# Multidimensional Analysis of Coronavirus CoVID-19 Spreading: Study in Arabic Countries Context

**Kais Khrouf**

Jouf University, College of Computer and Information Sciences, Al Jouf, Saudi Arabia

**Summary**
Since December 2019, unexplained cases of pneumonia have occurred in Wuhan. The health authorities of China identified a new type of Coronavirus, named COVID-19 by the World Health Organization (WHO) [8]. Using data analysis technologies on large volumes of Coronavirus CoVID-19 data constitutes a challenge for extracting new information and knowledge. In this context, we propose to apply the multidimensional analysis techniques on data about Coronavirus CoVID-19 evolution and spreading in Arabic Countries, according to several perspectives.

***Key words:***
*Multidimensional Analysis, Star Schema, Coronavirus CoVID-19, Arabic Countries.*

## 1. Introduction

The epidemics and pandemics constitute one of the most dangerous problems of the humanity (Spanish flu in 1917 and H1N1 in 2009). The World Health Organization (WHO) has announced the apparition of the novel Coronavirus CoVID-19 [8]. This virus, not identified in humans formerly, causes ailment ranging as the normal cold or also Respiratory Syndrome Severe. On 11 March 2020, WHO consider that Coronavirus CoVID-19 can be characterized as a pandemic [8]. In order to understand the evolution and spreading of this new virus, several studies (statistical and clinical) were proposed in the last months.

The Multidimensional Analysis Techniques provides a flexible representation and visualization of data from various viewpoints, in order to detect trends or exceptions in the data. It is a process of data analysis that contains two concepts: Fact (Analysis subject) and Dimensions (Axes of analysis). In this paper, we propose a multidimensional model in order to analyze the evolution and spreading of Coronavirus CoVID-19 in Arabic Countries.

The remainder of this paper is organized as follows. Section 2 presents the literature review about the multidimensional analysis techniques and data analysis of Coronavirus CoVID-19. Then, we present the new multidimensional model for spreading of this new virus in Arabic Countries. In Section 4, we present the implementation and discussions through multidimensional tables we generate.

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## 2. Literature Review

Multidimensional analysis techniques have been used to visualize data from several perspectives, in order to help decision-makers exploring data according to several granularities and so make appropriate decisions [4]. In the literature, these techniques have been used on several types of data: Factual data (Such as: Databases, Excel Sheets), Semi-Structured Data (Example: XML Documents) and Social Networks (Specially, Tweets).

For factual data, the authors of [2] propose a multidimensional data model for analyzing health service data. The aim of the proposed model is to enhance understanding decision-makers the information extracted from several data sources. This multidimensional model constitutes a guide to discover trends in historical information of patients (medical records, health resources, etc.).

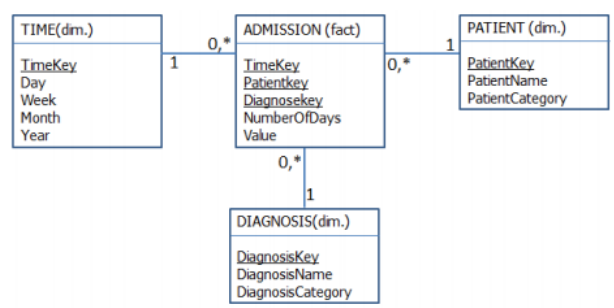



Fig. 2 Multidimensional Model of Health Service Data

For semi-structured data, the authors of [5] propose a new multidimensional model of XML documents that contains several dimensions (Content, Metadata, Structure, etc.). For improving the visualization of multidimensional tables, the authors use the concept of Tag Cloud; it is composed of a set of terms which the size of a term is proportional of its frequency in the collection of XML documents.

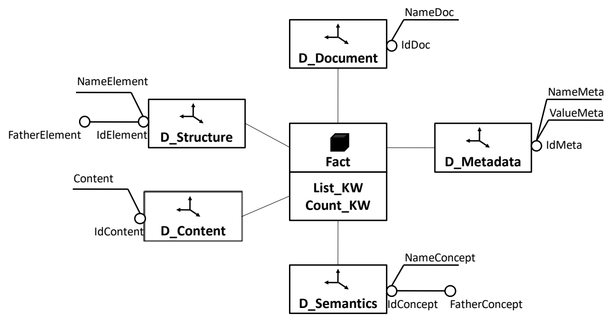



Fig. 2 Multidimensional Model of XML Documents.

For data extracted from social networks, the authors [3] propose a multidimensional model for analyzing the metadata (structural specificity) and the content (semantic data) of Tweets. They use the constellation schema by adding extensions according to specificities of Tweets. They also propose algebraic multidimensional operators with formalization and pseudo code algorithms.

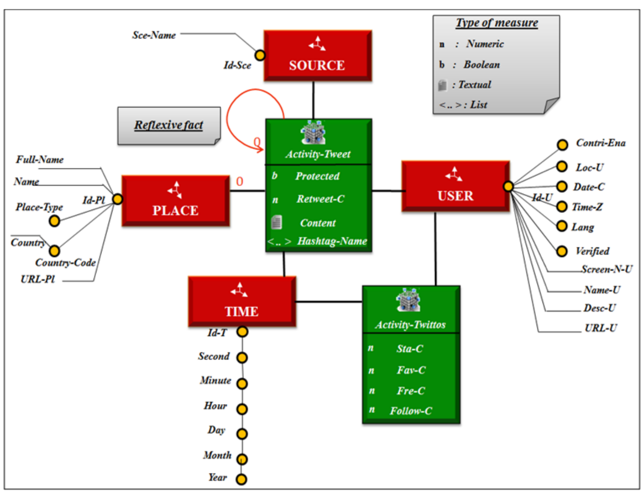



Fig. 3 Multidimensional Model of Tweets

With the appearance of the Coronavirus CoVID-19, several studies were focused on data analysis of this new virus. In this part, we present some works.

