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# Efficacy and Safety of Tocilizumab in COVID-19 Patients: Retrospective Study

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## Abstract

*Background:* In December 2019, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has infected millions of people across the globe and claimed hundreds of thousands of human lives. Indeed, elevated blood levels of IL-6 have been shown to correlate with COVID-19 disease severity and SARS-CoV-2 RNA blood levels in COVID-19 patients, and are also associated with a worse prognosis.

*Aim of Study:* The aim of this work is to Study Efficacy and Safety of Tocilizumab in COVID-19 patients: The usefulness of Tocilizumab (actemra) in patients with cytokine release storm and its efficacy to decrease mortality.

*Patients and Methods:* This study was carried out in ICU Department, Egypt Air Hospitals, Retrospective clinical study from the period of 1/6/2020 to 1/6/2021, 100 patients with diagnosed Covid 19, (clinically, laboratory and radiologically).

*Results:* Overall mortality in studied patients was 74 patients, 37 male and 37 female from the total 100 patients, Types of Organisms differentiation (cultured organisms) in studied patients, which 57% were candida, 21% were MRSA, 15% were Kliebsiella, 10%, Acinobacter and others were 4%. Incidence of improvement to hospital discharge studied patients, From the total 100 patient 26 patients improved to home discharge differentiated moderate to severe.

*Conclusion:* This study showed that tocilizumab did not reduce short-term mortality; low-certainty evidence from cohort studies suggests an association between tocilizumab and lower mortality.

We observed a higher risk of infections and adverse events with tocilizumab use.

***Key Words:*** *Cyto kin e release storm – ICU – COVID 19 – IL6 – Tozilizumab.*

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## Introduction

**SINCE** its emergence in December 2019, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has infected millions of people across the globe and claimed hundreds of thousands of human lives, as well as negatively impacting the economy of numerous countries. Although the majority of SAR-CoV-2-infected patients who develop coronavirus disease 2019 (COVID-19) manifest only mild symptoms, about 14% of patients develop severe symptoms and 5% develop critical disease defined by respiratory failure, shock and/or multiorgan failure **[1]**.

Patients with severe COVID-19 disease manifest immune system dysregulation, which is believed to be triggered by a particular mode of programmed cell death called pyroptosis. This form of cell death induces several pro inflammatory cytokines and chemokines such as IL-1b, IL-2, IL-6, tumour necrosis factor a (TNF-(x), and monocyte chemo attractant protein 1 (MCP 1) and lymphopenia with attrition of both CD4 and CD8 T cells and natural killer T cells Qin C, Zhou L, et al. **[1]**. IL-6 and IL-1® production promote neutrophil and cytotoxic T cell recruitment to the affected tissues, both of which contribute to tissue damage resulting in acute lung injury through production of oxygen free radicals and inflammatory mediators such as leukotrienes **[2]**.

Indeed, elevated blood levels of IL-6 have been shown to correlate with COVID-19 disease severity and SARS-CoV-2 RNA blood levels in COVID-19 patients, and are also associated with a worse prognosis **[3]**.

Among these, IL-6 receptor blockade with the humanized monoclonal antibody tocilizumab is

used routinely as a disease-modifying agent in the treatment of rheumatoid arthritis [4] and has been shown to be effective in the treatment of CRS associated with CAR-T therapy [5].

These observations formed the basis for targeting IL-6 as a therapeutic approach for severe COVID-19 disease [6].

## Patients and Methods

This study was carried out in ICU Department, Egypt Air Hospitals, was retrospective clinical study from the period of 6/2020 to 6/2021, 100 patients with diagnosed Covid 19: (Clinically, laboratory and Radiologically) were included in this study.

*Inclusion criteria:*

Patients with confirmed diagnosis of COVID 19 (clinically, laboratory and radiologically), Adult (age above 18 years or more) and Patients admitted in ICU from day 6 to 14 from confirmed infection with evidence of cytokine storm (clinically and laboratory) and elevated serum interleukin 6 (IL6).

*Exclusion criteria:* Sever immune compromised patients, age less than 18 years and Patients with signs of bacterial infection (clinically, Radiologically and laboratory).

