

# Falls as One of the Atypical Presentations of COVID-19 in Older Population

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Karolina Gawronska, MSc<sup>1</sup>  and Jacek Lorkowski, MD, PhD, DSc<sup>2,3</sup>

## Abstract

**Introduction:** Studies revealed COVID-19 atypical symptoms such as falls, delirium, confusion, dizziness, unusual fatigue in older patients. Falls in the older population and their consequences are one of the leading causes of disability; they significantly reduce the quality of life and lead to loss of independence and impaired social functioning. The aim of this study is to present the possible correlation between COVID-19 and diseases of the musculoskeletal system, in particular the occurrence of fall-related injuries. **Significance:** This article highlights the importance of falls as one of the atypical symptoms of COVID-19 infection in older adults, which is not directly associated with infection and could be misinterpreted. **Methods:** The conducted meta-analysis is based on a review of the scientific literature available in English, French, Dutch, Polish in the PubMed/MEDLINE, Cochrane Library, Embase, Scopus, PEDro, GBL databases from December 1, 2019 to July 30, 2020, covering Clinical Trial, Randomized Controlled Trial, Meta-Analysis, Systematic Reviews and Case Reports. The following keywords were taken into account: fall, (hip/pertrochanteric/proximal femur) fracture, aged and COVID-19. Twenty-seven references were accepted for final analysis. **Results:** It was found that symptoms such as falls observed in the older adults can be associated with COVID-19 infection. Falls and slips are also the most common mechanism for hip fracture during the pandemic outbreak. **Conclusions:** According to authors of this study, atypical presentations of COVID-19 should be considered when screening and testing the people at increased risk due to their age. However, further prospective studies are urgently needed to investigate the possible correlation between COVID-19 and falls in older adults.

## Keywords

anticipated physiological falls, accidents home, older adults, Coronavirus disease 2019, risk factors, hip fractures

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## Introduction

The SARS-CoV-2 infection outbreak in Wuhan, China, on December 2019 became a major world concern in 2020. Since December 2019, a lot of articles analyzing the course, complications and mechanisms of the infection have appeared. Articles on this subject appears actually every day. Major and most commonly reported symptoms of the infection were fever (high temperature—91.3% of patients), cough (67.7%), fatigue (51%) and dyspnea (30.4%). Other symptoms, such as headache, dizziness, abdominal pain, diarrhea, nausea and vomiting were also found. The most common comorbidities included hypertension (21.1%), diabetes mellitus (9.7%), cardiovascular disease (8.4%), and respiratory system disease (1.5%). Also, the age and comorbidities are risk factors for critical patients and an adverse outcome of COVID-19.<sup>1,2</sup> Globally, as of 6:31 pm CEST, 3 September 2020, there have been 25 884 895 confirmed cases of COVID-19, including 859 130 deaths, reported to WHO.<sup>3</sup>

However, there are still very few publications explaining the possible indirect correlation between COVID-19 and diseases

of the musculoskeletal system, in particular the occurrence of fall-related injuries.

## Methods

An analysis of scientific literature available in English, French, Dutch, Polish in the PubMed/MEDLINE, Cochrane Library,

<sup>1</sup> Rehabilitation Centre of the MSWiA Central Clinical Hospital in Warsaw, Warsaw, Poland

<sup>2</sup> Clinical Department of Orthopedics, Traumatology and Sports Medicine of the MSWiA Central Clinical Hospital in Warsaw, Warsaw, Poland

