

ORIGINAL PAPER

COMPARISON OF THE NUMBER AND CONTENT OF PATHOLOGY LABORATORY SAMPLES BEFORE AND AFTER THE COVID-19 PANDEMIC

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Coronavirus disease 2019 (COVID-19) has caused respiratory system diseases and affected people's access to healthcare services for diseases other than COVID-19. After the COVID-19 pandemic, changes occurred in the number and content of pathology laboratory samples, related to measures such as reducing the number of outpatient clinics in hospitals, postponing elective surgery, and restricting cancer screening.

All samples sent to the pathology laboratory between 2019 and 2020 were included in our study. Biopsy, cytology, histochemical, and immunohistochemical staining and biopsies for malignant cases were evaluated. Changes in sample number and content caused by the pandemic were examined. The number of biopsies was 24 312 in 2019 and 13 208 in 2020.

On comparison, a decrease was observed in all parameters. The largest (78.5%) and smallest (11.02%) decreases were observed in examinations of the incoming preparations for consultation (214–46) and Trucut needle biopsies (726–646), respectively. Cases such as appendectomies that require urgent intervention and malignancies that require further examination and diagnosis are the least affected. However, whether the decrease in cancer screening will affect the early diagnosis and treatment of malignancies and create a public health problem in the future remains to be established.

Key words: pandemic, pathology laboratory, sample, surgical pathology.

Introduction

Coronavirus disease 2019 (COVID-19) emerged in China toward the end of 2019 and soon affected the entire world. With the declaration of it as a pandemic by the World Health Organization in March 2020, it has become a public health concern due to its infectious nature. In Turkey, the first official case was reported on March 11, 2020. To break the transmission routes of the infection, it was necessary to take measures involving all aspects of social life. In

addition to international travel restrictions, restrictions were imposed on public transportation; stay-at-home practices were implemented; and schools, restaurants, shopping malls, cinemas, and gyms were closed. Consequently, concepts such as distance education and flexible working arrangements have entered our lives [1]. For non-COVID-19 patients, in many countries, different branches changed their approaches to diseases for this period in accordance with the respective guidelines. Diagnosis and treatment of diseases affecting the quality of life were

postponed to appropriate times in places where the pandemic was seen [2]. Similarly, the number of outpatient clinics in Turkish hospitals has been reduced, elective operations have been postponed, and cancer screening has been restricted. In our study, we aimed to examine the distribution of the pathology laboratory samples and changes in their content before and after the COVID-19 pandemic caused by the adoption of the abovementioned measures.

Material and methods

Our study was carried out retrospectively with the approval of the Harran University Clinical Research Ethics Committee (date: March 29, 2021; session no. 07; decision no. 05). All the samples sent to the pathology laboratory of the Mehmet Akif İnan Training and Research Hospital in 2019 and 2020 were included in the study. Each year was divided into four groups: January, February, and March constituted the first group; April, May, and June constituted the second group; July, August, and September constituted the third group; and October, November, and December constituted the fourth group. For 2 years, the number of both total and group-wise biopsy; cytology; histochemical and immunohistochemical (IHC) staining; frozen, endoscopic, needle, and bone marrow biopsies; radical materials; incoming preparations for consultation; appendectomy; cholecystectomy; tonsillectomy; pilonidal sinus and skin excisions; endometrial curettage; malignancies; procedures; cervical smears collected for screening purposes; and slides and blocks used were determined. Furthermore, the changes in the number and content of the samples were examined.

Statistical analysis

Statistical analysis was performed using the SPSS version 22.0 software program for Windows. Descriptive statistics for numerical variables are expressed as percentage and frequency values. The χ^2 test was used in the analysis of categorical data. The results were evaluated within the 95% confidence interval, and p -values of < 0.05 were considered significant.

Ethics committee approval

This study was performed in the Department of Pathology, University of Health Science Turkey, Mehmet Akif İnan Training and Research Hospital, Şanlıurfa, Turkey.

Our study was carried out retrospectively with the approval of the Harran University Clinical Research Ethics Committee (date: March 29, 2021; session no. 07; decision no. 05). All procedures in this study involving human participants were performed

in accordance with the 1964 Helsinki Declaration and its later amendments.

