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COVID-19: The Impact of Public Health Interventions on the Outbreak—Public Health Perspective and Future Trends

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ABSTRACT

In March 2019, before the first confirmed cases in Turkey, a scientific advisory board was created to develop guidelines for disease control and preventive health care. Public health interventions and treatment protocols were implemented by the health authority and scientific advisory board with daily analyses obtained from the databases. Soon after, the pandemic management process intensified with the closure of schools and partial curfews. Despite the decline in the number of cases and deaths, the number of cases plateaued and did not decrease further with the effect of the normalization period. With the end of the summer, the increase in spending time indoors, and the gradual start of face-to-face education in schools, the number of new cases has significantly increased. Therefore, the strict implementation of public health interventions has been established. In this period, the health literacy level of the population and the perception of risk also affected their compliance with health protocols. Moreover, vaccine studies and the application of practices for COVID-19 were deemed essential to effectively contain the virus. In the coming months, it is necessary to implement vaccination programs along with good planning and communication strategy. It is important to have a multi-sectoral approach, considering the possible security, health, economic, social, psychological, political, and social effects of this epidemic and other future outbreaks. Furthermore, it is necessary to comply with individual measures and restrictions for the benefit of society.

Keywords: COVID-19, intervention, pandemic, policy, prevention, public health, Turkey

INTRODUCTION

In 1965, Tyrrell and Bynoe had observed that coronaviruses were isolated in the tissue culture of a patient with a cold. It is called coronavirus because the surface protrusions look like crowns. SARS-CoV was responsible for the severe acute respiratory syndrome (SARS) epidemic in 2003 and MERS-CoV for the Middle East Respiratory Syndrome (MERS) epidemic in 2012 (1). COVID-19, which was declared a pandemic by the World Health Organization (WHO) on March 11, 2020, is an ongoing coronavirus outbreak (2).

The first case of COVID-19 was reported as an unidentified case of pneumonia in late December 2019 in Wuhan, Hubei Province, Republic of China. The COVID-19 pandemic disrupted with an effect on the public's health and economy as well as sociological, psychological, and cultural effects (3, 4). Currently, as vaccine studies are ongoing, effective ways of treating the disease are also measured by applying it to patients. Within this period, preventive health services, filtration, and public interventions were implemented to manage the outbreak. Primary, secondary, and tertiary protection strategies are key to pandemic management (5). Identification of risk factors and risk groups for the disease, planning of early diagnosis and treatment, public interventions, and attempts to manage it are intertwined with public behavior.

Monitoring daily data from a public health perspective and measuring and evaluating preventive, therapeutic practices are important in managing the pandemic and preventing future outbreaks. Therefore, the aim of this review is to examine the progress of the pandemic and the preventive measures taken in Turkey on a public health perspective.

Response to the Pandemic

The COVID-19 infection chain (source path of transmission-robust person):

- **Source:** All evidence suggests that SARS-CoV-2 is a zoonotic source. Although it is not yet clear, the available data points to wild animals sold illegally on the seafood wholesale market in China. Due to human-to-human transmission, the source of COVID-19 was identified as symptomatic/asymptomatic COVID-19-positive individuals. In this disease, resource-oriented interventions take precedence. Finding and treating those who are sick require isolation.
- **Path of transmission:** It is transmitted through droplets, which infected individuals emit through coughing. It can also be transmitted through sneezing; taking their hands to their mouth, nose, or eye mucosa; and coming

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into contact with other people's hands. Since the virus can also be detected in the respiratory secretions of asymptomatic people, it can be contagious. As a precaution against contamination in our country, mask, social distance, hand hygiene, surface cleaning, and indoor air cleaning are recommended.

