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ORIGINAL ARTICLE

Relationship of working arrangements and getting COVID-19 in the outpatients: "in the same storm but different boats"

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Abstract

Objective: It was aimed to examine the relationship between a getting COVID-19 and socioeconomic variables, employment status, and working arrangements including remote working and alternate working status.

Methods: The study was conducted between 1-8 June 2021 on 1090 people. It was conducted face-to-face interviews with patients who applied to tertiary outpatients in Ankara/Türkiye. A convenient sampling method was used for determining people. Except for emergency services, all outpatient clinics were included in the study. The self-reported information was used to determine the history of getting COVID-19.

Results: The regression model including all participants shows that getting COVID-19 risk higher in workers (OR: 1.719 95% CI:1.142-2.587) according to non-workers and 30-39 age group according to 18-30 (OR: 1.669 95% CI: 1.032-2.701). Bivariate analysis, including current workers, there was a statistically significant difference between income groups in terms of getting COVID-19 ($p<0.05$). The prevalence of COVID-19 is higher in people who attend workplace throughout the pandemic (31.3%) than in people who work remotely for a period of time (21.8%)($p<0.05$); additionally, it is higher in people who have never worked alternately (33.5%) than in people who work alternately for a period of time (22.2%) during the pandemic ($p<0.05$). Regression model only including currently workers shows that getting COVID-19 risk higher in those who had never worked alternately during the pandemic period (OR: 1.749 95% CI: 1.091-2.804).

Conclusion: Working arrangements are among the nonpharmaceutical interventions (NPIs) effective in combating the pandemic. More lives could be saved in future epidemics by implementing work arrangements to include more workers.

Keywords: Working Arrangement, Remote Working, Alternate Working, COVID-19, Nonpharmaceutical Interventions, Pandemic

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INTRODUCTION

It can be mentioned that there is a two-way causality relationship between COVID-19 and health inequalities. The COVID-19 epidemic has brought to light long-standing structural factors that contribute to health disparities, including unfavorable employment situations and widening economic inequality.[1] On the other hand differences in social determinants of health has led to variations in viral exposure, and variation in illness outcomes.[2] Studies have showed that COVID-19 more frequently seen and has higher mortality rates in disadvantaged socioeconomic groups and/or regions.[3-7] It is said that variables associated to the workplace may be partially to blame for the disproportionate COVID-19 infection and mortality rates.[8] Studies have been conducted to estimate the risk of contamination that employees will be exposed to according to their sectors.[9-11]

Public health interventions or non-pharmaceutical interventions (NPIs) implemented during COVID-19 pandemic includes, population based measures such as lockdowns, social distancing; case based measures such as contact tracing, isolation; and border control measures such as travel restrictions.[12] As noted in a systematic reviews NPIs were found effective for infection control.[13,14] Within the context of NPIs, various work arrangements such as remote working and alternate schedule working have been widely implemented worldwide during the pandemic.[15-17] In the lockdown periods, workers who working remote have increased to 47% in the UK, and France. Remote working rose from 10% to 28% in Japan, which did not implement a statewide lockdown.[18] Otherwise, according to Eurostat, working from home was less common in many eastern and southern regions of the EU in 2020, below 5%, and this ratio is lower than 2,5% in Türkiye.[19]

Some developed countries have used extensive national cohorts to investigate determinant factors of COVID-19 including employment status. A nationwide register-based cohort, including employed was used in Denmark, and a national population-based cohort was used in Germany[20,21.] There is a lack of sufficient information regarding this issue in developing countries that face limitations in terms of national health and/or occupational registrations.

As indicated by a systematic review, most of the studies regarding health inequalities during the COVID-19 pandemic were ecological studies; few were conducted at the individual level. It is said that there is a need for more studies at an individual level to understand the underlying pathways.[22]Furthermore, the impact of occupational arrangements such as remote working or alternate working on the frequency of getting COVID-19 has been relatively understudied during the pandemic.

