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Road Traffic Safety Before and During COVID-19: Have Restrictions Reduced Fatalities?

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Abstract

During COVID-19 pandemic, many restrictions have been applied to reduce social interaction, which might be related with road traffic density. The aim of the current study was to examine the relationship between COVID-19 related restrictions and road traffic accidents by comparing the monthly rates between 2019 and 2020 (traffic fatalities, traffic injuries, traffic accidents with injuries and fatalities, and traffic accidents with property damage only). For the analyses, the traffic accident data were computed per 1000 people in province for all 81 cities in Turkey to make more accurate comparisons. The traffic accident-related injury rates decreased in all months between March and December. Similarly rate of accidents with injuries and fatalities decreased in all months except for July. However, the road traffic fatality rates decreased only in May and October and, the rates of accidents with property damage only decreased in March, April, May, June, and December. According to results, although the rates of accidents declined in general, the fatality rates did not show a similar pattern. The low traffic density, which is due to the restrictions, might be related with higher speeds on the roads. The findings were discussed based on timeline of restrictions that have been applied by the government. It can be suggested that speed related enforcements might be applied even there is lockdown in a province not just to decrease number of accidents but also fatalities.

Keywords: road safety, COVID-19, speed, driver behaviors, fatality

COVID-19 Öncesinde ve Sonrasında Yol Trafik Güvenliği: Kısıtlamalar Ölüm Oranlarını Azalttı Mı?

Öz

COVID-19 pandemisi süresince sosyal etkileşimi azaltmak adına birçok kısıtlama uygulanmıştır ve bu kısıtlamaların yol trafik yoğunluğu ile ilişkili olduğu düşünülmektedir. Bu çalışmanın amacı 2019 ve 2020 yıllarındaki aylık verileri (trafikteki can kayıpları, trafikteki yaralanmalar, yara veya ölümle sonuçlanan trafik kazaları ve sadece mal hasarıyla sonuçlanan trafik kazaları) karşılaştırarak COVID-19 nedenli kısıtlamaların yollardaki trafik kazaları ile ilişkisini incelemektir. (Eski hali: trafik kazalarına etkisini incelemektir.) Analizlerde daha doğru karşılaştırmalar yapabilmek için trafik kaza verileri Türkiye'deki 81 il için 1000 kişide 1 olacak şekilde hesaplanmıştır. Trafik kazalarında yaralanma oranları Mart ve Aralık arasındaki her ay için azalış göstermiştir. Benzer olarak yaralama veya ölümle sonuçlanan kaza oranları da temmuz ayı hariç her ay azalış göstermiştir. Ancak, trafikteki can kaybı oranları sadece mayıs ve ekim ayında; sadece mal hasarıyla sonuçlanan trafik kazaları ise sadece mart, nisan, mayıs, haziran ve aralık aylarında azalmıştır. Sonuçlar incelendiğinde kaza oranları genel olarak azalsa da can kaybı oranları benzer bir azalış göstermemiştir. Kısıtlamalardan dolayı trafik yoğunluğunun azalmış olması ile yollarda daha hızlı araç kullanılması arasında ilişki olabilir. Bulgular hükümetin kısıtlama uyguladığı süre zarfına dayanarak ortaya konmuştur. Bir ilde sokağa çıkma yasağı olsa bile, sadece kaza sayısını değil, ölümleri de azaltmak için hız ile ilgili yaptırımların uygulanabileceği önerilebilir.

Anahtar Kelimeler: yol güvenliği, COVID-19, hız, sürücü davranışı, can kaybı

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Road Traffic Safety Before and During COVID-19: Have Restrictions Reduced Fatalities?