The authors of [1] present a data analysis of Covid-19 and an interactive visualization using the concept of Tableau [6]. They consider that data analysis can be very fast with Tableau and Visualizations (dashboards and worksheets). A Tableau dashboard is used to show the most important and personalized data (multiple visualizations in a single view). The data can be extracted from several sources.

The author of [7] presents a data analysis of CoVID-19 in cities of China, by using the “Novel Corona Virus Dataset”, published on Kaggle. For Data preparation, he use a Correlation matrix in order to summarize data for more advanced analyzes. For data Visualization, he uses Matplotlib and Seaborn (Python libraries). Matplotlib is the visualization library and Seaborn builds more complex visualizations, such as: Heatmaps.

In this work, we propose to apply multidimensional analysis techniques on data about Coronavirus CoVID-19 spreading in the Arabic Countries.

## 3. Multidimensional Model

Data warehouses provide consolidated data through the Online Analytical Processing (OLAP) tools. These tools allow an interactive and consistent analysis of data in a multidimensional way [4]. Multidimensional modeling describes a subject (Fact) according to multiple perspectives (Dimensions). The star schema consists of one *Fact* table surrounded by any number of *Dimension* tables.

***Star C*** = $(F\ ;\ D_i)$
$F$ is the fact (Subject of analysis).
$D_i$ is a set of dimensions.

Fact table generally represents metrics or measures (numeric values) for a specific event. It is composed of a large number of records in order to describe the analyzed subject. A fact table contains a set of indicators, called measures.

***Fact F***=$(NameF;\ M_i)$
*NameF* is the name of the fact $F$.
$M_i$ is a set of measures.

A Dimension table (descriptive information) represents the axis of analysis; it generally contains a small number of records, but having a large number of characteristics (attributes). An attribute can be a parameter (level of granularity into hierarch) or a weak attribute (descriptive attribute of a parameter).

***Dimension*** $\boldsymbol{D_i}$ = $(NameD_i;\ A_j;\ H_k)$
$NameD_i$ is the name of the dimension,
$A_j$ is the set of attributes. An attribute can be a parameter or a weak attribute.
$H_k$ is the set of hierarchies (from the finest granularity to the most general granularity).

Roll-up constitutes a data aggregation, by passing from the parameter to another having a higher level in the hierarchy. Example: For location hierarchy, we can aggregate data by ascending from the parameter *City* to the parameter *Country*.

**$Table_{res}$ = Roll-Up** ($Table_i$, $Dimension_j$, $Parameter_p$)
$Table_{res}$ is the result of the Roll-Up operator,
$Table_i$ is the initial table.
$Dimension_j$ is the concerned dimension by the Roll-Up.
$Parameter_p$ is the new parameter to apply the Roll_Up.

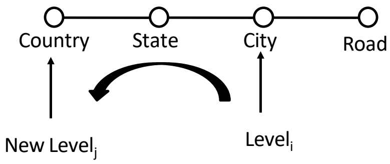



Fig. 4 Roll-Up Operator

Drill-down Operator (opposite of Roll-Up) fragments data into smaller parts. It can be done by descending from a parameter to another in the hierarchy. Example: For location hierarchy, we can visualize data by passing from the parameter *Country* to the parameter *State*.

**$Table_{res}$ = Drill-Down** ($Table_i$, $Dimension_j$, $Parameter_p$)
$Table_{res}$ is the result of the Drill-Down operator,
$Table_i$ is the initial table.
$Dimension_j$ is the concerned dimension by the Drill-Down.
$Parameter_p$ is the new parameter to apply the Drill-Down.

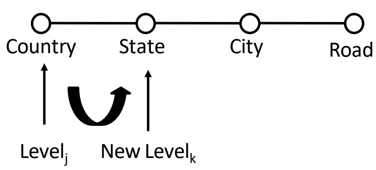



Fig. 5 Drill-Down Operator

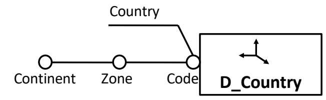
In the context of Coronavirus CoVID-19, we propose a Star Shema with Four dimensions:

- D_Country composed by the hierarchy (Code, Zone, Continent) and the weak attribute Country.
- D_Date composed by the hierarchy (Date, Month, Year) and the weak attribute Day.
- D_Population composed by the parameter Id and the weak attribute Interval.
- D_Sex composed by the parameter Code and the weak attribute Sex.

The Tables 1, 2 and 3 describe the content of the four proposed dimensions.

