Effects of the COVID-19 Pandemic on the Epidemiology of Knee and Shoulder Arthroscopy Procedures in a University Hospital Department in Poland

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Research article

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Abstract

**Background:** The purpose of our study was to comprehensively assess the effect of the COVID-19 pandemic on knee and shoulder arthroscopies performed in an orthopedic department of a university hospital in Poland.

**Methods:** This study compared the data on shoulder and knee arthroscopy procedures performed in two different periods: the period of the COVID-19 pandemic in Poland (from March 4, 2020 to October 15, 2020) and the corresponding period prior to the pandemic (March 4, 2019–October 15, 2019). The study evaluated epidemiological data, demographic data, and hospital stay duration.

**Results:** The total number of arthroscopy procedures conducted in the evaluated period in 2020 was approximately 8.6% higher than that in the corresponding 2019 period.

The mean duration of hospital stay for orthopedic patients after their knee or shoulder arthroscopy was 3.1 days in 2020 and 2.8 days in 2019. Our study revealed the mean age of arthroscopy patients during the pandemic to be lower at 48.4 years than the 51.2 years recorded in 2019. The male-to-female ratio was shown to be lower at 0.85 during the pandemic, having decreased from 1.5 in 2019.

**Conclusions:** The COVID-19 pandemic did not reduce the number of arthroscopies performed at our center and the mean age of the patients did not change. However, the pandemic had a marked effect on the mean duration of hospital stay and male-to-female ratio.

**Background**

The most common indication for shoulder or knee arthroscopy are pain due to osteoarthritis or injury, limited range of motion, signs of joint instability, problems with self-care, lower quality of life, progressive limitations in physical activity, which do not resolve after conservative management and rehabilitation [1].

The 2020 COVID-19 pandemic altered the way health care functions on the national and local levels [2–19]. Due to the pandemic, patients have encountered considerable limitations in their access to healthcare professionals, including orthopedic surgeons. The character of work in orthopedic wards and the orthopedic admission protocols have also changed [2–19]. Some healthcare workers contracted COVID-19 and were obligated to undergo quarantine; some were transferred to take care of COVID-19-positive patients. These changes had an impact on the number of patients hospitalized at orthopedic wards [2, 3]. In response to a spike in new COVID-19 cases, elective surgical procedures, including arthroscopies, were limited or halted altogether in some orthopedic departments [2–5, 10]. Some patients, particularly those with pre-existing illnesses, who had been scheduled to undergo arthroscopy postponed the date of the procedure due to fears of COVID-19 infection. Nonetheless, there have been recommendations to resume performing elective procedures [6, 7, 8, 11].
To date, there has been little research into such an important issue as the effect of the COVID-19 pandemic on the epidemiology of shoulder and knee arthroscopy procedures; hence, there continue to be many unknowns. The available reports—based on questionnaires sent to orthopedic surgeons—estimated the effect of the COVID-19 pandemic on reducing the number of orthopedic procedures, including arthroscopies, in German, Austrian, and Swiss centers [4, 5].

The purpose of our study was to comprehensively assess the effect of the COVID-19 pandemic on knee and shoulder arthroscopies performed in an orthopedic department of a university hospital in Poland.

**Methods**

The epidemiology of shoulder and knee arthroscopies was assessed in a Polish university medical center dealing with such procedures and offering medical rehabilitation. Two time periods were analyzed and compared: the period of the COVID-19 pandemic in Poland (Mar. 4–Oct. 15, 2020) and the corresponding period prior to the pandemic (Mar. 4–Oct. 15, 2019).

The inclusion criterion was one of the following arthroscopic procedures of the shoulder or knee (therapeutic arthroscopy, anterior cruciate ligament [ACL] reconstruction, rotator cuff repair, labral repair) conducted in the period between Mar. 4, 2019, and Oct. 15, 2019, or between Mar. 4, 2020, and Oct. 15, 2020. This study had been approved by the local review board.

