



## Research Article

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# CHRONIC DISEASE PREVALENCE AND COVID-19 RISK LEVELS IN HIGH SCHOOL STUDENTS LİSE ÖĞRENCİLERİNDE KRONİK HASTALIK PREVALANSI VE COVID-19 RİSK DÜZEYLERİ

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## Öz

**Amaç:** Çalışmamızda kronik hastalık durumuna göre öğrencilerin COVID-19 risk düzeylerini belirlemeyi amaçladık.

**Materyal ve Metot:** Araştırmanın evrenini Tekirdağ ili Çorlu ilçesinde bulunan lise öğrencileri (n = 8,926) oluşturmaktadır. Öğrencilere kronik hastalıkları olup olmadığı, bu kronik hastalıklar için ilaç kullanıp kullanmadıkları ve bu kronik hastalıkları nedeniyle bir sağlık kuruluşuna düzenli ziyaretlerinin olup olmadığı soruldu. Her bir katılımcı için COVID-19 risk seviyeleri belirlendi. Tanımlayıcı istatistikler, bağımsız grupların karşılaştırılmasında kategorik veriler için ki-kare testi ve sayısal veriler için t testi kullanıldı. İstatistiksel anlamlılık düzeyi  $p < 0,05$  olarak kabul edildi.

**Bulgular:** Katılımcıların ortalama yaşı  $15,71 \pm 1,13$  yıl (min14, maks18) idi. Bunların %52,27'si (n=4.666) erkektir. Katılımcıların %9.06'sında (n=809) en az bir kronik hastalık vardı. Çalışma süresince kronik bir hastalığa bağlı olarak en az bir ilacı aktif olarak kullanan öğrencilerin oranı %5,96' idi (n = 532). En az bir sağlık kurumu tarafından aktif olarak takip edilenlerin oranı %3,71' idi (n=331). Kızların COVID-19 ile ilişkili riskleri erkeklere göre daha yüksekti ( $p=0.019$ ). COVID-19 riski açısından yaşa, okul türüne, okul kategorisine ve sınıfa göre dağılımda anlamlı farklılık bulunmadı ( $p > 0.05$ ).

**Sonuç:** Öğrencilerde kronik hastalık prevalansının tespiti, COVID-19 hastalığının seyri üzerinde olumlu bir etkiye sahip olabilir ve bu, sınırlı sağlık kaynaklarını etkin bir şekilde kullanmayı ve eğitim sistemini buna göre doğru planlamayı mümkün kılabilir.

**Anahtar Kelimeler:** Lise, öğrenci, COVID-19 pandemisi, eğitim, prevalans, kronik hastalık.

## Abstract

**Objectives:** In our study, we aimed to identify the COVID-19 risk levels of students according to the chronic disease state.

**Materials and Methods:** The study population was composed of high school students in Çorlu district of Tekirdağ province (n=8,926). Students were asked if they had any chronic diseases, if they use drugs for these chronic diseases, and if they have regular visits to a healthcare institution due to their chronic disease for active follow-up. COVID-19 risk levels were identified Descriptive statistics, chi-square test for categorical data in the comparison of independent groups, and t-test for numerical data was used. The statistical significance level was accepted as  $p < 0.05$ .

**Results:** The mean age of participants was  $15.71 \pm 1.13$  years (min14, max18). 52.27% (n=4,666) of them were male. 9.06% (n=809) of the participants have had at least one chronic disease. The rate of the students who were actively using at least one drug due to chronic disease was 5.96% (n=532) during the study. The rate of participants who have been actively followed up by at least one health institution was 3.71% (n=331). Girls had higher COVID-19 related risks compared to boys ( $p=0.019$ ). In terms of COVID-19 risk, no significant difference was found in the distribution by age, school type, school category, and grade ( $p > 0.05$ ).

**Conclusion:** The detecting of the prevalence of chronic diseases in students, could have a positive impact on the course of COVID-19 disease, and this could make it possible to use the limited health resources effectively and to right plan the education system accordingly.