Table 1: Dimension 1 – D_Country

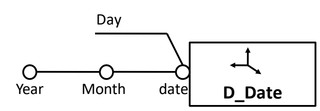
**Dimension 1: D_Country**




| **Parameter 3: Continent** | **Parameter 2: Zone** | **Week Attribute: Country** | **Parameter 1: Code** |
|---|---|---|---|
| Asia | Gulf countries | Saudi Arabia | SAU |
| | | Yemen | YEM |
| | | Oman | OMN |
| | | United Arab Emirates | ARE |
| | | Qatar | QAT |
| | | Bahrain | BHR |
| | | Kuwait | KWT |
| | Fertile Crescent | Palestine | PSE |
| | | Lebanon | LBN |
| | | Jordan | JOR |
| | | Syria | SYR |
| | | Iraq | IRQ |
| Africa | Greater Maghreb | Mauritania | MRT |
| | | Morocco | MAR |
| | | Algeria | DZA |
| | | Tunisia | TUN |
| | | Libya | LBY |
| | Nile Valley | Egypt | EGY |
| | | Sudan | SDN |
| | Africa Horn | Djibouti | DJI |
| | | Somalia | SOM |
| | Other | Comoros | COM |

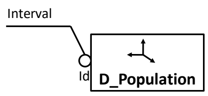
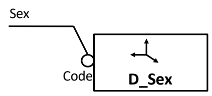
Table 2: Dimension 2 – D_Date

**Dimension 2: D_Date**




| **Parameter 3: Year** | **Parameter 2: Month** | **Week Attribute: Day** | **Parameter 1: Id** |
|---|---|---|---|
| 2020 | January | Tuesday | 01/01/2020 |
| | | … | … |
| | | Friday | 31/01/2020 |
| | February | Saturday | 01/02/2020 |
| | | … | … |
| | | Saturday | 29/02/2020 |
| | Marsh | Sunday | 01/03/2020 |
| | | … | … |
| | | Tuesday | 31/03/2020 |
| | April | Wednesday | 01/04/2020 |
| | | … | … |
| | | Thursday | 30/04/2020 |
| | May | Friday | 01/05/2020 |
| | | … | … |
| | | Sunday | 31/05/2020 |
| | June | Monday | 01/06/2020 |
| | | … | … |
| | | Monday | 15/06/2020 |

Table 3: Dimensions 3 &4 – D_Population and D-Sex

| **Dimension 3: D_Population** | | **Dimension 4: D_Sex** | |
|---|---|---|---|
|  | |  | |
| **Week Attribute: Interval Unit: Million** | **Parameter 1: Id** | **Week Attribute: Sex** | **Parameter 1: Code** |
| [0, 4[ | 1 | Male | M |
| [4, 9[ | 2 | Female | F |
| [9, 20[ | 3 | | |
| [20, 50[ | 4 | | |
| [50, 100[ | 5 | | |

The Figure 1 presents the proposed multidimensional model of Coronavirus CoVID-19 spreading. The fact is composed of 2 Measures (Cases and Deaths) and it is surrounded by four dimensions (D_Date, D_Country, D_Population and D_Sex).

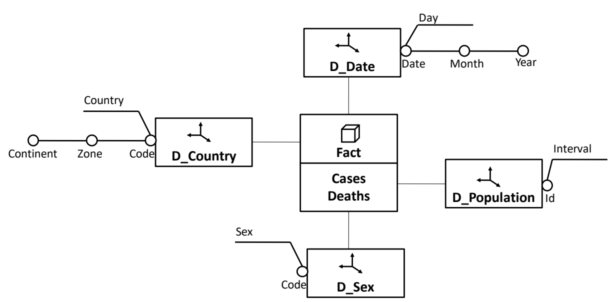



Fig. 5 Multidimensional Model of CoVID-19 Spreading

## 3. Implementation and Discussions

The data used for analysis in this paper was extracted from [9]. The analysis period is between 01/01/2020 and 15/06/2020.

In the following analyses, we focus on the number of cases. The first example concerns the number of cases (Measure of the fact) by Month (Dimension 1) and by Country (Dimension 2).

Table 4: Number of cases by Month and Country

| | Month | | | | | | |
|---|---|---|---|---|---|---|---|
| **Country** | **January** | **February** | **March** | **April** | **May** | **June** | **Total** |
| **Bahrain** | 0 | 38 | 477 | 2406 | 7872 | 7434 | **18227** |
| **Comoros** | | | | | 106 | 70 | **176** |
| **Djibouti** | | | 26 | 1051 | 2117 | 1271 | **4465** |
| **Egypt** | 0 | 1 | 608 | 4659 | 18181 | 21149 | **44598** |
| **Iraq** | 0 | 7 | 623 | 1373 | 4176 | 14030 | **20209** |
| **Jordan** | | | 268 | 183 | 283 | 227 | **961** |
| **Kuwait** | 0 | 45 | 221 | 3474 | 22452 | 9728 | **35920** |
| **Lebanon** | 0 | 3 | 443 | 275 | 470 | 255 | **1446** |
| **Libya** | | | 8 | 53 | 69 | 288 | **418** |
| **Mauritania** | | | 5 | 2 | 476 | 1300 | **1783** |
| **Morocco** | | | 556 | 3765 | 3459 | 954 | **8734** |
| **Oman** | 0 | 6 | 173 | 2095 | 8149 | 13058 | **23481** |
| **Palestine** | | | 115 | 392 | 119 | 47 | **673** |
| **Qatar** | 0 | 0 | 693 | 11871 | 42698 | 24340 | **79602** |
| **Saudi_Arabia** | | | 1453 | 19949 | 61982 | 44157 | **127541** |
| **Somalia** | | | 3 | 579 | 1334 | 687 | **2603** |
| **Sudan** | | | 6 | 369 | 4425 | 2420 | **7220** |
| **Syria** | | | 10 | 33 | 79 | 55 | **177** |
| **Tunisia** | | | 312 | 668 | 96 | 20 | **1096** |
| **United_Arab_E** | 4 | 15 | 592 | 11318 | 21967 | 8398 | **42294** |
| **Yemen** | | | | 6 | 304 | 418 | **728** |
| **Total** | **4** | **116** | **7175** | **67785** | **206233** | **151958** | **433271** |

In the second example, we apply a Roll-Up operation on dimension 2. The example becomes the number of cases by Month (Dimension 1) and Zone (Dimension 2).