*Methods:* Data will be collected including: Full medical history, full clinical examination (General & local), Imaging as Plain chest and heart X-ray, Computed tomography of chest and Laboratory investigations such as (Complete blood count (CBC), Liver function tests, Kidney function tests, Coagulation profile, Arterial blood gases (ABGs). 6. CRP, ferritin level, IL6, D-dimer and procalcitonin and PCR for SARS COV2 (COVID19).

*Satistical analysis of patient's data:*

Were pooled crude data from medical files records, were conducted a priority determined subgroup analyses to assess the impact of COVID-19 disease severity on response to tocilizumab therapy, we also conducted clinical data study of Covid 19 patients Identified data from the period of 6/2020 to 6/2021.

These variables included characteristics of study population (age, sex, comorbidities), dosing regimen and number of tocilizumab doses, adjustment for survivor bias, and levels of ferritin, interleukin 6 (IL-6), C-reactive protein (CRP) and lactate dehydrogenase (LDH).

*Outcome measures:*

- Primary outcome as overall mortality rate, average Length of hospital stay, Secondary outcome as Incidence of complications (sepsis) and Improvement to home discharge.
- $O_2$ saturation before Tocilizumab was below (90%) and needed for $O_2$ therapy up to Mechanical ventilation.
- Time of giving Tocilizumab from day 6 to day 12 from symptoms diagnosed COVID 19, elevated IL 6, with cytokine storm, procalcitonin level (0.1-0.5ng/ml), with no signs of bacterial infection and dose of Tocilizumab was (8mg/kg) first dose was (800mg) then 2nd dose (4mg/kg, 400mg).
- $O_2$ saturation and ABG after giving Tocilizumab, time of discharge after Tocilizumab, mortality rate and Cause of death was mainly from complication of sepsis and septic shock.

## Results

Table (1): Determining male to female sex ratio in studied patients.

| Sex | Males | Females |
|---|---|---|
| Total no. /100 | 52/100 | 48/100 |

This table shows the description of sex in studied patients, 52% were males and 48% were females.

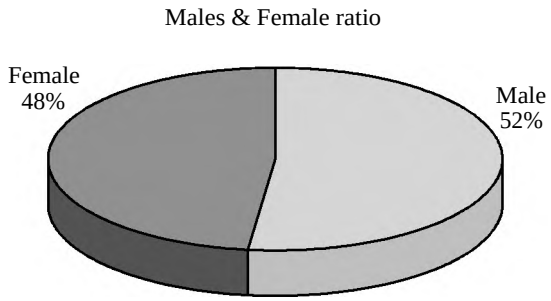


Fig. (1): Pie chart of the 100 patient determining male to female ratio in studied patients.

Table (2): Differentiating moderate to severe illness in all patients.

| Sex | Males | Females |
|---|---|---|
| Moderate | 17/100 | 19/100 |
| Severe | 35/100 | 29/100 |

This table shows the description of differentiating moderate to severe illness in all patients in studied patients, shows moderate cases 17/100 of males and 19/100 were females while sever cases were 35/100 of males and 29/100 were females.

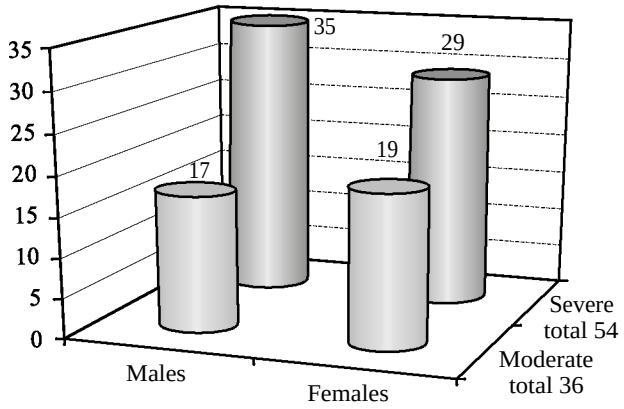


Fig. (2): Bar chart differentiating moderate to severe in all patients.

Table (3): Changes in leucocyte count before and after tociluzumab.

| TLC X 10^3/ul | Before tociluzumab Total, No. 100 | After tociluzumab Total, N.100 |
|---|---|---|
| Less than 4 X 10^3/ul | 0/100 | 5/100 |
| 4-11 X 10^3/ul | 100/100 | 10/100 |
| More than 11 X10^3/ul | 0/100 | 85/100 |

*This table shows Changes in leucocyte count before and after tociluzumab:*

- Before tociluzumab was zero case was less than 4 and 100 cases from (4-11) and zero case more than 11 X 10^3/ul.
- After tociluzumab was 5 cases less than 4 and 10 cases from (4-11) and 85 cases more than 11 X 10^3/ul.