The following data were analyzed: the total number of shoulder and knee arthroscopies; total number of women who underwent shoulder arthroscopy (therapeutic arthroscopy, rotator cuff repair); total number of men who underwent shoulder arthroscopy (therapeutic arthroscopy, rotator cuff repair); total number of women who underwent knee arthroscopy (therapeutic arthroscopy, ACL reconstruction); and total number of men who underwent knee arthroscopy (therapeutic arthroscopy, ACL reconstruction). Moreover, the analyzed data included the mean age of the men and women who underwent knee arthroscopy (therapeutic arthroscopy, ACL reconstruction); mean age of men and women who underwent shoulder arthroscopy (therapeutic arthroscopy, rotator cuff repair); mean age of the patients (without sex stratification) who underwent knee arthroscopy (therapeutic arthroscopy, ACL reconstruction); mean age of the patients (without sex stratification) who underwent shoulder arthroscopy (therapeutic arthroscopy, rotator cuff repair). The mean duration of hospital stay of those patients (total, men, and women) who underwent knee arthroscopy (therapeutic arthroscopy, ACL reconstruction); mean age of all arthroscopy patients (without sex stratification); mean duration of hospital stay of those patients (total, men, and women) who underwent shoulder arthroscopy (therapeutic arthroscopy, rotator cuff repair). We also assessed the male-to-female patient ratio.

All analyzed data from the period of the COVID-19 pandemic in Poland (Mar. 4–Oct. 15, 2020) were compared with those from the corresponding pre-pandemic period (Mar. 4–Oct. 15, 2019).

The obtained data were statistically analyzed using the Statistica 13.1 software. Pearson's chi-square test was used to compare the variables. The level of significance was set at $\alpha = 0.05$.
Results

All results have been presented in Table 1.

Table 1
epidemiological characteristics of patients who underwent shoulder and knee arthroscopy

| Variable                                      | 2020 pandemic | 2019 no pandemic | Differences between 2020 vs. 2019 | p      |
|-----------------------------------------------|---------------|------------------|-----------------------------------|--------|
| Total number of patients                      | 76            | 70               | 8,60%                             | 0,4841 |
| number of women                               | 35            | 28               | 25%                               | 0,4607 |
| number of men                                 | 41            | 42               | -2,38%                            |        |
| knee arthroscopy                              | 68            | 64               | 6,30%                             | 0,68858|
| shoulder arthroscopy                          | 8             | 6                | 33,30%                            |        |
| mean age of all patients                      | 48,4          | 51,2             | 5,46%                             | 0,1169 |
| mean age of women, shoulder arthroscopy       | 60            | 58,4             | 2,73%                             | 0,33259|
| mean age of men, shoulder arthroscopy         | 53,2          | 70               | -24%                              | 0,33259|
| mean age of women, knee arthroscopy           | 53,1          | 63               | -15,71%                           | 0,2003 |
| mean age of men, knee arthroscopy             | 36,2          | 50,2             | -27,88%                           | 0,32835|
| medium duration of hospitalization [days]     | 3,09          | 2,8              | 10,35%                            | 0,03848|
| medium duration of hospitalization, women, shoulder arthroscopy | 2  | 3,4 | -41,17% | 0,04979 |
| medium duration of hospitalization, men, shoulder arthroscopy | 2,4  | 4 | -40% | 0,18009 |
| medium duration of hospitalization, women, knee arthroscopy | 2,3  | 3 | -23,33% | 0,77416 |
| medium duration of hospitalization, men, knee arthroscopy | 3,1  | 2,6 | 19,23% | 0,02399 |
| male-to-female ratio                          | 0,85          | 1,5              | -43,33%                           | 0,03765|

Our analysis demonstrated that the total number of arthroscopy procedures conducted in the evaluated period in 2020 (pandemic) was approximately 8.6% higher than that in the corresponding 2019 period; this difference was not statistically significant (Fig. 1, Table 1), (P = 0.4841).
The total number of knee arthroscopies performed in the evaluated 2020 period was 6.3% higher than that in the corresponding 2019 period (prior to the epidemic); this difference was not statistically significant (Fig. 1, Table 1), (P = 0.68858).

The total number of shoulder arthroscopies in the evaluated 2020 period was 33.3% higher than that in the pre-pandemic period; this difference was not statistically significant (Fig. 1, Table 1), (P = 0.68858).

Moreover, our analysis revealed that the mean duration of hospital stay for orthopedic patients after their knee or shoulder arthroscopy was 3.1 days in 2020 and 2.8 days in 2019; this difference was statistically significant (Table 1), (P = 0.03848).

Our study revealed the mean age of arthroscopy patients during the pandemic to be lower at 48.4 years than the 51.2 years recorded in 2019 (Table 1); this difference was not statistically significant (Table 1), (P = 0.1169).