<sup>3</sup> Medical University of Mazovia, Warsaw, Poland

## Corresponding Authors:

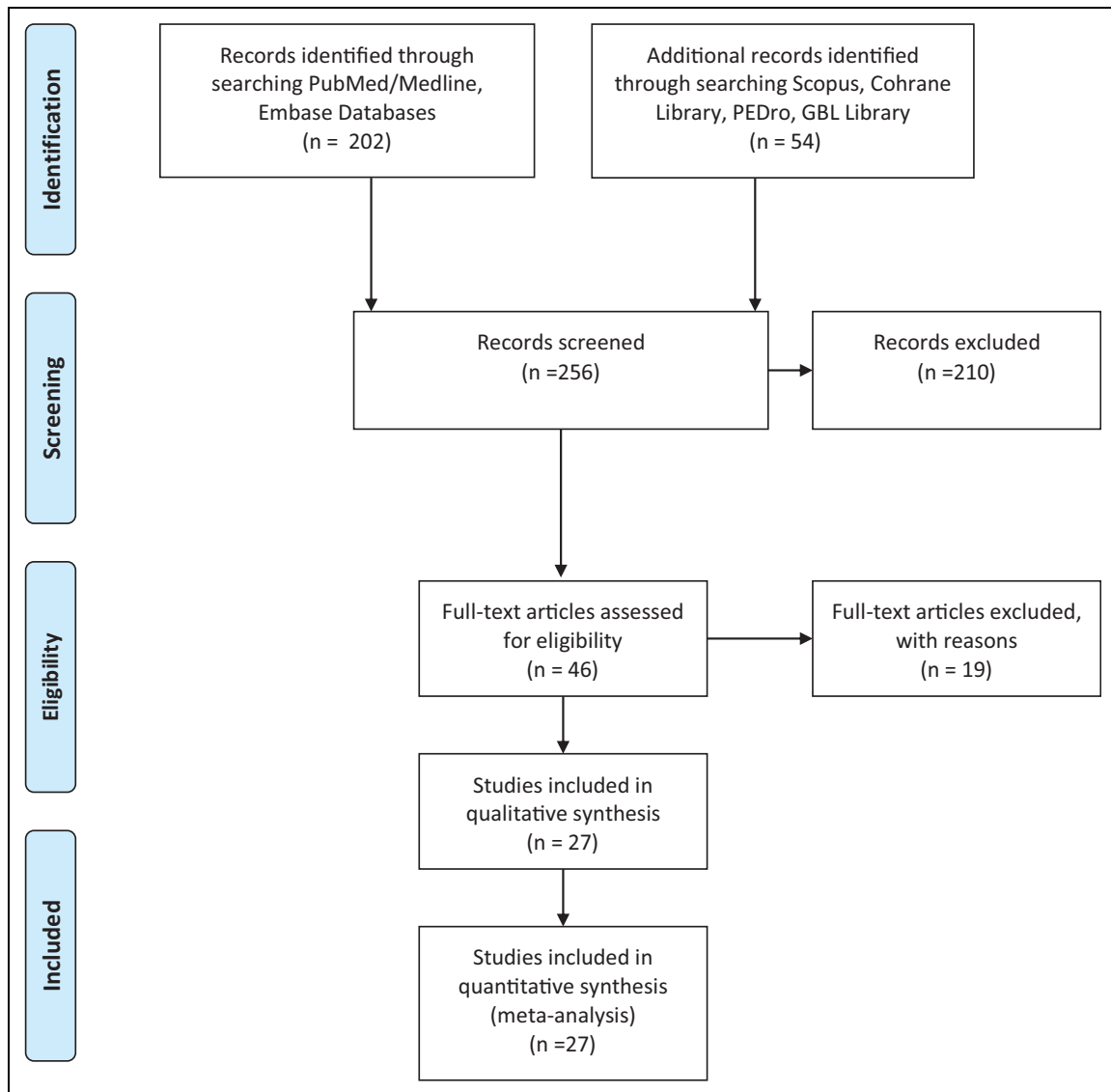
Karolina Gawronska, Rehabilitation Center, MSWiA Central Clinical Hospital in Warsaw, 137 Woloska Str, 02-507 Warsaw, Poland.

Email: kegawronska@gmail.com

Jacek Lorkowski, Clinical Department of Orthopedics, Traumatology and Sports Medicine of the MSWiA Central Clinical Hospital in Warsaw, 137 Woloska Street, 02-507 Warsaw, Poland.

Email: jacek.lorkowski@gmail.com





**Figure 1.** Scheme of the selection of analyzed articles.

Embase, Scopus, PEDro, GBL databases was undertaken from December 1, 2019 to July 30, 2020 to identify relevant articles reporting falls and fractures during the COVID-19 pandemic. The adopted methodology for selecting articles was based on the designed scheme of searching for scientific reports based on the following keywords: fall, fracture, aged, COVID-19, coronavirus, according to the scheme presented in the figure below (Figure 1).