Table (4): Changes in neutrophil count before and after tociluzumab.

| Neutrophil/cmm | Before tociluzumab Total, No. 100 | After tociluzumab Total, N.100 |
|---|---|---|
| Less than 2000/cmm | 0/100 | 2/100 |
| 2000/cmm_7000/cmm | 70/100 | 9/100 |
| More than 7000/cmm | 30/100 | 88/100 |

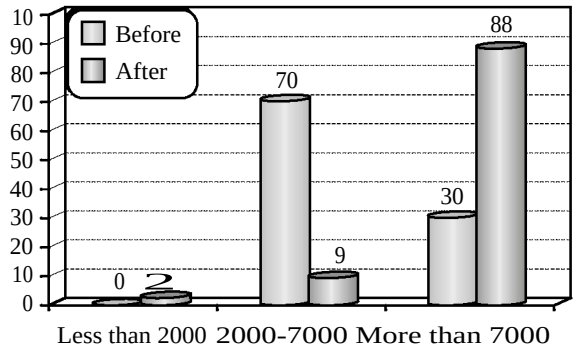


Fig. (4): Changes in neutrophil count before and after tociluzumab.

Table (5): Changes in lymphocytes count before and after tociluzumab.

| Lymphocytes /cmm | Before tociluzumab Total, No. 100 | After tociluzumab Total, N.100 |
|---|---|---|
| Less than 1000/cmm | 87/100 | 84/100 |
| 1000/cmm_3000/cmm | 11/100 | 14/100 |
| More than 3000 /cmm | 2/100 | 2/100 |

This table show Changes in lymphocytes count before and after tociluzumab, in which, Before tociluzumab was 87 case less than 1000/cmm, 11 cases were range from (1000-3000)/cmm and 2 cases were more than 3000/cmm and after tociluzumab was was 84 cases less than 1000/cmm, 14 cases were range from (1000-3000)/cmm and 2 cases were more than 3000/cmm.

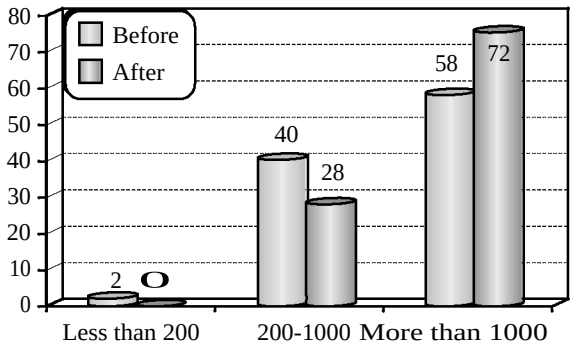


Fig. (6): Changes in ferritin before and after tociluzumab.

Table (6): Changes procalcitonin before and after tociluzumab.

| Procal ng/ml | Before tociluzumab Total, No. 100 | After tociluzumab Total, N.100 |
|---|---|---|
| 0. 1-0.5 ng/ml | 99/ 100 | 44/100 |
| More than 0.5 ng/ml | 1/100 | 56/100 |

This table show Changes in procalcitonin before and after tociluzumab, in which, Before tociluzumab was 99 cases less than (0.1-0.5) ng/ml and one case was range from more than 0.5ng/ml and after tociluzumab was was was 44 cases less than (0. 1-0.5) ng/ml and 56 cases was range from more than 0.5ng/ml.

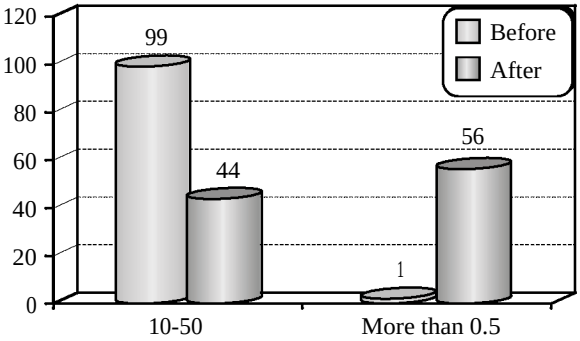


Fig. (7): Changes procalcitonin before and after tociluzumab.

