A Statistical Study on The Significant Differences in The Number of Infections with The Corona Virus for Some Arab Countries Based on The Tukey Test and The Scheffe Test

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Abstract: *In this study, two applied statistical tests were used, namely, the Tukey test and the Scheffe test, to study the significant differences in the number of infections with the Corona virus for some selected Arab countries (Iraq, Kuwait, UAE, Oman, Bahrain, Qatar, Morocco, Egypt, Algeria, Syria, Lebanon, Libya) for two months, which are January and February of the year 2022. In the beginning, analysis of variance was conducted to find out the presence of significant differences in the number of injuries or not, by applying a completely randomized design. After that, the two statistical tests were used, Scheffe test and a Tukey test, to study the significant differences in the rate of injuries between each of the two Arab countries selected under study. After conducting the statistical tests, it was concluded that there are significant differences between the number of infections with the Corona virus for most of the selected Arab countries under study.*

Keywords : Completely Randomized Design, Tukey's test , Scheffe Test, Corona virus.

I. INTRODUCTION

The aim of studying the subject of randomized trials is to obtain data on a problem in the community and to find the appropriate analysis of that data to reach the desired results, interpret it and write the final report on that problem. All randomized trials contain the three basic principles (randomization, repeatability, and judgment) and these principles are in some way complementary to each other in an attempt to increase the accuracy of the experiment and provide a valid test for it. Before starting a random experiment, the experimental unit must be determined, and the experimental unit can be a plant, animal or human.

There are many observations that can be made on the experimental units, and these observations are partially different from one experimental unit to another. The aim of these observations is to make some important changes, which are called treatments, in order to study their effect in the random experiment. Also, in random experiments, specifically within the experimental units, there are many possible differences that may occur and for many reasons, including the uncontrolled variation in the external factors of the surrounding environment, including

functional changes in some experimental materials under study and other differences, for this they exist and cannot be avoided in the experimental statistical process These differences are called experimental error, and this does not mean the arithmetic error, but rather the error resulting from a group of unknown factors beyond the researcher's control. Note that those errors caused by external factors within the experimental observations in a random experiment may be systematic and may be random in how they occur. As for the term "randomization" in its technical sense, it guarantees the elimination of systematic error. Through randomization, each experimental unit will be able to receive treatment with the same opportunities available to the rest of the other experimental units. As for the repetition in randomized trials, the aim is to conduct the experiment in the same available conditions several times to reduce the methodological error.

The aim of this study is to use data on the number of Coronavirus disease (COVID-19) infections for some selected Arab countries and for two consecutive months, January and February of 2022, where analysis of variance was used by applying a complete randomized design to find out whether there are significant differences in the number of coronavirus infections between Arab countries or no. If we find that, there is a significant difference in the number of injuries, then the Tukey's test and Scheffe Test are used to find out the significance of the differences in the number of injuries between each two countries separately.

Scientific Interest: It is the use of data on the number of cases of coronavirus disease (COVID-19) for some selected Arab countries (Iraq, Kuwait, UAE, Oman, Bahrain, Qatar, Morocco, Algeria, Egypt, Syria, Lebanon, Libya) for two consecutive months (January and February) from 2022.

Analysis of variance was used by applying a complete random design. To find out whether there are statistically significant differences in the number of coronavirus infections between Arab countries or not.

If statistically significant differences are obtained, then Tukey's test and Scheffe's test will be used to find out the significance of differences in the number of infections between each two countries separately.

II. THE COMPLETELY RANDOMIZED DESIGN CRD

The complete randomized design is one of the most common and used experimental designs in many areas of life, and the most used in behavioral sciences and agricultural sciences for several reasons, the most important of which is the simplicity of its application and the other reason is that the participants are chosen randomly, which gives a strong reason for causal inference. Completely randomized design (CRD) is an important design that assigns each experimental unit randomly, meaning that each experimental unit is exposed to the same conditions compared to the rest of the experimental units. Completely randomized Design is the one in which all the experimental units are taken in a single group which are homogeneous as far as possible. The randomization procedure for allotting the treatments to various units will be as follows:

Step 1: Determine the total number of experimental units.

