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# Impact of High Workload on the Medicolegal Responsibilities of Emergency Doctors

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**ABSTRACT**

High workload, fatigue, and burnout have been found to be associated with increased medical errors and impaired performance. The aim of this study was to evaluate whether medico-legal reports, which are a legal responsibility for doctors in Turkey, could be neglected on days with excessive high workload.

In this retrospective cross-sectional study, the daily total number of patients who presented at the emergency department of a state hospital and the number of medico-legal cases reported in a 1-year before and during the Covid-19 pandemic were analyzed. By using a workload score proposed and calculated for this study, the data of the days with and without excessive workload were compared.

As a result, it was determined that the number of medico-legal cases reported by doctors significantly decreased on days when the workload increased excessively. There was a significant correlation between the number of medico-legal cases and the total number of cases on days when the workload score was significantly reduced and it allowed a certain degree of modelling.

An excessive workload seems to be caused doctors to neglect their legal medicine responsibilities, which poses a risk to both doctors and patients.

**Keywords:** High workload, Impaired performance, Medico-legal reports, Emergency, Burnout

## Introduction

Increasing workload is an important problem for healthcare and it has been found to be associated with increased medical errors for physicians (1,2). There is evidence that high workload and work-related stress increase the risk of problems in social relationships, alcohol and substance abuse, depression and anxiety, and even suicide in physicians (3,4). When it comes to workload, emergency departments are one of the busiest departments in hospitals (5). The work environment in the emergency department is characterized by the constant arrival of new patients in a critical condition or the unexpected deterioration of the condition of existing patients. Diseases, demographic characteristics and the severity of the diseases of new patients presenting at the emergency department are unpredictable and uncontrollable features (6,7). As a result of working in such a complex environment, emergency medicine physicians face a relatively high risk of malpractice claims (6,8). In addition, it has been shown that problems in workplace safety, quality, and workload, have a negative effect on the general well-being of emergency physicians (9).

It is not easy to measure and objectively display high workload or burnout associated impaired performance for any employees in general, and for doctors in particular (10). Some studies have attempted to measure this using anonymous self-reported medical error questionnaires (11,12). Others have used changes in cognitive performance scales and obtained some important findings (13,14). A prospective observational study also used prescribing errors to measure the effects of interruptions, multitasking, and fatigue on physician performance (14). Other studies used indicators such as changes determined on brain magnetic resonance imaging (MRI) (15), academic performance (16), empathy level assessment (17), prevalence of unprofessional behaviors (18), task performance (19), and peer rating questionnaires for performance (20). The discovery of new indicators to be able to objectively reveal the effect of high workload and burnout on physician

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performance is important in terms of revealing the balance sheet of this situation both for public health and physicians.

Crisis situations in the emergency room can be stressful for doctors and trigger a survival-oriented response. This study hypothesized that there would be a significant decrease in the number of medico-legal reports, which is a less vital task, on the days with much higher workload than usual in the emergency room. The deterioration of the ratio of medico-legal reports to the total number of cases coming to the emergency service in high workload situations would be an important finding to confirm this hypothesis.

In this study, the number of medico-legal cases reported by doctors in a day is proposed as a measure of impaired performance for doctors in emergency departments when the workload increases excessively, and the validity of this hypothesis is aimed to be tested.

## Materials and Methods

**Hospital:** In Tokat State Hospital Emergency Service (Adult and Pediatric Emergency Services), the normal staff consisted of 2 emergency medicine specialists and 6 general practitioners in 2019-2020. These numbers increased to 2 emergency medicine specialists and 8 general practitioners in 2020-2021. The physicians worked in a 24-hour shift followed by a 48-hour rest. When new doctors joined the team, this schedule changed to a 24-hour shift followed by a 72-hour rest for a while.

**Medico-Legal Reports:** Legal procedures for medico-legal reports vary around the world, but doctors may have to issue them when requested by judicial authorities (21,22). In cases such as child abuse, healthcare professionals are expected to diagnose and report it without waiting for a request (23). The legal regulations on child abuse are similar in Turkey. However, there is a difference in other types of medico-legal reports. Doctors in Turkey are obliged to report cases where there is suspicion of other crimes. This situation should be reported with a medico-legal report. It has been found that between 2.1% and 7.24% of all cases coming to the emergency services in Turkey are reported as medico-legal cases (24,25).