Table (7): Changes in Interleukin 6 before and after tociluzumab.

| IL6 Pg/ml | Before tociluzumab Total, No. 100 | After tociluzumab Total, N.100 |
|---|---|---|
| Less than (6) Pg/ml | 0/100 | 0/100 |
| (6-12) Pg/ml | 0/100 | 12/100 |
| More than 12 Pg/ml | 100/100 | 88/100 |

This table show Changes in Interleukin 6 before and after tociluzumab, in which, Before tociluzumab was zero case less than (6) Pg/ml, zero case were range from (6-12) Pg/ml and 100 cases were more than 12Pg/ml and after tociluzumab was was zero case less than (6) Pg/ml, zero case were range from (6-12) Pg/ml and 100 cases were more than 12Pg/ml.

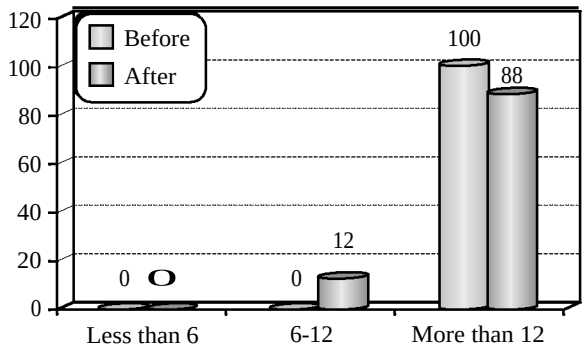


Fig. (8): Changes in Interleukin 6 before and after tociluzumab.

Table (8): Mortality difference between males and females in studied patients.

| Gender | Moderate total | Mortality | Severe total | Mortality |
|---|---|---|---|---|
| Male | 17/100 | 5/17 | 35/100 | 32/35 |
| Female | 19/100 | 9/19 | 29/100 | 28/29 |

Table (8) show mortality difference between males and females.

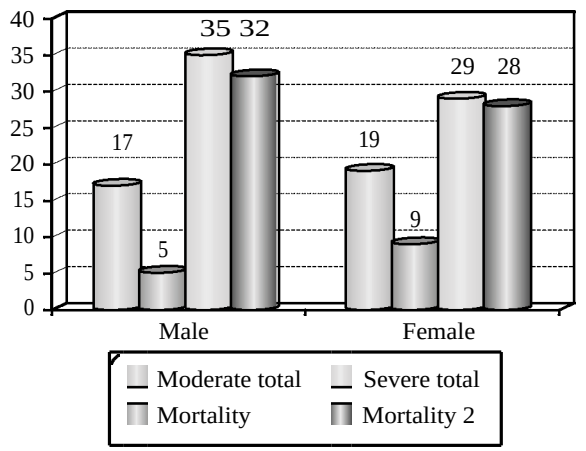


Fig. (9): Overall mortality in studied patients.

Overall mortality in studied patients was 74 patients, 37 male and 37 female from the total 100 patients, Length of hospital stay: Average length of hospital stay in all patients was 14.38 days with minimum 4 days to maximum 30 days and Incidence of complications defined by occurrence of sepsis due to Any cause were 81 patient developed sepsis after to cilozimab use and 19 patients was culture free and had no infection.

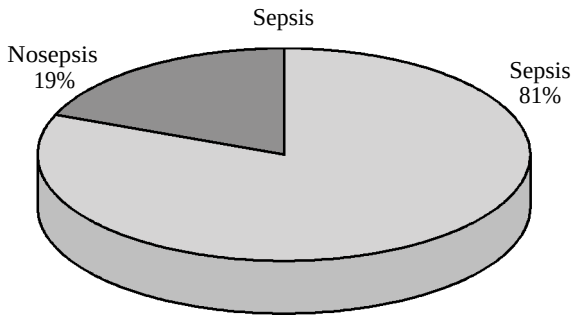


Fig. (10): Incidence of complications defined by occurrence of sepsis due to Any cause.

Table (9): Types of Organisms differentiation (cultured organisms) in studied patients.

| Organism | Percent per 100 case |
|---|---|
| Candida | 57/100 |
| MRSA | 21/100 |
| Kliebsiella | 15/100 |
| Acinobacter | 10/100 |
| Pseudomonas | 1/100 |
| Enterobacter | 1/100 |
| E.COLI | 2/100 |

This table show types of Organisms differentiation (cultured organisms) in studied patients, which 57% were candida, 21% were MRSA, 15% were Kliebsiella, 10%, Acinobacter and others were 4%.

