BAU Journal - Health and Wellbeing

Volume 4 | Issue 2
ISSN: 2617-1635

Article 7

April 2022

COVID-19 IN LEBANON: DEMOGRAPHICS AND DISTRIBUTION

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Abstract

COVID-19 pandemic has emerged over more than 200 countries leading to more than 117 million infection cases and more than 2.6 million deaths. Lebanon is one of the countries affected by this disease especially in the second half of 2020 reaching its peak early this year. In this study, we studied the impact of multiple factors on this surge and analyzed the positive tests among different age groups over a period of one year (from March 2020 to February 2021). Data was collected from one medical center in Beirut where more than 20,000 PCR tests were done using RT-PCR method between March 2020 and February 2021 and analyzed the pattern of increase of the rate of positivity over this period. The SARS-CoV-2 positivity rate was 13% over a period of one year. The highest number of positive PCR tests was in patients aged between 20 and 39 years. Furthermore, the number of positive tests was low in the first 4 months, which was followed by a dramatic increase in July 2020 reaching a peak in January 2021. Lebanon is among the countries affected lately by the COVID-19 pandemic with most cases arising after August 2020 affected by the blast of Beirut and emergence of new variants resulting in higher positivity rate. Moreover, our data shows a distribution of age similar to other countries and suggest its role in the rapid increase of positivity rate.

Keywords

COVID-19, COVID-19 demographics, SARS-CoV-2, Lebanon, Pandemic.

1. INTRODUCTION

In December 2019, an outbreak of unusual viral pneumonia was caused by a new severe respiratory coronavirus in Wuhan, a city in the Hubei province of China. This newly discovered coronavirus was then referred to as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the disease as coronavirus disease 2019 (COVID-19)(Hu, Guo, Zhou, & Shi, 2021). The exponential increase in the number of new cases led the World Health Organization to declare the COVID-19 a global pandemic in March 11, 2020 (Cucinotta & Vanelli, 2020). Ever since its discovery by the end of 2019, SARS-CoV-2 has quickly spread around the world and breached the boundaries of more than 200 countries, leading to more than 117 million infection cases and 2.6 million deaths as of March 9, 2021 (Coronavirus Outbreak. Available at: https://www.worldometers.info/coronavirus/. Accessed March 9; Esakandari et al., 2020). COVID-19 has been identified as a highly contagious infectious disease, with different mechanisms of transmission being reported. Droplets, aerosol and airborne transmission were documented (Hu et al., 2021; Meyerowitz, Richterman, Gandhi, & Sax, 2021). The average number of infected cases generated from an index case is the definition of reproductive number, or R0 and is estimated in a range from 2 to 3 in SARS-CoV-2 with higher estimates (up to 14.8) being reported (Meyerowitz et al., 2021; Salzberger et al., 2020). Clinically, the severity of symptoms ranges from totally asymptomatic or mild symptoms to severe illness and death (Esakandari et al., 2020). Regarding the age distribution, infection can occur in all groups (Singhal, 2020). However, the susceptibility to SARS-CoV-2 varies across different groups where it increases with age (Zhang et al., 2020). Older age is also associated with greater disease severity and increased morbidity and mortality (Harrison, Lin, & Wang, 2020). Moreover, other comorbidities as chronic lung disease, cardiovascular disease, hypertension, obesity and diabetes are associated with poor prognosis with higher risk of deteriorating outcomes (Sanyaolu et al., 2020).

In Lebanon, the first case was reported on February 21, 2020, and since then the number of cases has expanded to total of 395,588 cases and 5094 deaths as of March 7, 2021 (MOPH, 2021). However, this increase and its distribution among different groups of ages in Lebanon wasn't discussed or analyzed before. Consequently, we collected data from one medical center in Beirut, over a period of approximately one year where more than 20,000 SARS-CoV-2 Reverse transcriptase - polymerase chain reactions (RT-PCR) were done. Data were analyzed to assess the monthly and total percentages of positivity, to determine the distribution of positive tests over different groups of age and to evaluate the number of hospitalized patients among the positive cases.