Previous studies have found a similar ratio of medico-legal reports to all cases in emergency services, suggesting a correlation between them. This study tested this correlation and hypothesized that it would break down on days with extremely high workload in the emergency room, resulting in fewer medico-legal reports than expected.

**Workload Score:** This study proposed a workload score to estimate the daily workload of physicians in the emergency department. The score was calculated by multiplying the number of patients in each triage code group by the mean physician time allocated for each group, using the hospital's information management system. The triage code system was a color code system consisting of green, light yellow, yellow, and red codes. According to a study by Wrede et al., the mean physician time for each group was 18, 27, 48, and 76 minutes, respectively (26). The ideal average workload score per doctor was 60 per hour and 1,440 per day, based on the standards of the hospital where Wrede and colleagues conducted their study.

**Study Period:** This study analyzed the 1-year period before the Covid-19 pandemic, when hospital functioning was normal, and the 1-year period during the pandemic, when hospital admissions and emergency workload decreased significantly (27,28). A preliminary analysis confirmed a 46.7% decrease in emergency cases and a 30.2% decrease in workload score during the pandemic period compared to the pre-pandemic period ($p = 0.000$). For this reason, it was planned to make three different comparisons in our study. In the pre-pandemic period, the days were divided into days with excessive increase in the workload score and other days, and the first comparison was made between these two groups of days. The second comparison was made within the pandemic period using a similar method. The third comparison was between the pre-pandemic period and the pandemic period, which had a 30.2% decrease in workload score.

**Statistical Analysis:** The number of daily cases admitted to the emergency department, the number of medico-legal cases, total workload score and workload score per doctor were determined. Then, the days were re-ordered according to the workload scores, and the descriptive statistics were determined again in 12 periods of 30 days.

Correlation tests were performed to investigate whether there was a correlation between the number of medico-legal reports and the total number of emergency cases. After normality tests, parametric or non-parametric tests were used to examine whether the distribution of the number

of medico-legal reports and the total number of cases differed in different periods. In addition, when the required assumptions were met, Linear Regression Analysis was performed. Statistical analyses were performed using IBM SPSS v.26 software. Statistical significance level was accepted as 0.05.

**Ethical Considerations:** This study was carried out with the permission of the Clinical Research Ethics Committee of Tokat Gaziosmanpaşa University Faculty of Medicine (Decision Number: 83116987-293; Date: 27.04.2022) and the Research Requests Evaluation Commission of Tokat Provincial Health Directorate (Decision Number: 2022-03-07; Date: 08.04.2022).

**Limitations:** Although the workload decreased during the Covid-19 pandemic, this period was psychologically challenging, especially for health professionals. Therefore, employee morale can be a confounding factor when examining the relationship between workload and impairment during this period.

Lifestyle changes that occurred during the pandemic period and were effective at the community level have led to some changes in judicial events, the numbers and types of cases coming to the emergency department, and as a result, the numbers and types of medico-legal cases. These changes constitute another limitation regarding the comparability of the pre-pandemic and post-pandemic period in this sense.

## Results

**Descriptive Statistics:** Before the Covid-19 pandemic, a total of 11,858 medico-legal cases were reported in the 1-year period between 12.03.2019-10.03.2020 (Daily Average: 32.49; Min: 7 (29.02.2020); Max: 114 (25.09.2019); Standard Deviation: 16.7). In the 1-year pandemic period between 11.03.2020-10.03.2021, the total number of medico-legal cases reported was 8,215 (Daily Average: 22.5; Min: 2; Max: 56); Standard Deviation: 10.2).

The monthly descriptive statistics are summarized in Table 1.

**Workload of Doctors per Day and Hour:** In the pre-pandemic period, the average number of patients per doctor per day and per hour was 113.5 and 4.6, respectively. In the busiest 30 days of the year, these numbers increased to 156.0 and 6.5, respectively. In the pandemic period, the average number of patients per doctor per day and per hour decreased to 48.4 and 2.0, respectively. In the busiest 30 days of the year, these numbers were 91.2 and 3.8, respectively.