Starting from the first announced case at the end of 2019 in Wuhan, China, COVID-19 epidemic dramatically changed the routines of billions of people all over the world in various ways. On 11 March 2020, COVID-19 was declared as a "global pandemic" by the World Health Organization (WHO) and at the date of this paper there are more than 233 million confirmed cases and more than 4.7 million deaths around the world (Google News, 2021). After the announcement of COVID-19 as a global pandemic, some actions have been taken to restrict social life in almost all countries. Social distancing, use of masks and small social gatherings have been suggested by the WHO, in order to reduce the spread speed of Covid (WHO, 2021). Since traffic and especially use of public transportation prevents to follow these suggestions, traffic appears to be affected by Covid-19 just as other contexts of daily life. Traveling and transportation were one of the most affected parts of daily routine as a result of The Centers for Disease Control and Prevention's (CDC) recommendation on self-quarantine and restrictions by the governments (CDC, 2020). Current study examines the data about the traffic accidents and their consequences before and during the pandemic in Turkey and compares them, in order to investigate whether social life restrictions have related to traffic safety.

1.1. COVID-19 Pandemic in Turkey

The first confirmed case of COVID-19 in Turkey was announced by the Ministry of Health on March 10 in 2020. Series of measures restricting socialization and mobility enforced immediately. First, all educational institutions including universities (Higher Education Board, 2020) closed for 3 weeks starting from March 13, which was delayed until September 21 later. Passenger entries from Germany, Spain, France, Norway, Denmark, Sweden, Belgium and Holland banned a day after (Ministry of Interior, 2020a). Then, on March 15, operations of recreation and public facilities were temporarily stopped (Ministry of Interior, 2020b; Ministry of Interior, 2020c). The first curfew was imposed on people over 65 and persons with chronic illnesses on March 21 (Ministry of Interior, 2020d). At the same date, non-essential services were closed (Ministry of Interior, 2020e). On March 21, regulations over the number of passengers on intercity bus travels, until March 28 when permission started to be a requirement for travelling (Ministry of Interior, 2020f), and the number of customers in the marketplaces were limited by half of their maximum capacity (Ministry of Interior, 2020g). In Ankara, İstanbul and İzmir, the number of taxis allowed in traffic was limited according to the last number of license plates on March 30 (Ministry of Interior, 2020h). In addition to people over 65, people under 20 were put under a curfew, with the exception of certified workforce, as well as 30 metropolitan cities and Zonguldak were quarantined by the interior ministry on April 4 (Ministry of Interior, 2020i). Starting from April 10, periodically each weekend, a 48-hour curfew is imposed on everyone in the quarantined cities.

Since May 4, limits of the taxis on traffic have been removed. Quarantine restrictions were removed for 7 metropolitans (Ministry of Interior, 2020j) (Aydın, Antalya, Erzurum, Hatay, Malatya, Mersin and Muğla) after May 8 and for all remaining metropolitans and Zonguldak after May 31 (Ministry of Interior, 2020k). Also, restaurants ensuring hygiene standards were allowed to work until 10 p.m. An extended curfew applied to the Ramadan festival between May 22 and May 26 (Ministry of Interior, 2020l). On July 21, working hours of restaurants extended until midnight (Ministry of Interior, 2020m). Schools gradually re-opened on September 21.

Despite the relief on restraints in the previous months, starting from November 20 more precautions were taken as a result of an increasing number of cases. Since that date, schools

have been retaining distance education program (Ministry of Education, 2020), restaurants have been serving only home delivery or take-away, people over 65 and under 20 are imposed a curfew except the specified 3 hours a day and periodic weekend curfew for everyone between 8 p.m. to 10 a.m. are applied (Ministry of Interior, 2020n). Starting from December 4, periodic weekend curfew extended through all weekend from Friday night to Monday morning (Ministry of Interior, 2020o). Extended curfew is imposed for everyone between December 31, 2020 to January 2, 2021 (Ministry of Interior, 2020p).

