Original Article

JCMCTA 2026 ; 37 (1) : 25-31
DOI: https://doi.org/10.3329/jcmcta.v37i1.91552

C-Reactive Protein to Albumin Ratio as A Predictor of Outcome in Adult Patients with Sepsis Admitted in Chittagong Medical College Hospital

Mohammed Shahed Iqbal Hasan[1*] Muna Islam[2] Mohammed Nazmus Saleh[3]
Tanvir Mahmud[4] Rahima Akther[5] Aniruddha Ghose[6]

Abstract

Background: Sepsis contributes to global morbidity and mortality, but early identification remains challenging due to lack of reliable biomarkers. C-Reactive Protein (CRP) to albumin ratio may serve as a prognostic marker.

To ascertain the value of CRP to Albumin ratio as a predictor of in sepsis patients.

Materials and methods: A observational study was conducted among 190 adult sepsis patients admitted into Department of Medicine of Chittagong Medical College Hospital (CMCH) between January and December 2021. CRP, albumin, and Modified Sequential Organ Failure Assessment (MSOFA) scores were recorded on days 1 and 3. Patients were followed for 28 days. Data were analyzed using SPSS v25.

Results: In the mean age of patients was 54.1±9.8 years with 51.1% male. The 28-day mortality rate was 28.4%. Age, GCS, creatinine and a CRP to Albumin ratio >3.95 were significant independent predictors of 28-day mortality. CRP to albumin ratios on day 1 and 3 showed strong positive correlation with MSOFA scores (r=0.612 and r=0.610, p<0.001). The CRP to albumin ratio predicted 28-day mortality with an AUC of 0.87 and a cutoff >3.95, showing 72.2% sensitivity and 89.0% specificity.

Conclusion: The CRP to Albumin ratio is a practical, cost-effective and easily acquired biomarker particularly useful for assessing sepsis prognosis.

1. Medical Officer of Medicine OPD
Chittagong Medical College Hospital, Chattogram.
2. Assistant Professor of Medicine
Chittagong Medical College, Chattogram.
3. Assistant Registrar of Medicine
250 Bed General Hospital, Chattogram.
4. Medical Officer
250 Bed Feni General Hospital, Feni.
5. Senior Registrar of Obstetrics & Gynaecology
Apollo Imperial Hospitals, Chattogram.
6. Professor of Medicine
Chittagong Medical College, Chattogram.

***Correspondence: Dr. Mohammed Shahed Iqbal Hasan**
Cell : 01846 93 49 09
E-mail: shahediqbal119@gmail.com

Submitted on : 30.08.2025
Accepted on : 12.11.2025

Key words: CRP to Albumin ratio; MSOFA score; Sepsis.

Introduction

Sepsis remains a formidable global health challenge, significantly contributing to morbidity and mortality across all age groups, with an estimated 50 million cases and 11 million deaths worldwide in 2017.[1,2] The high inter-individual clinical variability and the paucity of reliable predictive and prognostic markers continue to impede efficient triage and timely initiation of definitive therapy.[3] Despite advancements in medical care and increased awareness, sepsis continues to be a major cause of morbidity and mortality globally, highlighting the urgent need for improved diagnostic and prognostic strategies.

A significant hurdle in managing sepsis is the inter-individual clinical variability and the lack of reliable predictive and prognostic markers, which often hinder efficient triage and prompt initiation of definitive therapy.[3] Delays in treatment profoundly impact early and late morbidity and mortality, while inappropriate antibiotic use contributes to the alarming rise of antimicrobial resistance.[4,5]

Organ dysfunction is central to the definition and mortality risk of sepsis, and clinical scoring systems like the Sequential Organ Failure Assessment (SOFA) score are widely used to assess severity.[6] However, the need for extensive laboratory investigations limits their practicality, particularly in resource-limited settings. To address this, the Modified SOFA (MSOFA) score was developed, simplifying the original score by reducing dependency on laboratory parameters.[7] Still, both scoring systems primarily reflect deranged vital signs, which may appear late in the disease course. Therefore, incorporating biochemical markers may improve early detection and prognostic accuracy.