**Keywords:** High school, student, COVID-19 pandemic, education, prevalence, chronic disease.

## Introduction

Immediately after the COVID-19 pandemic started to spread from China to the rest of the world, the World Health Organization (WHO) declared this epidemic as a pandemic. One of the first protective measures was, suspending school activities in many European, far East countries and America<sup>1</sup>. Countries that suspended all school activities have accelerated their efforts in issues such as reopening schools, how the new form of education should be, and how to take protective measures in schools during this period when the new school year is approaching<sup>2</sup>. Although data on the level of exposure to this virus in the 14-19 age group is not yet sufficient, many studies have demonstrated that COVID-19 is observed in all age groups. It is also reported that Covid-19 progresses severely and causes deaths in young people with chronic diseases<sup>3</sup>. While several concerns have been stated regarding the fact that reopening schools might increase the risk for elderly people who are already more at risk in society. It has also been stated that among young students who will attend schools, can transmit COVID-19 to this elderly group<sup>4</sup>.

In our study, we aimed to determine, the chronic disease prevalence and COVID-19 risk levels of high school students, in the Çorlu district, which is one of the most crowded districts in Turkey due to domestic migration. Also, our study's other aim was to contribute to both healthcare administrators and education administrators while they are developing protective measures in the school reopening process by considering research data.

## Materials and Methods

The study universe was composed of all students who attended the high schools in Çorlu district of Tekirdağ province during the 2019-2020 academic year. The approval for this study was obtained from the Ethics Committee of Namık Kemal University on 27.06.2019 with the protocol number of 2019.115.07.11. Necessary permissions were obtained from Tekirdağ Provincial Directorate of National Education dated 29.05.2019 and numbered 43996270-44. All the number of students, in the universe of this study's population, was 14,042. The number of those who volunteered to take part in the study and whose parents granted permission was 8926. The participation rate was 63.56%.

The random cluster sampling method was used while selecting participants in the study. School type and grade distribution of students in the schools were clustered by gender. Those who volunteered to participate in the study were listed in this cluster. These lists were compiled as groups of 10 people, and the first seven people in each list were selected by gender. The distribution of the number of students in high schools in Çorlu by school type and gender is given in Table 1. The student number was the official number obtained from Çorlu District Directorate of National Education in 2019.

In the study, students were asked about whether they had chronic diseases, if so, the name of the diseases, whether they were actively taking drugs, and whether they had regular visits to a healthcare institution for active follow-up. In the study, students were provided to fill out the questionnaire under the supervision of the teachers via smartphone or interactive whiteboard in the classroom. Health records were checked on the e-state personal health application to verify data regarding students with chronic diseases. The scoring system for COVID-19 risk level that we have used, was as follows: 1 point for having a chronic disease. 1 point for during the study period, who were receiving active treatment and 1 point for being actively followed-up. Moreover, 1 point was assigned to the presence of chronic diseases that posed a further risk for COVID-19 (asthma, bronchitis, congenital lung diseases, hypertension, congenital heart diseases, diabetes, thyroid dysfunction, congenital metabolic diseases, cancer, use of immunosuppressive agents, etc.) (5.6). Besides, evaluation of this scoring system was made in the following way: 0 points = No risk, 1-2 points = Medium risk, 3 points = High risk, and 4 points = Extremely high risk. Schools were divided into two groups as public and private schools according to whether schools they attended had tuition fees or not. In terms of vocational education types, schools were divided into three categories: Anatolian High School, Vocational and Technical High School, and Science High School. Grades were divided into four categories: 9th grade, 10th grade, 11th grade, and 12th grade. These groups were compared with the risk levels of COVID-19.

The data were analyzed using SPSS 22.0 statistical package program. The descriptive statistics were given as number and percentage for categorical variables, the mean and standard deviation for numerical variables. In the comparison of independent groups, the Chi-squared test was used for categorical data, and the t-test was used for numerical data. The statistical significance level was accepted as  $p < 0.05$ .

## Results

The mean age of the participants was  $15.71 \pm 1.13$  (min14, max18). The distribution of students by age, gender, school type according to whether schools had tuition fees, school category according to education type, and their grades are given in Table 2.

Of the high school students, the rate of those who had at least one chronic disease at the time of the study was 9.06% (n=809). The rate of students who actively used at least one drug due to chronic disease was 5.96% (n=532). The rate of those who were actively followed up by at least one health institution at the time of the study was 3.71% (n=331).