The median daily workload score was 28,902 in the pre-pandemic period and 17,912 in the pandemic period. The median hourly workload score per doctor was 150.5 in the pre-pandemic period and 74.6 in the pandemic period. The scores in the pandemic period were closer to the ideal score of 60 and there was a significant difference between the two periods (P = 0.000). In the busiest 30 days of the year, the hourly workload score per doctor was 212.3 in the pre-pandemic period and 167.8 in the pandemic period.

**Correlations:** Medico-legal cases constituted 3.6% of all emergency cases in the pre-pandemic period, and 4.7% in the pandemic period. When the correlation between the number of all cases admitted to the emergency department in the pre-pandemic period and the number of medico-legal cases was examined, no significant correlation could be found (Pearson Correlation: -0.047; p=0.373). During the pandemic period, a somewhat more pronounced and significant correlation was observed between the total cases admitted to the emergency department and the occurrences of medico-legal cases (Pearson Correlation: 0.466; p=0.000).

**Sorted Intervals Descriptive Statistics:** The days of the year were divided into 12 periods based on the daily workload scores, from the lowest (1st period) to the highest (12th period). Table 2 summarizes the descriptive statistics for these periods. In the pre-pandemic period, the number of medico-legal cases significantly decreased in the 12th period, which had the highest workload scores. The median number of medico-legal cases in this period was the lowest among all periods and below the general average, but the distribution was not significantly different. However, there was a significant difference between the 12th and 11th periods in terms of medico-legal case numbers (P = 0.018) (Table 2, Figure 1).

In the pandemic period, the number of medico-legal cases increased with the workload and the total number of cases in the first 6 sorted periods, and then slightly decreased. There was a significant difference between the 11th and 12th periods, which had the highest workload and total number of cases, and the 6th and 7th periods, which had the highest number of medico-legal cases (P = 0.003).