- **Robust person/susceptible individuals:** People in all age groups are susceptible individuals. Also, men, individuals who are above the age of 50, individuals with comorbidity (hypertension, heart disease, diabetes, lung cancer, COPD, kidney disease, etc.), rehabilitation and care centers, schools, military barracks, prisons, migrant camps, and seasonal agricultural workers are more susceptible to COVID-19, whereas health workers are the riskiest occupational group. The most important measure for a susceptible person is vaccination practices, which have considerably progressed nowadays. Vaccine studies have been showing positive results. Moreover, strengthening the immunity of individuals and health education (adequate and balanced nutrition, sufficient and regular sleep, physical exercise, not using tobacco, etc.) has been prioritized. In order to reduce the transmission rate of the disease, collective activities, limited access to outdoors, flexible working hours/working from home, reducing contact time, shortening of shifts, giving rest intervals, social distancing, hand hygiene, etc. were encouraged (6, 7).

The most important approach to successfully contain the pandemic, including those with mild diseases, is to diagnose, isolate, and treat all cases of COVID-19. Preventing cases from turning into clusters and avoiding clusters from spreading widely and quickly are fundamental principles (8).

People affected by humanitarian crises and those with low quality of life are affected differently by the COVID-19 outbreak. Critical measures to control and prevent COVID-19, physical distancing, movement restriction, and practices, such as staying at home, washing hands with soap and water, and closure of schools and workplaces, have made regular activities difficult. Furthermore, mass testing, isolation, and treatment as well as monitoring and quarantine of contacts of the disease have gained importance.

The response to the pandemic is generally affected by the following characteristics:

1. Overcrowded and inadequate housing or shelters/inadequate residential infrastructure
2. Lack of clean water and sanitation
3. High dependence on the unrecorded economy and daily wages
4. Poor access to health care and basic services
5. Impaired health system
6. Widespread food insecurity and malnutrition
7. Armed conflict and violence
8. Poor institutions/poor governance and lack of emergency response capacities
9. Prevalence of highly marginalized and under-served communities

Considering these limitations, it is necessary to strengthen the harmonious implementation of important public health measures and the strong ties, structures, and systems that exist individually and socially. Therefore, social determinants of health should not be forgotten in pandemic management.

Inadequate measures and interventions can increase the risks of COVID-19 transmission as well as having negative effects on general public health and a number of far-reaching economic, social, and political consequences (e.g., people who die from other diseases or people who remain unemployed and poor, increase in gender-based violence, increase in violence against children, social unrest, etc.). Pragmatically, local structures and systems must maintain social mobilization and strong community participation (9).

Epidemiological Criteria and Social Interventions in Turkey

The WHO classified the COVID-19 outbreak as an “international public health emergency” on January 30, 2020, with the occurrence of COVID-19 cases in 113 countries other than China, where the first outbreak began, and the global epidemic (pandemic) on March 11 due to the spread and severity of the virus. In Turkey, the COVID-19 management began on January 10 and January 22, 2020. The first meeting of the Scientific Advisory Board of the Ministry of Health was held, and the first case of COVID-19 was recorded on March 11, 2020, after neighboring provinces, such as Europe and Iran. In the period since the detection of the first case, the main strategy for the outbreak is to reduce the incidence of cases through public health measures and slow down the rise of the pandemic curve to prevent the strong demand for health care. Through field and clinical cooperation, COVID-19-related, aggravated medical outcomes were prevented (severe illness, intensive care requirement, death, disability, etc.). As a country, our approach is to gradually reduce the damage of the pandemic, limit the outbreak, and put it under control (10). The Ministry of Health and the Scientific Advisory Board has prepared a guide and made updates to necessary sections. This guide has been prepared to provide information about the COVID-19 infection chain, case definitions and diagnostic methods, outbreak management, strategies, and practices that should be followed when a COVID-19 case or contact is encountered. The guide was mainly created in accordance with the WHO recommendations. The Ministry of Health regularly publishes information regarding COVID-19 on its website (<https://covid19.saglik.gov.tr/TR-66300/covid-19-nedir.html>). The Ministry of Health collects data on the outbreak through information systems technologies and shares information in press releases. The systems used are HSYS (Public Health Management System), FITAS (Filiation and Isolation Monitoring), LBYS (Laboratory Information Management System), and MIZ (Spatial Business Intelligence), which are all integrated.

