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Study Effect of Some Atmospheric Elements on COVID-19 Infections in Iraq

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ABSTRACT

In late 2019 and in Wuhan, a new disease appears, consider as an extension of SARS-COV2 epidemic. This epidemic virus has configured a danger to global health. We studied the effect of some atmospheric elements in Iraq with a number of (COVID-19) infections. In this study daily infections in three regions of Iraq compares with (Tmax-Tmin) and (RH) observed in stations Mosul (represent north region), Baghdad and Rutba (represent middle regions), and Basra (represent south region). It's found that increasing the difference between Tmax and Tmin means more infections, except for the northern province. As for the relative humidity, it is inversely proportional to infections with the correlation coefficient R = -0.6 in Baghdad station, and in the southern province with R = -0.32, and the opposite occurs in the northern province. The results also indicate that increasing the relative humidity to more than 70% was effective in increasing the infections. Solar radiation was studied over the city of Baghdad and its effect on infections because solar radiation contains a large proportion of ultraviolet rays that killed many viruses, the study indicates an inverse relationship because most of the patients are infected in the shade and there is no clear relationship.

KEYWORDS: COVID-19; temperature differences; relative humidity; Iraq provinces; Relationship

الخلاصة

في أواخر عام 2019 وفي ووهان ، ظهرت حالة وفاة جديدة ، تعتبر امتدادًا لوباء سارس - COV2. شكل هذا الفيروس الوبائي خطرا على الصحة العالمية. في هذا البحث درسنا تأثير بعض عناصر الغلاف الجوي في العراق مع عدد الإصابات بـ (COVID-19). في هذه الدراسة ، تُقارن الإصابات اليومية في ثلاث مناطق من العراق مع (Tmax-Tmin) و (RH) التي لوحظت في محطات الموصل (تمثل المنطقة الشمالية)، بغداد والرطبة (تمثل المناطق الوسطى) والبصرة (تمثل المنطقة الجنوبية). وجد أن زيادة الفرق بين Tmax و Tmin يعني المزيد من الإصابات ، باستثناء المحافظات الشمالية أما بالنسبة للرطوبة النسبية فهي تتناسب عكسياً مع الإصابات بمعامل ارتباط مقداره R = -0.6 في محطة بغداد ، وفي المحافظات الجنوبية بقيمة R = -0.32 ، والعكس يحدث في المحافظات الشمالية. كما أشارت النتائج إلى أن زيادة الرطوبة النسبية إلى أكثر من 70٪ كانت فعالة في زيادة العدوى. تمت دراسة الاشعاع الشمسي فوق مدينة بغداد وتأثيره على الالتهابات لان الاشعاع الشمسي يحتوي على نسبة كبيرة من الاشعة فوق البنفسجية التي تقتل العديد من الفيروسات وتشير الدراسة الى وجود علاقة عكسية لان اغلب المرضى المصابون هم في منطقة الظل ولا يوجد صلة واضحة.

INTRODUCTION

Covid19 constitute the subfamily, in the family coronavirus. The name coronavirus is derived from the Latin word corona, meaning crown or halo, which could be seen under an electron microscope [1]. For about 5%-30% of total respiratory infections, SARSCoV caused an epidemic in 2002-2003 leading to the severe acute respiratory syndrome in 8000 subjects and 750 deaths.

Coronavirus classified to groups, first group put in HCoV-NL63, while second group consider in SARS-CoV. Signs of infection by SARS-CoV are represented by Acute respiratory due to the mutation or recombination of human and animal CoV [2]. Specialists from World Health Organization (WHO) and centers for disease control and prevention (CDC) identified the SARS-CoV as a causative agent for that outbreak [3]. Through December 2019 in Wuhan several cases of pneumonia are displaied with a novel (coronavirus infection disease-19). Where four cases of unknown infection by new pneumonia are reported in this region, this unknown pneumonia infection has very similar to the signs of infection resulted from SARS-COV that exposure at 2003[4]. After disappear SARS-Cov-2 epidemic

in Wuhan , and redisplay as Covid-19 it's become very difficult to management the case because it posed a challenge to health authorities especially in developing countries which were not ready to cope with it[5]. Its expansion is very large in cities, but in along an east west latitudes 30-50 N" these regions correlated with similar weather patterns (moderate temperature and low absolute humidity).