Phrases searched in English:

1. fall AND aged AND covid/coronavirus
2. (hip/petrochanteric/proximal femur) fracture AND aged AND covid/coronavirus

The works obtained included: Clinical Trial, Randomized Controlled Trial, Meta-Analysis, Systematic Reviews and Case Reports. For statistical purpose old age was defined as 65 years of age or older, therefore the “Aged 65+” and “80+ years” results filters were applied. As a result of the search in

accordance with the algorithm used, a total of 256 works were found. After excluding duplicates and articles that were not really thematically relevant for verification, based on titles and abstracts, 46 results were obtained. After careful examinations of the content of 46 articles, 27 of them were considered the most important and innovative information and those were subsequently discussed in this study. Definitions of falls proposed by Morse have been adopted in order to systematize the terminology of falls.<sup>4</sup> According to Morse, falls can be classified into 3 categories:

1. Unanticipated physiological falls occur when physical conditions cannot be predicted before falling,
2. anticipated physiological falls occur in those individuals with an increased risk of falling; this category refer to older adults, and those anticipated physiological falls are discussed in this study,

- accidental falls describe falls in people who have no risk for falling and usually caused by an external cause or by misjudgment.

## Results

### *COVID-19 and Falls*

Studies revealed that the coronavirus disease 2019 (COVID-19) manifests with a wide spectrum of presentations. Most reports of COVID-19 highlight shortness of breath, fever, cough, fatigue, abdominal pain, diarrhea and decreased appetite as the dominant initial presentations.<sup>5</sup> However, COVID-19 atypical symptoms, such as delirium, confusion, dizziness and unusual fatigue, can be observed in the older patients.<sup>6-8</sup> According to Norman et al. among the main presentations of COVID-19, balance issues, including falls, are listed.<sup>8</sup> It has been observed that older people tested positive for COVID-19 are more likely to experience.<sup>9</sup> It signifies that screening tests based on typical symptoms of the infection performed in older people are insufficient. The authors of the research point to the importance of a holistic, multidisciplinary assessment in targeting the profile of COVID-19 patients, including fall risk assessment, evaluation of motor functions, cognitive impairment and mental performance. All healthcare professionals, including physiotherapists, should be aware of the non-specific COVID-19 symptoms to ensure infection prevention and appropriate care for older people. Further prospective studies are urgently needed to investigate a combination of signs and symptoms to assess the COVID-19 syndrome in older adults.<sup>10,11</sup>

Tramontana et al. in their studies emphasize the fact that maintaining optimal vitamin D concentration is of great importance in older population, particularly in the context of the COVID-19 pandemic.<sup>12</sup> Imbalances and the associated increased frequency of falls and osteoporotic fractures, whose risk and frequency grow with age, are among the most dangerous effects of vitamin D deficiency. According to the authors of this study, the presumed beneficial effect of vitamin D in COVID-19 patients relates to its function as a modulator of the musculoskeletal and immune systems and its effectiveness in comorbidities such as recurrent respiratory complications.<sup>13</sup>

According to other authors, low serum concentration of 25(OH)D, the best index of vitamin D nutritional status, is associated with impaired respiratory health and increased susceptibility to acute respiratory infections.<sup>13</sup> It should be considered in comparison with data of COVID-19 patients. It was found that 67-85% of COVID-19 patients experience acute respiratory distress syndrome (ARDS), which represents one of the leading causes of mortality.<sup>14</sup> Tramontana et al. also suggest further research into the potential benefits of Vitamin D with regard to its effects on the immune system.<sup>12</sup>

### *COVID-19 and Hip/Proximal Femoral Fractures*

Significant reductions in trauma orthopedic fracture surgeries in the world during the COVID-19 pandemic were observed. It

was mainly due to preservation of hospital resources to decrease the risks of a nosocomial infection such as COVID-19 and to protect hospital staff. Authors also look for the causes in a significantly reduced number of fractures in patients globally.<sup>15</sup>

According to Maniscalco, there was significant reduction in proximal femur fractures in the first 8 weeks of the COVID-19 outbreak in Italy, Piacenza and Parma.<sup>16</sup> Researchers from the Tertiary Trauma Centre in Spain arrived at opposite conclusions. Based on their research, they observed that the number of osteoporotic hip fractures remained stable.<sup>17</sup>