JCMCTA 2026 ; 37 (1) : 25-31
DOI: https://doi.org/10.3329/jcmcta.v37i1.91552

CRP is a widely used biomarker in sepsis patients for diagnosis and severity prediction, with analysis readily available in hospitals. It is frequently measured in both ICU and non-ICU patients with suspected or verified infection.[8] Other than CRP, serum albumin is a useful marker that can predict morbidity and mortality among critically ill patients.[9] The level of hypoalbuminemia in sepsis patients correlates with the intensity of the inflammatory response triggered by the infection.[10] The CRP to Albumin ratio is a correlational index that indicates inflammation and nutritional status, and has been recognized as an independent prognostic marker in patients receiving parenteral nutritional support due to critical illness, malignancy, infection, anti- neutrophil cytoplasmic antibody associated vasculitis, acute kidney injury, peritoneal dialysis, sepsis, and coronavirus disease 2019.[8,11–13]

However, the predictive utility of CRP to Albumin ratio in general ward patients with sepsis— especially in the context of Bangladeshi healthcare settings—remains underexplored. This study aims to evaluate the CRP to Albumin ratio on admission and 48 hours post-admission as a predictor of 28-day mortality and other in-hospital outcomes in sepsis patients admitted to a tertiary care hospital in Bangladesh. The prognostic value of MSOFA scores was also assessed and compared with that of the CRP to Albumin ratio.

Materials and methods

This is a hospital based prospective cohort study. This study included adult patients (Aged ≥18 years) of either sex who were admitted to the medicine ward with sepsis or developed a new episode of sepsis during their hospital stay. Patients were excluded if informed consent could not be obtained or if they had underlying conditions known to cause hypoalbuminaemia or protein loss, such as chronic diarrhoea, nephrotic syndrome, or decompensated liver disease. Additional exclusion criteria included a history of receiving albumin therapy within the last three months and the presence of other acute illnesses that could confound the study outcomes, specifically severe malaria, severe dengue, or acute pancreatitis.

This study was conducted over a one-year period, from January to December 2021, enrolling 190 adult patients admitted to the hospital with a diagnosis of sepsis through convenient sampling. Sepsis was defined as life-threatening organ dysfunction, indicated by suspected or documented infection alongside two or more criteria: systolic blood pressure <100mmHg, GCS score ≤14 or respiratory rate ≥22 breaths/min.[3] Infection was categorized as either Clinically Defined Infection (CDI) characterized by fever and local inflammation without microbiological proof or Microbiologically Defined Infection (MDI) involving detected infectious organisms in blood cultures or localized, microbiologically documented infection. The Modified Sequential Organ Failure Assessment (MSOFA) score, with adjusted respiratory requirements, was utilized for assessment. Data were collected using a predesigned semi-structured case record form, with patients or their guardians providing informed consent within 24 hours of screening. Comprehensive clinical histories and examinations were performed, and venous blood samples were collected aseptically for analysis of CRP, albumin (On day 1 and 3) and other biochemical indicators (e.g. Vital signs, GCS, SpO_2/FiO_2, blood pressure, creatinine, bilirubin, platelet) to calculate MSOFA scores, using Siemens Advia 1800 and Atellica Neph 360 analyzers. Patient treatment protocols remained uninterrupted, with ongoing monitoring for ICU referral, organ support, microbiological results, and length of hospital stay; all patients were followed until death or for 28 days post-admission, with cause of death documented or telephonic follow-up conducted for discharged patients.