This study concentrated on the effect of some atmospheric elements such as temperature, relative humidity and solar radiation on new Covid-19 epidemic virus after increase infection recorded in most Iraqi cities in later February-2020.

Effect of Atmospheric element on Covid-19 epidemic

Most respiratory infection was enhanced in conditions of low temperature and low humidity this confirmed by researchers [6]. Respiratory disease resulted from low humidity in some cases this considers as important risk factor. Humidity values play large role out mortality, and low-humidity levels may cause a large increase in mortality rates in some cases these facts come from a study with data of more than 25 years, this is due to theoretically by influenza correlated mechanisms. Reliable to these conclusions, our results also indicated that the risk of disappearing from COVID-19 decreased only with absolute humidity increasing. Clearance reduced in breathing dry air to restraint infection more susceptible to respiratory virus infection the development of droplet nuclei is vital to diffusion, but exhaled respiratory droplets settle very rapidly at high humidity so that it is hard to contribute to influenza virus spread [7]. Moreover, the transmission of pandemic influenza virus is the most efficient under cold and dry conditions, and influenza virus survival rate increased markedly in accordance with decreasing of absolute humidity [8] which is similar to coronavirus. Therefore, the growth of COVID-19 mortality may also be linked to the lower humidity in winter.

However, the role of temperature and humidity in the propagation of COVID-19 has not been determined [9]. Thus Coronaviruses belong to the so-called "enveloped virus" families because they are surrounded a layer of oily coating known as the lipid bilayer. Under colder conditions, the lipid bilayer will harden into a rubber-like shape to protect the virus, Therefore, most enveloped viruses tend to exhibit strong seasonality [10]. Past research found that influenza viruses have a certain sensitivity to ultraviolet radiation [11]. Consequently, it has been assumed that viruses ejected into the atmosphere experience lower inactivation rates during seasons with reduced solar activity on sun, regular with moderate epidemics occurring during the winter and tropical epidemics during the raining seasons [12][9]. UV-B radiation is a fraction of the short-wave radiation from the sun reaching the surface, with a wavelength of 290–320 nm[9]. Maximum of the medium wave ultraviolet energies contained in rays are absorbed by the Ozone layer, and less than 2% can extent to surface of the earth, which is particularly strong during the summer and afternoon hours. UV-B radiation has an erythema effect on the human body and can encourage mineral metabolism and vitamin D formation in the body. The duration of human exposure to solar radiation can also regulate the level of vitamin D in the body, which can regulate invulnerability on a seasonal time scale[13]. Therefore, in temperate regions, winter solar radiation is the lowest, and vitamin D is generally scarce among the population[9]. Other studies have revealed that people with lower vitamin D levels are significantly more expected to be ill with respiratory disease [14]. Due to factors such as cloudy weather, the lowest solar radiation levels in tropical regions usually correspond with the local rainy season, which are also consistent with the relationship between tropical epidemics and rainy seasons[15]. Furthermore, above studies have identified the role of meteorological factors in Virus transmission and infection, which suggests that the impact of environmental Meteorological factors on COVID-19 requires further investigation[9]. Another factor that can be affected by infection is mixing the population, and government strategies to prevent infected people from mixing with others such as quarantine.

Location and Data

Iraq is located in the northern part of the subtropical region; the Northwest winds dominate most parts of the country for long periods of the year. The presence of Iraq to the east of the Mediterranean makes it affected by the climate of this region during the winter, which makes it a moderate climate rainy during this season, in

addition, the existence of Iraq close to the Arabian Gulf region presents it to hot and humid winds accompanied by cyclones most of the time causing dust stirring [16].

Data used in this study involve of two types, daily meteorological observations from Iraqi Meteorological Organization and Seismology (IMOS) that comprised (maximum relative humidity, wind speed and direction). Consequently, only four stations Mosul, Baghdad, Rutba, Basra occupied that denote regions north (Mosul), middle (Baghdad and Rutba) and south (Basra) individually. Solar radiation doesn't have a large variable over Iraq station, thus only total solar radiation from Baghdad station represented by atmospheric sciences department station that install over sciences college building is Adopted to obtain radiation data, see Figure 1. While the daily Infections are taken from the ministry of health and environment in Iraq.