The following epidemiological criteria are used to control and monitor outbreaks:

- Distribution of cases and deaths by age and gender
- Distribution of cases and deaths by settlement (province, district, village, neighborhood, etc.)
- Distribution of cases and deaths by specialized groups (medical personnel, nursing homes, prisons, immigrant groups, etc.)
- Distribution of diagnostic tests according to the purpose of conducting (outpatient application, patient monitoring, contact examination, risk group screening)
- The average time between the application and the conclusion of the diagnostic test
- The number of those diagnosed with radiological and clinical signs whose diagnostic test is negative

Table 1. Recommended public health measures and interventions

Cheap	Government	Giving authority to the disease control agency and central coordination Declaration of National Emergency Sharing detailed information with the public
	Education	Educating the public about personal protection methods
	Diagnosis and isolation	Test
		Filiation applications, contact tracing
		Mobile applications
		Health checks, body temperature measurements
		Case isolation
	Purification of public areas	Home quarantine
		Home isolation to suspicious cases and relatives
		Disinfection
Health-care resources	Risky waste management	
	Increasing bed capacity	
	Supplying materials (mask, disinfectant, hand antiseptic, soap, etc.)	
	Additional payments for health workers	
Social distancing and isolation measures	Call for volunteers (medical students, teachers, etc.)	
	Social distancing for elderly and chronic patients	
	Voluntary home quarantine	
	Quarantine to high-risk districts and villages	
	Prohibition of going outside the house except in cases where necessary	
Economic measures	Quarantining those who come from abroad	
	Postponing and easing some payments (bills and taxes) to prevent people from having to go out	
	Quarantine support packages (economic assistance)	
Travel bans	Long-term health report of respiratory and other chronic patients	
	Ban on non-mandatory international travel	
	Banning arrivals from certain countries	
	Closure of country borders	
Expensive	Closures	Closure of city limits
		Closure of all public and private schools
	Closure of all universities	
	Closure of places of worship	
	Closure of restaurants, bars, and other areas for social gathering	
	Ban on gathering over 250 people	
	Ban on gathering over 50 people	
Stopping all non-vital work		

- Average number of tests applied per person or single number of tests
- Temporal distribution of cases according to epidemiological history (travel abroad, domestic transmission, workplace transmission, etc.)
- Risk assessments
- R0 values and their change in the process
- Contact tracing (average number of contacts per case, rate of reach of health authorities to contacts, the average time of reach of health authorities to contacts, rate of disease development in contacts, rate of adaptation of contacts to isolation)
- Clinical process (distribution of symptoms and signs, distribution of risk factors (comorbidity), the average time from potential contact to symptom onset in symptomatic patients, distribution of cases by disease severity, information about the clinical process (average time from symptom onset and/or diagnosis time to intensive care, etc.), assessments of treatment models and results of outpatient and inpatient patients (rates of adaptation of outpatient cases to isolation, the average time to reach the drug, etc.), assessments of re-infection)
- Quarantine and isolation (number of people quarantined and their results, number of patients isolated at home [PCR+, CT/Clinic+], number of patients isolated outside the home or hospital [PCR+, CT/Clinic +]) (11).

To summarize the current epidemiological situation for this review, data from the Ministry of Health and WHO has been used (12, 13). The impact of public health measures and interventions is surveillance based on this data in Turkey from the General Directorate of Public Health, Department of The Health Threats, Early Warning and Response.

Table 1 presents the public health interventions that are recommended in the literature (from cheap to expensive). Central coordination, national emergency announcement, and risk communication are essential steps in this period. Education of the public regarding personal prevention rules must be the highest priority and must constantly continue in the pandemic period. Diagnosis and isolation of cases, disinfection of public places must also be prioritized and done immediately. Medical health-care system-related resources must be strengthened in the first stage. Public health interventions in the pandemic period could be a factor for the economic crisis in some countries. The timing of these interventions and public health measures is important. Depending on the course of the outbreak, such measures should be taken at the appropriate time, as well as community-level measures when finding and monitoring cases and their contacts. Since a single measure cannot be enough, it is necessary to make a combination of measures. Taking measures early will facilitate the prevention of the pandemic. In order to initiate or end a public measure, it must be ensured that it does not lead to a repeat in cases, cost, social problems, and “measure fatigue.” Different communication channels should be used effectively for the public’s participation in interventions and practices.