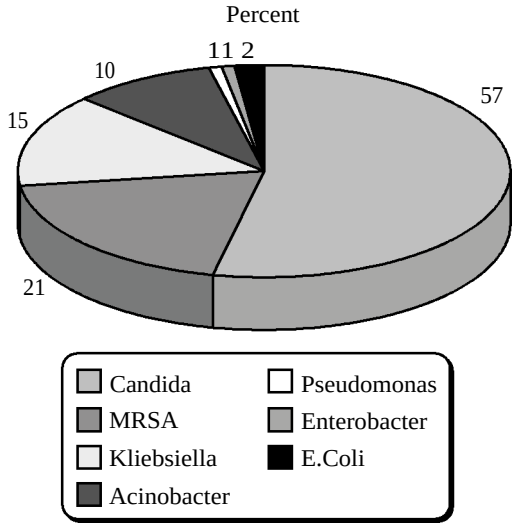


Fig. (11)

Table (10): Incidence of improvement to hospital discharge studied patients.

| Gender | Moderate total | Discharge | Severe total | Discharged |
|---|---|---|---|---|
| Male | 17/100 | 12/17 | 35/100 | 3/35 |
| Female | 19/100 | 10/19 | 29/100 | 1/29 |

This table shows Incidence of improvement to hospital discharge studied patients in which from the total 100 patient 26 patient improved to home discharge.

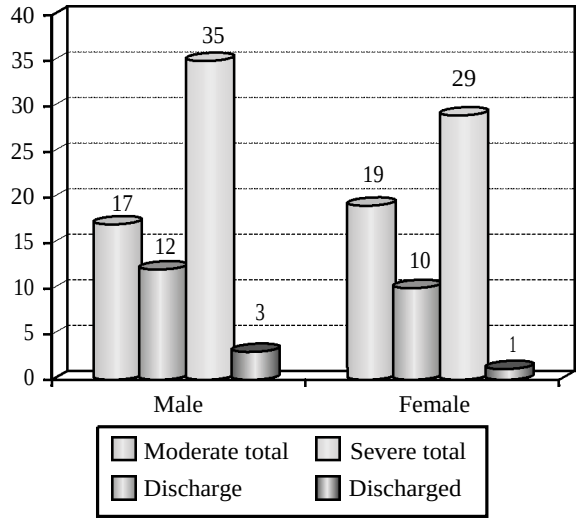


Fig. (12): Incidence of improvement to hospital discharge studied patients.

## Discussion

Coronaviruses are important human and animal pathogens. At the end of 2019, a novel coronavirus was identified as the cause of a cluster of pneumonia cases in Wuhan, a city in the Hubei Province of China. It rapidly spread, resulting in an epidemic throughout China, followed by a global pandemic. In February 2020, the World Health Organization designated the disease COVID-19, which stands for corona virus disease 2019 World Health Organization [7].

Patients with severe COVID-19 disease manifest immune system dysregulation, which is believed to be triggered by a particular mode of programmed cell death called pyroptosis. This form of cell death induces several proinflammatory cytokines and chemokines such as IL-1b, IL-2, IL-6, tumour necrosis factor a (TNF-(x), and monocyte chemoattractant protein 1 (MCP 1) and lymphopenia with attrition of both CD4 and CD8 T cells and natural killer T cells Qin C, Zhou L, et al. [8].

IL-6 and IL-1® production promote neutrophil and cytotoxic T cell recruitment to the affected tissues, both of which contribute to tissue damage resulting in acute lung injury through production of oxygen free radicals and inflammatory mediators such as leukotrienes Vardhana SA and Wolchok JD [2].

Indeed, elevated blood levels of IL-6 have been shown to correlate with COVID-19 disease severity and SARS-CoV-2 RNA blood levels in COVID-19 patients, and are also associated with a worse prognosis Chen X, Zhao B, et al. [9].

The present study was established to Study Efficacy and Safety of Tocilizumab in sever COV-ID-19 patients: The usefulness of Tocilizumab (actemra) in patient with cytokine release storme and its efficacy to decrease mortality.

This study was carried out in ICU Department, Egypt Air Hospitals.