Results

The number of biopsies performed was found to be 24 312 in 2019 and 13 208 in 2020. When the data from 2019 and 2020 were compared, a numerical decrease was observed in all the parameters examined. The largest decrease (78.5%) was seen in the examinations of the incoming preparations for consultation (214–46) that were received for consultation from an external center, and the smallest decrease (11.02%) was seen in Trucut needle biopsies (726–646) (Table I). It was observed that all parameters were partially equally distributed in all four groups in 2019, whereas a significant decrease was observed in the second and third groups in 2020 ($p < 0.05$). In the last group (fourth group), it was observed that some parameters (endoscopic biopsy, frozen, radical and cholecystectomy materials) approached the numbers in the first three months of the year with the normalization efforts that started in the summer months. Appendectomy materials and the number of biopsies from malignant cases did not change much among the groups ($p > 0.05$); however, when data from 2019 and 2020 were compared, the rates of total biopsies increased (Table II). Furthermore, while the number of biopsies from malignant cases decreased in 2020, the rate of total biopsies increased. This rate was 3.6% in 2019 and 4.6% in 2020. The proportional increase was found to be statistically significant ($p = 0.001$).

The block numbers showed a decrease in 2020. However, the number of blocks per biopsy decreased from 1.7 in 2019 to 2.2 in 2020. Similarly, the number of slides per biopsy in 2019 and 2020 was 3.4 and 4.9, respectively.

Discussion

Studies conducted during the pandemic have shown that hospitals are not only places where the treatment of COVID-19 is carried out but are also the most important source for the spread of this disease [3]. As a result, discontinuing elective surgical procedures and reducing the frequency of outpatient follow-ups have been an important step to prevent the spread of the disease during the pandemic [2].

It is seen in our routine practice that the sample volume and distribution have been affected in the pathology laboratory as a result of postponed elective operations. When 2019 and 2020 data were compared, the number of biopsies performed was found to be 24 312 in 2019 and 13 208 in 2020, and a decrease of 45.67% was observed. Consistent with the number of biopsies, a decrease was observed in

Table I. Comparison between 2019 and 2020 in terms of percentage decrease

PARAMETERS	2019 (N)	2020 (N)	PERCENTAGE DECREASE (%)
Biopsy	24312	13208	45.67
Total number of procedures	56390	31709	43.77
Cytology	2653	1445	45.53
Endoscopic biopsies	6937	3785	45.44
Frozen sections	99	28	71.72
Histochemical stainings	13935	9884	29.07
Immunohistochemical stainings	10665	4518	57.64
Trucut needle biopsies	726	646	11.02
Bone marrow biopsies	77	65	15.58
Radical materials	875	760	13.14
Incoming preparations for consultation	214	46	78.5
Appendectomy	1762	1224	30.53
Cholecystectomy	1146	599	47.73
Tonsillectomy	1262	469	62.84
Pilonidal sinus excisions	1236	434	64.89
Skin excisions biopsies	3972	1407	64.58
Endometrial curettage	2530	1282	49.33
Other procedures	8301	5117	38.36
Malignancies	878	737	16.06
Cervical smears	920	333	63.8
Blocks	41440	29304	29.29
Slides	83600	66000	21.05

Table II. Change in the percentage of procedures performed in 2019 and 2020 in relation to the total number of procedures performed

PARAMETERS	YEARS		P-VALUE
	2019, N (%)	2020, N (%)	
PROCEDURES	2019, N (%)	2020, N (%)	
Total number of procedures	56390 (100.0)	31709 (100.0)	
Cytology	2653 (4.7)	1445 (4.6)	0.340
Endoscopic biopsies	6937 (12.3)	3785 (11.9)	0.159
Frozen sections	99 (0.2)	28 (0.1)	0.001
Histochemical stainings	13935 (24.7)	9884 (31.2)	0.001
Immunohistochemical stainings	10665 (18.9)	4518 (14.2)	0.001
Trucut needle biopsies	726 (1.3)	646 (2.0)	0.001
Bone marrow biopsies	77 (0.1)	65 (0.2)	0.015
Radical materials	875 (1.6)	760 (2.4)	0.001
Incoming preparations for consultation	214 (0.4)	46 (0.1)	0.001
Appendectomy	1762 (3.1)	1224 (3.9)	0.001
Cholecystectomy	1146 (2.0)	599 (1.9)	0.151
Tonsillectomy	1262 (2.2)	469 (1.5)	0.001
Pilonidal sinus excisions	1236 (2.2)	434 (1.4)	0.001
Skin excisions biopsies	3972 (7.0)	1407 (4.4)	0.001
Endometrial curettage	2530 (4.5)	1282 (4.0)	0.003
Other procedures	8301 (14.7)	5117 (16.1)	0.001

all procedures. Tonsillectomy, cholecystectomy, and pilonidal sinus and skin lesion excisions decreased by approximately 60% each due to the discontinuation of elective operations. Sinard JH reported in his study that from the third week of March 2020, surgical pathology specimens began to decrease, and in the first week of April, it fell to the lowest level, which was 13.5% of the normal rate. He reported that hematopathological biopsy specimens were the least affected (30% of the normal rate), whereas genitourinary system biopsies were affected the most (by decreasing to 1% of the normal rate). Moreover, the number of genitourinary system biopsies increased most rapidly with the normalization of elective operations [4]. In our study, frozen and endoscopic biopsies and cholecystectomies were the ones whose numbers decreased in the second and third quarters of 2020, but whose numbers and rates increased with normalization of the daily routine.

