72 years in our study. In survivors the mean age of patients was 54.65 years and 53.92 years in non-survivors patients, which was statistical non-significant (P>0.05). Gender wise distribution in survivors and non-survivors was statistical non-significant.(table 1)

Our study showed that the mean value of SOFA score was 22.55±6.310 in <10mg/dl HDL and 10.93±7.163 in ≥10 mg/dl HDL. In survivors the mean value of SOFA score was 13.88±5.612 and 26.55±3.063 in non-survivors patients in<10mg/dl HDL, which was statistical significant (P<0.0001***). In survivors the mean value of SOFA score was 9.864±6.232 and

28.67±1.22 in non-survivors patients in ≥10mg/dl HDL, which was statistical significant (P<0.0001***) (table 2).

Our study showed that the mean value of HDL level at 1 day was 18.56±8.721 mg/dl, in survivors 24.33±7.243 mg/dl & in non-survivors was 8.537±2.682 mg/dl. The difference of mean was statistical significant (P<0.0001***). The mean value of HDL level at 5 day was 24.13±10.22 mg/dl, in survivors 30.22±7.534 mg/dl & in non-survivors was 9.813±2.056 mg/dl. The difference of mean was statistical significant (P<0.0001***) (table 3).

DISCUSSION

Persons with a weakened immune system are prone to develop sepsis, but the detrimental processes that may ultimately lead to the death of the patient are mostly caused by an exaggerated systemic response to an infection. Lipoproteins have been implicated to play a role in innate immunity.³ Knowledge of variations in blood lipid levels in patients with sepsis dates to 1980's, when studies showed significantly low HDL-C levels with sepsis, which improved with improvement in sepsis. But studies lacked correlation of with severity of sepsis with decrease in HDL-C levels nor infections agent or underlying illness.⁴

The overall mean age of patients was 55.72 years in our study. In survivors the mean age of patients was 54.65 years and 53.92 years in non-survivors patients, which was statistical significant (P>0.05). Gender wise distribution in survivors and non-survivors was statistical non significant. Which was statistical significant with Todi S⁵ found that the mean age of the population was 58.17 years (SD 18.66). Another study done by Mitra Barati et al (2011)⁶ found that the study population included 28 males and 42 females with mean (± standard deviation) age of years 73.6 ± 15.7 that 29 of them were in sepsis group and 41 of them in non-sepsis group. There wasn't any relationship between sex and mortality (p=0.34), although by increasing age mortality leveled out (r=-0.58, p=0.04). Our study showed that the mean value of SOFA score was 22.55±6.310 in <10mg/dl HDL and 10.93±7.163 in ≥10 mg/dl HDL. In survivors the mean value of SOFA score was 13.88±5.612 and 26.55±3.063 in non-survivors patients in <10mg/dl HDL, which was statistical significant (P<0.0001***). In survivors the mean value of SOFA score was 9.864±6.232 and 28.67±1.22 in non-survivors patients in ≥10mg/dl HDL, which was statistical significant (P<0.0001***) (table 3).

Sabari Das, Seema Bhargava et al (2011)⁷ observed that mean total cholesterol, HDL-C and LDL-C levels in the non surviving group were significantly less than the surviving group (p=0.000, p=0.008, p=0.04). The difference in the triglyceride level was not significant. Al-Zaidawi, Sejad et al (2014)⁸ found that a strong correlation between HDL level and septicemia in burned patient. HDL value is a good biomarker for sepsis, it decreases below normal level and continues to diminish and reach to immeasurable level at advance stage of septicemia

Sébastien Tanaka et al (2017)⁹ concluded that lipid profile was totally different between sepsis and trauma in ICU patients: HDL levels were low in septic patients, whereas their concentration was not altered in trauma patients. This major difference reinforces the necessity to explore the therapeutic potential of HDL in sepsis.

CONCLUSION

We concluded that HDL cholesterol on day of admission can be viewed as a significant predictor of mortality in patients with severe sepsis in medical ICU patients. Raising trend favours improvement in clinical condition and decreasing trend implied worsening of the clinical condition.

REFERENCES

1. Shankar-Hari M, Phillips GS, Levy ML, et al; Sepsis Definitions Task Force. Developing a new definition and assessing new clinical criteria for septic shock: for the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA. doi:10.1001/jama.2016.0289
2. Levine DM, Parker TS, Donnelly TM, Walsh A, Rubin AL. In vivo protection against endotoxin by plasma high density lipoprotein. Proceedings of the National Academy of Sciences of the United States of America. 1993;90(24):12040-4.
3. vanLeeuwen HJ, Heezius EC, Dallinga GM, van Strijp JA, Verhoef J, van Kessel KP. Lipoprotein metabolism in patients with severe sepsis. Critical care medicine. 2003;31(5):1359-66.
4. Alvarez C, Ramos A. Lipids, lipoproteins, and apoproteins in serum during infection. Clinical chemistry. 1986;32(1 Pt 1):142-5.
5. Todi S, Chatterjee S, Sahu S, Bhattacharyya M. Epidemiology of severe sepsis in India: an update. Critical Care. 2010;14(Suppl 1):P382.
6. Mitra Barati, Mohammad Reza Nazari, Mahshid Talebi Taher. Comparison of Lipid Profile in Septic and Non-Septic Patients. Iran J Clin Infect Dis, 2011;6(4):142-6.
7. Sabari Das, Seema Bhargava, Anjali Manocha, Mamta Kankra, Sumit Ray. The Prognostic Value of Hypocholesterolemia in Sepsis. Asian J Pharm Biol Res 2011 Jan-Mar ;1(1):41-6.
8. Al-Zaidawi, Sejad, Al-hashimi, Ridha. Pre- Sepsis Biomarker: HDL (High Density Lipoproteins). WJPPS, 2013;3(10):111-14.
9. Sébastien Tanaka, Julien Labreuche, Elodie Drumez. Low HDL levels in sepsis versus trauma patients in intensive care unit. Ann Intensive Care. 2017;7: 60.

Source of Support: Nil.

Conflict of Interest: None Declared.

Copyright: © the author(s) and publisher. IJMRP is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882.

This is an open access article distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Cite this article as: Manish Kumar Singhal, Arun Gaur. A Hospital Based Prospective Study to Association of Mortality with the Serum HDL Levels in Patients of Sepsis in Intensive Care Unit. Int J Med Res Prof. 2020 Sept; 6(5): 74-76. DOI:10.21276/ijmrp.2020.6.5.016