Step 2: Assign a plot number to each of the experimental units starting from left to right for all rows.

Step 3: Assign the treatments to the experimental units by using random numbers. The statistical model for CRD with one observation per unit $Y_{ij} = \mu + t_i + e_{ij}$. Where μ = overall mean effect, t_i = true effect of the i^{th} treatment and e_{ij} = error term of the j^{th} unit receiving i^{th} treatment. The arrangement of data in CRD is as follows:

Table 1: The arrangement of data in CRD

	Treatments	

	T_1	T_2	T_i	T_k	
	y_{11}	y_{21}	y_{i1}	Y_{K1}	
	y_{12}	y_{22}	y_{i2}	Y_{K2}	
	y_{1r1}	y_{2r2}	y_{iri}	Y_{krk}	
Total	T_1	T_2	T_i	T_K	GT

Where GT: Grand total. The null hypothesis will be

H_o : $\mu_1 = \mu_2 = \ldots\ldots\ldots\ldots = \mu_k$ or

H_1: $\mu_1 \neq \mu_2 \neq \ldots\ldots\ldots\ldots \neq \mu_k$.

There is significant difference between the treatments .The different steps in forming the analysis of variance table for a CRD are:

$$CF = \frac{(GT)^2}{n}$$

$$Total\ SS = SST = \sum_{i=1}^{k} \sum_{j=1}^{k} {y^2}_{ij} - CF$$

$$treatment\ SS = SSt = \sum_{i=1}^{k} \frac{{Y^2}_I}{r_i} - CF$$

$$Error\ SS = SSE = SST - SSt$$

Form the following ANOVA table and calculate F value.

Table 2: Analysis of variance (ANOVA table) for completely randomized design CRD with equal replication

S.O.V	df	SS	MS
Treat.	$t-1$	$\frac{\sum Y_i^2}{r} - cl$	$\frac{SST}{t-1}$
Error	$t(r-1)$	$SST - SSt$	$\frac{SSE}{t(r-1)}$
Total	$tr-1$	$\sum Y_i^2 - cf$	

Where, S.O.V = source of variation, df = degree of freedom , SS = sum of squares , MS = mean square, r = replication, And $F = \frac{MSt}{MSE}$. Then compare the calculated F with the critical value of F corresponding to treatment degrees of freedom and error degrees of freedom so that acceptance or rejection of the null hypothesis can be determined. If null hypothesis is rejected that indicates there is significant differences between the different treatment.[2],[3],[4].

III. TUKEY'S TEST

Tukey's test is a test that is used to find out whether there are significant differences between two variables (two groups) or not, by comparing the value of the Tukey statistic with the value of the difference between the average of the two variables. This test is used after the null hypothesis is rejected. In other words, the test is used after conducting the analysis of variance and obtaining the analysis of variance table and deducing from it that there are significant differences between the variables under study.

For example, if we have a study that contains several different groups and we want to answer the following question: Are there significant differences between each of these two groups or not. The answer to it is by arranging the rate of the groups (variables) in descending order and then calculating the value of the Tukey statistic T_α and then finding the difference between the average of each two groups and comparing their value with the value of the Tukey statistic T_α . Tukey's statistic can be calculated from the following equation:

$$Tukey's\ statistics = T_\alpha = q_\alpha(p, f)\sqrt{\frac{MSE}{r}}$$

Where P is the number of treatment, f is the degrees of freedom, and q_α can we get it from $q\ table$ with $\alpha = 0.05$ or $\alpha = 0.01$. If the value of the difference between the variables is greater than the value of the Tukey statistic, this means that there is a significant difference between the variables.[1], [5].