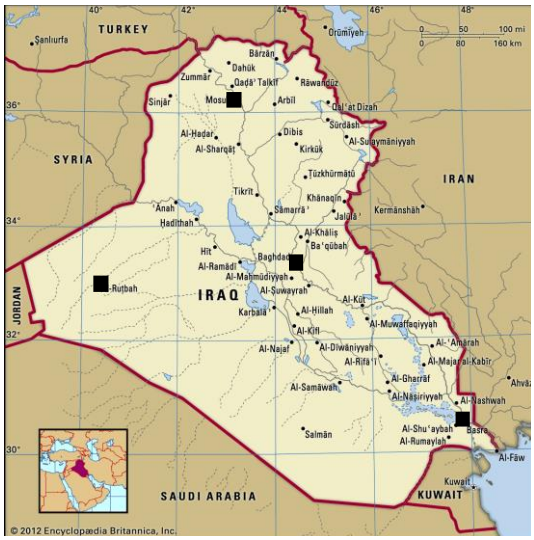

Figure 1. Map of Iraq and surrounding [17].

RESULTS AND DISCUSSION

Temperature effect

The change in temperature between daytime and nighttime could effect on the structure of the humanity body, and increases effect to infection influenza. In this study instantaneous difference between the maximum and minimum hourly temperature recorded through the period from 26-2-2020 to 30-5-2020 is plotted with the number of the infection in three main regions in Iraq, it noted that number of infection is increase with increase of the difference between the T_{max} and T_{min}, this case true where increase in difference between max. &min. temperature effected on infection by influenza and this case concede in results in middle provinces where the correlation coefficient is 0.414 as shown in fig. 3, but this rate is decreases in the south provinces to 0.007 as shown in fig. 4 this consider a weak relation, this return to the nature of this region that consider as plane land, where it is not lifted on the sea level only about 1-3 meter , this region classified as wetland, and difference between max-min temperature very small relative to the middle and west regions (provinces).

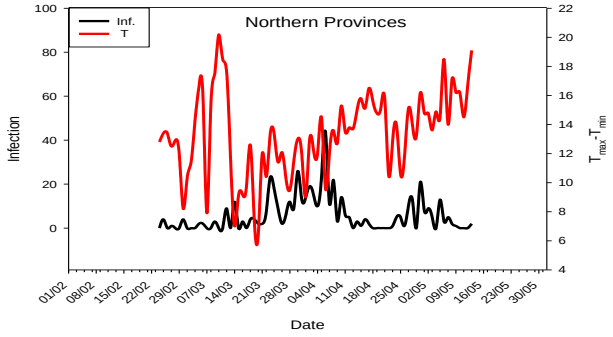

Figure 2. Variation of infections with temperature difference at period from 27-2-2020 to 15-5-2020 at north province region.

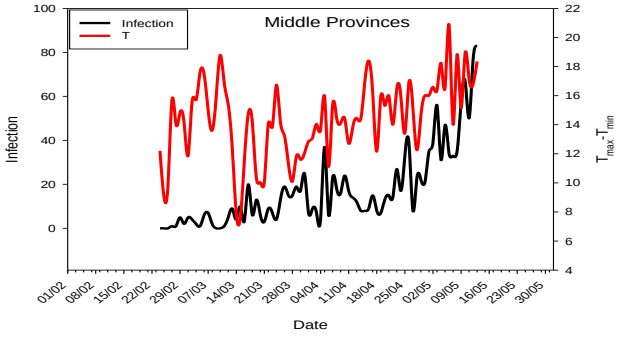

Figure 3. Variation of infections with temperature difference at period from 27-2-2020 to 15-5-2020 at middle province region.

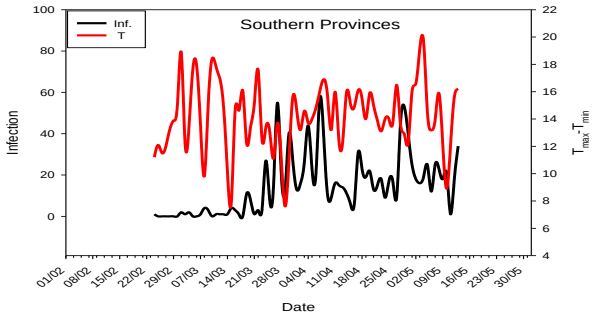

Figure 4. Variation of infections with temperature difference at period from 27-2-2020 to 15-5-2020 at south province region.