**Table 1.** Monthly Descriptive Statistics

| PARAMETERS | TWS | SD | Range | WS | SD | Range | EC | SD | Range | MLC | SD | Range |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERIODS | DESCRIPTIVE STATISTICS FOR THE PERIOD BETWEEN 12.03.2019-10.03.2020 | | | | | | | | | | | |
| March-April 2019 | 27,896 | 1,533.8 | 23,802 – 31,077 | 3,487.0 | 191.7 | 2,975 – 3,884 | 848.9 | 43.6 | 734 – 936 | 33.9 | 13.2 | 7 – 73 |
| April-May 2019 | 15,467 | 7,446.0 | 10,155 – 32,848 | 1,933.5 | 930.8 | 1,269 – 4,106 | 910.0 | 84.0 | 747 – 1,165 | 23.8 | 10.9 | 12 – 59 |
| May-June 2019 | 29,595 | 5,647.0 | 24,007 – 42,373 | 3,699.5 | 705.9 | 3,000 – 5,296 | 881.4 | 181.8 | 693 – 1,295 | 23.7 | 7.8 | 9 – 42 |
| June-July 2019 | 28,285 | 1,379.2 | 25,973 – 30,991 | 3,535.7 | 172.7 | 3,246 – 3,873 | 823.9 | 41.9 | 761 – 908 | 27.9 | 10.7 | 14 – 72 |
| July-August 2019 | 31,973 | 3,406.0 | 26,827 – 40,646 | 3,996.7 | 425.8 | 3,353 – 5,080 | 938.4 | 102.9 | 776 – 1,238 | 39.6 | 21.7 | 12 – 101 |
| August-September 2019 | 35,437 | 5,539.8 | 28,165 – 46,991 | 4,429.6 | 692.5 | 3,520 – 5,873 | 1,056.0 | 170.9 | 836 - 1404 | 36.0 | 28.5 | 12 – 102 |
| September-October 2019 | 29,825 | 2,266.7 | 25,375 – 34,203 | 3,728.1 | 283.3 | 3,171 – 4,275 | 876.1 | 61.7 | 730 – 1,012 | 41.8 | 25.4 | 15 – 114 |
| October-November 2019 | 28,385 | 1,902.9 | 24,713 – 33,205 | 3,548.1 | 237.9 | 3,089 – 4,150 | 831.1 | 52.8 | 740 – 953 | 33.4 | 15.9 | 11 – 98 |
| November-December 2019 | 27,587 | 1,330.1 | 25,014 – 30,842 | 3,448.4 | 166.3 | 3,126 – 3,855 | 839.6 | 49.4 | 755 – 968 | 30.3 | 9.1 | 12 – 57 |
| December 2019-January 2020 | 36,943 | 3,426.0 | 30,180 – 43,909 | 4,617.9 | 428.3 | 3,772 – 5,488 | 1145.7 | 108.6 | 921 – 1,351 | 31.6 | 9.9 | 16 – 55 |
| January-February 2020 | 29,229 | 3,919.8 | 22,500 – 37,625 | 3,653.6 | 489.9 | 2,812 – 4,703 | 888.1 | 135.4 | 660 – 1,197 | 31.2 | 11.5 | 8 - 63 |
| February-March 2020 | 28,336 | 3,362.3 | 21,902 – 34,613 | 3,542.0 | 420.3 | 2,737 – 4,326 | 845.2 | 107.9 | 611 – 1,036 | 37.1 | 11.7 | 7 - 65 |
| P* | | 0.000 | | | 0.000 | | | 0.000 | | | 0.000 | |
| PERIODS | DESCRIPTIVE STATISTICS FOR THE PERIOD BETWEEN 11.03.2020-10.03.2021 | | | | | | | | | | | |
| March-April 2020 | 14,816 | 6,228.4 | 8,198 – 28,295 | 1,481.6 | 622.8 | 820 – 2,829 | 429.8 | 203.1 | 210 – 851 | 17.2 | 9.8 | 5 – 44 |
| April-May 2020 | 11,482 | 1,389.6 | 7,993 – 13,584 | 1,148.3 | 138.9 | 799 – 1,358 | 269.8 | 31.7 | 196 – 316 | 10.7 | 5.6 | 3 – 24 |
| May-June 2020 | 14,762 | 2,588.2 | 9,138 – 19,893 | 1,476.3 | 258.8 | 914 – 1,989 | 361.4 | 74.4 | 225 – 529 | 19.4 | 7.7 | 8 – 38 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June-July 2020 | 16,643 | 1,905.1 | 13,017 – 20,926 | 1,664.3 | 190.5 | 1,302 – 2,093 | 436.8 | 47.3 | 350 – 545 | 33.5 | 10.6 | 15 – 56 |
| July-August 2020 | 20,699 | 3,553.7 | 13,740 – 26,278 | 2,069.9 | 355.4 | 1,374 – 2,628 | 551.7 | 90.6 | 379 – 703 | 29.5 | 9.4 | 12 – 50 |
| August-September 2020 | 28,217 | 2,949.1 | 21,042 – 33,578 | 2,821.8 | 294.9 | 2,104 – 3,358 | 663.2 | 67.1 | 471 – 794 | 24.1 | 7.3 | 9 – 37 |
| September-October 2020 | 21,491 | 3,587.2 | 16,263 – 31,425 | 2,149.2 | 358.7 | 1,626 – 3,143 | 487.3 | 77.9 | 379 – 701 | 26.8 | 7.6 | 14 – 41 |
| October-November 2020 | 28,036 | 6,957.8 | 17,826 – 44,463 | 2,803.7 | 695.8 | 1,783 – 4,446 | 628.1 | 150.7 | 409 – 1,010 | 26.7 | 9.2 | 9 – 41 |
| November-December 2020 | 39,082 | 6,484.6 | 21,075 – 51,126 | 3,908.2 | 648.5 | 2,108 – 5,113 | 866.8 | 145.1 | 462 – 1,129 | 20.9 | 9.2 | 5 – 37 |
| December 2020-January 2021 | 17,461 | 5,736.2 | 10,338 – 32,460 | 1,746.2 | 573.6 | 1,034 – 3,246 | 394.0 | 124.4 | 243 – 720 | 17.9 | 7.9 | 2 – 34 |
| January-February 2021 | 13,945 | 2,724.3 | 8,653 – 22,216 | 1,394.5 | 272.4 | 865 – 2,222 | 325.3 | 61.6 | 205 – 500 | 19.9 | 7.7 | 6 – 35 |
| February-March 2021 | 16,756 | 3,305.9 | 11,658 – 25,408 | 1,675.7 | 330.6 | 1,166 – 2,541 | 395.1 | 77.3 | 275 - 586 | 23.6 | 8.8 | 8 - 40 |
| P* | | 0.000 | | | 0.000 | | | 0.000 | | | 0.000 | |
| P† | | 0.000 | | | 0.000 | | | 0.000 | | | 0.000 | |