IV. SCHEFFE TEST

Scheffe test used in analysis of variance and to find significant differences between any two groups of groups under study. The test is used after obtaining the analysis of variance table and

rejecting the null hypothesis, which means that there are significant differences between the groups. After that, Scheffe's statistic is calculated and compared with the absolute value of the difference between the average of each two groups separately. If the absolute value of the mean of any two groups is greater than the value of the Scheffe statistic, this means that there is a significant difference between the two groups. Use the following formula to find a set of Scheffe formula:

$$F = Critical\ F\ value\ for\ Scheffe = F_{Critical(Table)} \times (k-1)$$

$$F_s = F\ for\ Scheefe = \frac{\left(\overline{x_i} - \overline{x_j}\right)^2}{\frac{2MSE}{n}}$$

Where: k is the number of groups included in the comparison, $F_{Critical}$ is F_{Table} (from F distribution), $\overline{x_i}$ is the arithmetic mean for each group, MSE is the mean square error (from ANOVA) and n is the sample size.[4], [6].

V. APPLICATIONS

We have the data of the number of COVID 19 for January 2022 for some selected Arab countries that is shown in the following tables (Table 3-A, 3-B, 3-C).

Table 3-A: Number of corona virus for January 2022 for some selected Arab countries (Iraq, Kuwait, UAE, Oman)

R	Iraq	Kuwait	UAE	Oman
1	7217	6063	2028	1757
2	5582	5592	2291	1547
3	5827	5808	2355	2389
4	8554	6913	2545	2441
5	7609	6515	2638	2162
6	8107	6454	2369	2079
7	7693	5742	2504	1647
8	5756	5176	2629	4166
9	4931	4347	2813	0
10	4884	4148	3020	0
11	7155	4809	2921	1800
12	5767	4510	3014	1619
13	6234	4337	2902	1315
14	6487	4825	2792	1113
15	4466	5147	2989	727
16	3630	4503	3067	605
17	2477	4517	3116	755
18	3266	4881	3068	750
19	2385	4883	2683	718
20	2037	4548	2616	609
21	1610	4397	2511	539
22	1368	3683	2562	373
23	734	2999	2759	251
24	316	2820	2655	343
25	642	2645	2627	263
26	665	2413	2687	252
27	516	2246	2708	232
28	318	1482	2581	176
29	252	982	2515	122
30	206	609	2600	102
31	151	588	2556	119
Sum	116842	128582	83121	30971
Mean	3769.1	4147.8	2681.3	999.1

Table 3-B: Number of corona virus for January 2022 for some selected Arab countries (Bahrain, Qatar, morocco, Egypt)

N= R	Bahrain	Qatar	Morocco	Egypt
1	6745	1509	1321	2210
2	6708	1557	2255	2018
3	6659	1538	4154	2007
4	5255	1743	4899	1985
5	4876	1952	5560	1910
6	4360	2204	7002	1809
7	3543	2551	6362	1651
8	3155	2748	2750	1603
9	3162	2981	4435	1569
10	3616	3087	7638	1533
11	3308	3204	8338	1403
12	3455	3294	9061	1379
13	3019	3723	9355	1303
14	2898	3816	7756	1232
15	2594	3998	3177	1197
16	2542	4021	5428	1101
17	2241	4007	8826	1079
18	2089	4123	8501	1011
19	2289	4187	8338	948
20	1787	4206	5518	932
21	1894	4169	7336	951
22	1694	3878	2622	912

23	1424	3689	4963	830
24	1515	3487	7064	821
25	1410	3192	6428	840
26	1081	2779	6050	803
27	1224	2273	5618	769
28	880	1695	4299	723
29	667	1177	885	801
30	615	998	1357	783
31	656	833	2328	847
Sum	87361	88619	169624	38960
Mean	2818.09	2858.7	5471.7	1256.8

Table 3-C: Number of corona virus for January 2022 for some selected Arab countries (Algeria, Syria, Lebanon, Libya)

R	Algeria	Syria	Lebanon	Libya
1	1464	57	7105	5694
2	1742	54	7726	0
3	1870	53	8116	3320
4	2130	53	9199	3157
5	2162	49	8639	2245
6	2521	46	7250	3063
7	2215	44	1665	2333
8	2134	42	6381	2281
9	2211	41	5596	0
10	1855	40	5628	1700
11	1552	41	7110	1331
12	1359	37	6643	1173
13	810	36	7592	885
14	692	38	6109	736
15	573	36	5539	867
16	505	33	6019	0
17	596	31	6811	765
18	577	30	7057	618
19	610	28	7246	599
20	557	25	6665	487
21	482	25	6653	518
22	415	20	4780	597
23	426	18	7547	0
24	491	22	7974	592
25	410	25	7247	643
26	462	27	5818	698
27	421	26	5087	651
28	373	27	2994	634
29	341	27	1445	916
30	386	32	3358	0
31	395	35	4290	551
Sum	32737	1098	191289	37054
Mean	1056.03	35.4	6170.6	1195.3