Table 5: Number of cases by Month and Zone

| | Month | | | | | | |
|---|---|---|---|---|---|---|---|
| **Zone** | **January** | **February** | **March** | **April** | **May** | **June** | **Total** |
| **Africa Horn** | | | 29 | 1630 | 3451 | 1958 | **7068** |
| **Fertile Crescent** | 0 | 10 | 1459 | 2256 | 5127 | 14614 | **23466** |
| **Greater Maghreb** | 0 | 1 | 1464 | 7752 | 9519 | 4214 | **22950** |
| **Gulf countries** | 4 | 104 | 3609 | 51119 | 165424 | 107533 | **327793** |
| **Nile Valley** | 0 | 1 | 614 | 5028 | 22606 | 23569 | **51818** |
| **Other** | | | | | 106 | 70 | **176** |
| **Total** | **4** | **116** | **7175** | **67785** | **206233** | **151958** | **433271** |

In the following example, we apply again a Roll-Up operation on Dimension 2. This example analyses the number of cases by Month (Dimension 1) and Continent (Dimension 2).

Table 6: Number of cases by Month and Continent

| | Month | | | | | | |
|---|---|---|---|---|---|---|---|
| **Continent** | **January** | **February** | **March** | **April** | **May** | **June** | **Total** |
| **Africa** | 0 | 2 | 2107 | 14410 | 35682 | 29811 | **82012** |
| **Asia** | 4 | 114 | 5068 | 53375 | 170551 | 122147 | **351259** |
| **Total** | **4** | **116** | **7175** | **67785** | **206233** | **151958** | **433271** |

In Table 4, we note that the first cases of CoVID-19 were detected in United Arab Emirates (February month) and the important number of cases was recorded in Saudi Arabia, Qatar and United Arab Emirates (Gulf Countries, confirmed by Table 6 and Asian countries, confirmed by Table 7).

By comparing the number of cases by months (March, April and May), we note also that only Palestine and Tunisia where the number of cases has decreased.

In this part, we focus on the number of deaths. The following example concerns the number of deaths (Measure of the fact) by Month (Dimension 1) and by Country (Dimension 2).

Table 7: Number of deaths by Month and Country

| | Month | | | | | | |
|---|---|---|---|---|---|---|---|
| Country | January | February | March | April | May | June | Total |
| Algeria | 0 | 0 | 35 | 409 | 202 | 121 | **767** |
| Bahrain | 0 | 0 | 4 | 4 | 9 | 26 | **43** |
| Comoros | | | | | 2 | 0 | **2** |
| Djibouti | | | 0 | 2 | 20 | 21 | **43** |
| Egypt | 0 | 0 | 40 | 340 | 533 | 662 | **1575** |
| Iraq | 0 | 0 | 46 | 46 | 103 | 412 | **607** |
| Jordan | | | 5 | 3 | 1 | 0 | **9** |
| Kuwait | 0 | 0 | 0 | 24 | 181 | 91 | **296** |
| Lebanon | 0 | 0 | 11 | 13 | 2 | 6 | **32** |
| Libya | | | 0 | 2 | 3 | 3 | **8** |
| Mauritania | | | 0 | 1 | 20 | 66 | **87** |
| Morocco | | | 33 | 135 | 36 | 8 | **212** |
| Oman | 0 | 0 | 0 | 10 | 32 | 62 | **104** |
| Palestine | | | 1 | 1 | 3 | 0 | **5** |
| Qatar | 0 | 0 | 1 | 9 | 26 | 37 | **73** |
| Saudi_Arabia | | | 8 | 149 | 323 | 492 | **972** |
| Somalia | | | 0 | 28 | 45 | 15 | **88** |
| Sudan | | | 2 | 26 | 234 | 197 | **459** |
| Syria | | | 2 | 1 | 1 | 2 | **6** |
| Tunisia | | | 8 | 32 | 8 | 1 | **49** |
| United_Arab_E | 0 | 0 | 5 | 93 | 164 | 27 | **289** |
| Yemen | | | | 0 | 77 | 87 | **164** |
| **Total** | **0** | **0** | **201** | **1328** | **2025** | **2336** | **5890** |

From the Table 7, we apply a Roll-Up operation on dimension 2. The example becomes the number of deaths by Month (Dimension 1) and Zone (Dimension 2).

Table 8: Number of deaths by Month and Zone

| | Month | | | | | | |
|---|---|---|---|---|---|---|---|
| Zone | January | February | March | April | May | June | Total |
| Africa Horn | | | 0 | 30 | 65 | 36 | **131** |
| Fertile Crescent | 0 | 0 | 65 | 64 | 110 | 420 | **659** |
| Greater Maghreb | 0 | 0 | 76 | 579 | 269 | 199 | **1123** |
| Gulf countries | 0 | 0 | 18 | 289 | 812 | 822 | **1941** |
| Nile Valley | 0 | 0 | 42 | 366 | 767 | 859 | **2034** |
| Other | | | | | 2 | 0 | **2** |
| **Total** | **0** | **0** | **201** | **1328** | **2025** | **2336** | **5890** |

In the following example, we apply again a Roll-Up operation on Dimension 2. This example analyses the number of cases by Month (Dimension 1) and Continent (Dimension 2).