1.2. Traffic During COVID-19 Pandemic

Certain studies have shown a significant decrease in vehicle kilometers for both in general (Qureshi et al., 2020; Vingilis et al., 2020) and young drivers during Covid-19 pandemic (Stavrinos et al., 2020). National Safety Council's Data of Occupational Health and Safety (2020) shows 14% rise in traffic accident fatality rates for March 2020 however, driven miles faced with 18.6% fall compared to the same season of 2019. This situation caused an increase in fatality rate per 100 million from 1.07 to 1.22 for the stated period. Although the promising reduction in traffic density, Kamga, Moghimi, Vicuna, Mudigonda, and Tchamna's (2020) report suggested that there has been an increase at the speed of traffic in New York city as a result of lower congestion. Toronto Police reported 35% increase in speeding during lockdown (City of Toronto, 2020). Also, in California, numbers of citations that include driving over 100 miles per hour seem to be 87% more than last year for the dates between mid-March and mid-April. This ratio was 30% for the USA in general (Kaji, Barr and Maile, 2020) Additionally, in the survey that British Columbia Automobile Association (2020) conducted, 49% of the participants reported that they have been seeing drivers who exceed speeds and 43% of all participants said that these drivers are not obeying traffic signs. High speed crashes might have been increased due to COVID-19 restrictions among the country and these are likely to be severe and fatal (National Highway Traffic Safety Administration, 2019). In their research, Sarman and Sarman (2020) focus on driver behaviors and suggest that both women and men tend to make more violations while driving during rush traffic hours. However, considering the density during the rush hours these violations are less likely to be a speed violation. Therefore, appeared light traffic volume and reduced overall vehicle travel within the environment sedative effect of Covid-19 may be encouraging for drivers to increase their speed.

During the pandemic, especially during March and April, overall traffic and number of accidents have shown decrease. In Turkey, according to Anadolu Agency (April 2020) while the only action taken was closing the schools, the accident rate decreased by 35% in Istanbul. Aloi et al. (2020) in Spain compared the data of one and a half month before quarantine and during quarantine and a total number of decreases in traffic accidents have been observed. According to US Early Reports between March and April, driving reduced by as much as 2/3 of vehicle miles traveled (Dutzik, 2020). However, since personal travelling showed rise at some point, there are some indicators showing the rebound in April (Schuman, 2020). These low numbers of accidents did not positively correlate with curiously casualty accidents but with injuries. Shilling and Waetjen (2020) found 50% decrease to the extent of same time of previous year in total and casualty accidents for 2 months period (1 March – 30 April 2020) in California while there was a lockdown of non-essential businesses. Similarly, in a study conducted in North Carolina investigated the data from 15 March 2020 to 16 May 2020, 50% decrease in total accidents and %10 decrease in fatal accidents were reported however, there was 6% increase in curiously casualty accidents which has been attributed to single vehicle accidents (Carter, 2020). Sutherland, McKenney and Elkbuli (2020) formulated the traffic injury as equal to "exposure x risk x injury" and waited for a decrease due to restrictions throughout the USA. In the study, three states of the USA (New York, Florida and Massachusetts) were examined,

and results indicated significant differences from the 3 previous years. Vehicle accidents and vehicle injuries decreased during COVID-19 period compared to the previous years.

Road traffic accidents and medical resources including personnel and equipment have essential effects on each other. Not only road traffic accidents are a notable contributor to utilization of hospital resources which is vital during epidemic (Qureshi et al., 2020); prehospital time (Kim et al., 2017) and resources reserved for treatment (Karthigeyan, 2021) affects the severity of results of traumas as well. Furthermore, research analyzing the effect of economic recession on traffic and since COVID-19 pandemic led grand falls in GDP for almost every country, we may want to see how traffic is affected by this situation in order to understand the changes in accidents and fatalities. Maheshri and Winston (2016), stated that 1% increase in unemployment rate reduced the vehicles kilometers travelled for 0.15km per day. However, this reduction occurred for risky groups only, while safer driver groups tend to increase their vehicles kilometers travelled as each percent of unemployment rate. However, in similar research He (2016), stated that vehicles kilometers travelled fails to explain reduced fatality rate. This reduction can be explained by reduction in the total number of fatalities.

1.3. Aim of the Study

This study aims to examine the relationship between COVID-19 pandemic and restrictions that have been applied in order to face less serious health problems on traffic accidents, injuries and fatalities in Turkey. Hence, the traffic fatality rates, traffic injury rates, road traffic accidents with injuries and fatalities and road traffic accidents with property damage before and during pandemic was compared monthly.

