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ORIGINAL ARTICLE

Diagnostic Value of Hematological Parameters in COVID-19 Patients

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ABSTRACT

Background: Covid-19 was fulminant and had a rapid spread in China and many other areas around the globe. This is a life threatening problem at present as it causes the severe acute respiratory syndrome corona virus (SARS-CoV).
Aim: To explore the diagnostic value of hematological parameters in COVID-19 patients.
Study Design: Comparative Cross-Sectional Study.
Methodology: Patients (n=200) having COVID-19 were enrolled. All patients had CBC and inflammatory markers. Various hematological markers were used as prognostic markers. SPSS software, v 23 analyzed data. Independent t-test and Chi square were applied and p value of <0.05 was taken significant.
Results: Mean age for patients having COVID was 47± 15.48 years. Mean values of hematological parameters and platelet count were significantly low among COVID patients when compared with non-COVID patients thus having significant difference.
Practical Implication: This study highlighted simple, cost-effective hematological parameters that can be useful diagnostic tools for COVI-19. This study indicated that routine tests can guide towards disease like COVID-19.
Conclusion: We concluded that hematological parameters (TLC, ANC, AMC, NLR and platelet count) play a vital role as diagnostic tool for COVID-19 patients.
Keywords: Covid-19, d-Dimers, NLR, NLM and Hematological Parameters.

INTRODUCTION

Covid-19 was fulminant and had a rapid spread in China and many other areas around the globe. This is a life threatening problem at present as it causes the severe acute respiratory syndrome corona virus (SARS-CoV). This virus first appeared at China in 2019[1]. Throat cultures from these patients revealed that the causative organism was a new type of beta-coronavirus[2]. In Pakistan, first case of Covid-19 was reported on 26th February, 2020 in Karachi[3].

The route of transmission of this virus is inhalational or contact with infected droplets. Its incubation period varies ranging from 2 to 14 day. Patients experience a variety of symptoms like flue, dry cough, headache, fever, fatigue, muscle pain, breathlessness, loss of taste and smell, and in some cases, loose motion, conjunctivitis and skin rash[4]. Majority of the patients remain asymptomatic. Special care needs to be taken in the elderly patients with co-morbidities. The complications of COVID-19 are pneumonia, severe acute respiratory distress syndrome, acute renal injury, myocarditis, septic shock, pulmonary embolism and multi-organ failure[5]. People with old age and those having co-morbidities like heart disease, diabetes mellitus or any lung pathology are more likely to develop serious complications[6]. Covid-19 PCR done by using nasal swabs as a standard for its diagnosis. A High Resolution CT scan of chest showing features of pneumonia can also aid in diagnosis[7].

Treatment strategies aim to reduce the symptoms of the patients. Several drugs are under trials, however, FDA has approved Remdesivir as an antiviral agent in the management of COVID-19[8,9]. Hematological parameters along with biochemical inflammatory markers can help in diagnosing COVID-19 infections. In developing countries like Pakistan, there is a need of low cost and readily available tests for early diagnosis of the disease as well as to avoid unnecessary testing of the non COVID-19 patients.

Its treatment is usually supportive as no proper treatment cure has yet been identified. There are preventive measures which we need to take and that include home isolation of suspected as well as mild cases and strict infection control measures to be followed at hospitals, markets and at places of social gatherings by using masks, proper hand washing, avoidance of hand shake and disinfectants[10,11].

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The objective of the study was to explore the diagnostic value of hematological parameters in COVID-19 patients.

METHODOLOGY

Cross-sectional study was conducted at department of Pathology, CMH, Multan, through non-probability convenient sampling. Patients with known hematological disorders were excluded. Patients (n=200) having COVID-19 were enrolled. They were divided into two groups depending on result of real time PCR of NP and/or OP swab for SARS-CoV-2. All patients underwent CBC and inflammatory markers. Various hematological markers were used as prognostic markers. Ethical approval was taken before research followed by written consent.
Statistical Analysis: SPSS software vision 23.0 was used for data statistics. Categorical variables were presented as frequency and percentages while quantitative data (age, Hb, MCV, MCH, MCHC, TLC, ANC, ALC, AMC, NLR,LMR, Platelet count, PT, APTT, serum ferritin, CRP and LDH) was represented as mean ± SD. Independent t-test and Chi square were applied and p-value of <0.05 was taken significant.

RESULTS

Among enrolled patients, 136 (68%) were males and 64(32%) were females. In group A (Covid positive) patients, 81% were males and 19% were females. In group B (Covid negative) patients, 55% were males and 45% were females. Male individuals were more affected than females. Mean age of COVID-positive patients was 47±15.48 years (p value=0.01) as shown by table-1.