Table 9: Number of deaths by Month and Continent

| | Month | | | | | | |
|---|---|---|---|---|---|---|---|
| Continent | January | February | March | April | May | June | Total |
| Africa | 0 | 0 | 118 | 975 | 1103 | 1094 | **3290** |
| Asia | 0 | 0 | 83 | 353 | 922 | 1242 | **2600** |
| **Total** | **0** | **0** | **201** | **1328** | **2025** | **2336** | **5890** |

Unlike Table 4, we note in Table 7 the highest number of deaths was recorded in Egypt as Country, Nile Valley as Zone and Africa as Continent.

The next example concerns the percentage of deaths compared to the sum of cases and deaths by Interval of population (Dimension 1) and the Month (Dimension 2). Table 10 shows that the percentage of deaths increases with the number of population ([0, 4[: 0.19% and [50, 100[: 3.11%).

Table 10: Percentage of deaths by Interval and Month

| | Interval | | | | | |
|---|---|---|---|---|---|---|
| Month | [0, 4[ | [4, 9[ | [9, 20[ | [20, 50[ | [50, 100[ | Average |
| January | 0,00% | 0,00% | 0,00% | 0,00% | 0,00% | **0,00%** |
| February | 0,00% | 0,00% | 0,00% | 0,00% | 0,00% | **0,00%** |
| March | 0,42% | 1,23% | 1,66% | 3,71% | 6,17% | **2,64%** |
| April | 0,10% | 0,80% | 1,21% | 2,59% | 6,80% | **2,30%** |
| May | 0,11% | 0,75% | 0,91% | 1,21% | 2,85% | **1,17%** |
| June | 0,50% | 0,92% | 0,48% | 2,03% | 2,84% | **1,35%** |
| **Average** | **0,19%** | **0,62%** | **0,71%** | **1,59%** | **3,11%** | **1,24%** |

From Table 10, we replace Month by Zone for Dimension 2, we obtain the following table. We note that the highest percentage of deaths was recorded at Nile Valleys.

Table 11: Percentage of deaths by Interval and Zone

| | Interval | | | | | |
|---|---|---|---|---|---|---|
| Zone | [0, 4[ | [4, 9[ | [9, 20[ | [20, 50[ | [50, 100[ | Average |
| Africa Horn | 0,95% | 0,00% | 3,27% | 0,00% | 0,00% | **0,84%** |
| Fertile Crescent | 0,00% | 1,72% | 1,30% | 2,92% | 0,00% | **1,19%** |
| Greater Maghreb | 0,00% | 4,14% | 4,28% | 4,75% | 0,00% | **2,63%** |
| Gulf countries | 0,12% | 0,67% | 0,68% | 0,88% | 0,00% | **0,47%** |
| Nile Valley | 5,32% | 0,00% | 0,00% | 5,98% | 3,34% | **2,93%** |
| Other | 1,12% | 0,00% | 0,00% | 0,00% | 0,00% | **0,22%** |
| **Average** | **1,25%** | **1,09%** | **1,59%** | **2,42%** | **0,56%** | **1,38%** |

The last example presents the number of cases by Interval of population (Dimension 1) and Country (Dimension 2).

Table 12: Number of Cases by Interval and Country

| | Interval | | | | | |
|---|---|---|---|---|---|---|
| Country | [0, 4[ | [4, 9[ | [9, 20[ | [20, 50[ | [50, 100[ | Total |
| Algeria | | | | 10919 | | **10919** |
| Bahrain | 18227 | | | | | **18227** |
| Comoros | 176 | | | | | **176** |
| Djibouti | 4465 | | | | | **4465** |
| Egypt | 1618 | | | | 42980 | **44598** |
| Iraq | | | | 20209 | | **20209** |
| Jordan | | | 961 | | | **961** |
| Kuwait | | 35920 | | | | **35920** |
| Lebanon | | 1446 | | | | **1446** |
| Libya | | 418 | | | | **418** |
| Mauritania | | 1783 | | | | **1783** |
| Morocco | | | | 8734 | | **8734** |
| Oman | | 23481 | | | | **23481** |
| Palestine | | 673 | | | | **673** |
| Qatar | 79602 | | | | | **79602** |
| Saudi_Arabia | | | | 127541 | | **127541** |
| Somalia | | | 2603 | | | **2603** |
| Sudan | | | | 7220 | | **7220** |
| Syria | | | 177 | | | **177** |
| Tunisia | | | 1096 | | | **1096** |
| United_Arab_ | | | 42294 | | | **42294** |
| Yemen | | | | 728 | | **728** |
| **Total** | **104088** | **63721** | **47131** | **175351** | **42980** | **433271** |

In the Annex, we present the number of cases by Code of country and Date for the May Month (Annex 1) and the number of deaths by Code of country and Date for May Month (Annex 2).

## 5. Conclusion

In this paper, we propose a multidimensional model based on four dimensions (D_Date, D_Country, D_Population and D_Sex) in order to deduce knowledge from the spreading of Coronavirus CoVID-19 in Arabic countries.
Several perspectives are possible. We intend to add colors to highlight the most important values in the tables, according to the criteria chosen by the user. In addition, we plan to integrate other dimensions to our multidimensional model, such as: Gross Domestic Product, Average Wages. Finally, we propose to extend this study to all countries of Africa and Asia.