Data were analyzed using SPSS version 25.0. Continuous variables were expressed as mean ± SD or median with Interquartile Range (IQR) while categorical variables were presented as frequencies and percentages. Multivariate binary logistic regression was conducted to identify independent predictors of mortality. ROC curve analysis was used to assess the predictive accuracy of CRP to Albumin ratio and MSOFA scores for 28-day mortality and the optimal cut-off values were determined using Youden's index. Correlations between CRP to Albumin ratio and

JCMCTA 2026 ; 37 (1) : 25-31
DOI: https://doi.org/10.3329/jcmcta.v37i1.91552

MSOFA scores were assessed using Pearson's correlation. A p-value <0.05 was considered statistically significant.

Ethical approval was taken before starting the study from the Ethical Review Committee of Chittagong Medical College (memo no. CMC/PG/2021/695 Dated 14/02/2021).

Results

Table I Patient Baseline Data: The study included 190 patients, predominantly aged over 60 years (53.7%) with an even sex distribution. Diabetes (37.9%) and hypertension (27.9%) were common comorbidities. Urinary (48.9%) and respiratory (40.0%) infections were the most frequent.

Table II Primary and Secondary Outcomes: The median in-hospital stay was 7.0 days. In-hospital and 28-day mortality rates were 22.1% and 28.4%, respectively. Few patients required ICU admission (3.7%), mechanical ventilation (3.2%) or renal replacement therapy (1.6%).

Table III Multivariate Binary Logistic Regression Analysis: Age (OR: 1.21, p<0.001), GCS (OR: 0.34, p=0.012) creatinine (OR: 7.18, p=0.045) and a CRP to Albumin ratio > 3.95 (OR: 7.70, p=0.043) were identified as significant independent predictors of 28-day mortality.

Figure 1 ROC Curves for CRP to Albumin Ratio and MSOFA Score:
ROC curves demonstrate that both the CRP to Albumin ratio and MSOFA scores at Day 1 and Day 3 exhibit good predictive performance for 28-day mortality. The Day 1 CRP to Albumin ratio generally showed higher sensitivity and specificity than the Day 3 ratio.

Figure 2 Correlation Between CRP to Albumin Ratio and MSOFA Score: A positive linear correlation was observed between the CRP to Albumin ratio and MSOFA scores on both Day 1 (R^2=0.380) and Day 3 (R^2=0.372). This indicates that higher CRP to Albumin ratios correlate with increased organ dysfunction severity.

Table I Patient Baseline Data: Demographics, Comorbidities and Infection patterns

Variables		Frequency	Percentage
	40 years	9	4.7
Age groups	41-60 years	79	41.6
	>60 years	102	53.7
Age (Mean ±SD) years		54.1±9.8	
Gender	Male	97	51.1
	Female	93	48.9
	Diabetes	72	37.9
Comorbidities	Hypertension	53	27.9
	COPD	17	8.9
	IHD	5	2.6
	Urinary	93	48.9
	Respiratory	76	40.0
Site of infections	Abdomen	8	4.2
	CNS	7	3.7
	Skin	4	2.1
	Blood	2	1.1
	Clinically Defined	174	91.6
Types of infection	Microbiologically Defines	16	8.4

Data were expressed as frequency (Percentage) if not mentioned otherwise. SD: Standard Deviation; COPD: Chronic Obstructive Pulmonary Disease, IHD: Ischemic Heart Disease, CNS: Central Nervous System.

Table II Primary and Secondary outcomes of the studied patients (n=190)

Parameters	Frequency	Percentage (%)
Required ICU admission	7	3.7
Required vasopressors	37	19.5
Required inotropes	2	1.1
Required mechanical ventilation	6	3.2
Required renal replacement therapy	3	1.6
Length of stay in-hospital, median (IQR) days		7.0 (5.0-9.0)
In-hospital mortality	42	22.1
28-day morality	54	28.4

IQR: Interquartile Range

JCMCTA 2026 ; 37 (1) : 25-31
DOI: https://doi.org/10.3329/jcmcta.v37i1.91552

Table III Multivariate binary logistic regression analysis to determine the independent predictors of 28-day mortality