2. MATERIALS AND METHODS

This is a retrospective, non-interventional, descriptive study to assess the rate of positivity of COVID-19 in one hospital center in Beirut, Lebanon. All positive and negative Reverse Transcriptase - Polymerase Chain Reaction (RT-PCR) tests done in one medical center in Beirut were evaluated over a period of one year between March 2020 and February 2021.

Regarding the clinical specimens, we carried out a secondary analysis of molecular data including all nasopharyngeal swab specimens tested for SARS-CoV-2 using RT-PCR. All Positive and negative test results were included. Inconclusive results specimens were excluded.

As for the nucleic acid extraction, QIAamp viral RNA kits and Liferiver EX3600 automated nucleic acid extraction system were used. RT-PCR reaction was done on Qiagen Rotor-Gene Q system following the protocol provided by the manufacturer targeting 3 genes (E, N and RdRp genes).

We assessed the number of positive tests among the total tests done in the medical center over the period of the study. In addition, number of positive and total tests were compared between different age groups (Group 1:0 to 19 years, group 2: 20 to 39 years, group 3: 40 to 60 years, group 4: 60 and above) and months.

A chi-squared test was used to evaluate any significant difference between the categorical variables. Statistical Package for Social Science software (SPSS, Inc., version 25.0, Armonk, NY, USA) was used for conducting the statistical analyses. The level of significance was set at $p < 0.05$ for all statistical analyses.

3. RESULTS

3.1 SARS-CoV-2 Infection

Out of 20,781 SARS-CoV-2 tests done over one year, 2,750 (13.3%) tests were positive and 18,031 (86.7%) tests were negative (Fig.1).

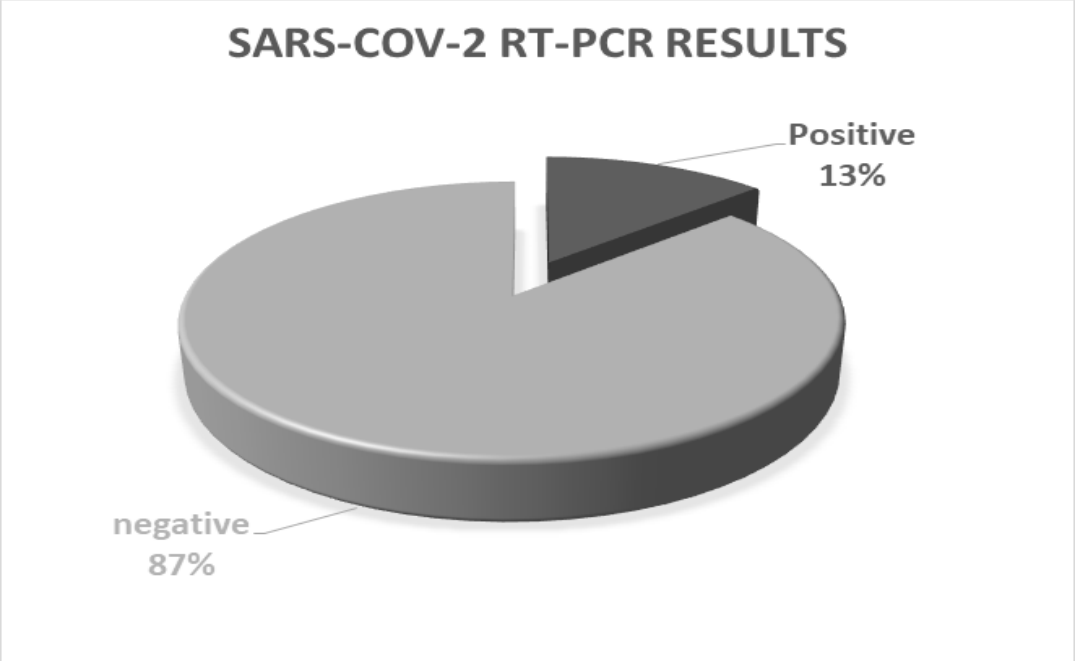

Fig.1: SARS-CoV-2 RT-PCR positive and negative results percentages between March 2020 and February 2021. 2750 out of 20781 specimens showed positive result.