2. Method

In the current study, number of road traffic fatalities, number of road traffic injuries, number of road traffic accidents with injuries and fatalities, number of road traffic accidents with property damage only for each city (N=81) were gathered. A retrospective analysis was performed after gathering data. The information was taken from Traffic Statistics Bulletins that are published by General Directorate of Security monthly (General Directorate of Security, 2019a-j;2020a-j). The data was taken for all months of 2019 and 2020 except for January and February, since the COVID-19 pandemic related restrictions have been applied from March 2019 in Turkey. The populations of 81 cities show differences. Hence, the number of accident-related outcomes show differences across cities. In order to overcome this problem, each variable was converted as per 1000 person by using the related year's population (Turkish Statistical Institute, 2020a; 2020b). All analyses were conducted by SPSS v.25 software. In order to investigate whether the mean distributions of four study variables (i.e., road traffic fatalities, road traffic injuries, road traffic accidents with injuries and fatalities, road traffic accidents with property damage only) are different between 2019 and 2020, Wilcoxon Signed Rank Test was conducted. The differences in mean distributions were tested separately for four variables. Also, to test the monthly differences between 2019 and 2020, related samples t-test was conducted for each month (e.g., March2019-March2020) and each variable.

3. Results

3.1. Road Traffic Fatalities

The means of road traffic fatalities for each month were calculated for both 2019 and 2020 (see Figure 1). The results of Wilcoxon Signed Rank Test shows that the mean distribution of road traffic fatalities for 2019 and 2020 are significantly different (z = -2.50, p=.013, r=-.70) and all ranks of 2020 (except for November) are lower than 2019 ranks.

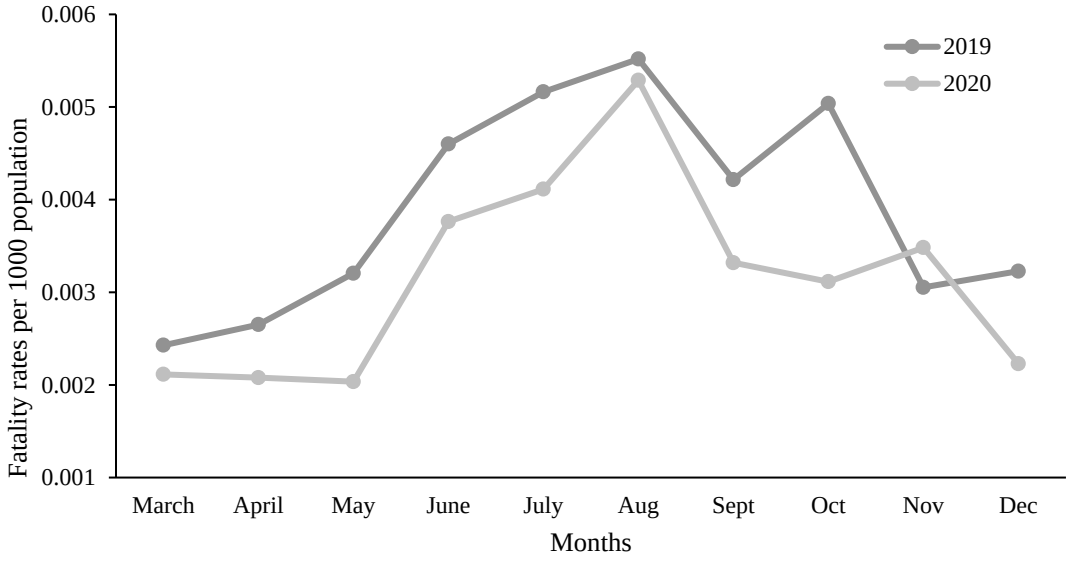

Figure 1. Road traffic fatalities for 2019-2020 by months

When monthly based differences are examined, results showed that the number of road traffic fatalities significantly decreased in 2020 only in May and October (see Table 1).