Another aspect raised in the literature analyzed for the purpose of this study was fracture type and location, mechanism of injury and places where fracture occurred during the COVID-19 outbreak. A study by Yanbin Zhu in China on 436 patients with 453 fractures in total showed that hip fractures were the most frequent (58.3% of all fractures). The dominant mechanism of injury was fall from standing position, representing a proportion of 89.4% (405/453). It was found that 72.7% of all fractures occurred in the patient's home. Most fractures (95.8%, 434/453) were treated surgically, and 4.2% (19/453) were treated by plaster fixation or traction.<sup>18</sup> Similar results were obtained after testing 2489 patients with 2590 fractures in 11 hospitals in China. The study group consisted of people who had a fracture during the COVID-19 outbreak between 20 January to 19 February 2020, and the control group consisted of people with fractures in the same period in 2019. The study revealed that 66.6% of the fractures occurred at home in the study group, while in the control group—11.3%. The most common mechanism of injury during the pandemic was also low-energy injury (i.e. slip, trip or fall at home)—79.1%, compared to 34.4% of low energy fracture in the control group.<sup>19</sup>

Another aspect raised by the researchers was the mortality rate among COVID-19 patients who were surgically treated for proximal femur fractures and hip fractures. A study conducted by Spanish researchers indicates, respectively, that the total mortality rate was 30.4% for COVID-19 positive patients and 10.3% for patients without coronavirus.<sup>20</sup> Similar results were obtained by Kumar et al, Maniscalco et al and Hadfield et al.<sup>15,16,21,22</sup> They indicate an increase in mortality rate of people tested positive for the presence of COVID-19 virus, with proximal femur fracture or hip fracture.

In the literature analyzed for the purpose of this study, attention was also paid to the treatment algorithms during the COVID-19 pandemic.<sup>15,16,21,23-25</sup> Study was conducted in order to compare the management and 30-day outcomes of hip fracture patients admitted during the COVID-19 outbreak with the pre-pandemic period. Three periods have been analyzed: period "A" from 23/03/2018 to 11/05/2018, period "B" from 23/03/2019 to 11/05/2019 and period "C" from 23/03/2020 to 11/05/2020. As a result, no statistically significant differences in time to surgery, type of treatment, complications, and mortality rates were noted. It is worth mentioning that among "period-C" patients, only 1 person was diagnosed with coronavirus. Due to poor health status, the patient did not undergo

surgery and died on the fourth day after being admitted to hospital.<sup>23</sup>

Other researchers point out that hip fracture patient who present with asymptomatic or mild COVID-19 infection can safely undergo early surgical intervention after appropriate medical optimization.<sup>23</sup> Analyses by Italian researchers indicate that the use of surgical treatment of fractures at the proximal end of the femur in older patients diagnosed with COVID-19 may have a positive effect on the stability of the patient (saturation, hemodynamic and respiratory improvement), improvement in ventilation and general mobilization and patient's comfort.<sup>26</sup>

Minimal invasive surgery should be used in COVID-19 positive patients if possible, in order to shorten hospitalization time and reduce the burden on hospital resources.<sup>18</sup>

The re-organization of medical facilities in medical centers where elderly patients with hip and femur fractures undergo surgery is essential. An appropriate resource allocation should be made to ensure that patients are properly looked after while minimizing the risk of spreading the virus. Surgeries should only be performed in facilities where intensive care is available.<sup>15,24,25,27,28</sup>

## Conclusions

1. Atypical presentations of COVID-19 should be taken into account during the screening and testing of people at increased risk due to their age.
2. Vitamin D may reduce risk of falls and improve immune system; however, further investigations are needed.
3. During the COVID-19 outbreak, low-energy injuries (falls, slips,) were the most common mechanism of injury. Preventing home hazards that cause low-energy injuries to elderly population should become a priority in comprehensive geriatric care.
4. Mortality rate of patients with a hip fracture or proximal femur fracture and an associated positive test for COVID-19 is higher than in COVID-19 negative patients.
5. Surgical intervention after hip or proximal femur fracture may improve overall stability of COVID-19 positive patients.
6. Optimal patient care should be provided while minimizing viral spread to other patients and staff members.

## Authors' Note

Karolina Gawronska and Jacek Lorkowski contributed to Study Design, Data Interpretation, Manuscript Preparation, and Literature Search.


## Declaration of Conflicting Interests

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## ORCID iD

Karolina Gawronska  <https://orcid.org/0000-0002-3658-0110>

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