SD: Standard Deviation
P* was obtained by comparing the monthly data for the pre-pandemic and post-pandemic periods within themselves.
p† was obtained by comparing the data of the pre- and post-pandemic period with each other.
TWS: Mean Total Workload Score per Day,
WS: Mean Workload Score per Doctor per Day,
EC: Mean Emergency Case Count per Day,
MLC: Mean Medico-Legal Case Count per Day

**Table 2.** Descriptive Statistics of Data for Days Sorted by Workload Score

| Parameters | Tws | Sd | Range | Ws | Sd | Range | Ec | Sd | Range | Mlc | Sd | Range |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Periods | Pre-pandemic period (11.03.2019-10.03.2020) | | | | | | | | | | | |
| 1.-30. Days | 13,781 | 4,550.7 | 10,155 – 23,263 | 1,722 | 568.8 | 1,269 – 2,907 | 869.1 | 130.2 | 611 – 1,165 | 26.6 | 11.3 | 14 – 59 |
| 31.-61. Days | 25,128 | 678.5 | 23,787 – 25,995 | 3,141 | 84.8 | 2,973 – 3,249 | 750.7 | 29.1 | 693 – 814 | 30.4 | 12.2 | 9 – 57 |
| 62.-91. Days | 26,501 | 235.7 | 26,049 – 26,848 | 3,312 | 29.5 | 3,256 – 3,356 | 789.2 | 24.6 | 751 – 855 | 31.7 | 12.4 | 14 – 65 |
| 92.-122. Days | 27,301 | 215.4 | 26,895 – 27,671 | 3,412 | 26.9 | 3,361 – 3,458 | 820.2 | 24.7 | 762 – 873 | 28.1 | 10.3 | 12 – 63 |
| 123.-152. Days | 28,039 | 196.4 | 27,696 – 28,341 | 3,504 | 24.6 | 3,462 – 3,542 | 835.3 | 26.0 | 759 – 886 | 31.3 | 11.5 | 13 – 73 |
| 153.-183. Days | 28,622 | 196.3 | 28,356 – 28,902 | 3,577 | 24.5 | 3,544 – 3,612 | 854.5 | 29.2 | 794 – 927 | 30.7 | 10.5 | 16 – 62 |
| 184.-213. Days | 29,245 | 206.4 | 28,918 – 29,562 | 3,655 | 25.8 | 3,614 – 3,695 | 865.9 | 23.7 | 810 – 915 | 33.5 | 11.3 | 13 – 60 |
| 214.-244. Days | 29,910 | 248.8 | 29,563 – 30,352 | 3,738 | 31.1 | 3,695 – 3,794 | 894.7 | 24.4 | 847 – 936 | 31.0 | 15.1 | 7 – 73 |
| 245.-274. Days | 30,996 | 408.3 | 30,388 – 31,937 | 3,874 | 51.0 | 3,798 – 3,992 | 917.0 | 30.1 | 851 – 994 | 36.3 | 22.2 | 16 – 114 |
| 275.-305. Days | 33,087 | 643.2 | 32,098 – 34,006 | 4,135 | 80.4 | 4,012 – 4,250 | 981.9 | 42.5 | 877 – 1,057 | 40.8 | 26.0 | 18 – 107 |
| 306.-335. Days | 35,590 | 954.9 | 34,007 – 37,063 | 4,448 | 119.4 | 4,250 – 4,632 | 1,073.0 | 56.5 | 955 – 1,191 | 43.3 | 28.4 | 12 – 107 |