A. Using complete random design

- To calculate the analysis of variance ANOVA (Table 4) to find out whether there are significant differences between the number of injuries in the Arab countries or not (Table 3-A, 3-B, 3-C), we have the following steps:

Step 1 : calculating the hypothesis test

$H_0: \mu_1 = \mu_2 = \cdots = \mu_{12}$,

$H_A: \mu_1 \neq \mu_2 = \cdots = \mu_{12}$

Step 2: we have correct factor that is $CF = \frac{Y^2}{tr} 18.9$

Step 3: then we find Total SS, treatments SS, error SS , as follows

$SST = 5323.64$, $SSt = 4796.84$, and $SSE = 526.8$

Step 4: Complete the analysis of variance table

Table 4: ANOVA table of the number of corona virus infections for the month of January 2022 for some selected Arab countries

S.O.V	df	SS	MS
Treat.	11	4796.84	436.076
Error	360	526.8	1.46
Total	371	5323.64	

Step 5: Calculate $F_{0.05,11,360} = 1.75$, and $F_{calc} = 298.68$, then

Step 6: Since $F_{calc}\,(298.68) > F_{0.05,11,360}(4.522)$, we reject H_o at the 95% level confidence .

- The number of (COVID-19) for the month of February 2022 (Table 4-A, 4-B, 4-C) for some selected Arab countries is shown in the following tables. In the same way in above, it is possible to find a ANOVA table (Table 5) to find out the moral differences in the number of infections with Corona virus , that is shown in the tables in below.

Table 5-A: Number of corona virus for February 2022 for some selected Arab countries (Iraq, Kuwait, UAE, Oman)

N= R	Iraq	Kuwait	UAE	Oman
1	1203	584	605	563
2	945	607	622	507
3	878	582	644	693
4	1603	846	696	696
5	1499	866	782	974
6	1736	1012	740	1224
7	1685	1053	626	1036
8	2074	1329	651	1123
9	1159	1195	725	1027
10	1234	1019	790	1478
11	2326	1348	882	1440
12	2246	1501	895	1430
13	2639	1917	957	1511
14	2984	2166	930	1979
15	3011	2562	1191	1342
16	2036	2268	1266	1295
17	2014	2254	1395	2065
18	3776	2896	1474	1743
19	4220	3324	1588	2356
20	4681	3463	1538	2303
21	5360	3989	1615	2410
22	5285	4294	1704	2084
23	3589	4232	2015	1538
24	4316	4445	1991	2524
25	6569	5407	2114	1998
26	6949	5990	2232	2335
27	8293	6592	2163	2828
28	7901	6436	2084	2420
Sum	92211	74177	34915	44921
Mean	3293.3	2649.2	1246.9	1604.3

Table 5-B: Number of corona virus for February 2022 for some selected Arab countries (Bahrain, Qatar, Morocco, Egypt)

N= R	Bahrain	Qatar	Morocco	Egypt
1	2916	311	83	1521
2	2416	308	142	1743
3	2599	297	188	1811
4	2732	326	259	1832
5	3006	343	362	1892
6	3425	365	357	1989
7	2885	394	427	2003
8	3904	416	190	2009
9	3260	442	298	2025
10	3651	434	524	2053
11	3762	452	508	2071
12	4288	447	636	2101
13	4839	498	645	2117
14	4818	547	822	2129
15	5266	601	369	2131
16	4623	613	634	2145
17	5750	607	969	2179
18	6104	657	1148	2189
19	6818	783	1333	2191
20	7121	776	1499	2194
21	7042	819	1618	2272
22	7709	923	721	2301
23	7434	912	1202	2298
24	7273	903	2067	2291
25	8063	997	2266	2281
26	7854	1183	2861	2278
27	8173	1245	3051	2291
28	5808	1236	3080	2223
Sum	143539	17835	28259	58560
Mean	5126.4	636.9	1009.3	2091.4