The male-to-female ratio was shown to be lower at 0.85 during the pandemic, having decreased from 1.5 in 2019; this difference was statistically significant (Table 1).

**Discussion**

Due to the high number of patients requiring shoulder or knee arthroscopy, assessing the epidemiology of shoulder and knee arthroscopies during the COVID-19 pandemic is important.

Previous reports estimated the effect of the COVID-19 pandemic on lowering the number of orthopedic procedures, including arthroscopies, in Germany, Austria, and Switzerland; and a decrease in the number of European centers performing elective arthroscopies has been speculated [4, 5].

There have been no studies analyzing the impact of a nation-wide pandemic-related lockdown on the real-world epidemiology of shoulder and knee arthroscopies performed in individual orthopedic departments.

The COVID-19 pandemic considerably altered the way the healthcare systems (including orthopedic departments) functioned in many countries [2–19]. Doctors, nurses, and rehabilitation specialists found themselves in a new reality. Some healthcare professionals contracted COVID-19, some were quarantined, others were delegated to work with COVID-19-positive patients [2, 3]. Elective admissions to most trauma and orthopedic wards were limited (at first) and then, completely halted in order to limit the spread of the causative pathogen, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [2–5, 10]. In other centers, a large proportion of patients cancelled or postponed their scheduled procedure due to fears of COVID-19 infection. However, as the pandemic continued, recommendations to resume elective procedures, including arthroscopies, began to emerge [6, 7, 8, 11].

Literature reports estimated a 23–100% decline in the total number of elective surgical procedures being performed [2, 4, 5, 10]. The COVID-19 pandemic saw arthroscopies being cancelled or postponed
(delayed) in an estimated 38.9–69.2% of centers [4, 5]. Our study shows that the COVID-19 pandemic had no significant impact on the number of arthroscopic procedures in the evaluated 2020 period in comparison with the pre-pandemic period. This may be a result of significant restrictions imposed (in our orthopedics department) on procedures involving larger numbers of personnel and those potentially requiring blood transfusions and longer hospitalization; such procedures include total hip or knee arthroplasty. The relatively long waiting list for an elective arthroscopy in our center was another reason why patients—reluctant to have the waiting period extended even more—avoided cancelling their surgery and presented for the procedures as scheduled, despite the COVID-19 pandemic.

There have been no studies assessing the impact of the COVID-19 pandemic on the age of patients undergoing shoulder or knee arthroscopy. Our study did not showed a marked effect of the pandemic and nation-wide lockdown measures on the mean age of patients undergoing arthroscopic procedures. The fact that their mean age did not decreased may be due to the elderly did not fearing SARS-CoV-2 infection and its possible complications.

There have been no studies evaluating the effect of lockdown measures on the mean duration of hospital stay following shoulder or knee arthroscopy. Our data showed the mean hospitalization, which was lower at 2.8 days in 2019, increased to 3.1 days during the pandemic. This resulted from several factors: a longer waiting period before the procedure, due to the limited number of available orthopedic surgeons and anesthesiologists during the pandemic, and the priority being given to managing patients with fresh injuries.

There have been no studies assessing the effect of the COVID-19 pandemic on the male-to-female ratio in patients undergoing arthroscopy. During the evaluated 2020 period, we observed a considerable reduction in the number of male patients and a considerable increase in the number of female patients in comparison with the figures for the corresponding period in 2019.

Conclusions

This study demonstrated moderate impact of the COVID-19 pandemic on the epidemiology of shoulder and knee arthroscopic procedures.

Contrary to expectations, the COVID-19 pandemic did not reduce the number of arthroscopies performed at our center and the mean age of the patients did not change. However, the pandemic had a marked effect on the mean duration of hospital stay and male-to-female ratio.

Declarations

Ethics approval and consent to participate:

Not applicable.
Consent for publication:
Not applicable.

Availability of data and materials:
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests:
The authors declare that they have no competing interests

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Authors' contributions:
KK and PM carried out the concepts, design, definition of intellectual content, literature search, data acquisition, data analysis, and manuscript preparation. ŁT provided assistance for data acquisition, data analysis, and statistical analysis. All authors have performed manuscript review. All authors have read and approved the content of the manuscript.

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**Figures**

![Figure 1](image_url)

**Figure 1**

Total number of arthroscopy
Supplementary Files

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- data.xls