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ORIGINAL

D-Dimer post-COVID19 in Karbala governorate, Iraq

Dímero D post-COVID19 en la gobernación de Karbala, Iraq

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ABSTRACT

After the Coronavirus epidemic, there are indications that a significant number of COVID-19 survivors experience long-term respiratory, cardiovascular, and psychological issues, necessitating the assessment of these complications for effective healthcare resource allocation. The test can help identify blood clotting problems. A positive result may suggest a blood clot has recently formed and broken down. In our study, the post-covid-19 d-dimer concentration was measured, and three groups were taken for each of males and females, with a total of 30 samples. The first group are those infected once with Covid-19 and then recovered included 5 males and 5 females, and the highest concentration found in the sample 10 was 211,2 µg FEU/ml in females, it within normal limits (500 µg FEU/ml). The second group are those hits twice with Covid-19 and then recovered, it consisted from 10 samples (5 males, 5 females). The highest concentration in sample 20 was 350,62 µg FEU/ml and it has short period between hits, also was the short period between hits higher concentration from long period between hits. In the last group, those hits three times with Covid-19, then recovered, included 10 samples (5 males, 5 females), maximum concentration in sample 30 was 386,7 µg FEU/ml, it has the short period between hits. In three group was d-dimer concentration higher in females from males, and in short period between hits higher long period. The factor can increase d-dimer age, Gender, diseases, treatment, pregnancy, trauma and the vaccine to covid-19.

Keywords: D-Dimer; COVID-19; Longer-Term Respiratory; Period Between Hits; Last Hit.

RESUMEN

Tras la epidemia de coronavirus, hay indicios de que un número significativo de supervivientes de la COVID-19 experimentan problemas respiratorios, cardiovasculares y psicológicos a largo plazo, lo que hace necesaria la evaluación de estas complicaciones para una asignación eficaz de los recursos sanitarios. La prueba puede ayudar a identificar problemas de coagulación de la sangre. Un resultado positivo puede sugerir que un coágulo de sangre se ha formado y roto recientemente. En nuestro estudio, se midió la concentración de dímero d postcovídico-19 y se tomaron tres grupos de hombres y mujeres, con un total de 30 muestras. El primer grupo son los infectados una vez con Covid-19 y luego se recuperó incluido 5 hombres y 5 mujeres, y la mayor concentración encontrada en la muestra 10 fue de 211,2 µg FEU/ml en las mujeres, que dentro de

los límites normales (500 µg FEU/ml). El segundo grupo, formado por 10 muestras (5 machos y 5 hembras), está constituido por las muestras a las que se administró Covid-19 dos veces y que luego se recuperaron. La concentración más alta en la muestra 20 fue de 350,62 µg FEU/ml y tiene un corto período entre aciertos, también fue el corto período entre aciertos mayor concentración de largo período entre aciertos. En el último grupo, los golpes tres veces con Covid-19, luego se recuperó, incluido 10 muestras (5 hombres, 5 mujeres), la concentración máxima en la muestra 30 fue de 386,7 µg FEU/ml, tiene el corto período entre los golpes. En tres grupo fue la concentración de dímero d mayor en las hembras de los machos, y en el corto período entre hits mayor período largo. El factor puede aumentar d-dímero edad, Género, enfermedades, tratamiento, embarazo, trauma y la vacuna a covid-19.

Palabras clave: D-Dímero; COVID-19; Respiratorio a Largo Plazo; Período entre Golpes; Último Golpe.

INTRODUCTION

The coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has not only led to respiratory distress but has also been associated with an increased incidence of thrombotic eventsz Thrombosis, including deep vein thrombosis, pulmonary embolism, and microvascular thrombosis, has been observed in patients with severe COVID-19.[1] These thrombotic complications contribute significantly to morbidity and mortality rates among affected individuals.[2,3,4]

Several long-lasting health complications have been reported in previous coronavirus infections.[4] Therefore, the aim of this study was to review studies d-dimer problems post- COVID-19. D-dimer, a fibrin degradation product resulting from the breakdown of cross-linked fibrin by plasmin, has been extensively studied as a marker of coagulation activation and fibrinolysis.