| 336.-366. Days | 40,772 | 2,895.5 | 37,186 – 46,991 | 5,096 | 361.9 | 4,648 – 5,873 | 1,248.2 | 81.4 | 1,131 – 1,404 | 26.2 | 6.6 | 8 - 40 |
| P | | 0.000 | | | 0.000 | | | 0.000 | | | 0.000 | |
| Correlation* | Pearson correlation: -0.047; p=0.373. | | | | | | | | | | | |
| Periods | Pandemic period (11.03.2020-10.03.2021) | | | | | | | | | | | |
| 1.-30. Days | 9,908 | 933.5 | 7,993 – 11,137 | 990.9 | 93.4 | 799 – 1,113 | 243.8 | 24.3 | 196 – 310 | 10.9 | 4.6 | 3 – 21 |
| 31.-61. Days | 11,827 | 306.2 | 11,156 – 12,474 | 1,182.8 | 30.6 | 1,115 – 1,247 | 280.9 | 15.7 | 258 – 338 | 12.4 | 5.7 | 4 – 25 |
| 62.-91. Days | 13,246 | 376.0 | 12,562 – 13,861 | 1,324.6 | 37.6 | 1,256- 1,386 | 325.1 | 31.3 | 285 – 402 | 16.2 | 7.9 | 3 – 38 |
| 92.-122. Days | 14,480 | 322.9 | 13,943 – 15,009 | 1,448.0 | 32.3 | 1,394 – 1,500 | 362.1 | 42.9 | 315 – 462 | 19.9 | 7.3 | 6 – 36 |
| 123.-152. Days | 15,675 | 413.6 | 15,048 – 14,470 | 1,567.6 | 41.4 | 1,504 – 1,647 | 393.3 | 28.7 | 349 – 458 | 25.9 | 8.2 | 8 – 49 |
| 153.-183. Days | 17,241 | 447.9 | 16,509 – 17,912 | 1,724.2 | 44.8 | 1,650 – 1,791 | 418.9 | 31.2 | 371 – 495 | 28.9 | 10.4 | 5 – 56 |
| 184.-213. Days | 18,680 | 410.7 | 17,918 – 19,263 | 1,868.0 | 41.1 | 1,791 – 1,926 | 460.7 | 40.5 | 398 – 570 | 28.9 | 11.7 | 2 – 52 |
| 214.-244. Days | 20,566 | 754.1 | 19,311 – 21,739 | 2,056.6 | 75.4 | 1,931 – 2,173 | 497.2 | 42.9 | 434 – 580 | 26.7 | 8.9 | 7 – 40 |
| 245.-274. Days | 23,417 | 797.6 | 21,975 – 24,618 | 2,341.8 | 79.8 | 2,197 – 2,461 | 566.7 | 71.1 | 460 – 746 | 26.1 | 7.8 | 11 – 44 |
| 275.-305. Days | 26,626 | 1187.8 | 24,729 – 28,295 | 2,662.6 | 118.8 | 2,472 – 2,829 | 651.5 | 79.0 | 544 – 851 | 27.2 | 8.3 | 14 – 41 |
| 306.-335. Days | 30,984 | 1768.6 | 28,324 – 34,338 | 3,098.4 | 176.8 | 2,832 – 3,433 | 703.4 | 40.5 | 637 – 794 | 24.4 | 8.8 | 9 – 41 |
| 336.-366. Days | 41,110 | 3729.5 | 34,408 – 51,126 | 4,111.0 | 372.9 | 3,440 – 5,112 | 911.6 | 85.4 | 748 – 1,129 | 22.3 | 8.9 | 5 – 37 |
| P | | 0.000 | | | 0.000 | | | 0.000 | | | 0.000 | |
| Correlation* | Pearson correlation: 0.470; p=0.000. | | | | | | | | | | | |