The present study was Retrospective clinical study from the period of 6/2020 to 6/2021.

The study included 100 patients have with diagnosed Covid 19: (Clinically, laboratory and Radiologically) will be included in this study.

There was no significant difference between studied groups of patients regarding age and sex distribution (Table 1).

In the present study, we revealed 52 males and 48 female's patients (Table 1).

In the present study, we can show the description of differentiating moderate to severe illness in all patients in studied patients, shows moderate cases 17/100 of males and 19/100 were females while sever cases were 35/100 of males and 29/100 were females (Table 2).

In the present study we can show the Changes in leucocyte count before and after tociluzumab in which, Before tociluzumab was zero case was less than (4) X 10^3/ul and 100 cases from (4-11) X 10^3/ul and zero case more than 11 X 10^3/ul, But After tociluzumab was 5 cases less than (4) X 10^3/ul and 10 cases from (4-11) and 85 cases more than 11 X 10^3/ul (Table 3).

In the present study we can show Changes in ferritin before and after tociluzumab, in which, Before tociluzumab was 2 cases less than 200 ng/ml, 40 cases were range from (200ng/ml-1000 ng/ml) and 58 cases were more than 1000/ng/ml and after tociluzumab was was zero case less than

200ng/ml, 28 cases were range from (200ng/ml-1000ng/ml) and 72 cases were more than 1000/ ng/ml (Table 6).

In the present study we can show Changes in procalcitonin before and after tociluzumab, in which, Before tociluzumab was 99 cases less than (0.1-0.5) ng/ml and one case was range from more than 0.5ng/ml and after tociluzumab was 44 cases less than (0.1-0.5) ng/ml and 56 cases was range from more than 0.5 ng/ml (Table 7).

In the present study we can show Changes in Interleukin 6 (IL6) before and after tociluzumab, in which, Before tociluzumab was zero case less than (6) Pg/ml, zero case were range from (6-12) Pg/ml and 100 cases were more than 12 Pg/ml and after tociluzumab was zero case less than (6) Pg/ml, zero case were range from (6-12) Pg/ml and 100 cases were more than 12 Pg/ml (Table 8).

In the present study we can show types of Organism differentiation (cultured organisms) in studied patients, which 57% were candida, 21% were MRSA, 15% were Kliebsiella, 10%, Acinobacter and others were 4%.

In the present study we can show Incidence of improvement to hospital discharge studied patients, From the total 100 patient 26 patient improved to home discharge differentiated moderate to severe as shown in (Table 11).

Several studies addressing the role of tocilizumab were subsequently published with variable results, two recent systematic reviews (Aziz M, et al.) **[10]** and Malgie J, Schoones JW, et al.) **[11]**.

Moreover, the two reviews by Aziz M, et al., **[10]** and Malgie, et al., **[11]** did not address the adverse events and did not evaluate the certainty of cumulative evidence. Therefore, we thought to perform a living systematic review of randomized trials and observational studies addressing the efficacy and safety of tocilizumab in the treatment of COVID-19 patients.

In other systematic review and meta-analysis by Imad M et al., **[12]** that included five RCTs and 18 cohorts as of October 2020, cumulative moderate certainty evidence shows that tocilizumab reduces the risk of mechanical ventilation in hospitalized COVID-19 patients.

The present retrospective study included 100 patients have with diagnosed Covid 19: (Clinically, laboratory and radiologically) will be included in this study, this was small number of patient in this our study.

While RCTs by Benson K and Hartz **[13]** were The total number of patients in the five RCTs is 772 patients in the tocilizumab group and 553 patients in the control group. Finally, these empirical studies have shown that pooled estimates from Meta analyses of observational studies yield similar estimates to those pooled from RCTs.

Moreover, many of the cohort studies included in Imad M et al., **[12]** assessed patients receiving tocilizumab in the ICU of whom many were on mechanical ventilation. The high absolute incidence of secondary bacterial infections in the ICU by van Vught, et al., **[14]**. That was also observed in the cohort studies is probably related to critical illness and ICU admission as opposed to the use of tocilizumab. Tocilizumab use in CRS following CAR-T therapy was not associated with increased infections Frigault, et al., **[15]**.

The findings of Imad M et al., **[11]** meta-analysis further support the role of IL-6 in CRS and establishes the potential therapeutic benefits of tocilizumab in CRS syndromes in general, and more specifically in severe COVID-19 disease.