D-dimer is a terminal degradation product of cross-linked fibrin that can be easily quantified in the laboratory and may be assessed in venous thrombosis and disseminated intravascular coagulopathy. It's a plasmin-derived soluble degradation product of cross-linked fibrin.[5] D-dimer is one of the methods for thrombotic-state identification. It aims to highlight the role of D-dimer in COVID-19 infection by presenting the latest information available from studies evaluating D-dimer levels in COVID-19 patients.[4]

This study aims to a D-dimer study in recovered patients from COVID-19, Comparing males and females who contracted Covid-19 and then recovered and Comparison in terms of periods between hits.

METHOD

Plasma samples were taken from people who had recovered from the Corona virus and the samples were divided into three groups:

- People who were once infected with COVID-19 and then recovered.
- People who have been infected with COVID-19 twice and then recovered.
- People who have been infected with COVID-19 three or more times and then recovered.

Each group consists of 10 individuals (5 males, 5 females), the average age of people from whom plasma was taken is 21-27, table 1-6 shows the totals recovering from the Corona virus.

Table 1. The last hit to males after hit once

Sample code	Gender	Last hit (month)
1	Male	3
2	Male	9
3	Male	16
4	Male	20
5	Male	25

Table 2. The last hit to females after hit once

Sample code	Gender	Last hit (month)
6	Female	4
7	Female	8
8	Female	15
9	Female	18
10	Female	25

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Table 3. The last hit and period between hits to males after hit twice

Sample code	Gender	Last hit (month)	Period between hits
11	Male	11	Long period
12	Male	20	Long period
13	Male	13	Long period
14	Male	9	Long period
15	Male	10	Long period

Table 4. The last hit and period between hits to females after hit twice

Sample code	Gender	Last hit (month)	Period between hits
16	Female	11	Long period
17	Female	20	Long period
18	Female	13	Short period
19	Female	9	Short period
20	Female	10	Short period

Table 5. The last hit and period between hits to males after hit twice hit three times or more

Sample code	Gender	Last hit (month)	Period between hits
21	Male	7	Long period
22	Male	8	Long period
23	Male	5	Short period
24	Male	9	Short period
25	Male	4	Short period

Table 6. The last hit and period between hits to females after hit twice hit three times or more

Sample code	Gender	Last hit (month)	Period between hits
26	Male	2	Long period
27	Male	6	Long period
28	Male	8	Long period
29	Male	12	Short period
30	Male	14	Short period

The D-Dimers assay was done using a reagent kit and following the manufacturer's protocol.[6] The device used to measure concentration d-dimer is MAGLUMI® 800 is one of the word's smallest fully automated chemiluminescence immunoassay analyzers, the MAGLUMI® 800 integrates a large capacity and highspeed analysis into a compact design, achieving the perfect balance between size and performance in immunological testing.[7,8]

The date from MAGLUMI® 800 was analysis by was coded and entered into the statistical analysis software Statistical Package for the Social Sciences (SPSS, version 23) and Origin 2018.

RESULTS

D-dimer post-covid 19: Hit once by covid-19

The D-dimer was measured by MAGLUMI® 800 for hit males and females once and then they recovered from hit with Covid-19, the measurement of d-dimer concentration post-coivd-19 in male and females (table 7 and 8).