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**Dr. Kais Khrouf** has completed his PhD. in Computer Sciences from University of Toulouse 3 (France). He has 12 years of teaching and administrative experience at University of Sfax (Tunisia) and 3 years at Jouf University (Saudi Arabia). He has supervised several Masters and Ph.D. thesis. He published more than 40 papers in international journals and conferences and he is a permanent reviewer in International Journal of Information and Decision Sciences (Inderscience Publishers). His research interests include Decision Support Systems, Data Warehouses, Multidimensional Analysis, Semi-Structured Data and Social Networks.

# Annex

## 1. Number of cases by Code of country and Date (May Month)

| | Code | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | ARE | BHR | COM | DJI | DZA | EGY | IRQ | JOR | KWT | LBN | LBY | MAR | MRT | OMN | PSE | QAT | SAU | SDN | SOM | SYR | TUN | YEM | Total |
| 01/05/2020 | 552 | 119 | | 12 | 158 | 269 | 82 | 2 | 284 | 4 | 0 | 102 | 1 | 74 | 0 | 845 | 1351 | 67 | 19 | 0 | 14 | 0 | **3955** |
| 02/05/2020 | 557 | 130 | 1 | 8 | 148 | 358 | 68 | 6 | 353 | 4 | 2 | 146 | 0 | 99 | 10 | 687 | 1344 | 0 | 0 | 1 | 4 | 1 | **3927** |
| 03/05/2020 | 561 | 114 | 0 | 15 | 141 | 298 | 66 | 1 | 242 | 4 | 0 | 160 | 0 | 36 | 0 | 776 | 1362 | 150 | 70 | 0 | 11 | 3 | **4010** |
| 04/05/2020 | 564 | 99 | 2 | 0 | 179 | 272 | 77 | 1 | 364 | 4 | 0 | 174 | 0 | 85 | 5 | 679 | 1552 | 86 | 51 | 0 | 4 | 0 | **4198** |
| 05/05/2020 | 567 | 150 | 1 | 4 | 174 | 348 | 50 | 4 | 295 | 3 | 0 | 140 | 0 | 69 | 2 | 640 | 1645 | 0 | 34 | 0 | 5 | 2 | **4133** |
| 06/05/2020 | 462 | 187 | 0 | 4 | 190 | 388 | 85 | 6 | 526 | 1 | 0 | 176 | 0 | 98 | 14 | 951 | 1595 | 100 | 79 | 0 | 4 | 9 | **4875** |
| 07/05/2020 | 546 | 214 | 4 | 0 | 159 | 387 | 49 | 2 | 485 | 9 | 1 | 189 | 0 | 168 | 8 | 830 | 1687 | 74 | 38 | 1 | 3 | 4 | **4858** |
| 08/05/2020 | 502 | 265 | 0 | 13 | 185 | 393 | 63 | 21 | 278 | 34 | 0 | 140 | 0 | 55 | 1 | 918 | 1793 | 78 | 55 | 0 | 1 | 1 | **4796** |
| 09/05/2020 | 553 | 245 | 0 | 2 | 187 | 495 | 60 | 14 | 641 | 12 | 0 | 163 | 0 | 154 | 0 | 1311 | 1701 | 181 | 0 | 2 | 4 | 8 | **5733** |
| 10/05/2020 | 624 | 330 | 3 | 54 | 189 | 488 | 76 | 14 | 415 | 13 | 0 | 199 | 0 | 112 | 0 | 1130 | 1704 | 53 | 69 | 0 | 2 | 0 | **5475** |
| 11/05/2020 | 781 | 167 | 0 | 21 | 165 | 436 | 88 | 18 | 1065 | 36 | 0 | 153 | 0 | 175 | 0 | 1189 | 1912 | 199 | 57 | 0 | 0 | 17 | **6479** |
| 12/05/2020 | 680 | 295 | 0 | 17 | 168 | 346 | 51 | 22 | 598 | 14 | 0 | 218 | 0 | 175 | 0 | 1103 | 1966 | 163 | 35 | 0 | 0 | 5 | **5856** |
| 13/05/2020 | 783 | 295 | 0 | 29 | 176 | 347 | 95 | 14 | 991 | 11 | 0 | 137 | 0 | 147 | 0 | 1526 | 1911 | 135 | 81 | 0 | 0 | 11 | **6689** |