3.2 Demographic Characteristics

The demographic characteristics of patients doing SARS-CoV-2 test is presented in Table 1. The highest number of PCR tests were done in the patients aged between 20 and 39 where 8,792 tests were carried. The total positives in this group were 1,115 representing 12% of the tests done in this group age and 40% of total positive cases. On the other hand, the lowest number of PCR tests done was done in children and young adults younger than 20 years, where a total of 936 tests were done (4.5% out of total tests). Although, the number of positive cases was the lowest in comparison to the other groups (119 positive tests), the percentage of positivity was similar (12%). However, these tests contributed to only 4% of total positive cases. Number of tests done in patients aged between 40 and 59 years and patients older than 60 was approximately similar where 5,995 tests and 5,058 tests were done respectively. Nonetheless, number and percentage of positivity was slightly higher in patients older than 60 years where 778 tests (15.4%) were positive in comparison to 738 positive tests in adult patients aged between 40 and 59 years (12.3%) (Table 1).

Table 1: Total and positive tests among different group of age (p-value <0.05)

	Total Tests	Positive Tests
0 to 19	936	119
20 to 39	8792	1115
40 to 59	5995	738
60 and above	5058	778
Total	20781	2750

3.3 Progression of Total and Positive Cases

In March 2020, 155 tests were done and 174 tests in April. The tests done were doubled in May (478 tests) and again in June (741 tests). Moreover, a greater increase was observed in the next few months with 1,893 tests in July up to 3,959 in January 2021 where the highest number of tests was done. Consequently, the number of positive tests was low in the first few months (March, April, May and June) with only 17 positive tests. Despite the rise of testing, no positive test was recorded in May. However, since July, the number of monthly positive tests increased rapidly from 79 up to 924 positive tests in January 2021.The increase in testing and positivity wasn't consistent where we had a slight decrease in November 2020 with a total of 2,007 tests were done and 293 positive tests were recorded. These numbers increased again in December with 3,062 tests done and 471 positive tests detected. Afterward, during February 2021, 242 tests were positive out of 1,753 tests done in comparison to 924 positive tests out of 3,959 tests done in January 2021. This represent a 55% decrease in number of testing and 10% decrease in rate of positivity (23.3% total positives in January compared to 13.8% in February) (Fig.2)(Table.2).

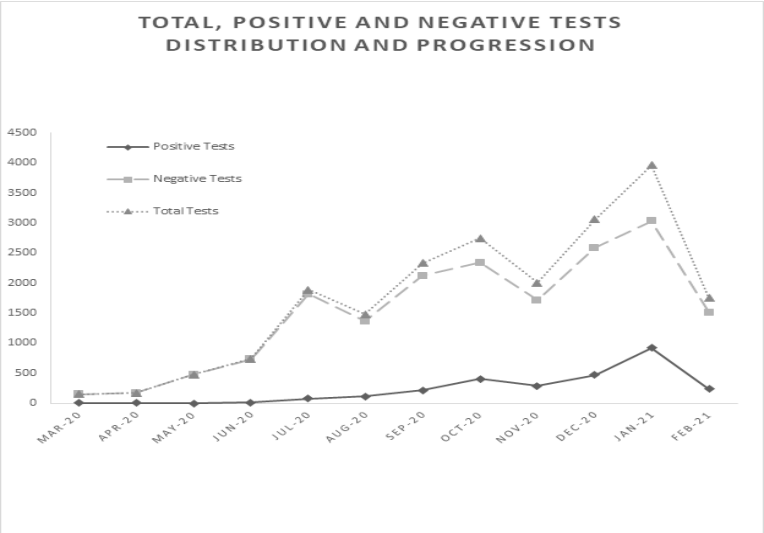

Fig.2: Total, positive, and negative tests distribution and progression.