Illustrate from table 7 the value of D-dimer in males, the maximum value of which in sample 5 was 188 µg FEU/ml and the minimum was 56,8 µg FEU/ml in sample 1, and the average D-dimer was 108,4 µg FEU/ml. The figure 1 shows the relationship between last hit and the concentration of d-dimer post-covid-19 in the males. In

female (from table 8) the d-dimer value was maximum 211,2 µg FEU/ml in sample 10 and minimum in sample 6 was 35,31 µg FEU/ml, the average d-dimer in female was 155,862 µg FEU/ml. In simple 4 d-dimer concentration the figure 2 shows the relationship between last hit and the concentration of d-dimer post-covid-19 in the females

Table 7. The d-dimer concentration post-coivd-19 in male; Hit once

Sample code	Last hit	d-dimer (µg FEU/ml)
1	3	56,8
2	9	57,6
3	16	110
4	20	129,6
5	25	188
Average		108,4
maximum		188
minimum		56,8

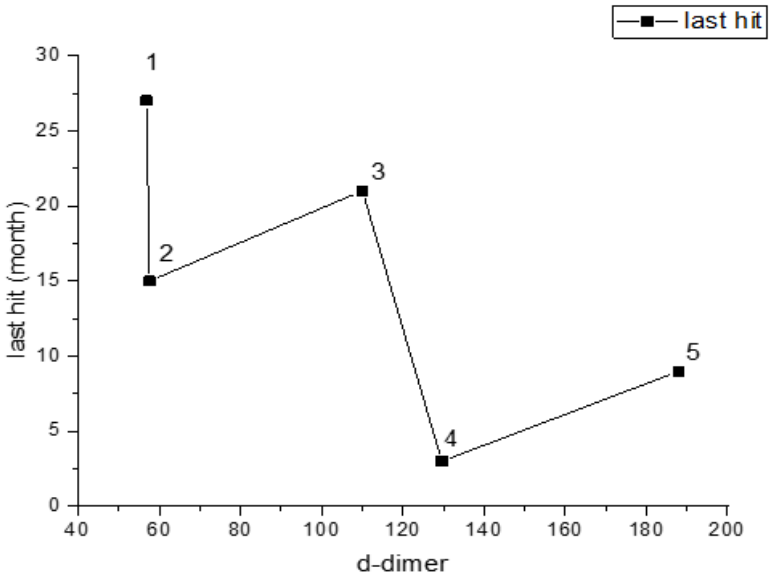

Figure 1. The relationship between last hit and the concentration of d-dimer post-covid-19 in the males

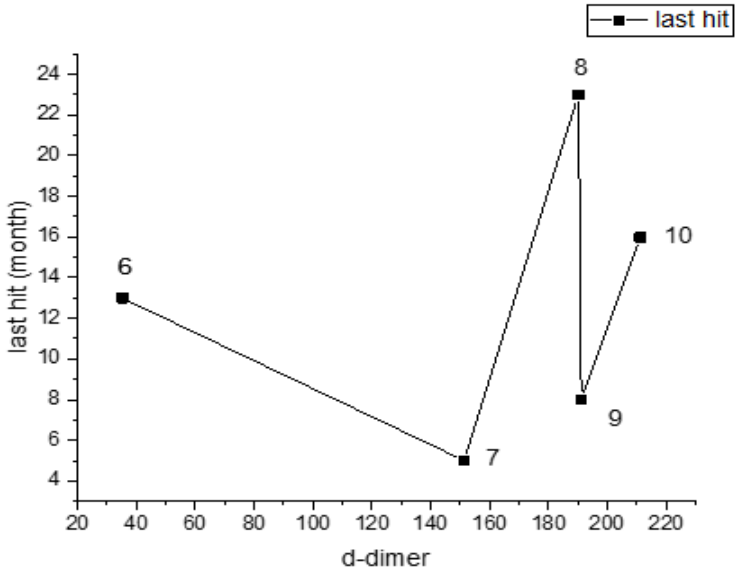

Figure 2. The relationship between last hit and the concentration of d-dimer post-covid-19 in the females

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Table 8. The d-dimer concentration post-coivd-19 in female; Hit once		
Sample code	**Last hit**	**d-dimer (µg FEU/ml)**
6	4	35,31
7	8	151,4
8	15	190,2
9	18	191,2
10	25	211,2
Average		155,862
Maximum		211,2
Minimum		35,31

D-dimer post-covid 19: hit twice by covid-19

As for individuals who were hit twice with the Corona virus and then recovered, the concentrations of D-dimer and impact of time between hits show in table 9 for males and 10 for females.