(*): represents the correlation between the number of all cases and the number of medico-legal cases.
TWS: Mean Total Workload Score per Day,
WS: Mean Workload Score per Doctor per Day,
EC: Mean Emergency Case Count per Day,
MLC: Mean Medico-Legal Case Count per Day

**Table 3.** Linear Regression Analysis Results of Pandemic Period First 7 Sorted Interval Data

| Model Summary | | | | | |
|---|---|---|---|---|---|
| R | R Square | Adjusted R Square | | Std. Error of the Estimate | Significance |
| 0.696 | 0.484 | 0.482 | | 7.8 | 0.000 |
| | | Anova | | | |
| | Sum of Squares | df | Mean Square | F | Significance |
| Regression | 12020.9 | 1 | 12020.9 | 198.154 | 0.000 |
| Residual | 12800.2 | 211 | 60.7 | | |
| Total | 24821.1 | 212 | | | |
| | | Coefficients | | | |
| | Unstandardized Coefficients | | Standardized Coefficients | | |
| | B | Std. Error | Beta | t | Significance |
| Constant | -13.868 | 2.497 | | -5.553 | 0.000 |
| Emergency Case Count | 0.097 | 0.007 | 0.696 | 14.077 | 0.000 |
| Dependent Variable: Medico-Legal Case Count | | | | | |
| Independent Variable: Emergency Case Count | | | | | |

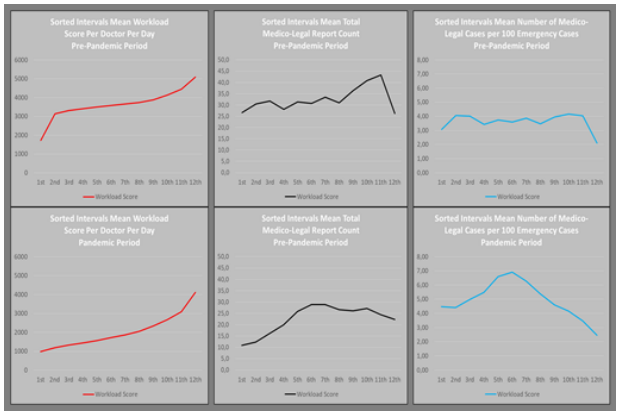


**Fig. 1.** Graphical representation of the change in the number of medico-legal cases and the ratio of the number of medico-legal cases per 100 emergency cases with increasing workload at sorted intervals

**Linear Regression Analysis:** Linear Regression Analysis was not applicable to the pre-pandemic data due to the lack of significant correlation and assumptions. It was applied to the pandemic period data, but the R Square value was low. The regression model showed that only 10.9% of the sample could be explained successfully (Adjusted R Square: 0.109; B: 0.018; P: 0.000).

When the days with a workload score close to the ideal score of 1,440 during the pandemic period were analyzed, the correlation coefficient between the total number of cases and the number of medico-legal cases increased. The correlation coefficient was highest when the first seven 30-day periods with the lowest workload were analyzed together (Pearson Correlation: 0.696; P: 0.000). Linear regression analysis on these days yielded a better R Square value (Adjusted R Square: 0.482; B: 0.097; P: 0.000) (Table 3). These results imply that when the workload is significantly reduced, the number of medico-legal cases can be estimated to some extent using emergency case numbers.

## Discussion

Many countries have experienced an increase in the number of patients presenting at emergency services, which poses a significant problem (29). One of the important factors in this increase is the presentation of non-urgent cases that do not require urgent and complex treatments and can be treated by primary healthcare services (29,30). The annual number of emergency service presentations has increased by 5-10% in various countries in recent years (31). According to an analysis covering Australia, Denmark, England, France, Germany, and the Netherlands, and data from 2011 or 2013, the number of emergency department visits per 1000 population in these countries ranges from 124 to 311 (30). According to 2005 data, in the USA this rate was estimated to be between 369-393 per 1000 population considering 109 to 116 million visits for 295 million population (32). When the rates are compared, Turkey is in a much worse situation in terms of this issue. According to 2015 data, the total number of presentations at emergency services in Turkey, which had a population of 78.7

million at that time, was over 110 million (33). This figure represents 1408 presentations per 1000 population per year, which is considerably higher than the rates of other countries given above. In addition, the number of doctors per 100,000 people in Turkey was determined as 186 according to 2017 data. This rate is 378 on average for European Union countries, 272 for the USA and an average of 351 for OECD countries according to the data of about the same period. The statistics are similar in terms of the number of nurses (34).