COVID-19 has been qualified as an occupational disease on a case-by-case basis in many developed and developing countries such as Australia, Canada, Denmark, Germany, France, South Africa, Slovakia. It has been qualified as a work-related disease in some countries such as Brazil. It has been qualified as an occupational accident in some countries such as Italy and China. In Türkiye, on the other hand, it is not accepted as an occupational accident, work-related disease, or occupational disease legally.[23] It was only accepted as an occupational disease in the health care workers, on by cases. This has

been a limiting factor in obtaining information regarding the relationship between employment status or work arrangements and getting COVID-19, through occupational health records in Türkiye. Therefore, we wanted to investigate this relationship through a population-based study involving outpatient applicants. Establishing a clear relationship between work arrangements and the risk of infection, based on concrete experiences during the COVID-19 pandemic, can aid in better outbreak management in the future.

In this study, it was aimed to examine the relationship between getting COVID-19 and socioeconomic variables, employment status, and working arrangements, including remote working status and alternate working status in patients who applied to tertiary outpatient clinics.

METHOD

Sampling

The study is a cross-sectional study conducted on outpatients aged 18 and over who applied to the Gazi University hospital. The hospital in question is a tertiary healthcare institution and is located in Ankara the capital city of Türkiye.

While calculating the sample size, 16.650 people, the total number of outpatient visits during one week, were taken as a reference for the study population. By taking 50% unknown frequency, 3% margin of error, 95% confidence level, and 1.0 design effect, we achieved a sample size of 1003. The OpenEpi program was used in the sampling calculation.

Study participants were selected from those who applied to the outpatient clinics using the convenient sampling method. Outpatient clinics involved in the study include all outpatient clinics of university hospital. On the other hand, persons attending emergency services were not included in the study. At the end of the study, 1090 people were reached.

Implementation

Data was collected by applying a face-to-face interview method to the people who agreed to participate in the study on June 1 and 8, 2021. Before starting the survey, the participants were informed about the study, and their verbal consent was obtained. The Gazi University Ethics Commission's approval with research code 2021 - 689 was obtained for the study.

Variables

The dependent variable of the study is the getting COVID-19. The history of getting COVID-19 before the study was ascertained based on the self-reported declarations of the individuals. The history of getting COVID-19 has been inquired about based on the medical history, regardless of whether their current complaints are related to COVID-19 or not. Independent variables are gender, age groups, educational levels, income groups, employment status, perceived health, and presence of chronic disease.

Independent variables related working arrangements for currently workers are remote working status, alternate working status, and occupational groups. Alternate working was one of the restriction methods that was implemented during the pandemic. It was implemented by employees working alternately, going to work on certain days of the week, and not going to work on certain days. With the alternate working status, it was

questioned whether they had ever worked alternately during the pandemic. Remote working was another restriction method that was implemented during the pandemic. It refers to work that takes place within the worker's own residence. With the remote working status variable, it was questioned whether they had ever worked remotely during the pandemic.

Statistical Analyses

While forming the income group, categorization was made according to quartile values. The first quartile for income is 4000 TL, the median is 6000 TL, and the third quartile value is 10000 TL. Income status groups are categorized as those whose income is up to 4000 TL, 4001-6000 TL, 6001-10000 TL, and more than 10000 TL, respectively. Since the exchange rate for 1 US $ is 8.52 TL on June 1, 2021, the income groups are as follows: The lowest group is below 469,4 $, the medium-low group is between 469,5-704,1 $, the medium-high group is between 704,2-1103,6 $, and the highest group is the above 1103,7 $.

Descriptive variables are expressed as numbers and percentages. The chi-square test was used for bivariate analyses. We have created a logistic regression model of factors associated with getting COVID-19. To determine the factors associated with the getting COVID-19 in those who were employed, we analyzed only currently workers.

The statistical significance level was accepted as $p<0.05$ in the bivariate analysis. Independent variables with $p<0.25$ in the bivariate analysis were included in the multivariate model. "Backward LR" was used as the "variable selection method" while creating logistic regression models. Statistical analyses were performed using Statistical Package for the Social Science (SPSS) version 23.

RESULTS

The frequency of those who stated that they had COVID-19 in all participants (n=1090) was 19.9%. Table 1 shows the status of having had COVID-19 according to some descriptive characteristics of the participants. There is a statistically significant difference between age groups in terms of getting COVID-19 ($p<0.001$). The prevalence of getting COVID-19 is 24% in the 30-39 age group and 7.8% in those aged 70 and over. The frequency of those who had COVID-19 was 26.7% in those who were employed, while it was 14.3% in those who were non-employed ($p<0.001$). According to the results of the bivariate analysis, the variables that did not meet the inclusion criteria in the multivariate model are gender, perceived health status, presence of chronic disease ($p>0.25$).