Table-1: Basic Characteristics among Participants

Gender	**Frequency**	**Percent**
Males	136	68%
Females	64	32%
Group-A		
Males	81	81%
Females	19	19%
Group-B		
Males	55	55%
Females	45	45%
Parameters	**Mean ± SD**	
Age (Group-A)	47± 15.48 years	
Age (Group-B)	41±16 years	

Among hematological parameters, TRBC, Hb, MCH, MCHC showed insignificant difference between groups having p-value>0.05. Mean values of HCt, MCV, TLC, ANC, ALC, AMC, NLR and platelet counts were significantly low in Covid-19 patients as shown by table-2.

Table-2: Comparison of Hematological & biochemical Parameters between group A and B

Parameters	PCR results	Mean ±SD	p-value
RBC(x10´12/L)	Group-A	4.74±0.71	0.82
	Group-B	4.75±0.74	
Hb (g/dl)	Group-A	13.27±1.96	0.07
	Group-B	12.67±2.49	
Hct (%)	Group-A	41.70±5.75	0.02*
	Group-B	39.3±7.0	
MCV (fL)	Group-A	87.27±6.43	0.0006*
	Group-B	82.80±9.24	
MCH (pg)	Group-A	28.17±2.74	0.37
	Group-B	31.9±1.61	
TLC(x10´9/L)	Group-A	7.59 7.92	0.018*
	Group-B	10.43±5.34	
ANC(x10´9/L)	Group-A	4.79±2.90	<0.0001*
	Group-B	7.92±5.28	
ALC(x10´9/L)	Group-A	1.60±0.74	0.0035*
	Group-B	2.05±1.48	
AMC(x10´9/L)	Group-A	0.28	0.02*
	Group-B	0.38±0.42	
NLR	Group-A	3.93±3.35	0.02*
	Group-B	6.25±8.40	
LMR	Group-A	6.97±4.14	0.95
	Group-B	7.0±3.77	
Serum Ferritin (ng/ml)	Group-A	369.36±729.01	0.19
	Group-B	503.06±718.02	
CRP(mg/L)	Group-A	34.39±52.53	0.86
	Group-B	41.14±59.65	
LDH (U/L)	Group-A	290.78±110.16	0.65
	Group-B	298.52±131.68	
PT (seconds)	Group-A	15.27±2.82	0.43
	Group-B	15.6±3.0	
APTT(seconds)	Group-A	15.27±2.82	0.11
	Group-B	15.6±3.0	

*Statistically significant

Parameters like LMR, PT, APTT and d-Dimers showed no significant association. Inflammatory markers (CRP, ferritin and LDH) were raised in both (COVID+ve and COVID-ve) groups with insignificant p-value as summarized in table-3.

Table-3: Comparison of d-Dimer positivity in Both Groups

d-Dimers	Group-A	Group-B	p-value
Positive	80(80%)	78(78%)	
Negative	20(20%)	22(22%)	0.12

DISCUSSION

Severity of ongoing inflammatory response is linked with disease progression in covid-19 patients[8]. Various inflammatory biomarkers (CRP, serum ferritin and LDH) can be used to measure this inflammatory response.[9] Various studies showed that these inflammatory markers are raised extraordinarily among patients with severe covid-19 symptoms.[10,11] However few studies showed that there was no significant correlation of these biomarkers with Covid-19 disease and symptoms thus contradicted from results of present study[12,13].

One meta-analysis showed significantly lower TLC, ANC and platelet count in COVID-19 patients similar to our study but no difference in ALC, d-Dimer and CRP between both groups.[13] One reseacher reported significant difference between mean values of TLC, ANC and platelet count which were lower in COVID-19 patients. These findings were similar to our results[14]. In one study, results of enrolled patients (n=80) showed that the mean values of NLR and CRP were significantly higher and ALC was lower in COVID-19 patients (n=54) as compared with non COVID-19 patients (n=26). No significant difference was shown between mean values of TLC, ANC and platelet count of both groups.[15] There results were in contrast with our findings where above mentioned parameters were significantly lower in COVID-19 patients while insignificant difference was observed between mean values of CRP, ferritin, LDH and d-dimers.

Patients of COVID-19 show coagulation abnormalities like elevated d-Dimers and fibrinogen levels with mild derangements of PT and APTT. Elevated d-Dimers have a prognostic value in COVID-19 patients.[16] One researcher observed insignificant difference in PT, APTT and d-Dimer values of COVID-19 and non COVID-19 patients that is consistent with the results of our study[15].
Limitations: Financial resources with lack of genetic workup and small sample size to generalize the results.

CONCLUSION

We concluded that hematological parameters (TLC, ANC, AMC, NLR and platelet count) play a vital role as diagnostic tool for COVID-19 patients. Thus this study will also help to avoid unnecessary testing of all the patients with respiratory tract symptoms in this pandemic.
Authors' Contribution: SBZ&JZC: Conceptualized the study and formulated the initial draft, **HI&ZER**: Contributed to the analysis of data and proofread the draft, **MAK& STM:** Collected data,
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