Variables	B	SE	Wald	OR (95% CI)	p value
Age, Years	0.191	0.046	17.288	1.21 (1011-1.32)	0.000
Diabetes	-0.488	0.705	0.479	0.61 (0.15-2.44)	0.489
Respiratory rate,/min	-0.039	0.104	0.138	0.96 (0.78-1.18)	0.710
GCS	-1.067	0.426	6.281	0.34 (0.14-0.79)	0.012
Bilirubin, mg/dl	-1.115	1.356	0.677	0.32 (0.02-4.67)	0.411
Creatinine, mg/dl	1.972	0.982	4.032	7.18 (1.05-49.21)	0.045
Platelet count	-0.005	0.004	1.623	0.99 (0.99-1.00)	0.203
CRP,mg/L	-0.003	0.009	0.136	0.99 (0.98-1.01)	0.712
Albumin, gm/L	-0.122	0.065	3.555	0.88 (0.78-1.00)	0.059
CRP to Albumin *>3.95	2.042	1.010	4.087	7.70 (1.06-55.83)	0.043
MSOFA* >5.5	0.329	1.147	0.082	1.39 (0.15-13.16)	0.774

*Admission (Day 1) values and cutoff level obtained from ROC curve analysis, OR: Odds Ratio, CI: Confidence Interval.

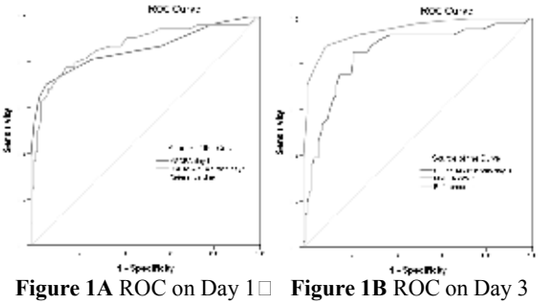

Figure 1A ROC on Day 1 **Figure 1B** ROC on Day 3

Figure 1 ROC Curves for CRP to Albumin Ratio and MSOFA Score

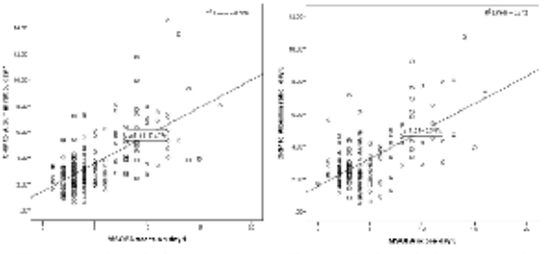

Figure 1A Correlation on Day 1 **Figure 1B** Correlation on Day 3

Figure 2 Correlation Between CRP to Albumin Ratio and MSOFA Score

Discussion

Accurate prognostication is especially important in critically ill patients with sepsis and many biochemical markers could reflect the severity of diseases. Albumin levels are associated with the chronic nature of disease. On the other hand, CRP is an acute-phase protein.[14] The present study was conducted to determine the role of CRP to Albumin ratio in predicting the outcome in terms of 28-day mortality in patients with sepsis. One hundred and ninety adult (Age >18 years) patients with sepsis admitted in the medicine ward of CMCH were included and CRP to Albumin ratio and MSOFA scores were calculated on day 1 and day 3. Patients were followed-up for 28 days to determine the outcome including 28-day mortality. The main findings of the study were the initial value of CRP to Albumin ratio was strongly and independently associated with 28 days mortality, and day 1 and day 3 CRP to Albumin ratio significantly correlated with the corresponding MSOFA scores in hospitalized patients with sepsis.