Table 1. Changes in the status of getting COVID-19 according to some descriptive characteristics in participants

	%*	n	Getting COVID-19 (%)**	p
Gender n=1090				
Female	53.6	584	18.8	0.341
Male	46.4	506	21.1	
Age Groups (n=1090)				
18-29	25.2	275	18.2	**<0.001**
30-39	19.3	210	29.0	
40-49	18.5	202	27.7	
50-59	20.2	220	12.3	
60-69	12.1	132	14.4	
≥70	4.7	51	7.8	
Educational Levels (n=1090)				
Didn't go to school	2.6	28	21.4	0.064
Primary education graduate	21.1	230	20.4	
High school graduate	31.7	346	15.3	
University and higher degree	44.6	486	22.8	
Income Group (n= 912)				
Highest	15.6	142	26.8	0.118
Medium/High	30.9	282	20.6	
Medium/Low	26.6	243	16.5	
Lowest	26.9	245	20.4	
Employmnet Status (n=1090)				
Worker	45.4	495	26.7	**<0.001**
Nonworker	54.6	595	14.3	
Perceived Health (n=1089)				
Excellent	12.0	131	22.9	0.410
Good	46.3	504	18.7	
Fair	26.9	293	21.8	
Poor	12.9	140	16.4	
Bad	1.9	21	28.6	
Chronic Disease (n=1090)				
Yes	43.3	472	19.1	0.544
No	56.7	618	20.6	

*: column percentage , **:row percentage

The variables included in the multivariate model for the getting COVID-19 were age groups, education levels, employment status and income groups. Table 2 shows the logistic regression model of factors associated with getting COVID-19. While the risk increases in the 30-39 age group (aOR: 1.669 95%CI: 1.032-2.701) compared to the 18-29 age group, the risk decreases in the 70 and older age group (aOR: 0.100 95%CI: 0.013- 0.773). Risk of the getting COVID-19 in the workers is higher than non-workers according to regression model (aOR:1.719 95%CI: 1.142-2.587).

Table 2. Logistic regression model of factors associated with getting COVID-19*

	Bivariate model cOR (95%CI)	Multivariate model aOR (95%CI)
Age Groups		
18-29	1	1
30-39	1.842 (1.202-2.825)	1.669 (1.032-2.701)
40-49	1.726 (1.118-2.665)	1.606 (0.979-2.635)
50-59	0.630 (0.380-1.044)	0.601 (0.344-1.052)
60-69	0.757 (0.426-1.344)	0.892 (0.458-1.736)
≥70	0.383 (0.132-1.112)	0.100 (0.013-0.773)
Educational Levels		
Didn't go to school	1	1
Primary education graduate	0.942 (0.361-2.454)	0.589 (0.189-1.835)
High school graduate	0.663 (0.257-1.713)	0.327 (0.104-1.026)
University and higher degree	1.085 (0.429-2.743)	0.444 (0.141-1.401)
Employment Status		
Nonworker	1	1
Worker	2.182 (1.610-2.957)	1.719 (1.142-2.587)

*: The variable income groups, whose effect on the last step of the model is not statistically significant. cOR: crude Odds Ratio, aOR: adjusted Odds Ratio

Among the individuals interviewed, 495 people (45.4%) reported being currently employed. Table 3 shows the changing of getting COVID-19 in current workers according to some descriptive characteristics and variables related to work arrangements. The prevalence of getting COVID-19 in persons who went to the workplace during

the entire pandemic (31.3%) is higher than in persons who worked remotely for a period (21.8%) (p<0.05). The prevalence of getting COVID-19 in those who have never worked alternately (33.5%) is higher than in those who worked alternately for a period (22.2%) during the pandemic (p<0.05). There is no significant difference between occupational groups (p>0.05).

Income group, alternate working status, remote working status, age and education level are the variables examined in the logistic regression model. Table 4 shows the logistic regression model of factors associated with getting COVID-19 in currently workers. Those who never worked alternately were at higher risk (aOR: 1.749 – 95%CI: 1.091-2.804).