One of the most important parameters determining the measures taken by governments in contact monitoring is the number of tests performed. The ratio between the number of tests performed and the identified cases shows the extent to which governments have been successful in contact monitoring with the measures taken. Turkey is in a peremptory position at the point of the number of tests and the number of cases announced in this context in global comparisons.

As of November 13, 2020, the ratio between the number of tests per million people and the number of cases per million people

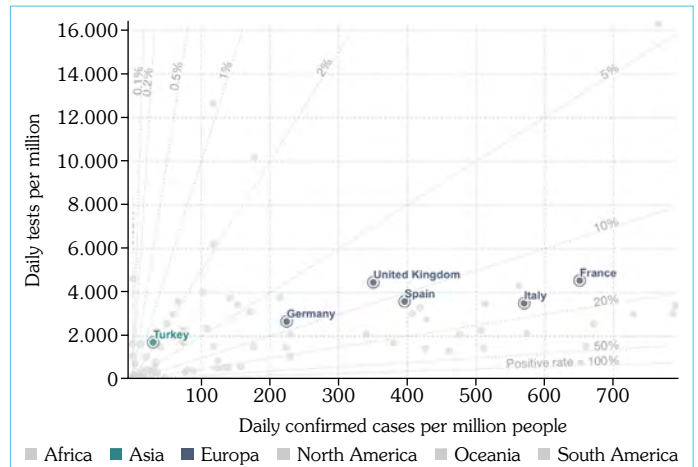


Figure 1. COVID-19: Daily tests vs daily new confirmed cases per million (the figure is given as rolling 7-day average)

Source: Testing data from official sources by Our World in Data, confirmed cases from ECDCourWorldInData.org/coronavirus • CC BY. Note: Comparisons of testing data across countries are affected by differences in the way the data are reported. Daily data is interpolated for countries not reporting testing data on a daily basis. Details can be found at our Testing Dataset page

announced on a daily basis was lower than other countries, such as Germany, France, Spain, and Italy (Fig. 1).

The positive situation that exists in proportional comparisons reverses in the number of tests per thousand people per day. Turkey is far behind in the number of tests per thousand people compared to the countries shown in Figure 2 (Fig. 2). It seems that the number of daily tests should be increased across the country in order to prevent breakages that may occur in contact tracing in the fight against the pandemic.

Turkey has started community interventions since the day after the first case was recorded on March 11. Therefore, as the Scientific Advisory Board was established in February 2020, Turkey has succeeded in taking early preventive measures. Many communication channels have been used, such as written, visual, etc., to spread information to the community. Case numbers