In terms of the distribution of chronic diseases, the number of those who had respiratory system diseases was 243 (%2,72). Among respiratory system diseases, the most common disease was asthma (n=178). While 67.98% (n=121) of students with asthma were actively using drugs, 58.43% (n=104) were being actively

followed-up in a healthcare institution. The distribution of students by their chronic diseases, whether they received active treatment and were actively followed-up in a healthcare institution has been given in Table 3.

While 90.94% (n=8,117) students did not have a chronic disease, accepted as no COVID-19 related risk., the group which constituted 2.29% (n=204) was found to be at extremely high risk for COVID-19 due to their health condition. The distribution of students by risk groups is given in Graph 1.

In the analysis of COVID-19 risk levels by age, although it was observed that risk was higher for 18-year-old students compared to other age groups, no significant difference was found between age groups ( $p>0.05$ ). Girls had higher COVID-19 related risks in terms of chronic diseases, treatment, and active follow-up compared to boys ( $p=0.019$ ). Analysis of COVID-19 risks in high school students participating in the study by age and gender has been given in Table 4.

Although the risk of covid-19 was found to be higher in students studying at public schools compared to students studying at private schools, no significant difference was found between them ( $p>0.05$ ). The analysis of COVID-19 risks for students has given in Table 4 considering school type, school category, and grade.

**Table 1.** The school type of high school students in Çorlu district of Tekirdağ province, used as the study sampling, and the gender distribution by grade levels

|            | Public School    |                  | Private School   |               | Total            |                  |
|------------|------------------|------------------|------------------|---------------|------------------|------------------|
|            | Boy<br>n (%)     | Girl<br>n (%)    | Boy<br>n (%)     | Girl<br>n (%) | Boy<br>n (%)     | Girl<br>n (%)    |
| 9th Grade  | 1,687<br>(12.01) | 1,616<br>(11.51) | 595 (4.24)       | 213 (1.52)    | 2,282<br>(16.25) | 1,829<br>(13.03) |
| 10th Grade | 1,251 (8.91)     | 1,435<br>(10.22) | 504 (3.59)       | 230 (1.64)    | 1,755<br>(12.50) | 373 (2.66)       |
| 11th Grade | 1,297 (9.24)     | 1,309 (9.32)     | 418 (2.98)       | 293 (2.09)    | 1,715<br>(12.21) | 1,602<br>(11.41) |
| 12th Grade | 1,194 (8.50)     | 1,309 (9.32)     | 385 (2.74)       | 306 (2.18)    | 1,579<br>(11.24) | 1,615<br>(11.50) |
| Total      | 5,429<br>(38.66) | 5,669<br>(40.37) | 1,902<br>(13.55) | 1,042 (7.42)  | 7,331<br>(52.21) | 6,711<br>(47.79) |

**Table 2.** The distribution of high school students participating in the study by age, gender, school type, school category, and grade level

|                             | <b>n</b> | <b>%</b> |
|-----------------------------|----------|----------|
| <b>Age</b>                  |          |          |
| 14                          | 1,560    | 17.48    |
| 15                          | 2,418    | 27.09    |
| 16                          | 2,378    | 26.64    |
| 17                          | 2,169    | 24.30    |
| 18                          | 401      | 4.49     |
| <b>Gender</b>               |          |          |
| Male                        | 4,660    | 52.21    |
| Female                      | 4,266    | 47.79    |
| <b>School type</b>          |          |          |
| Public HS*                  | 7,060    | 79.09    |
| Private HS                  | 1,866    | 20.91    |
| <b>School category</b>      |          |          |
| Science HS                  | 656      | 7.35     |
| Vocational and Technical HS | 3,168    | 35.50    |
| Anatolian HS                | 5,102    | 57.15    |
| <b>Grade</b>                |          |          |
| 9th Grade                   | 2,609    | 29.23    |
| 10th Grade                  | 2,192    | 24.56    |
| 11th Grade                  | 2,109    | 23.62    |
| 12th Grade                  | 2016     | 22.59    |