Table 3. Changing of getting COVID-19 in current workers according to descriptive characteristics and working status

	%*	n	Getting COVID-19 (%)**	p
Gender (n=495)				0.387
Female	38.0	188	24.5	
Male	62.0	307	28.0	
Age Groups (n=495)				
18-29	24.4	121	27.3	0.246
30-39	29.1	144	30.6	
40-49	23.6	117	29.9	
50-59	19.8	98	17.3	
60-69	2.8	14	21.4	
≥70	0.2	1	0	
Educational Levels (n=495)				
Didn't go to school	0.2	1	0	0.225
Primary education graduate	9.3	46	39.1	
High school graduate	19.8	98	25.5	
University and higher degree	70.7	350	24.9	
Income Group (n= 418)				
Highest	26.3	110	30.9	**0.017**
Medium/High	36.4	152	27.0	
Medium/Low	24.4	102	16.7	
Lowest	12.9	54	38.9	
Perceived Health (n=494)				
Excellent	15.0	74	24.3	0.855
Good	52.8	261	25.7	
Fair	23.3	115	28.7	
Poor	7.3	36	30.6	
Bad	1.6	8	37.5	
Chronic Disease (n=495)				
Yes	31.1	154	29.9	0.279
No	69.9	341	25.2	
Remote working status (n=495)				
I worked by going to the workplace during the entire pandemic period.	51.7	256	31.3	**0.019**
I worked remotely for a period during the pandemic	48.3	239	21.8	
Alternate working status (n=437)				
I have never worked alternately during the pandemic period.	44.4	194	33.5	**0.009**
I worked alternately for a period during the pandemic	55.6	243	22.2	
Occupational Group (n=495)				
Blue collar employees	22.4	111	28.8	0.890
White collar employees	65.9	326	25.8	
Self employed	8.3	41	29.3	
Employers	3.4	17	23.5	

*: column percentage , **:row percentage

Table 4. Logistic regression model of factors associated with getting COVID-19 in currently workers

	Bivariate model cOR (95%CI)	Multivariate model aOR (95%CI)
Income Group		
Highest	0.703 (0.356-1.388)	0.679 (0.331-1.390)
Medium/High	0.580 (0.302-1.116)	0.574 (0.288-1.149)
Medium/Low	0.314 (0.148-0.669)	**0.285 (0.129-0.631)**
Lowest	1	1
Alternate working status		
I have never worked alternately during the pandemic period.	**1.764** (1.153-2.697)	**1.749** (1.091-2.804)
I worked alternately for a period during the pandemic	1	1

*Variables whose model effect is not statistically significant in the last step; remote working status, age groups and education levels. cOR: crude Odds Ratio, aOR: adjusted Odds Ratio

DISCUSSION

We have analyzed factors related to getting COVID-19, firstly, all participants and then only for workers. In the 30-39 age group, the prevalence of COVID-19 is highest, and in the 70 and older age group, the prevalence of COVID-19 is lowest. In multivariate analysis, it was determined that the risk increased in the 30-39 age group compared to the 18-29 age group, and decreased in the 70 and over age group. Studies have found that increasing risk with age.[24-26] Measures specified for elderlies were implemented in Türkiye. For example, curfew was declared for those over the age of 65 at 20 March 2020. From 18 November 2020 people over the age of 65 were allowed to go out between 10:00 and 13:00.[27] These interventions may have played a part in decreasing risk among the elderly.

We did not find any statistically significant difference between genders, education levels, and income groups in terms of getting COVID-19. While some studies suggest that the risk is higher in men [25,26], others indicate no significant gender difference in the risk of COVID-19.[28] While some studies identify income level as a risk factor[25,29], others present conflicting findings.[26] Several studies have demonstrated that individuals with lower education levels are at a higher risk of getting COVID-19.[28-30] Health inequalities regarding COVID-19 have also been demonstrated in terms of variables other than those we have considered in our study, as is the case of detecting inequalities between different regions.[5] The lack of difference for some socioeconomic variables in our study may be due to the fact that the data are based on outpatients's and do not fully reflect the socioeconomic differences in the general population. On the other hand, the fact that socioeconomic variables are measured by different methods may also be a factor preventing standardized comparison of study results.