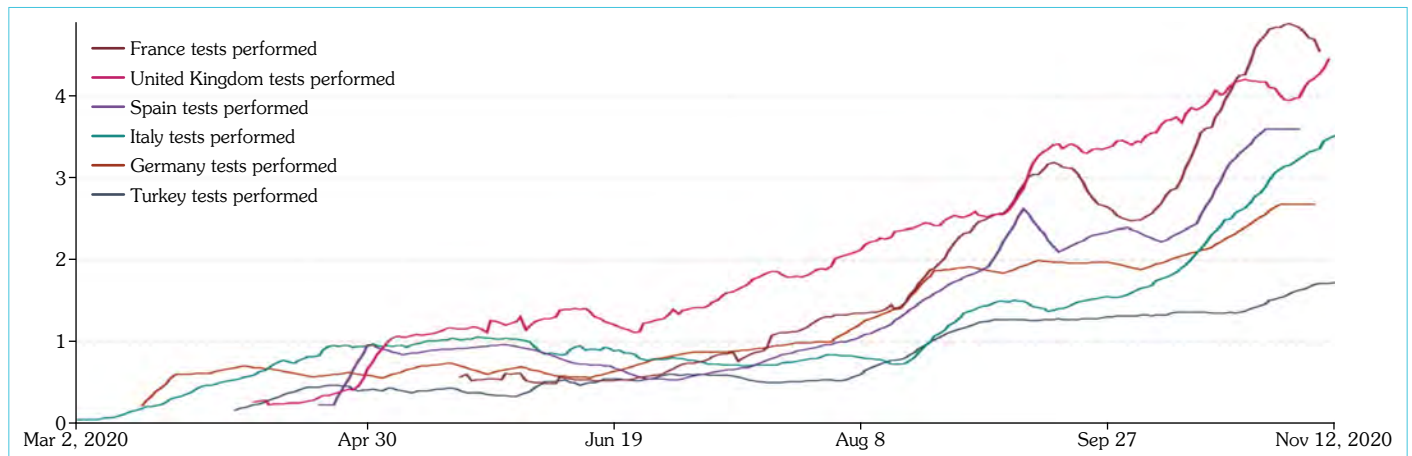


Figure 2. Daily COVID-19 test per thousand people

Source: Official data collated by Our World in Dat, WorldInData.org/coronavirus • CC BY. Note: Comparisons of testing data across countries are affected by differences in the way the data are reported. Daily data is interpolated for countries not reporting testing data on a daily basis. Details can be found at our Testing Dataset page

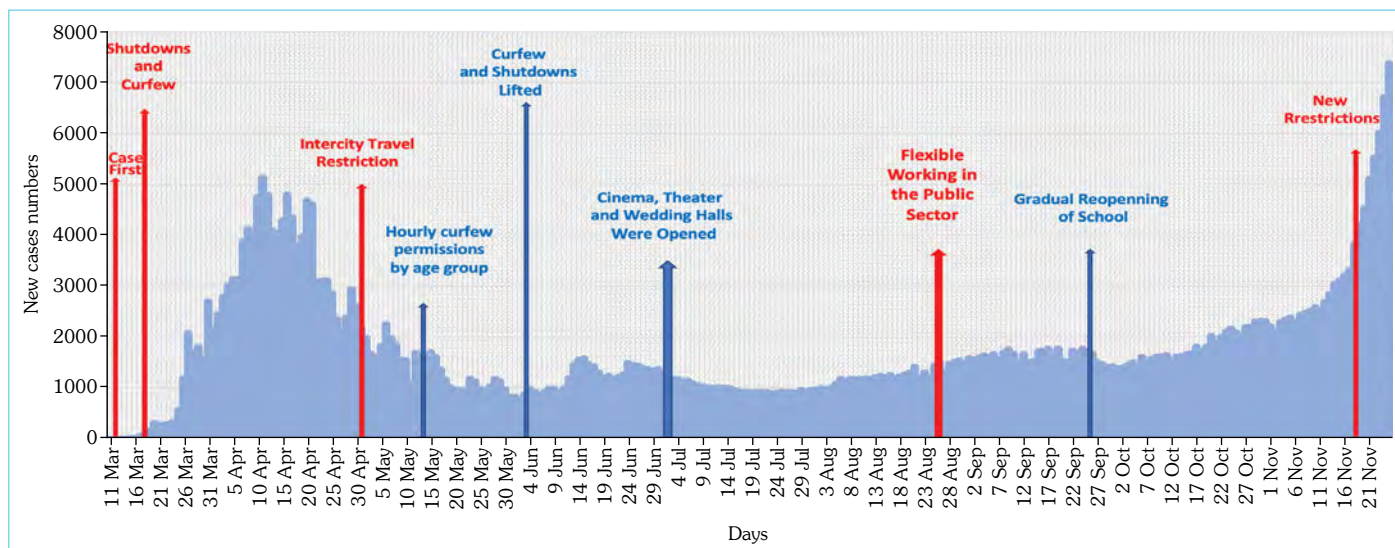


Figure 3. Daily number of new cases and public health Interventions in Turkey (between March 11 and October 28, 2020)