Among 190 study participants, mean age was 54.1±9.8 years. This age distribution was similar to the studies conducted in this part of the world.[15,16] Age was an independent factor for the 28-day mortality in the study with a significantly higher age among non-survivor than the survivors. Similar observation was also reported in the earlier studies conducted by Ranzani et al. and Kim et al.[8,17] The current study indicated an almost equal male to female ratio, which is similar to the findings of the previous report.[8,16,17]

Among the studied patients the most common associated comorbidity was Diabetes Mellitus present in 37.9% followed by Hypertension in 27.9%. In the Hamsa et al. study, diabetes was the most frequent comorbidity, accounting for 56% of cases, followed by hypertension (32.67%).[16] According to Lie et al. the most common comorbidities among adult hospitalized patients with community-acquired sepsis in Southeast Asia were diabetes and hypertension.[15] It is of great concern for Bangladesh as both aging population and the prevalence of Diabetes and Hypertension are on rise in Bangladesh.[18–20] So, burden of sepsis will definitely create an enormous challenge for our health care system.

In the study population, the most common site of infections was urinary tract (48.9%) followed by respiratory tract in 40.0% patients. Other investigations found that the most frequent infection sites among hospitalized sepsis patients were respiratory and urinary tract infections.[15,16]

JCMCTA 2026 ; 37 (1) : 25-31
DOI: https://doi.org/10.3329/jcmcta.v37i1.91552

Only about 9% of sepsis patients had a pathogen identified in the study. It is possible that many patients in our settings may have taken antibiotics prior to hospital admission. An alternative explanation is that patients were infected by pathogens that were not targeted by our diagnostic tests.

In the present study the 28-day mortality rate was 28.4%. The 28-day rate of mortality for hospitalized patients with community-acquired sepsis was 22%, according to a new international multicenter prospective observational research from Southeast Asia.[15] The high mortality rate in that study may have been caused by the fact that the majority of patients are treated on the wards rather than in the intensive care unit and that there is often little adherence to the Surviving Sepsis Campaign bundles, even 24 hours after admission.[15] In contrast to the present study findings, a study conducted in India found that the 28-day mortality rate for sepsis patients admitted to the intensive care unit was 38.7%.[16]

The CRP to Albumin ratio is currently used as a prognostic value. The information offered by albumin and CRP separately is transformed into a stronger marker by using this ratio, which rises with the intensity of inflammation and positively corresponds with infectious causes.[21] The CRP to albumin ratio was shown to be a better indicator than either CRP or albumin alone in predicting mortality in patients with sepsis in the study by Cakir et al.[13] In the present study though both serum albumin and serum CRP had significant association with 28-day mortality in univariate analysis, none of these two revealed as an independent predictor of 28-day mortality in multivariate analysis.

Based on the ROC curve, cut-off values of 3.95 for the CRP to Albumin ratio was found to be predictive of 28-day mortality with a sensitivity of 72.2% and specificity of 89.0%. Kim et al. found that in patients receiving early goal-directed treatment for septic shock or severe sepsis, the CRP to albumin ratio at admission was favourably connected with outcome.[8] That study also reported that an admission CRP to albumin ratio above 5.09 predicted mortality in severe sepsis or septic shock, while Park et al. found a cut-off of 3.43 for predicting 28-day mortality in ICU patients.[8,11]

CRP to Albumin had a threshold value of >1.75 for 30-day mortality and >1.58 for 1-year mortality, according to Oh et al. who studied the largest series of postoperative patients hospitalised to the intensive care unit (n=11,832).[12] The age distribution of the patient groups in that research was comparable to that of the current study. The present study's higher mortality cut- off value of >3.95, however, is probably due to the fact that the patient group solely had sepsis. Oh et al. included medical, surgical, neurologic, and emergency cases in their patient group, which resulted in significant diagnostic heterogeneity.[12] The findings of the present study align more closely with those of Ranzani et al. who demonstrated that a CRP to albumin ratio >2 was the most sensitive and responsive predictor of 90-day mortality in patients with sepsis or septic shock.