In north provinces the relation is reverse, where the infection is smaller relative to other regions, correlation coefficient record about -0.414 as shown in fig. 2, from the results its notes that the relationship between infection and the range of difference between temperature is weak, this conclusion is return to the other element ruled this case, such as the number of population and the crowed in the general places social relation and modes. These cases also return to the government procedure to reduce infection. The infections may be return to health procedure and the obligation people to this procedure, thus most high infection is in the middle provinces about 1384 in 30-5-2020 and about 1171 in the southern region province while about 477 in north provinces.

Relative Humidity

In this study, relative humidity is assessment, to effected on the number of infection for covid-19, from plotted number of daily infection, with daily values of RH observed, it noted there is inverse relationship, especially in the medium provinces, with correlation coefficient with R=-0.6, this relation continuous in the south provinces with R=-0.32. In the north provinces relative humidity increase because the nature of this region to about 88.7%, thus there is positive relation with increase infection in this region with R=0.11, while the highest values for RH in the medium and south region is about 68.7% and 71.3%.

Generally, from the examination data, there is relation between relative humidity and the temperature in one hand, and relation with infection in other hand, thus relative humidity to 70% in this scope temperature difference is operative on the infection number and the association between the two is directly relational and with growth relative humidity over this value, the infection increases with stopover temperature difference constant.

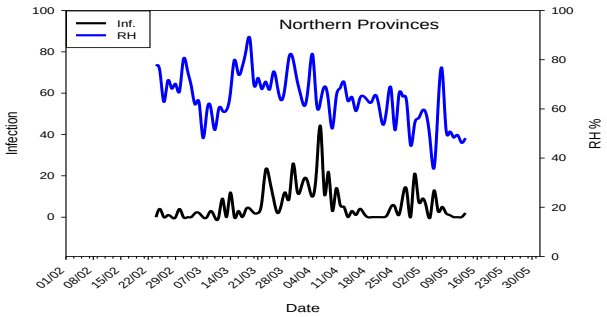

Figure 5. Variation of infections with relative humidity at period from 27-2-2020 to 15-5-2020 at north provinces.

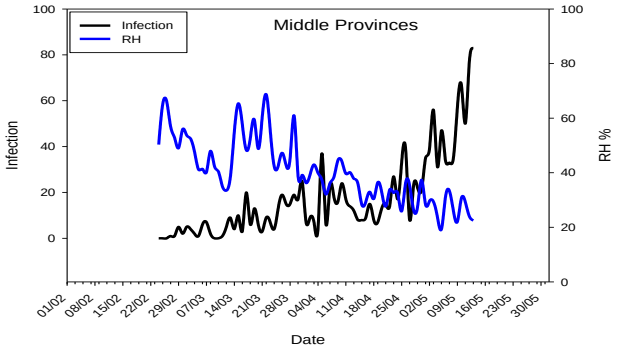

Figure 6. Variation of infections with relative humidity at period from 27-2-2020 to 15-5-2020 at medium provinces.

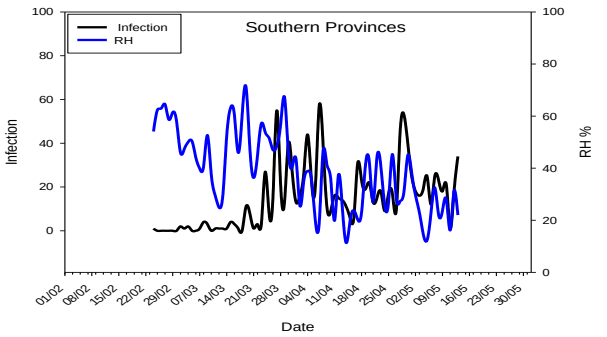

Figure 7. Variation of infections with relative humidity at period from 27-2-2020 to 15-5-2020 at south provinces.

Although relationship between RH and infection number weak and not stable, and fluctuated, and results refer other factor effected such as number of population, for example the reason to increase infection in the middle provinces, specifically Baghdad provinces that consider as capital of Iraq and Karbala that wetness events of pairing from large number of people because Religious nature, while the north provinces characterized scarce in number of population because the geographical nature of this region where most of lands consist of mountains.