Schools, international flights, places of worship, restaurants, pubs and clubs were closed. Flexible working hours in public sector had started

peaked on April 11 in the outbreak curve. Later, the case numbers began to decline. On June 1, 2020, most of the restrictions and closures were opened. During the summer period and even now, large meetings, congresses, and symposiums are not allowed. Considering the economic situation and social problems, no new measures have been introduced since June 1, 2020. Individuals have been asked to follow the rules of social distancing, the use of face masks, and proper hand-washing. National examinations were conducted in accordance with the COVID-19 health protocols. But the number of new cases in the outbreak did not reach zero and continued to rise in a certain number range. On September 21, kindergarten and Grade 1 students' face-to-face training began in the classrooms. Participation in face-to-face training was not mandatory, and it was reported that the students' parents could continue their distance education at their own request without submitting a written application. As of October 12, all primary schools, village schools, and schools for children with special needs (Grades 8 and 12) were opened. For students to adapt to the new school system, limited timed face-to-face education and online education for the rest of the students were still offered. Since the beginning of October, Turkey has again taken measures to restrict mobility, with the number of cases, severe patients, and patients in intensive care increasing significantly. From November 20, 2020, in addition to the measures regarding the use of face mask, social distancing, proper hygiene, work shifts, etc., all formal education and university education have been conducted online. Regulations for cafes and restaurants to offer takeaways only and curfews for special age groups have been implemented (Fig. 3).

The government response index, prepared by Oxford University to fight the pandemic, provides the opportunity to assess and analyze differences between countries on a global scale. It is important to compare measures using a standardized index. It should be noted here that the number of daily reported deaths is shown based on the 7-day average used as a benchmark for comparison with the government response index. As can be seen in the United Kingdom in the early days of the pandemic,

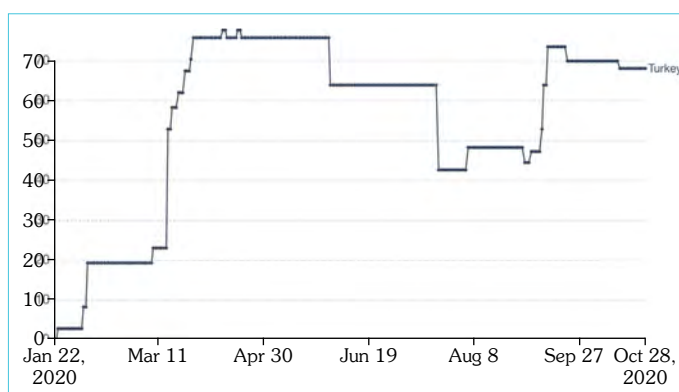


Figure 4. COVID-19 government response stringency index, Oct 29, 2020. This is a composite measure based on nine response indicators including school closures, workplace closures, and travel bands, rescaled to a value from 0 to 100 (100=strictest). If policies vary at the subnational level, the index is shown as the response level of the strictest sub-region

Source: Hale, Webster, Petherick, Philips, and Kira (2020). Oxford COVID-19 Government Response Tracker – Last updated 11 November, 08:30 (London time). Note: This index simply records the number and strictness of government policies, and should not be interpreted as 'scoring' the appropriateness or effectiveness of a country's response. OurWorldInData.org/coronavirus • CC BY

some governments have been quite late in taking measures for pandemic management. As seen in Figure 4, the Turkish government response index increased since the first case was diagnosed because of the school and commercial workplaces' closure decisions. The number of deaths in Turkey was also lower than that in European countries at the beginning of the pandemic. Based on the graph, a transition to the normalization period in Turkey can be observed, where the number of cases decreased in July and August. In September 2020, new public health interventions were imposed and the government response index increased again. Figure 5 shows the indexes as of October 29, 2019. It was also observed that the Turkish index was higher than that of European countries.