Table 1. ***Mean differences in road traffic fatalities by months***

	2019		**2020**			
	M	***SD***	***M***	***SD***	**t-test**	***p***
March	.002	.004	.002	.002	.655	.514
April	.003	.003	.002	.002	1.550	.125
***May**	.003	.004	.002	.002	2.805	.006
June	.005	.005	.004	.004	1.281	.204
July	.005	.005	.004	.004	1.274	.206
August	.006	.006	.005	.006	.285	.777
September	.004	.005	.003	.003	1.469	.146
***October**	.005	.007	.003	.004	2.243	.028
November	.003	.004	.003	.004	-.810	.420
December	.003	.004	.002	.003	1.891	.062

*Note: *Significantly different months*

3.2. Road Traffic Injuries

The means of road traffic injuries for each month were calculated for both 2019 and 2020 (see Figure 2). The results of Wilcoxon Signed Rank Test shows that the distribution of means of road traffic injuries for 2019 and 2020 are significantly different (z = -2.80, p=.005, r=-.89) and ranks of 2020 are lower than 2019 ranks.

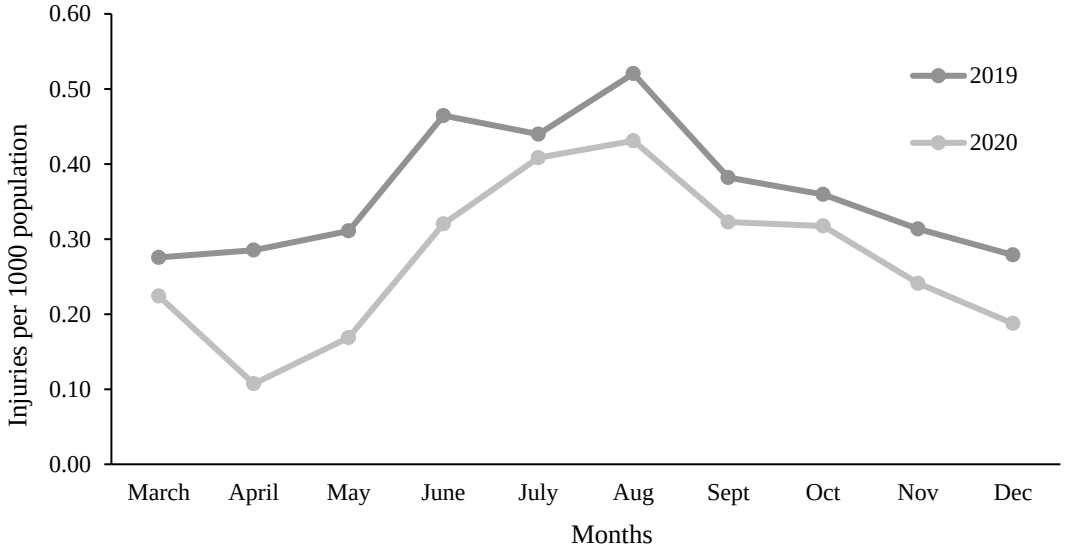

Figure 2. Road traffic injuries for 2019-2020 by months

When monthly based differences are examined, results showed that the number of road traffic injuries significantly decreased in 2020 in all months (see Table 2).

Table 2. ***Mean differences in road traffic injuries by months***

	2019		**2020**			
	M	***SD***	***M***	***SD***	***t-test***	***p***
*__March__	.276	.093	.224	.079	6.644	.000
*__April__	.285	.097	.107	.040	20.549	.000
*__May__	.311	.108	.169	.059	16.550	.000
*__June__	.465	.165	.320	.110	12.077	.000
*__July__	.440	.155	.408	.172	2.245	.028
*__August__	.520	.210	.431	.164	7.767	.000
*__September__	.382	.127	.323	.107	6.818	.000
*__October__	.359	.121	.317	.099	4.862	.000
*__November__	.313	.097	.241	.065	9.441	.000
*__December__	.279	.086	.188	.058	10.548	.000

*Note: *Significantly different months*

3.3. Road Traffic Accidents with Injuries and Fatalities

The means of road traffic accidents with injuries and fatalities for each month were calculated for both 2019 and 2020 (see Figure 3). The results of Wilcoxon Signed Rank Test shows that the distribution of means of road traffic injuries for 2019 and 2020 are significantly different (z = -2.80, p=.005, r=-.89) and ranks of 2020 are lower than 2019 ranks.