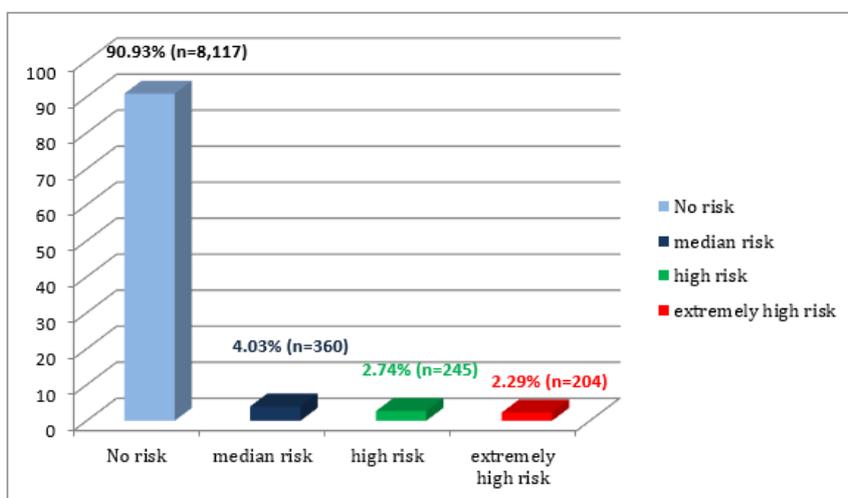
**Table 3.** Distribution of students' chronic diseases, the state of receiving active treatment, and the state of being actively followed-up in a healthcare institution

|                                  | <b>n (%)</b>      | <b>Students who receive active treatment<br/>n (%)</b> | <b>Students who are actively followed-up<br/>n (%)</b> |
|----------------------------------|-------------------|--|--|
| Respiratory system diseases      | 243 (2.72)        | 121 (1.36)   | 104 (1.17)   |
| Eye diseases                     | 99 (1.11)         | 75 (0.84)  | 26 (0.29)  |
| Cardiovascular system diseases   | 78 (0.87)         | 72 (0.81)  | 56 (0.63)  |
| Neurological diseases            | 53 (0.59)         | 47 (0.53)  | 34 (0.38)  |
| Hematological diseases           | 52 (0.58)         | 47 (0.53)  | 31 (0.35)  |
| Musculoskeletal system diseases  | 49 (0.55)         | 17 (0.19)  | 2 (0.02)   |
| Endocrine and metabolic diseases | 43 (0.48)         | 37 (0.41)  | 35 (0.39)  |
| Gastrointestinal system diseases | 41 (0.46)         | 31 (0.35)  | 5 (0.06)   |
| Psychiatric diseases             | 35 (0.39)         | 27 (0.30)  | 13 (0.15)  |
| Otorhinolaryngological diseases  | 34 (0.38)         | 23 (0.26)  | 4 (0.04)   |
| Dermatological Diseases          | 33 (0.37)         | 17 (0.19)  | 4 (0.04)   |
| Urogenital system diseases       | 31 (0.35)         | 14 (0.16)  | 3 (0.03)   |
| Genetic disease                  | 18 (0.20)         | 4 (0.04)   | 14 (0.16)  |
| <b>Total</b>                     | <b>809 (9.06)</b> | <b>532 (5.96)</b>                                      | <b>331 (3.71)</b>                                      |

**Table 4.** Comparison of high school students' COVID-19 risk levels by age, gender, school type, school category, and grade level