Notably, the only socioeconomic variable found to be effective in the regression model, other than age, is employment status. The multivariate model shows that the risk of getting COVID-19 in workers increased by 72% compared to non-workers. It has been highlighted that workplaces are key areas for NPIs aiming to protect workers and all.[0,31] "Job exposure matrices" have been developed to estimate risk for planning restriction measures.[32,33] There are examples of countries where restriction measures are implemented to include working life. All industries, businesses, and non-essential production were shut down in Italy, and new laws were put in place to protect families, seasonal workers, healthcare professionals, and independent contractors. Furthermore, a protocol has been signed by the government, labor unions, and businesses to control the working environment with regard to occupational health and safety in Italy.[34] Measures implemented in the UK for a period included COVID-19 testing for general practitioners, care home residents and those who had to go to work. For those unable to work due to COVID-19, it was decided that they should pay 60% of their salary up to £2,500.[35] Mitigation measures have been implemented in the USA, but it is stated that they are less applied in small enterprises employing less than 10 workers.[36] The higher risk of infection in workers may be due to the inadequate measures taken in the workplace

during the pandemic period in Türkiye. According to a study aimed at representing the working population in Türkiye (excluding public employees) at the national level, 30% of workers noted that the work was not stopped despite the fact that COVID-19 cases were seen at the workplace, and 12.6% said that the case section was closed but the work continued in other departments.[37] A descriptive study implemented in Türkiye and included the workplace chief has shown that suspending production, implementing alternate work schedules, isolating cases from other workers in a designated room, avoiding face-to-face meetings, and checking the workers' COVID-19 status using contact tracing application of Ministry of Health were not available in more than half of the workplaces.[38] In other studies, it is pointed out that restriction measures are not implemented adequately in workplaces in Türkiye.[39-41] Because our work is done with outpatients, no workplace measures have been questioned, so we can't directly associate our results with workplace measures. However, indirectly, based on studies that express the shortcomings of measures taken at the workplace, we can say that the insufficiency of workplace measures may lead to an increase in the number of cases.

While there were differences between work arrangements in the bivariate analysis involving only workers, there were no differences among occupational groups. The lack of difference between occupational groups in our study may be because the groups were categorized to include only four variables. On the other hand, certain studies have identified specific sectors, including healthcare, social care, logistics, and others, that carry an increased risk of COVID-19 contamination.[2,42] However, our study indicates that work arrangements may be the ultimate determinant of transmission risk. This result implies that a comparison between occupations should be made in terms of the risk of transmission, taking into account the work arrangements.

The multivariate model only includes workers, which shows that the risk of getting COVID-19 is 75% higher for those who don't work alternately. Alternate work schedules (AWS) is an umbrella term that refers to compressed work schedules and flexible work schedules.[43] The alternate working practice during the pandemic period, which is one of the examples of NPIs, was carried out in Türkiye in such a way that employees go to work on certain days and do not go to work on certain days. NPIs including capacity limitation in public spaces, closure of some shopping places, curfew for certain times, full lockdown etc. were implemented in Türkiye as well as worldwide during pandemic.[27,44] NPIs implemented in different countries have been found effective for struggling with the pandemic.[45-47] In ecological studies assessing the combined effectiveness of all restrictive practices in Türkiye, they have been found to be effective in reducing the number of cases and deaths.[48] As in these studies, the effects of different NPIs were evaluated cumulatively in most studies. There are fewer studies evaluating the effectiveness of the intervention singular.[49] Our study shows that alternate working is functional in preventing contamination as one of the implementation of the NPIs.

Studies on the risk estimation of COVID-19 transmission have helped epidemic management, but studies aiming to determine the protection or risk caused by

the working arrangements are not available enough. Similar to our study, there are few studies comparing those with and without COVID-19 in terms of work arrangements. A study conducted in USA compared COVID-19 positive persons and symptomatic persons that have got negative results. Those who attend telework 14 days before the onset of illness are more common in the group with negative results (53.1%) than in the group with positive results (35.0%). (P<0.01).[50] A study conducted in Japan and used the data of 275 thousand respondents, investigated that the percentage of people who reported a fever within one month, among teleworkers and non-teleworkers. It found that higher fever rates in the non-teleworker group, difference is small but have got statistical significance (for the 30- to 59-year age-group, non-teleworkers: 3.46%; teleworkers:3.14%).[51] While the impact of work arrangements on mitigating the epidemic is a relatively understudied topic, current studies are proving that interventions are effective. This result shows that the experience of the pandemic reveals that occupational health-related measures should be taken into account in the management of public health emergencies.