| 14/05/2020 | 725 | 285 | 0 | 12 | 186 | 338 | 119 | 6 | 751 | 8 | 0 | 94 | 1 | 298 | 1 | 1390 | 1905 | 157 | 49 | 1 | 0 | 3 | **6329** |
| 15/05/2020 | 698 | 382 | 0 | 16 | 189 | 398 | 111 | 4 | 947 | 8 | 0 | 95 | 7 | 322 | 0 | 1733 | 2039 | 146 | 65 | 0 | 0 | 17 | **7177** |
| 16/05/2020 | 747 | 385 | 0 | 25 | 187 | 399 | 50 | 10 | 885 | 5 | 0 | 45 | 13 | 284 | 6 | 1153 | 2307 | 0 | 0 | 2 | 3 | 19 | **6525** |
| 17/05/2020 | 796 | 164 | 0 | 22 | 192 | 491 | 67 | 11 | 942 | 11 | 1 | 89 | 0 | 404 | 0 | 1547 | 2840 | 0 | 73 | 1 | 0 | 18 | **7669** |
| 18/05/2020 | 731 | 209 | 0 | 70 | 198 | 510 | 144 | 6 | 1048 | 9 | 0 | 129 | 33 | 157 | 6 | 1632 | 2736 | 325 | 64 | 7 | 2 | 4 | **8020** |
| 19/05/2020 | 832 | 228 | 0 | 117 | 182 | 535 | 150 | 16 | 841 | 20 | 0 | 82 | 19 | 193 | 7 | 1365 | 2593 | 302 | 34 | 0 | 6 | 2 | **7524** |
| 20/05/2020 | 873 | 348 | 23 | 0 | 176 | 720 | 57 | 20 | 1073 | 23 | 3 | 71 | 0 | 292 | 3 | 1637 | 2509 | 0 | 47 | 0 | 1 | 37 | **7913** |
| 21/05/2020 | 941 | 356 | 0 | 310 | 165 | 745 | 113 | 23 | 804 | 7 | 1 | 110 | 50 | 372 | 7 | 1491 | 2691 | 137 | 71 | 0 | 1 | 13 | **8408** |
| 22/05/2020 | 894 | 286 | 0 | 219 | 186 | 774 | 153 | 12 | 1041 | 63 | 2 | 78 | 42 | 327 | 25 | 1554 | 2532 | 410 | 21 | 0 | 1 | 13 | **8633** |
| 23/05/2020 | 994 | 240 | 44 | 223 | 190 | 783 | 87 | 16 | 955 | 62 | 1 | 121 | 0 | 424 | 0 | 1830 | 2642 | 240 | 0 | 1 | 2 | 12 | **8867** |
| 24/05/2020 | 812 | 388 | 0 | 0 | 195 | 827 | 308 | 4 | 900 | 11 | 3 | 74 | 54 | 463 | 0 | 1732 | 2442 | 250 | 0 | 11 | 0 | 7 | **8481** |
| 25/05/2020 | 781 | 336 | 9 | 0 | 193 | 652 | 197 | 4 | 838 | 17 | 0 | 27 | 10 | 513 | 0 | 1501 | 2399 | 6 | 0 | 16 | 3 | 10 | **7512** |
| 26/05/2020 | 822 | 33 | 0 | 198 | 197 | 702 | 163 | 3 | 665 | 5 | 0 | 99 | 0 | 0 | 0 | 1751 | 2235 | 192 | 95 | 20 | 0 | 15 | **7195** |
| 27/05/2020 | 779 | 195 | 0 | 0 | 194 | 789 | 216 | 7 | 608 | 21 | 2 | 45 | 25 | 348 | 3 | 1742 | 1931 | 150 | 22 | 15 | 0 | 12 | **7104** |
| 28/05/2020 | 883 | 267 | 0 | 229 | 160 | 910 | 287 | 2 | 692 | 21 | 22 | 24 | 30 | 255 | 8 | 1740 | 1815 | 170 | 20 | 0 | 0 | 6 | **7541** |
| 29/05/2020 | 563 | 419 | 0 | 217 | 140 | 1127 | 322 | 8 | 845 | 7 | 6 | 42 | 0 | 636 | 12 | 1967 | 1644 | 200 | 97 | 0 | 17 | 23 | **8292** |
| 30/05/2020 | 638 | 397 | 0 | 0 | 137 | 1289 | 416 | 2 | 1072 | 4 | 13 | 71 | 131 | 811 | 0 | 1993 | 1581 | 175 | 0 | 1 | 3 | 9 | **8743** |
| 31/05/2020 | 726 | 344 | 19 | 280 | 133 | 1367 | 306 | 4 | 1008 | 19 | 12 | 66 | 60 | 603 | 1 | 2355 | 1618 | 279 | 88 | 0 | 5 | 23 | **9316** |
| **Total** | **21967** | **7872** | **106** | **2117** | **5419** | **18181** | **4176** | **283** | **22452** | **470** | **69** | **3459** | **476** | **8149** | **119** | **42698** | **61982** | **4425** | **1334** | **79** | **96** | **304** | **206233** |