On the other hand, there are other means that can

influence and limit the spread of the epidemic, such as home health reservation. The government-imposed health reservation within 20 days on 20-2-2020 to 18-4-2020 has significantly reduced infection, as rates have decreases within 12 days of imposing healthy protection, but it increased again after booking raised. In general, adopting healthy methods to prevent infection and social divergence can contribute significantly to reducing infection.

Solar Radiation

Solar radiation can affect the virus processes, where exposure any viruses to solar radiation can kill it, because its contain UV radiation. Spatial distribution of solar radiation data over Iraq is not available in every location and constricted on city center such as Baghdad and some stations. In this study only daily global solar radiation in Baghdad is consider, and plotted with daily infection by covid19. Figure 8, shows behavior of total infection recorded in Baghdad province from end of January month to the end of the May month. Overall all there is stable number increases of the infection at these period, but stay beyond the average that is about 37infection, but at day 9-5-2020 infection increase to 54 cases, it's more the average. The cases of infections in Baghdad increased every day but the number of cases stays beyond 100 up to day 17-5-2020, where daily recorded infection jump to 105 cases. The infection also gradually continuous to increases until reach to large value 274 cases in 23-5-2020, see figure 8. Figure 8 displays also the relationship between solar radiation and the infection numbers. It can notes ascending increases in solar radiation, because there is trends towards summer months, in this season there is increases in solar radiation amount over the general average about 269 W/m^2, the increases started from April. The finger refers to direct relationship with the correlation coefficient more than 0.5. This relationship does not mean clear effect of solar radiation on increase infection, although medical facts say solar radiation effected on limited virus life. The reverse relation effect of the solar radiation can be understood if you assumed that most infected patients is stay in the shadow and there is no direct exposure to the spray from coughing to the radiation, in other hand covid19 consider new virus and information about the nature of its action don't clear, but the best action is stay far from the social closeness.

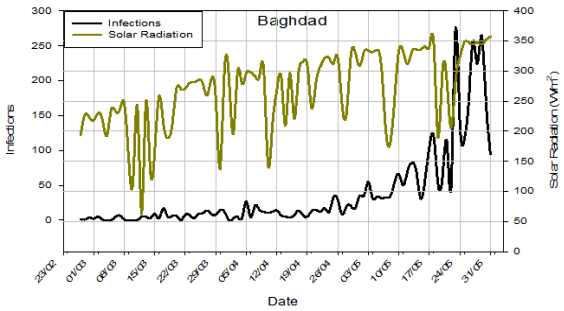

Figure 8. Variation of infections with solar radiation at period from 27-2-2020 to 15-5-2020 for Baghdad province.

CONCLUSION

At the beginning of the current year 2020, COVID-19 epidemic spread in the world and in the cities of Iraq and governorates, and because the virus is new and has no information about its behavior or inoculation, many theories about the effect of weather and environmental factors on it prevalent and that it is spreading in a particular season. The request here is: Do weather features such as temperature, humidity, and solar radiation limit the blowout of this epidemic, particularly during the conversion from winter to summer through spring, the temperature intensifications and the amount of solar radiation in the northern hemisphere, together with Iraq. The current study deals with the effect of daily rates of temperature and different maximum and minimum temperatures in addition to the relative humidity of selected stations demonstrating the northern, central and southern regions of Iraq, as well as the total amount of total solar radiation for the Baghdad station the central region of Iraq, the data used strained from winter and spring to part of The summer season, when these connections were compared with the daily recordings to prepare the infection from the epidemic to find a straightforward mathematical relationship, thus knowing which of these weather-related factors affects the preparation of the recorded daily infection. Unfortunately, the results of this study, in this sample of data were disappointing, as we did not notice the presence of a direct effect of temperature and its difference on the rates of increase in the numbers of infection and the mathematical relationship was mostly

counterproductive, whereas the relative humidity values may have a comparative impact on the spread of the virus, the reason is due to the effect of vapor pressure on the wall of the fatty virus. As for the effect of solar radiation containing UV-B, which greatly affects the work of the virus, the relationship is also indirect and also indirectly influences by increasing the resistance of the infected body to the virus and infection by increasing exposure and taking quantities of vitamin D, which works on the body gained natural protection to fight viruses, especially the Corona epidemic.

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