The fact that about half of the employees in our research stated that they never worked remotely during the pandemic, and that about half of them never worked on a alternately, indicates that a significant part of the workers are out of the scope of working arrangements. According to a national study examining all employees except public employees in Türkiye, 25.8% of workers stated that there was no change in their working style during the pandemic period. Those who worked remotely were 5.5%, and those who worked on an alternating were 13.5%. [37] According to a study conducted in the cargo sector, measures such as regulating working hours and keeping the number of employees at a minimum level were not implemented.[52] On the other hand, the exclusion of some sectors from the scope of restriction measures legally in Türkiye may have resulted in a lower number of workers within the scope of remote working or alternately working. Sectors that are exempt from closure have been identified for the full lockdown implemented from 29 April to 17 May 2021. According to estimates made by a Confederation of Revolutionary Trade Unions (DISK) in Türkiye, about 61% of employment worked in sectors exempt from closure, while about 22% of employment worked in partially exempt sectors and about 17% in sectors covered by closure.[53] In our study, the increased risk detected for those who have never worked alternately suggests that the fact that restriction measures are not applicable to all workers may have played an important role in the increase in the number of cases in Türkiye.

Figure 1 shows the change in the number of deaths from COVID-19 in Türkiye between March 2, 2020 and November 14, 2022.[54] As seen in the graph, the peak with the highest number of deaths during the course of the pandemic is the second one. The fact that the number of deaths was lower in the third peak, which is the highest peak of the epidemic in terms of the number of cases, may be due to the vaccination rates reached in this period. Different NPI were implemented in in different times in Türkiye, but the most drastic measure was implemented via partial and full lockdown in the May 2021.[27] Our study was implemented in the June 2021 just after this period. The arrow in this figure corresponds

to the beginning of June and indicates the date of data collection in our study. Since the effect of restriction measures on mortality lasts for about a month after the end of the measure, it is observed in the graph that the number of deaths continues to decrease for a while. Considering the date of our study, it can be said that, deaths that may result from the narrow scope of different working arrangements such as remote working or alternate working, may have a role in the occurrence of the most mortal peak of the pandemic.

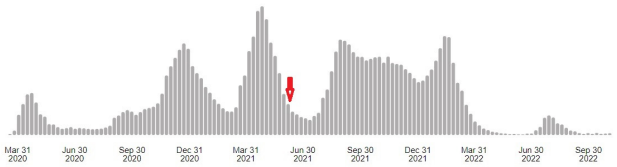

Figure 1. Number of deaths regarding COVID-19 in Türkiye[54]

CONCLUSION

The fact that the risk of getting COVID-19 is 1.7 times higher in those who are currently working in the multivariate model, reveals the disadvantaged position of the workers in the pandemic through a cross-sectional study. In the multivariate model involving employees, the fact that the risk is approximately 1.7 times higher in those who have never worked in alternately shows how effective the working arrangements are in preventing contamination. The experiences gained in the COVID-19 pandemic can guide the planning and implementation of measures to be taken in terms of occupational health and safety in future public health emergencies.

Limitations

Our study type is a cross-sectional study; therefore, determining causality is limited. There was the possibility that some workers may have had a non-occupational relationship with COVID-19. While the status of getting COVID-19 was questioned, it was not asked whether they contracted the disease before or after the working arrangements were implemented. In cross-sectional studies, the simultaneous questioning of risk factor presence and disease status is a disadvantage of this type of study, and this limitation was also present in our study. Another limitation of this study is that the relationship between working arrangements and contracting the disease was not questioned for those who died due to COVID-19.

Another matter regarding limitation is that, since it is a study conducted on patients who applied to tertiary outpatient clinics, the ability to represent the whole society is insufficient.

A limitation of this study is that the history of getting COVID-19 was asked without being specific for any restriction application period in the pandemic. Specific questioning of the history of having COVID-19 in periods when different working arrangements were applied may help to determine the relationship more clearly. The fact that the history of getting COVID-19 is based on the statement is another limitation.

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