Table 5-C: Number of corona virus for February 2022 for some selected Arab countries (Algeria, Syria, Lebanon, Libya)

N= R	Algeria	Syria	Lebanon	Libya
1	77	100	1533	1394
2	72	105	2428	0
3	103	115	2727	938
4	115	120	3152	1276
5	123	128	3748	1373
6	164	128	3978	1815
7	147	125	3101	2307
8	118	132	3145	2292
9	251	124	3729	0
10	316	125	4090	1208
11	375	130	5211	2457

12	424	137	6063	2884
13	405	130	3731	2490
14	413	130	3717	2800
15	526	125	4443	3648
16	503	122	5935	0
17	532	126	6954	3345
18	518	135	6060	3733
19	585	124	8488	3272
20	610	114	6482	3326
21	502	90	6351	2832
22	378	89	6147	4242
23	792	85	8472	0
24	970	85	8472	3917
25	951	87	9446	3656
26	1365	86	10760	4371
27	1403	81	7314	4266
28	1343	61	6279	4429
Sum	14081	3139	151911	68311
Mean	502.9	112.1	5425.4	2439.7

Table 6: ANOVA table of the number of corona virus infections for the month of February 2022 for some selected Arab countries

S.O.V	df	SS	MS
Treat.	11	918146378.9	83467852.6
Error	324	573227396.3	1769220.3
Total	335	1491373775.2	

And , $F_{Table} = 1.75$, $F_{calc.} = 47.17$.

Since $F_{calc}(47.17) > F_{Table}$ (1.75), we $reject\ H_0$ at the 95% level of confidence.

B. Using Tukey's Test

Using the data about COVID 19 (Tables 3-A, 3-B, 3-C) to find the moral differences between the Arab countries selected in this study. The beginning is by finding the value of Tukey T_α, which is equal to 6.2. In order to find out the significant differences between each of the two Arab countries under study and compare them with the value of the Tukey's statistics T_α, we follow the following table:

Table 7-A: The Significant differences in the number of infections with the corona virus for some Arab countries and their comparison with the Tukey statistic

Treat's pair	$\bar{X}_\iota - \bar{X}_J$	T_α	Conclusion
Syria& Bahrain	2782.7	6.2	Significant
Syria& Oman	963.7	6.2	Significant
Syria& Algeria	1020.6	6.2	Significant
Syria& Libya	1159.9	6.2	Significant
Syria& Egypt	1221.4	6.2	Significant
Syria& UAE	2645.9	6.2	Significant
Syria& Qatar	2823.3	6.2	Significant
Syria& Iraq	3733.7	6.2	Significant
Syria& Kuwait	4112.4	6.2	Significant
Syria& Morocco	5436.3	6.2	Significant
Syria& Lebanon	6135.2	6.2	Significant
Bahrain& Oman	1818.9	6.2	Significant
Bahrain& Algeria	1762.1	6.2	Significant
Bahrain& Libya	1622.8	6.2	Significant
Bahrain& Egypt	1561.3	6.2	Significant
Bahrain& UAE	136.79	6.2	Significant
Bahrain& Qatar	40.61	6.2	Significant
Bahrain& Iraq	951.01	6.2	Significant
Bahrain& Kuwait	1329.7	6.2	Significant
Bahrain& Morocc	2653.7	6.2	Significant
Bahrain& Lebanor	3352.5	6.2	Significant
Oman & Algeria	56.93	6.2	Significant
Oman & Libya	196.2	6.2	Significant
Oman & Egypt	257.7	6.2	Significant
Oman & UAE	1682.2	6.2	Significant
Oman & Qatar	1859.6	6.2	Significant
Oman & Iraq	2770	6.2	Significant
Oman & Kuwait	3148.7	6.2	Significant
Oman & Morocco	4472.6	6.2	Significant
Oman & Lebanon	5171.5	6.2	Significant

Table 7-B: The Significant differences in the number of infections with the corona virus for some Arab countries and their comparison with the Tukey statistic.