## 2. Number of deaths by Code of country and Date (May Month)

| | Code | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | ARE | BHR | COM | DJI | DZA | EGY | IRQ | JOR | KWT | LBN | LBY | MAR | MRT | OMN | PSE | QAT | SAU | SDN | SOM | SYR | TUN | YEM | Total |
| 01/05/2020 | 7 | 0 | | 0 | 6 | 12 | 1 | 0 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 5 | 3 | 0 | 0 | 0 | 2 | **44** |
| 02/05/2020 | 6 | 0 | 0 | 0 | 3 | 14 | 1 | 0 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 7 | 0 | 0 | 0 | 1 | 0 | **39** |
| 03/05/2020 | 8 | 0 | 0 | 0 | 6 | 9 | 1 | 1 | 3 | 1 | 0 | 2 | 0 | 1 | 0 | 0 | 7 | 10 | 3 | 0 | 1 | 0 | **53** |
| 04/05/2020 | 7 | 0 | 0 | 0 | 4 | 14 | 2 | 0 | 5 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 8 | 0 | 1 | 0 | 0 | 0 | **42** |
| 05/05/2020 | 11 | 0 | 1 | 0 | 2 | 7 | 1 | 0 | 2 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 7 | 0 | 3 | 0 | 1 | 0 | **40** |
| 06/05/2020 | 9 | 0 | 0 | 0 | 5 | 16 | 4 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 9 | 4 | 3 | 0 | 0 | 1 | **53** |
| 07/05/2020 | 11 | 0 | 0 | 1 | 6 | 17 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 9 | 4 | 1 | 0 | 0 | 2 | **56** |
| 08/05/2020 | 8 | 0 | 0 | 0 | 7 | 13 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 10 | 3 | 5 | 0 | 1 | 1 | **51** |
| 09/05/2020 | 9 | 0 | 0 | 0 | 5 | 21 | 2 | 0 | 3 | 1 | 0 | 3 | 0 | 1 | 0 | 0 | 10 | 7 | 0 | 0 | 1 | 1 | **64** |
| 10/05/2020 | 11 | 0 | 0 | 0 | 6 | 11 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 10 | 5 | 4 | 0 | 0 | 0 | **55** |
| 11/05/2020 | 13 | 0 | 0 | 0 | 8 | 11 | 2 | 0 | 9 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 7 | 6 | 3 | 0 | 0 | 1 | **63** |
| 12/05/2020 | 3 | 0 | 0 | 0 | 5 | 8 | 1 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 4 | 1 | 0 | 0 | 1 | **39** |
| 13/05/2020 | 2 | 1 | 0 | 0 | 8 | 11 | 2 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 6 | 0 | 0 | 0 | 2 | **51** |
| 14/05/2020 | 3 | 1 | 0 | 0 | 7 | 12 | 3 | 0 | 7 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 9 | 10 | 0 | 0 | 0 | 1 | **54** |
| 15/05/2020 | 2 | 0 | 0 | 0 | 7 | 15 | 0 | 0 | 6 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 10 | 1 | 1 | 0 | 0 | 1 | **47** |
| 16/05/2020 | 2 | 2 | 0 | 1 | 7 | 21 | 2 | 0 | 8 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 2 | **55** |
| 17/05/2020 | 4 | 0 | 0 | 0 | 6 | 20 | 4 | 0 | 11 | 0 | 0 | 2 | 0 | 2 | 0 | 1 | 10 | 0 | 2 | 0 | 0 | 4 | **66** |
| 18/05/2020 | 6 | 0 | 0 | 0 | 6 | 18 | 2 | 0 | 5 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 10 | 6 | 1 | 0 | 0 | 1 | **57** |
| 19/05/2020 | 4 | 0 | 0 | 3 | 7 | 15 | 4 | 0 | 6 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 8 | 8 | 1 | 0 | 1 | 0 | **61** |
| 20/05/2020 | 3 | 0 | 0 | 0 | 6 | 14 | 4 | 0 | 3 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 9 | 0 | 2 | 0 | 1 | 8 | **52** |
| 21/05/2020 | 6 | 0 | 0 | 2 | 7 | 21 | 3 | 0 | 3 | 0 | 0 | 1 | 0 | 3 | 0 | 1 | 10 | 6 | 2 | 0 | 0 | 1 | **66** |
| 22/05/2020 | 4 | 0 | 0 | 1 | 7 | 16 | 6 | 0 | 5 | 0 | 0 | 2 | 1 | 1 | 0 | 1 | 12 | 10 | 0 | 0 | 0 | 4 | **70** |
| 23/05/2020 | 4 | 0 | 0 | 0 | 7 | 11 | 7 | 0 | 9 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 13 | 16 | 0 | 1 | 0 | 0 | **72** |
| 24/05/2020 | 3 | 1 | 0 | 0 | 10 | 28 | 5 | 0 | 10 | 0 | 0 | 1 | 1 | 4 | 1 | 2 | 15 | 9 | 0 | 0 | 1 | 6 | **97** |
| 25/05/2020 | 1 | 1 | 0 | 0 | 8 | 29 | 8 | 0 | 8 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 11 | 0 | 0 | 0 | 0 | 3 | **73** |
| 26/05/2020 | 3 | 0 | 0 | 4 | 9 | 19 | 3 | 0 | 9 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 9 | 19 | 5 | 0 | 0 | 3 | **87** |
| 27/05/2020 | 5 | 0 | 0 | 0 | 8 | 14 | 6 | 0 | 7 | 0 | 0 | 2 | 3 | 0 | 0 | 2 | 12 | 5 | 1 | 0 | 0 | 4 | **69** |
| 28/05/2020 | 2 | 1 | 1 | 4 | 6 | 19 | 6 | 0 | 3 | 0 | 1 | 0 | 7 | 1 | 0 | 2 | 14 | 14 | 0 | 0 | 0 | 4 | **85** |
| 29/05/2020 | 3 | 0 | 0 | 2 | 7 | 29 | 4 | 0 | 10 | 0 | 1 | 0 | 0 | 2 | 0 | 3 | 16 | 11 | 5 | 0 | 0 | 4 | **97** |
| 30/05/2020 | 2 | 0 | 0 | 0 | 8 | 34 | 6 | 0 | 9 | 0 | 0 | 0 | 4 | 0 | 0 | 3 | 17 | 38 | 0 | 0 | 0 | 9 | **130** |
| 31/05/2020 | 2 | 2 | 0 | 2 | 8 | 34 | 10 | 0 | 11 | 0 | 0 | 2 | 1 | 2 | 0 | 0 | 22 | 29 | 1 | 0 | 0 | 11 | **137** |
| **Total** | **164** | **9** | **2** | **20** | **202** | **533** | **103** | **1** | **181** | **2** | **3** | **36** | **20** | **32** | **3** | **26** | **323** | **234** | **45** | **1** | **8** | **77** | **2025** |