The present study a significant positive correlation was observed between CRP to Albumin ratio and MSOFA score both at day 1 and day 3. Similar positive correlation between SOFA score and CRP to Albumin ratio in sepsis patients in ICU setting were reported previously[8,22] These findings indicated that CRP to Albumin ratio can be used as a prognostic marker in patients with sepsis instead of SOFA or MSOFA score.

The results of this study suggest that serum CRP to Albumin ratio might serve as a clinically valuable marker in patients with sepsis. These investigations are readily available and usually done within minutes of acute admission. Although the present study showed the strong independent prognostic value of the CRP to Albumin ratio in patients with sepsis.

Limitations

This single-center observational study had a relatively small sample size and included only patients from the medicine ward, limiting the generalizability of its findings to other institutions and to surgical patients with severe sepsis.

Conclusions

In summary, the CRP to albumin ratio on day 1 was an independent predictor of 28-day mortality in sepsis patients, showing strong correlation with MSOFA scores and higher prognostic accuracy than day 3 values, while also being associated with greater need for critical care interventions and worse outcomes.

JCMCTA 2026 ; 37 (1) : 25-31
DOI: https://doi.org/10.3329/jcmcta.v37i1.91552

Recommendations

CRP to Albumin ratio on admission can be used to prioritize patients with sepsis and guide clinicians in making appropriate treatment decisions. However, additional well designed multicenter prospective studies with larger sample sizes are required to further strengthen the findings of the present study.

Acknowledgement

All the authors expressed their heartfelt gratitude to all doctors and stuff working in Medicine Department of CMCH.

Contributions of authors

MSIH-Conception, design, acquisition of data, data analysis, interpretation of data, drafting, critical revision & final approval.

MI-Design, acquisition of data, interpretation of data, drafting & final approval.

MNS-Data analysis, critical revision & final approval.

TM-Data analysis, interpretation of data, critical revision & final approval.

RA-Data analysis, drafting, critical revision & final approval.

AG-Conception, design, critical revision & final approval.

Disclosure

All the authors declared no conflict of interest.

References

1. Schlapbach LJ, Kissoon N, Alhawsawi A, Aljuaid MH, Daniels R, Gorordo-Delsol LA et al. World Sepsis Day: A global agenda to target a leading cause of morbidity and mortality. American Journal of Physiology-Lung Cellular and Molecular Physiology. 2020 ;319(3):L518–522.

2. Rudd KE, Johnson SC, Agesa KM, Shackelford KA, Tsoi D, Kievlan DR et al. Global, regional and national sepsis incidence and mortality, 1990–2017: Analysis for the Global Burden of Disease Study. The Lancet. 2020;395(10219):200–211.

3. Singer M, Deutschman CS, Seymour CW, Shankar-Hari M, Annane D, Bauer M et al. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA. 2016;315(8):801.

4. Prescott HC, Iwashyna TJ. Improving Sepsis Treatment by Embracing Diagnostic Uncertainty. Annals ATS. 2019;16(4):426–429.

5. Seymour CW, Gesten F, Prescott HC, Friedrich ME, Iwashyna TJ, Phillips GS et al. Time to Treatment and Mortality during Mandated Emergency Care for Sepsis. N Engl J Med. 2017;376(23):2235–2244.

6. Vincent JL, Moreno R, Takala J, Willatts S, De Mendonça A, Bruining H et al. The SOFA (Sepsis-related Organ Failure Assessment) score to describe organ dysfunction/failure: On behalf of the Working Group on Sepsis-Related Problems of the European Society of Intensive Care Medicine (See contributors to the project in the appendix). Intensive Care Med. 1996;22(7):707–710.

7. Grissom CK, Brown SM, Kuttler KG, Boltax JP, Jones J, Jephson AR et al. A Modified Sequential Organ Failure Assessment Score for Critical Care Triage. Disaster med public health prep. 2010;4(4):277–284.