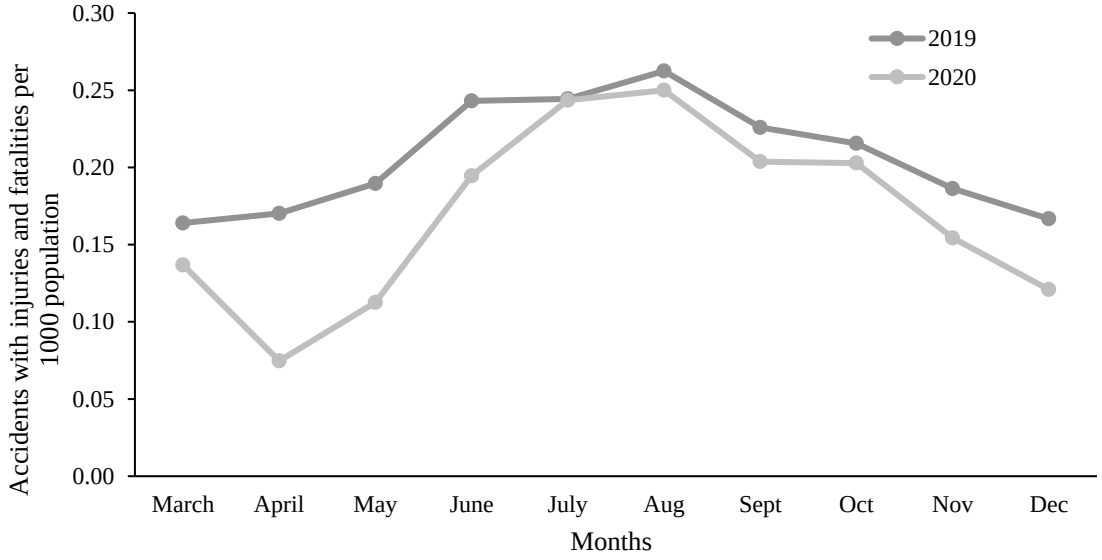

Figure 3. Road traffic accidents with injuries and fatalities for 2019-2020 by months

When monthly based differences are examined, results showed that the number of road traffic accidents with injuries and fatalities significantly decreased in 2020 in all months except for July (see Table 3).

Table 3. ***Mean differences in road traffic accidents with injuries and fatalities by months***

	2019		**2020**			
	M	***SD***	***M***	***SD***	***t-test***	***p***
***March**	.164	.064	.137	.051	8.520	.000
***April**	.170	.057	.075	.026	21.984	.000
***May**	.190	.067	.113	.039	15.579	.000
***June**	.243	.083	.195	.065	9.576	.000
July	.244	.087	.244	.091	.182	.856
***August**	.262	.097	.248	.086	2.969	.004
***September**	.226	.076	.204	.068	5.226	.000
***October**	.216	.076	.203	.066	3.401	.001
***November**	.186	.059	.154	.046	8.615	.000
***December**	.167	.052	.121	.033	10.780	.000

*Note: *Significantly different months*

3.4. Road Traffic Accidents with Property Damage Only

The means of road traffic accidents with property damage only for each month were calculated for both 2019 and 2020 (see Figure 4). The results of Wilcoxon Signed Rank Test shows that the distribution of means of road traffic injuries for 2019 and 2020 are not significantly different (z = -1.68, p=.093, r=-.53).