|                                | No-Risk<br>n (%) | Medium Risk<br>n (%) | High risk<br>n (%) | Extremely<br>High Risk<br>n (%) | p            |
|--------------------------------|------------------|----------------------|--------------------|---------------------------------|--------------|
| <b>Age</b>                     |                  |                      |                    |                                 |              |
| 14                             | 1,412 (90.51)    | 64 (4.10)            | 45 (2.88)          | 39 (2.50)                       | 0.853        |
| 15                             | 2,213 (91.52)    | 87 (3.60)            | 67 (2.77)          | 51 (2.11)                       |              |
| 16                             | 2,156 (90.66)    | 108 (4.54)           | 61 (2.57)          | 53 (2.23)                       |              |
| 17                             | 1,975 (91.10)    | 88 (4.06)            | 58 (2.68)          | 48 (2.21)                       |              |
| 18                             | 361 (90.02)      | 13 (3.24)            | 14 (3.49)          | 13 (3.24)                       |              |
| <b>Gender</b>                  |                  |                      |                    |                                 |              |
| Female                         | 3,840 (90.01)    | 185 (4.34)           | 126 (2.95)         | 115 (2.70)                      | <b>0.019</b> |
| Male                           | 4,277 (91.78)    | 175 (3.76)           | 119 (2.55)         | 89 (1.91)                       |              |
| <b>School type</b>             |                  |                      |                    |                                 |              |
| Public                         | 6,413 (90.84)    | 286 (4.05)           | 196 (2.78)         | 165 (2.34)                      | 0.901        |
| Private                        | 1,704 (91.32)    | 74 (3.97)            | 49 (2.63)          | 39 (2.09)                       |              |
| <b>School category</b>         |                  |                      |                    |                                 |              |
| Science HS*                    | 591 (90.09)      | 34 (5.18)            | 21 (3.20)          | 10 (1.52)                       | 0.211        |
| Vocational and<br>Technical HS | 2,877 (90.87)    | 139 (4.39)           | 78 (2.46)          | 74 (2.34)                       |              |
| Anatolian HS                   | 4,649 (91.12)    | 187 (3.67)           | 146 (2.86)         | 120 (2.35)                      |              |
| <b>Grade</b>                   |                  |                      |                    |                                 |              |
| 9th Grade                      | 2,381 (91.26)    | 97 (3.72)            | 67 (2.57)          | 64 (2.45)                       | 0.892        |
| 10th Grade                     | 1,980 (90.33)    | 96 (4.38)            | 68 (3.10)          | 48 (2.19)                       |              |
| 11th Grade                     | 1,924 (91.23)    | 88 (4.17)            | 52 (2.47)          | 45 (2.13)                       |              |
| 12th Grade                     | 1,832 (90.87)    | 79 (3.92)            | 58 (2.88)          | 47 (2.33)                       |              |

\*HS: High school



**Graph 1.** Distribution of COVID-19 risk levels in high school students according to the presence of chronic diseases, whether they received active treatment, and whether they were actively followed-up

## Discussion

During the pandemic, many countries have suspended schools in order to protect their young population's health and to prevent the dissemination of the diseases from the young population to elder age groups that are at risk, and have decided to prohibit face to face education<sup>5,6</sup>. However, many reports demonstrate that young people do not comply with this prohibition and regulations due to their lifestyle habits<sup>7</sup>. In studies on the course of COVID-19 in adolescents, it has been reported that approximately 70% of them have overcome the disease with mild symptoms of simple upper respiratory tract infection. But these studies also have shown at the ones who have a chronic disease, the prevalence of COVID-19 has increased, prognosis has been more severe<sup>8,9</sup>. In studies investigating chronic diseases causing a more severe course of COVID-19 in young people, it has been found so far that these diseases are cardiovascular diseases, respiratory tract diseases, hypertension, diabetes, thyroid diseases, cancer, and use of immunosuppressive drugs<sup>10,11</sup>. In our study, about one out of every ten students had these chronic diseases, and the risk levels of covid-19 were high. We hold the belief that more strict measures must be taken in order to protect this 'high risk' group if face-to-face education will start in the new school year. Administrators from the Ministry of Health and the Ministry of National Education could identify these high-risk groups as well as planning an online education program while considering the principle of equal opportunity for this student group.

Asthma is one of the most common diseases in children and adolescents in the world. In many prevalence studies, these rates vary between 1-18% depending on the country. It is estimated that there are approximately 300 million asthmatic students or student candidates, especially with the increase in recent years<sup>12,13</sup>. The proportion of students with asthma in Turkey was found to be approximately 13%, as is the case in prevalence studies in the entire world<sup>14</sup>. Further research is needed in order to better understand whether asthma poses a risk for children in terms of COVID-19 later in life. However, there are studies demonstrating that prognosis is more severe when patients with asthma contract COVID-19<sup>15</sup>. Another chronic disease known to aggravate the prognosis of COVID-19 is hypertension. In a field study conducted in Turkey, diastolic blood pressure was found to be high in 12.3% of adolescents. It was reported that only 50% of these students could be tracked down and received treatment while the rest of them were diagnosed when they went to a healthcare institution later in life with increasing complaints<sup>16</sup>. In our study, the same as the literature, the most common disease detected in the students was respiratory system problems as asthma. Approximately seventy percent of students diagnosed with asthma were still taking medication, and approximately half of them were actively and regularly followed-up by a healthcare provider. The second most common disease in students was hypertension.