Although IL-6 level determination is not performed routinely in most hospitals, acute-phase proteins can serve as surrogate markers for elevated IL-6 in COVID-19 disease, especially CRP and ferritin, as their assays are widely available. Therefore, CRP and ferritin can be used as markers of elevated IL-6 to help in selecting candidate COVID-19 patients for tocilizumab therapy.

The studies of Imad M et al., **[12]** indicate that not all COVID-19 patients respond equally to tocilizumab, which is likely reflecting the heterogeneous nature of the disease and the possibility that it encompasses different subphenotypes. While in trials by Imad M et al., **[12]** included published and unpublished randomized trials, employed rigorous methodologies, and excluded unadjusted crude effect estimates from cohort studies and inclusion of real-world data from good-quality observational studies and randomized trials allowed us to explore sources of heterogeneity and to compare the results of the RCTs with those of cohort studies. Although observational studies are prone to different biasesd including confounding by indication, survivor bias and residual confounding empirical studies have shown that pooled estimates from meta-analyses of observational studies yield similar estimates to those pooled from RCTs.

Imad M et al., **[12]** shows that tocilizumab reduces the risk of mechanical ventilation in hospitalizedn COVID-19 patients. While others RCTs

showed that tocilizumab did not reduce short-term mortality, low-certainty evidence from cohort studies suggests an association between tocilizumab and lower mortality.

Imad M et al., [12] did not observe a higher risk of infections or adverse events with tocilizumab use. This review by Imad M et al., [12] will continuously evaluate the role of tocilizumab in COVID-19 treatment.

*Conclusion:*

Our results highlight the need for more robust studies investigating the safety, efficacy, and optimal timing of tocilizumab in COVID-19 patients, showed that tocilizumab did not reduce short-term mortality; low-certainty evidence from cohort studies suggests an association between tocilizumab and lower mortality and observed a higher risk of infections and adverse events with tocilizumab use.

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# دراسة مرجعية منهجية :
# فعالية وسلامة التوسيليزوماب فى مرضى الكوفيد ١٩

أجريت الدراسة الحالية فى قسم العناية المر كزة بمستشفى مصر للطيران فى الفترة من ٢٠٢٠/٦/١ إلى ٢٠٢١/٦/١.

وكان الهدف من الدراسة : هو دراسة فعالية وسلامة Tocilizumab فى مرضى COVID-19 فائدة Tocilizumab actemrar فى المريض المصاب بعاصفة إطلاق السيتوكين وفعاليته فى تقليل الوفيات.

وقد اشتملت الدراسة على ما مجموعة ١٠٠ مريض تم تشخيصهم بـ COVID-19 (إكلينيكياً ومختبرياً وأشعاعياً). تم قبول ١٠٠ مريض فى قسم العناية المركزة بمستشفى مصر للطيران.

معايير الاشتمال : المرضى الذين تم تشخيص إصابتهم بفيروس كوفيد ١٩ (إكلينيكياً و مختبرياً وأشعاعياً). البالغ (فوق ١٨ سنة فأكثر).

المرضى الذين تم قبولهم فى وحدة العناية المركزة من اليوم السادس إلى الرابع عشر من الإصابة المؤكدة مع وجود دليل على وجود عاصفة خلوية (سريرياً ومختبراً) وارتفاع مستوى إنترلوكين ٦ (IL6) فى الدم.

معايير الاستبعاد : المرضى المصابين بضعف المناعة العمر أقل من سنة المرضى الذين تظهر عليهم علامات الإصابة بالإنتان (إكلينيكياً، إشعاعياً، معملاً).

طريقة البحث العلمى : تم جمع البيانات بما فى ذلك : – التاريخ الطبى الكامل. – الفحص السريرى الكامل (عام ومحلى).

التصوير : أشعة سينية للصدر والقلب – التصوير المقطعى

الفحوصات المخبرية : تعداد الدم الكامل (CBC) – اختبارات وظائف الكبد – اختبارات وظائف الكلى – الملف الشخصى التخثر – غازات الدم الشريانى (ABGs) – CRP – مستوى الفيريتين – PCR-D-dimer-IL6 – COVID 19 (SARS COV2).

أظهرت نتيجة هذه الدراسة ما يلى :

١– وصف الجنس عند المرضى المدروسين ٥٢٪ ذكور و٤٨٪ إناث.