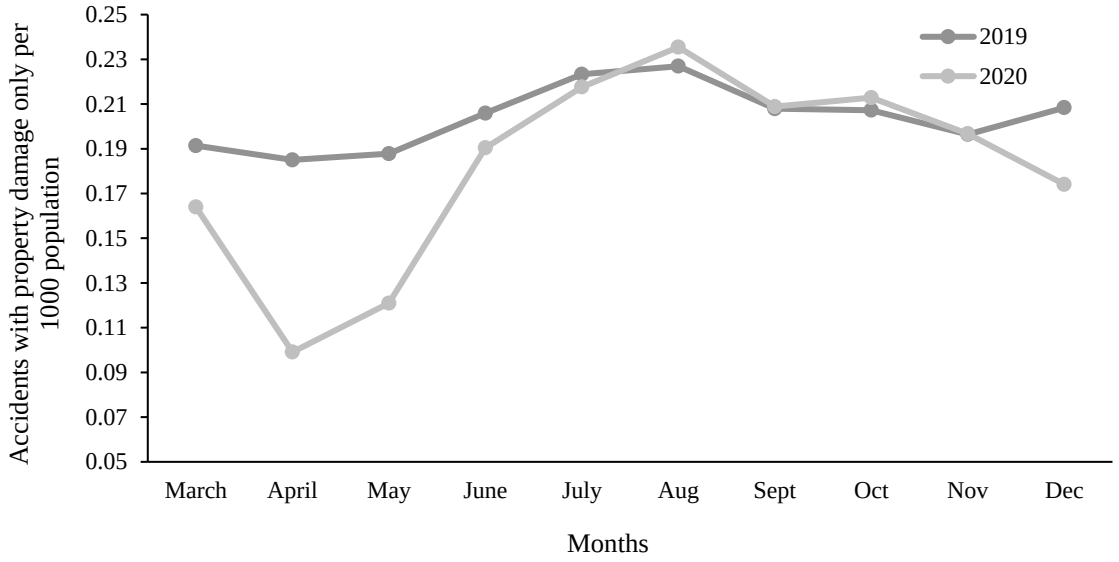

Figure 4. Number of road traffic accidents with property damage only 2019-2020 by months

When monthly based differences are examined, results showed that the number of road traffic accidents with property damage only significantly decreased in 2020 only in March, April, May, June, and December (see Table 4).

Table 4. ***Mean differences in road traffic accidents with property damage only***

	2019		**2020**			
	M	***SD***	***M***	***SD***	***t-test***	***p***
*__March__	.191	.087	.164	.077	5.597	.000
*__April__	.185	.088	.099	.0464	14.278	.000
*__May__	.188	.088	.121	.051	10.886	.000
*__June__	.206	.090	.190	.080	3.014	.003
July	.223	.101	.218	.088	1.082	.282
August	.227	.104	.235	.102	-1.877	.064
September	.208	.099	.209	.085	-.173	.863
October	.207	.098	.213	.077	-.985	.327
November	.196	.089	.197	.072	-.053	.958
*__December__	.208	.096	.174	.063	4.897	.000

*Note: *Significantly different months*

4. Discussion

The aim of the current study was to examine whether COVID-19 and restrictions within it have any relation to road traffic accidents by comparing the traffic fatality rates, traffic injury rates, road traffic accidents with injuries and fatalities and road traffic accidents with property damage between 2019 and 2020. To test the stated differences, the rates were computed per 1000 population. The findings suggested that lockdown policies might have been related to road traffic safety related variables.

The road traffic fatality rates decreased only in May and October. The road traffic injury rates decreased in all months between March and December. Öztürk and Karcıoğlu (2021) stated the insufficiency of public hospitals in several different aspects in Turkey during the first six months of pandemic, which might be the possible explanation for the difference between fatality and injury rates. The rates also showed decrease for accidents with injuries and fatalities

in all months except for July; however, the rates decreased for accidents with property damage only in March, April, May, June, and December.

The accidents with property damage only decreased significantly in March, April, May, June and December. The decline is highly related to the travelling prohibition and lockdowns on weekends, except June. Surprisingly, after the relief on restraints applied on 1st of June, the downgrading trend continued. Although the results were non-significant, an increased trend was observed for August, September, October and November.

According to the investigation of Traffic Statistics Bulletins (General Directorate of Security, 2019a-j;2020a-j), in the months in which there were decreases, most of the accidents have occurred in inner city roads. This can be a possible explanation for the decrease in accidents with property damage only during lockdown and traffic restrictions. In interurban roads, the speed of the vehicles is higher than in the inner-city roads because of the necessity of the roads and legal regulations. The decrease of high-speed accidents may be related to diminished numbers of interurban travels.