If face-to-face education starts again in the schools, we think that these students may pose a serious risk for their health due to the potential of contracting COVID-19. Furthermore, this group while going to school for

face-to-face education at the same time must go to hospitals for their chronic disease's follow-up. Thus they can take the virus from hospitals to the schools. For that reason, the education process of these students who are actively followed-up must be planned very carefully.

While many studies have shown that COVID-19 is seen in all ages, it is now known that the prevalence increases and the prognosis is severe in older people<sup>17,18</sup>. In our study, no significant difference was found according to age groups. The reason for this was that the age ranges of the students participating in the study were close to each other and they were 14-18 age group adolescents. According to this data, it shows that when applying protective measures for COVID-19 for schools, holistic regulations should be made regardless of the age of high school students.

Since COVID-19 was first detected in China, all sociodemographic studies have reported that the disease is seen more in males compared to females<sup>19</sup>. The course of the disease is also more severe in males than in females, and the rate of patients who need intensive care and the number of intubated patients is significantly higher in male patients<sup>20</sup>. Although there is not sufficient research on why COVID-19 is seen more in males and why prognosis is more severe, it is thought that several causes such as lifestyle, the inability to comply with social distancing rules, the presence of more chronic diseases, more contact with the outer world increase prevalence and aggravate prognosis in male patients<sup>21</sup>. In our study, we found that COVID-19 risk levels identified according to high school students' chronic diseases, state of using drugs, and state of being actively followed-up in a healthcare institution were higher in female students compared to male students, unlike the literature. The reason for this was that the proportion of female students with chronic diseases who participated in our study was higher than that of male students. Therefore, it may be a mistake to take protective measures for male students by looking at the literature. Our recommendation is that the measures to be taken for students should be regulated without gender discrimination, and the regulations should only be planned according to the presence of chronic diseases.

In our study, we concluded that approximately one-tenth of high school students had a chronic disease and that the presence of chronic diseases was higher in girls compared to boys. It was found that approximately one student in every twenty students received active treatment due to these chronic diseases at the time of the study. We also came to the conclusion that if approximately one of ten students participating caught covid-19, the disease could be more severe for them

It may be appropriate to be careful, taking the necessary precautions and even focusing on online education of these high-risk students, if necessary, by considering the students with chronic diseases at the time when face-to-face education is planned.

In conclusion, it seems that this pandemic for which no vaccine and treatment has been found will continue to affect all countries for a long time. In this process, all countries have to reconsider their education systems and working patterns in schools and to adapt them according to this new process. It is very important in the right manner, protect our students in terms of health, and try to overcome this pandemic with the least damage and loss without disrupting their education. It is important to conduct studies all over Turkey similar to our study conducted in a district with a population of 350,000 as well as using data from the Ministry of Health and to identify students who are at risk in terms of the COVID-19 pandemic.

The detection and follow-up of chronic diseases will have a positive impact on the course of COVID-19 disease, and it will make it possible to use the limited health resources effectively and to plan the education system accordingly.