Table 2: Number of monthly positive cases (p-value <0.05)

Month	March 2020	April 2020	May 2020	June 2020	July 2020	August 2020	September 2020	October 2020	November 2020	December 2020	January 2021	February 2021
Positive tests	3	4	0	10	79	116	214	405	293	417	924	242
Total tests	155	175	478	741	1893	1479	2333	2746	2007	3062	3959	1753

4. DISCUSSION

The SARS-CoV-2 positivity rate at our medical center was 13% over a period of one year (March 2020 and February 2021). However, this rate varied remarkably with only 1% of tests positive (17 out of 1,549 tests) during the first 4 months (from March to June 2020). This percentage increased over the next months, doubling between July and September (4.1% and 9.1%), increasing up to approximately 14.7% in October with similar rate in November and December. The peak was reached in January 2021 with 23% positivity rate.

These changes were comparable with the total number of positive cases in Lebanon with 1,778 cases by the end of June 2020, up to 17,308 cases at the end of August. This number increased in a doubling pattern between September, October, November and December reaching more than 180,000 positive cases. The greater increase in number of cases was recorded in January 2021 with more than 100,000 positive cases. The low rate of positivity during the first five months was affected by the curfew and the travel restrictions in the country at the beginning of pandemic. However, different factors accompanied the increase of positive cases.

Essentially, the catastrophic blast of Beirut port in August 4th, where multiple medical centers and facilities including COVID-19 units were damaged, led to limited access to COVID-19 testing and hospitalization. Furthermore, compromised precautions standards and massive gathering during urban search and rescue operations after the explosion contributed in the surge of COVID-19 cases (El Sayed, 2020; Hashim, Uakkas, Reda, Ramadhan, & Al Mostafa, 2021).

Moreover, mutations have led to emergence of SARS-CoV-2 new variants, having more infective potential compared to the original virus found in Wuhan (Chen, Wang, Wang, & Wei, 2020). On December 22, the first B.1.1.7 variant was detected in Lebanon. A study conducted in two medical center in Beirut suggested the emergence of the new variant in Lebanon since December 9(Younes et al., 2021). Regarding the distribution among age, our data shows significantly higher number of positive tests in patients group between 20 and 39 years. This finding was similar to other studies conducted in the country earlier last year and Lebanese Ministry of public health data (Bizri, Khachfe, Fares, & Musharrafieh, 2020; MOPH, 2021). In addition, a review article published by Salzberger et al. showed a similar age distribution pattern with most of positive cases in the age group between 20 and 59 years (Salzberger et al., 2020). However, younger adults are at higher risk than other group of ages to be exposed to SARS-CoV-2. This group makes a large proportion of high risk industries and frontlines occupations where prevention strategies may be difficult to implement (Boehmer et al., 2020). Moreover, the high number of asymptomatic COVID-19 infection which is a significant cause in SARS-CoV-2 rapid progression and estimated to be as high as 40 to 45%, is more likely to occur in this group age, and consequently contribute to higher COVID-19 community transmission (Boehmer et al., 2020; Oran & Topol, 2020). On the other hand, the positive cases were minimal in patient younger than 20 years contributing only to 4% of total positive tests suggesting low susceptibility to SARS-CoV-2 infection in this age group. However, an evidence of significantly lower rate of infection in children younger than 10 years old in comparison to young and middle aged adults have been documented (Goldstein, Lipsitch, & Cevik, 2020). This evidence was supported by a study conducted by Zhang et al. showing a lower risk of infection in young individuals (0-14 years) in comparison to older ages (15-64) (Zhang et al., 2020). In the older age group, despite lower number of positive tests, a higher rate of positivity was observed (15.3%) suggesting a higher susceptibility for infection. This data was supported by similar studies demonstrating higher susceptibility to infection in adults above 60-year-old (Goldstein et al., 2020; Zhang et al., 2020).

5. CONCLUSION

According to the data mentioned above, Lebanon as among the countries affected lately by the COVID-19 pandemic with most cases arising after August 2020 affected by the blast of Beirut and emergence of new variants resulting in higher positivity rate. On the other hand, our data shows a distribution of age similar to other countries and suggest its role in the rapid increase of positivity rate. This is the first descriptive analysis of COVID-19 in Lebanon after the surge that lasted till the end of January 2021 after a new curfew and restriction were applied in the country.

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