The accidents with injuries and fatalities decreased in all months except for June. Starting normalization on June 1st and the rising number of people who had changed locations may be the possible explanation for the non-decreasing number of fatalities in June. Interprovincial travels had decreased during the pandemic even if there was not any lockdown application by the government. This can be considered as the plausible explanation for the decrease in the accidents with injuries and fatalities. As stated above, the speed is usually higher in intercity roads. Both travel restrictions and people's own precautions may have association with lower numbers of accidents in intercity roads, which also decreased the number of the accidents with injuries and fatalities.

Similar to the decrease in the number of accidents with injuries and fatalities, the number of injuries decreased in all months. The decrease in the number of intercity accidents with high speed might be positively associated with traffic safety and resulted in a decrease in injuries. Analyses comparing the number of deaths due to accidents indicate the least variation. More specifically, the numbers decreased only in May and October for road traffic fatalities. In May, 4 days restriction due to Ramadan may be related to the decrease. However, the decrease in October is remarkable. Not having reduction on deaths while having for other patterns is an undesired result. Although the number of accidents decreased, the fact that fatality did not decrease may be indicating the importance of speed in accidents. A 30% increase in speed almost doubles the probability of getting injured in an accident (NSW Centre for Road Safety, 2011). Speed is also closely related to the severity of an accident. Naghawi, Qatawneh and Louzi (2018) showed the downturn of both traffic violations (66%) and traffic accidents (63%) as a result of the integration of excessive speed cameras. In order to decrease speed behavior, the increase in the frequency of enforcements about speeding might influence road traffic safety in a positive way.

Road traffic injuries, road traffic accidents with injuries and fatalities and road traffic accidents with property damage only shows reduction in April and at least two following months. This reduction may be related to restrictions that have been applied to people who are under 20. By preventing young adults from going out, edgeway their existence in traffic has been prevented. Since this age group is less experienced (in Turkey a person is called an intern driver for the first two years) and includes young male drivers -who have been stated as the riskiest group in several research (e.g., de Winter & Dodou, 2010; Taubman-Ben-Ari, O., Eherenfreund-Hager, A., & Prato, C. G, 2016), decomposed traffic from these age groups might have been safer.

Sutherland et al. (2020) mentioned the possible role of decreased alcohol consumption on vehicle collusions. They stated that since most of the workplaces are closed except non-essential ones, alcohol consumption moves to houses from bars, clubs or restaurants and this situation may be contributing the decrease of alcohol related vehicle collusions. Same condition probably valid for Turkey also. A part of decreased fatalities, injuries or property damages may have a relationship with this situation.

Starting from March 2020, people started to use more personal vehicles due to the necessity of social distancing. Use of public transportation showed great decline during this period as it can be seen in the research of Aloi et. al (2020) that works in Spain case. Increased ratio of using private vehicles leads to an expectation of more crowded roads; however, because of restrictions and closing of schools and non-essential businesses the same study shows proof for less mobility. In the long term, people may gain new habituation and may continue to use their own vehicles even if use of public transportation becomes riskless. This situation may increase the traffic density with respect to pre-pandemic and therefore accident numbers may rise.

The results of the current study show that precautions during pandemic were related to road traffic safety. Due to restrictions, the mobility might have decreased, meaning less vehicles on roads. The less traffic density might be in association with drivers' preferred speed. Drivers tend to exceed speed limits by observing other drivers in traffic (Haglund & Åberg, 2000). Yannis, Louca, Vardaki and Kanelleidis (2013) reported that if other drivers in traffic exceed the speed limits, people exceed the speed limit as well. It can be suggested that, during restrictions, the enforcements especially for speeding might be increased to decrease traffic accidents and their consequences. In future studies, interviews can be conducted to understand the underlying factors of speeding during restrictions.

Ethics Committee Approval Statement

Ethics committee approval is not required since data was not collected from human or animal participants in the relevant study.

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