When compared with the work of Wrede et al. (26), which was used as a reference for the workload score in our study, it can be seen that our country is at risk in terms of the workload of doctors, although the study was conducted in a developed European country and its comparability with the conditions in our country is debatable. When calculated according to the standards in the study of Wrede et al., the ideal workload score for a 24-hour shift per doctor was 1440. In our study however, this score was calculated as 3612 in the pre-pandemic period and 1790 in the pandemic period.

When all these statistics are considered together, it becomes clearer how big a problem the high workload is in the emergency services in Turkey. It seems inevitable that this will lead to impaired performance, disruptions, errors and ultimately malpractice accusations for doctors. It also means that even if the doctors do not have such an intention, patients are also harmed.

This study aimed to reveal the impaired performance of doctors due to high workload, using a proposed indicator. A significant correlation was found between the number of medico-legal reports and the number of emergency cases during the pandemic period, when the patient admissions, workload score, and workload decreased significantly, and the number of working physicians increased. This correlation deteriorated in the pre-pandemic period, especially in the 30 days with the highest workload. The number of medico-legal reports was the lowest on average on those days (Table 2, Figure 1). Therefore, it was suggested that the number of medico-legal reports may be an indicator of doctors' impaired performance due to high workload in Turkey. These findings indicate that the doctors in this study may have failed to fulfill their legal responsibilities regarding the patients because of the high workload and may face various legal problems in the future. They may also imply that doctors may neglect other less vital tasks when their workload becomes excessive. These issues can be explored in future studies.

Measuring the effects of high workload, fatigue or burnout on physician performance is not easy. Some outcomes are more obvious and quantifiable, such as the quality of chest compressions during cardiopulmonary resuscitation (35). Some authors have used anonymous surveys to assess more difficult issues, such as medical errors. Shanafelt et al conducted a large study of 7905 surgeons, and found that 8.9% of surgeons expressed concern that they had made a major medical error in the past 3 months (36). They also analyzed the surgeons' situation regarding quality of life and burnout and found that depression and burnout were associated with recent major medical error.

Westbrook et al. studied medical errors in emergency service physicians (14). They found that prescribing errors were related to multitasking, interruptions, and low sleep, but not to workload. These results seem partly inconsistent with ours. However, we could not examine these risk factors separately in our study. We can argue that in extremely high workload situations, like in our study, multitasking and interruptions are inevitable.

Another study investigated the medical errors of interns working in shifts of 24 or more hours (37). They found that these interns made more serious medical errors than those working in shorter and less frequent shifts. More importantly, a recent large study compared the medical errors before and after a regulation that limited the daily consecutive working hours of first-year residents to 16 hours. After the regulation, the risk of self-reported medical errors, preventable side effects, and fatal medical errors decreased significantly by 32%, 34%, and 63%, respectively (38). In the hospital analyzed in this study and in most emergency services in Turkey, 24-hour shifts are implemented. This situation poses a risk for doctors and patients in terms of medical errors, especially when the number of cases and the workload increase excessively.

In future studies on this subject, although there are differences in legal regulations regarding medico-legal reports, the effect of high workload on child abuse reporting rates can be investigated as an indicator, similar to the current study. There could also be investigation of whether tasks that are less vital than life-saving are neglected by doctors in crisis situations. Paperwork and the length of anamnesis or discharge reports can be an indicator in this regard.

In conclusion, it was observed that the excessive workload caused the doctors included in this study to neglect medico-legal reports, which is one of their legal responsibilities regarding the hospital, and they were able to focus on this issue better with better workload conditions. This situation may also be an indication that in case of high workload, doctors are neglecting other less vital tasks, which shows the need for improvements to be made in this regard for the well-being of both doctors and patients.

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