Aggressive containment measures implemented by almost all the European governments at the start of the pandemic were aimed at preventing rapid spread of the virus and flattening the infection curve. These measures have led to a drastic reduction in the number of healthcare procedures performed although there was no interruption in cancer screening programs [5]. In our study, a 63.8% decrease was observed in the cervical smear tests carried out for screening purposes between the two years due to the effect of the pandemic.

The COVID-19 outbreak has resulted in a substantial reduction in the total number of cytology specimens, regardless of the anatomical region or specimen type. In a survey-based study in which 167 centers of the Asia-Pacific region participated, it was found that 80.8% of patients had limited access to the laboratory due to implementation of measures against COVID-19 throughout the country. As a result, in terms of the number of cytology samples, 71 of 167 laboratories reported a decrease of more than 50% in gynecological cytology tests and 58 laboratories reported a decrease in nongynecological (lung, urine, thyroid, etc.) cytology tests compared to those during the same period in 2019 [6]. Vigliar *et al.* analyzed the cytological data of 23 countries and found that the number of cytological materials decreased by 45.3% due to the pandemic [7]. Rana *et al.* also reported a significant decrease (90.8%) in the number of samples collected for cytopathological evaluation during the pandemic, and attributed this decrease to the delay of screening activities for clinically benign cases [8]. In our study, the number of cytology tests performed was 2653 in 2019 and 1445 in 2020, and we observed a decrease of 45.53% between the two evaluated years.

The number of cancer biopsies and resection samples can also be taken as an indication of complex and

difficult cases. In a study conducted by Brugel *et al.* in which they investigated the change in oncological screening, diagnosis, and treatment due to COVID-19 in the first 5 months of 2019 and 2020, they reported that the number of samples collected for the histopathological diagnosis of cancer, such as biopsy and cytological samples, decreased in 2020 compared to 2019 with a percentage decrease of 14% in March, 48% in April, and 31% in May [9]. In a study where Ahmad *et al.* presented the data of the early pandemic period (March 20, 2020 – May 10, 2020), they reported that although the number of cases decreased rapidly during the 50-day period, the number of cancer-related samples increased proportionally to a large extent, and the rate of cancer cases had risen to approximately 35% of the total cases. They emphasized that these figures add to the fact that caseloads, which in normal times were extremely complex and emotionally stressful, have increased even more during the lockdown, contributing to a further increase in professional stress in an atmosphere already filled with fear, anxiety, and tension due to the pandemic [10]. In our study, the number of malignant cases was 878 in 2019 and 737 in 2020. Considering these data, the decrease in biopsies of malignant cases between the two years is among the least affected, with a rate of 16.06%. However, when the rate of malignancy in the total number of biopsies is considered, it was observed that there was an increase of 3.6% in 2019 and 5.6% in 2020, which was similar to the study of Ahmad *et al.* [10]. In addition, Sinard JH reported that despite the decreasing number of biopsies in their routine practice, the average number of blocks per case increased 5–9 due to the fact that the majority of the samples collected were of major cancer resections and prostate needle and bone marrow biopsies [4]. In our study, the average number of blocks per case increased from 1.7 in 2019 to 2.2 in 2020. We attributed this situation to the increasing percentage of malignant cases and the necessity of performing IHC analysis. Similarly, in the study of Pelsemaeker *et al.*, despite the significant decrease in the number of samples due to the pandemic, the number of IHC staining procedures and the number of blocks did not decrease at the same rate, and they attributed this to the fact that sampled oncological histopathological specimens often require more than one IHC staining to achieve a definitive diagnosis; therefore the overall IHC load was observed to be less affected compared to the total work load or number of samples [11].

Conclusions

Although cancer rates seem to be increasing, this increase is only an increase in the rate of biopsies of malignant cases among the decreasing number

of biopsies. Additional molecular studies show a reduction in molecular testing that can be attributed to staff reduction due to the implementation of social distancing practices. These effects may further increase cancer rates in the future [12].

The authors declare no conflict of interest.

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