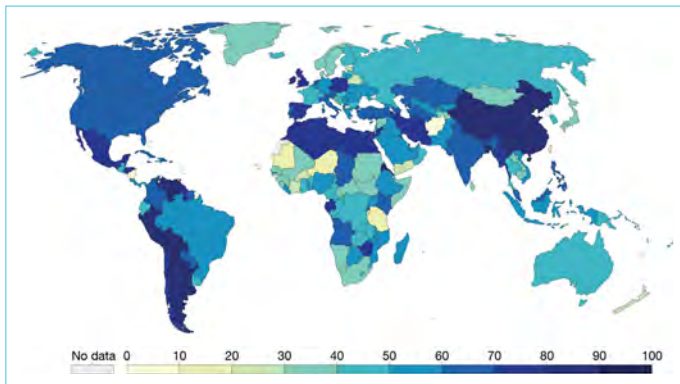


Figure 5. COVID-19: Government response stringency index, Oct 29, 2020. This is a composite measure based on nine response indicators including school closures, workplace closures, and travel bands, rescaled to a value from 0 to 100 (100=strictest). If policies vary at the sub-national level, the index is shown as the response level of the strictest sub-region

Source: Hale, Webster, Petherick, Philips, and Kira (2020). Oxford COVID-19 Government Response Tracker – Last updated 11 November, 08:30 (London time). Note: This index simply records the number and strictness of government policies, and should not be interpreted as ‘scoring’ the appropriateness or effectiveness of a country’s response. OurWorldInData.org/coronavirus • CC BY

Community Involvement in Public Health Interventions

In the pandemic management, public participation should be evaluated while taking measures and interventions. The level of public compliance with measures and proper use of the services provided is essential for success in controlling the pandemic. Compliance with different measures should be monitored using qualitative and quantitative methods, and measures should be taken against a decrease in compliance over time. In Turkey, scientific regional and national studies were conducted to determine the adaptation of the public to such interventions.

During the pandemic, the people’s behavioral responses have been observed to influence their social outcomes. In the case of a health-related emergency, the need to systematically include community-based interventions has been considered. It is important to integrate social sciences-based approaches and interventions for emergency response, to create basic social and cultural data on known risky behaviors and to apply it to countries in non-emergency and emergency periods to reduce health risks. The perception, acceptance, and application of these interventions by the public are closely related to the level of health literacy of the individuals (14).

Health literacy is defined as the cognitive and social skills required for individuals to access, understand, and use health-related knowledge. Limited and inadequate health literacy is actually a silent pandemic. Moreover, health literacy is essential for the formation of public response in the emergence of an outbreak and to develop healthy behaviors in case of a pandemic (15).

Considering the insufficient and limited health literacy (68.9%) in Turkey, it is necessary that a greater focus should be placed on public behavior and risk communication as in the case of a pandemic (16). On the other hand, according to the results of a survey conducted by the Ministry of Health, those with limited health literacy correspond to about 7 out of 10 people. In comparison, in

the elderly, this increases to 9 out of 10 people. Considering that the coronavirus is progressing more seriously or fatally, especially in the elderly, the importance of ensuring appropriate communication with social groups that are poor in terms of health literacy during the epidemic becomes more evident.

CONCLUSION and RECOMMENDATIONS

Monitoring daily data from a public health perspective and measuring and evaluating preventive, therapeutic practices are important in managing the pandemic and preventing future outbreaks. By tracking the outbreak with epidemiological data, public health interventions should be made. The timing of public health measures is also important. It is necessary to implement measures in order and at the appropriate time. Since a single measure is not sufficient, it is necessary to make a combination of measures. Turkey has taken early measures during the outbreak, which began in March 2020, along with regional, provincial, and local measures. In addition to the National Scientific Advisory Board, provincial pandemic boards and Provincial-District Hifzissihha boards have also conducted local measures and monitoring. The pandemic did not exceed the health system capacity in Turkey. Precautions, health system, and health workforce are factors that positively affect preparedness. Vaccine studies are ongoing. It will be necessary to continue precautions to prevent transmission through droplets after vaccination programs are started. It is also necessary to have planned, gradual vaccination programs. Moreover, risk communication plans should be developed to establish a positive approach to vaccination and social behaviors. Since the activity level and duration of the vaccines and the mutations that may occur in the virus are not yet determined, all sectors especially the health sector should fully provide the infrastructure, technology, and service structure needed to effectively prevent and manage ongoing or future outbreaks. Overall, it is important to improve health literacy, community behavior, and community participation in response to the pandemic. Furthermore, development plans should be made, taking into account the socio-economic and educational factors affecting them.

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