Treat's pair	$\overline{X}_\iota - \overline{X}_J$	T_α	Conclusion
Algeria& Libya	1039.27	6.2	Significant
Algeria& Egypt	200.77	6.2	Significant
Algeria& UAE	1625.27	6.2	Significant
Algeria& Qatar	1802.67	6.2	Significant
Algeria& Iraq	2713.07	6.2	Significant
Algeria& Kuwait	391.77	6.2	Significant
Algeria& Morocc	4415.67	6.2	Significant
Algeria& Lebano	5114.57	6.2	Significant
Libya& Egypt	61.5	6.2	Significant
Libya& UAE	1486	6.2	Significant
Libya& Qatar	1663.4	6.2	Significant
Libya& Iraq	2573.8	6.2	Significant
Libya& Kuwait	2952.5	6.2	Significant
Libya& Morocco	4276.4	6.2	Significant
Libya& Lebanon	4975.3	6.2	Significant
Egypt& UAE	1424.5	6.2	Significant
Egypt& Qatar	1601.9	6.2	Significant
Egypt& Iraq	2512.3	6.2	Significant
Egypt& Kuwait	2891	6.2	Significant
Egypt& Morocco	4214.9	6.2	Significant
Egypt& Lebanon	4913.8	6.2	Significant
UAE& Qatar	177.4	6.2	Significant
UAE& Iraq	1087.8	6.2	Significant
UAE& Kuwait	1466.5	6.2	Significant
UAE& Morocco	2813	6.2	Significant
UAE& Lebanon	3489.3	6.2	Significant
Qatar& Iraq	910.4	6.2	Significant
Qatar& Kuwait	1289.1	6.2	Significant
Qatar& Morocco	2613	6.2	Significant
Qatar& Lebanon	3311.9	6.2	Significant
Iraq& Kuwait	378.1	6.2	Significant
Iraq& Morocco	1702.6	6.2	Significant
Iraq& Lebanon	2401.5	6.2	Significant
Kuwait& Morocc	1323.9	6.2	Significant
Kuwait& Lebano	2022.8	6.2	Significant
Morocco& Leban	698.9	6.2	Significant

C. Using Scheffe Test

Using the data about COVID 19 (Tables 5-A, 5-B, 5-C) to find the differences between the Arab countries. The beginning is by finding the value of (critical F value), which is equal to (2.94). In order to find out the moral differences between each of the two Arab countries (Scheffe value (F_{Scheffe})) and compare them with the value of the (critical F value), we follow the following table:

Table 8: The Significant differences in the number of infections with the corona virus for some Arab countries and their comparison with the Scheffe test

Treat's pair	F_{Schaffer}	Critical F value	Conclusion
Iraq & Kuwait	3.28	2.94	Significant
Iraq & UAE	33.14	2.94	Significant
Iraq & Oman	22.57	2.94	Significant
Iraq & Bahrain	26.59	2.94	Significant
Iraq & Qatar	55.83	2.94	significant
Iraq & Morocco	41.28	2.94	significant
Iraq & Egypt	11.43	2.94	Significant
Iraq & Algeria	61.61	2.94	Significant
Iraq & Syria	80.08	2.94	Significant
Iraq & Lebanon	35.97	2.94	Significant
Iraq & Libya	5.76	2.94	Significant
Kuwait &UAE	15.56	2.94	Significant
Kuwait & Oman	8.64	2.94	Significant
Kuwait &Bahrain	48.56	2.94	Significant
Kuwait &Qatar	32.04	2.94	Significant
Kuwait &Morocco	21.28	2.94	Significant
Kuwait &Egypt	2.46	2.94	Not Significant
Kuwait &Algeria	36.45	2.94	Significant
Kuwait &Syria	50.93	2.94	Significant