Table 9. D-dimer Levels in Males Post-COVID-19: Impact of Time Between hits			
Sample code	**Last hit**	**Period between hits**	**d-dimer (µg FEU/ml)**
11	11	long period	68
12	20	long period	75,2
13	13	long period	80,8
14	9	long period	156
15	10	long period	203
Average			116,6
maximum			203
minimum			68

Table 10. D-dimer Levels in Females Post-COVID-19: Impact of Time Between hits			
Sample code	**Last hit**	**Period between hits**	**d-dimer (µg FEU/ml)**
16	**13**	long period	198
17	11	long period	209,1
18	**3**	short period	305,6
19	12	short period	307,7
20	**7**	short period	350,6
Average			274,2
Maximum			350,6
Minimum			198

In table 9 the concentrations of D-dimer in males were maximum in sample 15 was 203 µg FEU/ml, also minimum in sample 11 was 68 µg FEU/ml. and average of d-dimer 116,6 µg FEU/ml. all sample in table 9 was period between hits is long period (more 6 month). The figure 3 shows relationship between last hit and the concentration of d-dimer post-covid-19 and period between hits in the males.

In table 10 the concentrations of D-dimer in males were maximum in sample 20 was 350,6 µg FEU/ml, also minimum in sample 16 was 198 µg FEU/ml. and average of d-dimer 274,2 µg FEU/ml. The figure 4 shows relationship between last hit and the concentration of d-dimer post-covid-19 and period between hits twice in the females.

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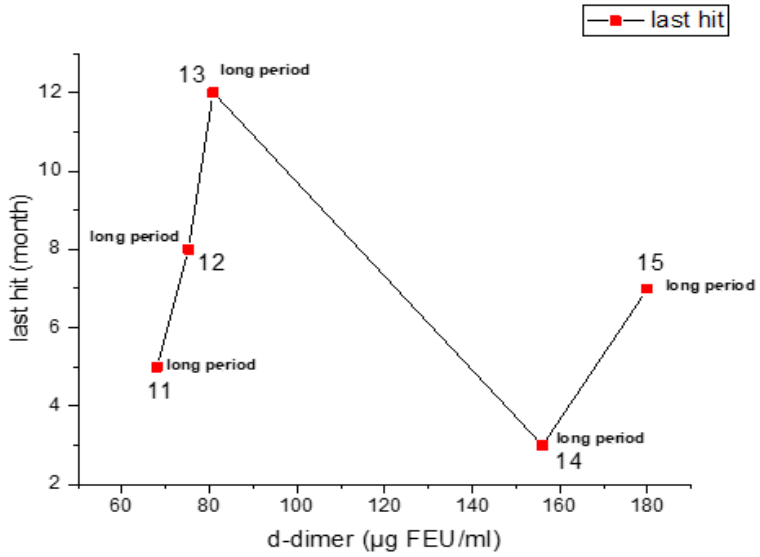

Figure 3. The relationship between last hit and the concentration of d-dimer post-covid-19 and period between hits twice in the males