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## References

1. The Ministry of Education of the Republic of Turkey.(2020) Measures taken in the field of education against corona virus. (Accessed:20.04.2020). <https://www.meb.gov.tr/bakan-selcuk-koronaviruse-karsi-egitim-alanindaalanan-tedbirleri-acikladi/haber/20497/tr>
2. Viner MR, Russel JS, Croker H, et.al. School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review. *The Lancet Child & Adolescent Health*. 2020;4(5):397-04. (doi: 10.1016/S2352-4642(20)30095-X).
3. Archard D, Caplan A. Is it wrong to prioritise younger patients with covid-19? *BMJ* 2020;369:m1509 (doi: <https://doi.org/10.1136/bmj.m1509>)
4. Chowell G, Mizumoto K. The covid-19 pandemic in USA: What might we expect. *The lancet*,2020; 395(10230):1093-94. (doi: [https://doi.org/10.1016/S0140-6736\(20\)30743-1](https://doi.org/10.1016/S0140-6736(20)30743-1)).
5. Wu Z, Mc Googan JM. Characteristics of and important lessons from the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a report of 72 314 Cases from the Chinese Center for Disease Control and Prevention. *JAMA*. 2020;323(13):1239-42. (doi:10.1001/jama.2020.2648).
6. Centers for Disease Control and Prevention. People who are at higher risk for severe illness (Accessed: 30.07.2020). <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-athigher-risk.html>
7. Andrews JL, Foulkes L, Blakemore SJ. Peer influence in adolosecence: Public health implications for Covid-19. *Trend cognitivescience*, 2020;24(8):585-86.
8. Liao J, Fan S, Chen J, et al. Epidemiological and clinical characteristics of COVID-19 in adolescents and young adults. *The Innovation*.2020;1(1) 100001. <https://doi.org/10.1016/j.xinn.2020.04.001>
9. De Abajo FJ, Rodriguez-Martin S, Lerma V, et al. Use of renin-angiotensin-aldosterone system inhibitors and risk of COVID-19 requiring admission to hospital: a case-population study. *Lancet*2020;395(10238):1705-14.
10. Grasselli G, Zangrillo A, Zanella A, et al. Baseline characteristics and outcomes of 1591 patients infected with SARS-CoV-2 admitted to ICUs of theLombardy Region, Italy. *JAMA* 2020;323(16):1574-81.
11. Zhou F, Yu T, Du R, et al. Clinical course and risk factors formortality of adult in patients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet* 2020;395(10229):1054-62.
12. Turkish Thoracic association. Astım Tanı ve Tedavi Rehberi. *Turkish Thoracic Journal* 2009; 10 (Supp10):6.
13. Demir AU, Karakaya G, Bozkurt B, et al. Asthma and allergic diseases in school children: third cross-sectional survey in the same primary school in Ankara, Turkey. *Pediatr AllergyImmunol* 2004;15(6):531-38.

14. Demir AU, Kalaycı O, Kalyoncu AF. Time trend of asthma prevalence: ecological analysis of investigations in school children in Turkey. 16th. ERS Annual Congress , Munich, 2006. *EurRespir J*;2006 28(suppl 50):240.
15. Özşeker ZF. Astım ve covid-19. *ejp-ek-sayı-covid19-29042020.pdf* ;91-94 (Accessed: 20.07.2020). <http://www.solunum.org.tr/TusadData/userfiles/file/EJP-EK-SAYI-COVID19-29042020.pdf#page=92>
16. Şimşek MA. Screening of adolescents in terms of obesity and hypertension Haliç Üniv. Sağ. Bil. Ens. Master thesis 2016;64.
17. Wu Z, McGoogan JM. Characteristics of and important lessons from the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a report of 72 314 Cases from the Chinese Center for Disease Control and Prevention. *JAMA*. 2020;323(13):1239-42. (doi:10.1001/jama.2020.2648).
18. Republic of Turkey Ministry of Health. Current situation in Turkey in 2020 (Accessed: 30.07.2020). <https://covid19.saglik.gov.tr/TR-68443/covid-19-durum-raporu.html>
19. Wu D, Wu T, Liu Q, Yang Z. - e SARS-CoV-2 outbreak: what we know. *Int J Infect Dis*. 2020;94:44-48. (doi:S1201-9712(20)30123-5).
20. Wenham C, Smith J, Morgan R, et.al. COVID-19: Gendered impacts of the outbreak. *The lancet*, 2020;395(10227);846-48. (doi: [http://doi.org/10.1016S140-6736\(20\)30526-2](http://doi.org/10.1016S140-6736(20)30526-2)).
21. Culebras E, Hernández F. ACE2 is on the X chromosome: could this explain COVID-19 gender differences? [publishedonlineahead of print, 2020 Jun 24]. *EurHeart J*. 2020;ehaa521. doi:10.1093/eurheartj/ehaa521.