Kuwait &Lebanon	60.99	2.94	Significant
Kuwait &Libya	0.347	2.94	Not Significant
UAE & Oman	1.01	2.94	Not Significant
UAE & Bahrain	119.09	2.94	Significant
UAE& Qatar	2.94	2.94	Not Significant
UAE& Morocco	0.447	2.94	Not Significant
UAE& Egypt	5.64	2.94	Significant
UAE& Algeria	4.38	2.94	Significant
UAE& Syria	10.19	2.94	Significant
UAE& Lebanon	138.16	2.94	Significant
UAE& Libya	11.26	2.94	Significant
Oman & Bahrain	98.16	2.94	Significant
Oman & Qatar	7.40	2.94	Significant
Oman & Morocco	2.80	2.94	Not Significant
Oman & Egypt	1.877	2.94	Not Significant
Oman & Algeria	9.59	2.94	Significant
Oman &Syria	17.62	2.94	Significant
Oman & Lebanon	115.54	2.94	Significant
Oman & Libya	5.52	2.94	Significant
Bahrain& Qatar	159.5	2.94	Significant
Bahrain& Morocco	134.13	2.94	Significant
Bahrain& Egypt	72.89	2.94	Significant
Bahrain& Algeria	169.2	2.94	Significant
Bahrain &Syria	198.9	2.94	Significant
Bahrain &Lebanon	0.707	2.94	Significant
Bahrain& Libya	57.12	2.94	Significant
Qatar & Morocco	1.09	2.94	Not Significant
Qatar& Egypt	16.74	2.94	Significant
Qatar& Algeria	0.14	2.94	Not Significant
Qatar & Syria	2.179	2.94	Not Significant
Qatar & Lebanon	181.4	2.94	Significant
Qatar & Libya	25.71	2.94	Significant
Morocco &Egypt	9.26	2.94	Significant
Morocco &Algeria	2.03	2.94	Not Significant
Morocco & Syria	6.36	2.94	Significant
Morocco &Lebanon	154.3	2.94	Significant
Morocco &Libya	16.19	2.94	Significant
Egypt & Algeria	19.97	2.94	Significant
Egypt & Syria	31.00	2.94	Significant
Egypt & Lebanon	87.95	2.94	Significant
Egypt & Libya	0.959	2.94	Not Significant
Algeria & Syria	1.208	2.94	Not Significant
Algeria & Lebanon	191.74	2.94	Significant
Algeria &Libya	29.68	2.94	Significant
Syria & Lebanon	223.4	2.94	Significant
Syria& Libya	42.87	2.94	Significant
Lebanon & Libya	70.54	2.94	Significant

VI. CONCLUSION

1. From Table 4, Since $F_{calc}\,(298.68) > F_{0.05,11,360}(1.75)$, we reject H_o at the 95% level confidence. Then there are significant differences between the number of injuries in the Arab countries (Iraq, Kuwait, UAE, Oman, Bahrain, Qatar, Morocco, Egypt, Algeria, Syria, Lebanon, Libya) for the month of January 2022. Also, from Table 6, the number of injuries in the Arab countries (Iraq, Kuwait, UAE, Oman, Bahrain, Qatar, Morocco, Egypt, Algeria, Syria, Lebanon, Libya) for the month of January 2022 and Since $F_{calc}(47.17) > F_{Table}\ (1.75)$, Then we $reject\ H_0$ at the 95% level of confidence. And we conclude that there are significant differences in the number of injuries among the Arab countries under study.
2. The significant differences between each of the two Arab countries (Iraq, Kuwait, UAE, Oman, Bahrain, Qatar, Morocco, Egypt, Algeria, Syria, Lebanon, Libya) for the month of January 2022 when we compare the difference with the value of the Tukey's statistics T_α. This thing is clear from the Tables 7-A, 7-B.
3. Table 8 shows that there are significant differences between most of the Arab countries (Iraq, Kuwait, UAE, Oman, Bahrain, Qatar, Morocco, Egypt, Algeria, Syria, Lebanon, Libya) for the month of February 2022, , as is clear from the above table, by comparing the value of the difference between the average number of infections with the Corona virus between each two countries separately (F_{Scheffe}) with the (critical F value).

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