8. Kim MH, Ahn JY, Song JE, Choi H, Ann HW, Kim JK et al. The C-Reactive Protein/Albumin Ratio as an Independent Predictor of Mortality in Patients with Severe Sepsis or Septic Shock Treated with Early Goal-Directed Therapy. Azevedo LCP, editor. PLoS ONE. 2015;10(7):e0132109.

9. Quispe E Á, Li XM, Yi H. Comparison and relationship of thyroid hormones, IL-6, IL-10 and albumin as mortality predictors in case-mix critically ill patients. Cytokine. 2016;81:94–100.

10. Domínguez De Villota E, Mosquera JM, Rubio JJ, Galdos P, Díez Balda V, De La Serna JL et al. Association of a low serum albumin with infection and increased mortality in critically Ill patients. Intensive Care Med. 1980;7(1):19–22.

11. Park JE, Chung KS, Song JH, Kim SY, Kim EY, Jung JY et al. The C-Reactive Protein/Albumin Ratio as a Predictor of Mortality in Critically Ill Patients. JCM. 2018;7(10):333.

12. Oh T, Ji E, Na H seok, Min B, Jeon YT, Do SH et al. C-Reactive Protein to Albumin Ratio Predicts 30-Day and 1-Year Mortality in Postoperative Patients after Admission to the Intensive Care Unit. JCM. 2018;7(3):39.

13. Çak r E. Which parameter is the most effective in predicting poor outcomes in sepsis: C- reactive protein, albumin or C-reactive protein/albumin ratio? Erciyes Med J. 2021.

14. Pierrakos C, Vincent JL. Sepsis biomarkers: a review. Crit Care. 2010 Feb 9;14(1):R15.

15. Lie KC, Lau CY, Van Vinh Chau N, West TE, Limmathurotsakul D. Utility of SOFA score, management and outcomes of sepsis in Southeast Asia: A multinational multicenter prospective observational study. j intensive care. 2018;6(1):9.

16. T. HB, V. SS, A. R. C-reactive protein/albumin ratio as a predictor of 28 day mortality in patients with sepsis. Int J Res Med Sci. 2020;8(2):503.

17. Ranzani OT, Zampieri FG, Forte DN, Azevedo LCP, Park M. C-Reactive Protein/Albumin Ratio Predicts 90-Day Mortality of Septic Patients. Salluh JIF, editor. PLoS ONE. 2013;8(3):e59321.

JCMCTA 2026 ; 37 (1) : 25-31
DOI: https://doi.org/10.3329/jcmcta.v37i1.91552

18. Chowdhury MZI, Rahman M, Akter T, Akhter T, Ahmed A, Shovon MA et al. Hypertension prevalence and its trend in Bangladesh: Evidence from a systematic review and meta-analysis. Clin Hypertens. 2020;26(1):10.

19. Kabir R, Khan HTA, Kabir M, Rahman MT. Population Ageing in Bangladesh And Its Implication on Health Care. European Scientific Journal. 2013;9(33).

20. Hossain MB, Khan MdN, Oldroyd JC, Rana J, Magliago DJ, Chowdhury EK et al. Prevalence of, and risk factors for, diabetes and prediabetes in Bangladesh: Evidence from the national survey using a multilevel Poisson regression model with a robust variance. Sarker AR, editor. PLOS Glob Public Health. 2022;2(6):e0000461.

21. Basile-Filho A, Lago AF, Menegueti MG, Nicolini EA, Rodrigues LADB, Nunes RS et al. The use of APACHE II, SOFA, SAPS 3, C-reactive protein/albumin ratio, and lactate to predict mortality of surgical critically ill patients: A retrospective cohort study. Medicine. 2019;98(26):e16204.

22. Abdi T, Solihat Y, Ganie RA. The C-reactive protein/albumin ratio as a predictor of mortality in sepsis patients in ICU H. Adam Malik Hospital Medan and connected to SOFA score. IJBS. 2019;13(1):31–5.