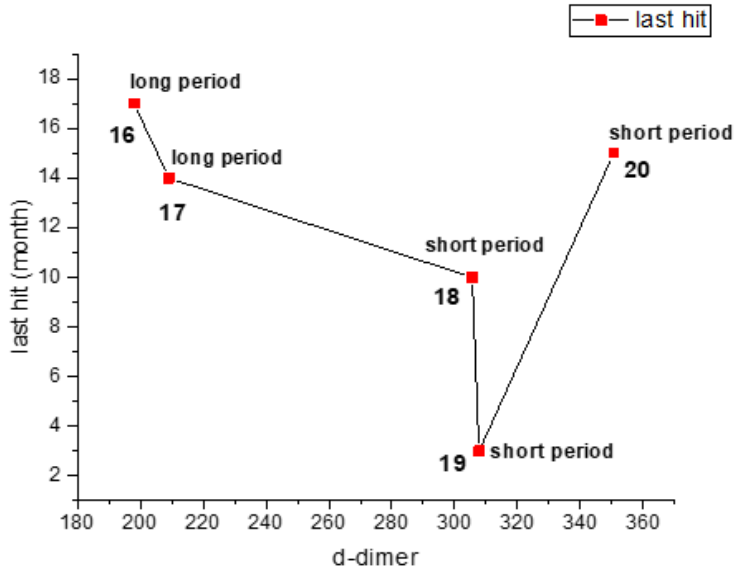

Figure 4. The relationship between last hit and the concentration of d-dimer post-covid-19 and period between hits twice in the females

D-dimer post-covid 19: hit three times or more by covid-19

The subjects in our study who were infected three or more times and then recovered had D-dimer and last hit and period between hits as shown in the tables 11, 12.

Table 11. Post-COVID-19 D-dimer Concentrations in Males: Relationship with Time Since Last hit and Interval Between hits

Sample code	Last hit	Period between hits	D-dimer(µg FEU/ml)
21	7	long period	184,5
22	8	short period	283,5
23	5	short period	291,2
24	9	short period	312,8
25	4	short period	366,6
Average			287,72
Maximum			366,6
Minimum			184,5

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Table 12. Post-COVID-19 D-dimer Concentrations in Females: Relationship with Time Since Last hit and Interval Between hits

Sample code	Last hit	Period between hits	D-dimer (µg FEU/ml)
26	7	long period	230,3
27	8	short period	244,2
28	5	short period	283
29	9	short period	301
30	4	short period	386,7
Average			289,04
Maximum			386,7
Minimum			230,3

In table 11 the d-dimer concentration in males, the maximum concentration in sample 25 was 366,6 **µg** FEU/ml and minimum in sample 21 was 184,5 **µg** FEU/ml, average d-dimer concentration was 287,72 **µg** FEU/ml. The figure 5 shows the concentration of d-dimer in males who were hit three times or more by covid-19 and then recovered.

In female (from table 12) the d-dimer concentration was maximum 386,7 **µg** FEU/ml in sample 30 and minimum in sample 26 was 230,3 **µg** FEU/ml, the average d-dimer in female was 289,04 **µg** FEU/ml. The figure 6 shows the concentration of d-dimer in females who were hit three times or more by covid-19 and then recovered.

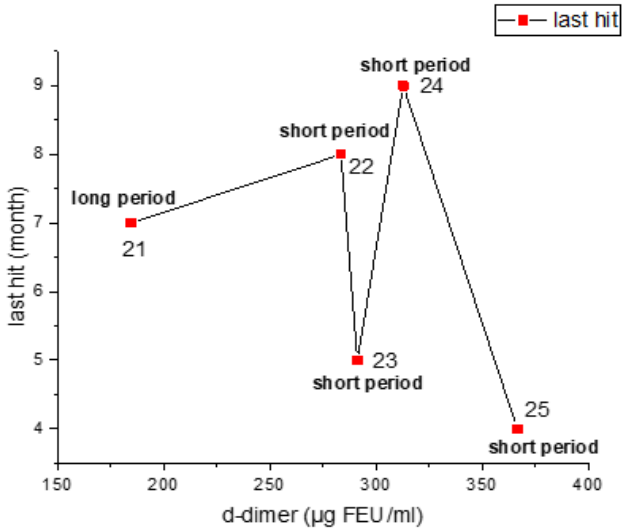

Figure 5. The relationship between the concentration of d-dimer post-covid-19and last hit and period between hits three time or more in males