٢– توصيف حالات التفريق بين المرض المتوسط والشديد فى جميع المرضى الذين خضعوا للدراسة تبين الحالات المتوسطة ١٠٠/١٧ للذكور و ١٠٠/١٩ للإناث بينما كانت الحالات الحادة ١٠٠/٥٣ للذكور و ١٠٠/٢٩ للإناث.

٣– التغيرات فى تعداد كريات الدم البيضاء قبل وبعد التوسيلوزوماب :

– قبل حالة التوسيلوزوماب كانت الحالة الصفرية أقل من ٤ و ١٠٠ حالة من (٤–١١) وصفر حالة أكثر من 11 x 10^3/ul.

– بعد التوسيلوزوماب كان ٥ حالات أقل من ٤ و ١٠ حالات من (٤–١١) و ٨٥ حالة أكثر من 11 x 10^3/ul.

٤– التغيرات فى عدد العدلات قبل وبعد التوسيلوزوماب، حيث كانت ٧٠ حالة قبل التوسيلوزوماب أقل من ٢٠٠٠/ سم، ٧٠ حالة تتراوح بين (٢٠٠٠ – ٧٠٠٠)/سم و ٣٠ حالة كانت أكثر من ٧٠٠٠/سم وبعد التوسيلوزوماب كان ٢ أقل من ٢٠٠٠/سم، ٩ علب تتراوح من (٢٠٠٠–٧٠٠٠)/سم و ٨٨ حالة أكثر من ٧٠٠٠/سم.

٥– التغييرات فى الفيريتين قبل وبعد التوسيلوزوماب، حيث كان قبل التوسيلوزوماب ٢ حالتين أقل من ٢٠٠ نانو غرام/مل، ٤٠ حالة تتراوح من (٢٠٠ نانو غرام/مل – ١٠٠٠ نانو غرام/مل) و ٥٨ حالة كانت أكثر من ١٠٠٠/نانو غرام/مل، مل وبعد أعطاء التوسيلوزوماب صفر حالة أقل من ٢٠٠ نانو غرام/مل، كانت ٢٨ حالة تتراوح من (٢٠٠ نانو غرام/مل – ١٠٠٠ نانو غرام/مل) و ٧٢ حالة كانت أكثر من ١٠٠٠ / نانو غرام/مل.

٦– التغييرات فى بروكالسيتونين قبل وبعد التوسيلوزوماب، حيث كان قبل التوسيلوزوماب ٩٩ حالة أقل من (٠.١–٠.٥) نانو غرام/مل وكانت حالة واحدة تتراوح من أكثر من ٠.٥ نانو غرام/مل وبعد التوسيلوزوماب كان ٤٤ حالة. أقل من (٠.١–٠.٥) نانو غرام/مل و ٥٦ حالة كانت تتراوح من أكثر من ٠.٥ نانو غرام/مل.

٧– أظهر التغييرات فى انترلوكين ٦ قبل وبعد التوسيلوزوماب، حيث قبل أن يكون التوسيلوزوماب أقل من (٦) Pg/ml، كانت الحالة الصفرية تتراوح من (٦–١٢) Pg/ml و ١٠٠ حالة كانت أكثر من ١٢ Pg/ml وبعد أن كان التوسيلوزوماب صفر حالة أقل من (٦) Pg/ml، كانت الحالة الصفرية تتراوح من (٦–١٢) Pg/ml و١٠٠ حالة كانت أكثر من ١٢ Pg/ml.

٨– بلغ معدل الوفيات الإجمالى فى المرضى الخاضعين للدراسة ٧٤ مريضاً، ٣٧ ذكور و ٣٧ أنثى من إجمالى ١٠٠ مريض.

٩– تمايز أنواع الكائنات الحية (الكائنات المستزرعة) فى المرضى الخاضعين للدراسة : ٥٧٪ كانت المبيضات candida، ٢١٪ جرثومة MRSA، ١٥٪ Kliebsiella، ١٠٪، Acinobacter وغيرها ٤٪.

١٠– نسبة حدوث تحسن فى الخروج من المستشفى للمرضى الخاضعين للدراسة : من إجمالى ١٠٠ مريض تم تحسين ٢٦ مريضاً إلى الخروج من المنزل متباينة متوسطة إلى شديدة.