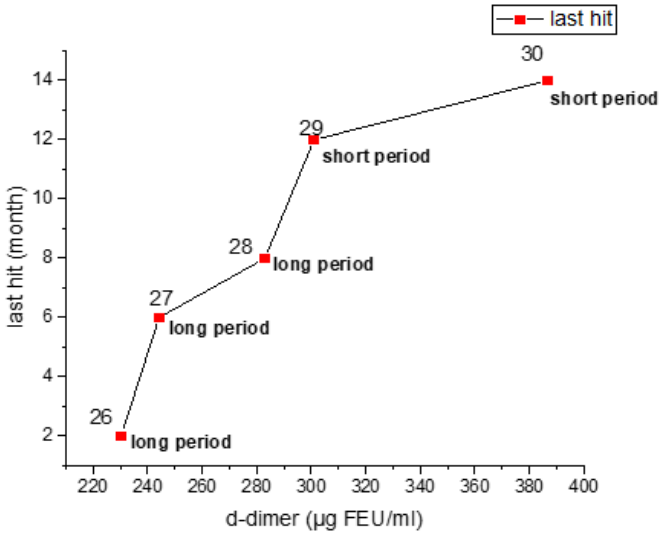

Figure 6. The relationship between the concentration of d-dimer post-covid-19and last hit and period between hits three time or more in females

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DISCUSSION

The ages of the people participating in the study were 21-27, the factor effect on d-dimer value age, Low rates of kidney function, malignant diseases, and chronic inflammatory processes, Medications, pregnancy[3,4] and the vaccine from covid-19.[9,10]

In our study was the average d-dimer value in females higher males, This may be due to physiological reasons or as a result of the vaccine, which was indicated in previous studies that it may lead to an increase in the d-dimer sometimes.[11] The universal limiter to the d-dimer is 500 µg FEU/ml and All concentrations of d-dimer were less than 500 µg FEU/ml.[12,13]

d-dimer concentration post covid-19 in sample 1 and 6 is low concentration because the medications administered during a COVID-19 infection can lead to a reduction in D-dimer concentration.[2,14]

The People who were hit twice by covid-19 and then recovered, Comparing the concentration of D-dimer between repeated hits and period between hits, in the females were hit twice by covid-19 and then recovered (in table 10) show the sample 16 and 17 have d-dimer concentration (198, 209,1 µg FEU/ml) less than other d-dimer concentration in same group because the period in sample 16 and 17 longer other samples in table 10, also the all sample in males were long period between hits (in table 9).

The females who were hit three times or more by covid-19 and then recovered (in table 12) show in sample 26 have d-dimer concentration (230,3 µg FEU/ml) less than other samples d-dimer concentration, a close hits had a higher concentration compared to hits that were spaced over a period of time (more than 6 months), The males who were hit three times or more by covid-19 and then recovered (in table 11) show d-dimer concentration in sample 21 was (184,5 µg FEU/ml) less than other samples concentration in the table 10.

Compared between repeated hits, the peoples who were hit three times or more by covid-19 and then recovered has higher than the People who were hit once or twice by covid-19 and then recovered, this indicates repeated hits lead to increase sensitive to clotting factors, also, the previously mentioned factors may lead to a change in D-dimer concentrations.[10,15]

CONCLUSIONS

A positive result may suggest a blood clot has recently formed and broken down. The factor can increase d-dimer age, Gender, diseases, treatment, pregnancy, trauma and the vaccine. Covid-19 can lead to a number of complications after recovery, and these complications are high D-dimer, but less than 500 µg FEU/ml. Repeated hits with the Corona virus infection led to an increase in the D-dimer. Repeated hits by covid-19 that has the periods between them are close (short period), have a higher d-dimer concentration than the other hits have short periods between hits. the average D-dimer concentration in females was higher than that of males in all study groups

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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