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Influenza complications among patients attending family practitioner practice

Powikłania grypy wśród pacjentów zgłaszających się do poradni lekarza rodzinnego

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Abstract

Introduction: Influenza is an acute viral disease of the respiratory system. Its course can be complicated, particularly in seniors, young children or patients with chronic conditions. Common complications include pneumonia, exacerbation of chronic diseases, heart muscle involvement, and neurologic disorders. This paper analyses the frequency and factors contributing to the development of influenza complications in primary healthcare patients. **Materials and methods:** The study enrolled a total of 631 adult patients who visited a family physician complaining of respiratory tract infections from January 2019 to April 2020 in the Family Doctor's Clinic in Gostyń, Greater Poland Province. Of them, 90 patients were diagnosed with influenza. The data sources included patient interviews, physical examinations, results of additional tests, and the patients' medical files. The diagnosis of influenza was based on the accepted clinical criteria, i.e. a sudden onset of fever + ≥1 clinical symptom in the respiratory system + ≥1 general systemic symptom, lasting <72 hours and confirmed with an Actim Influenza A&B test (Medix Biochemica). **Results:** Complications of influenza were noted in 13 patients (14%), compared to 77 uncomplicated cases. Four patients required hospital admission. The diagnosed complications included secondary bacterial infection of the lower respiratory tract (61%), exacerbation of chronic diseases (31%), and myocarditis (8%). In logistic regression analysis, asphyxia, wheezing, and crackles were linked to a higher risk of complicated influenza. **Conclusions:** Complicated influenza occurs significantly more often in patients with multiple comorbidities, including obesity, thyroid diseases, and liver diseases. Clinical symptoms related to the risk of complications include asphyxia, wheezing, and crackles.

Keywords: influenza, complications, pneumonia, myocarditis, COPD

Streszczenie

Wprowadzenie i cel: Grypa jest ostrą wirusową chorobą układu oddechowego. Jej przebieg może być powikłany, szczególnie u osób starszych, dzieci oraz pacjentów z chorobami przewlekłymi. Powikłania najczęściej obejmują: zapalenie płuc, zaostrzenie chorób przewlekłych, zajęcie mięśnia sercowego i zaburzenia neurologiczne. W pracy przeanalizowano częstość i czynniki powikłań grypy u pacjentów podstawowej opieki zdrowotnej. **Materiał i metody:** Badaniem objęto 631 dorosłych pacjentów, którzy zgłosili się do Poradni Lekarza Rodzinnego w Gostyniu w Wielkopolsce z powodu infekcji dróg oddechowych w okresie od stycznia 2019 do kwietnia 2020 roku. Spośród nich grypę zdiagnozowano u 90 osób. Źródłami danych były: wywiad z pacjentem, badanie przedmiotowe, wyniki badań dodatkowych oraz kartoteka pacjenta. Rozpoznanie grypy opierało się na przyjętych kryteriach klinicznych, tj. nagłym wystąpieniu gorączki plus co najmniej jeden objaw kliniczny ze strony układu oddechowego plus co najmniej jeden objaw ogólnoustrojowy trwający <72 godzin i potwierdzeniu testem Actim Influenza A&B (Medix Biochemica). **Wyniki:** Powikłania grypy odnotowano u 13 chorych (14%) wobec 77 przypadków niepowikłanych. Czterech pacjentów wymagało hospitalizacji. Stwierdzono następujące powikłania: wtórne zakażenie bakteryjne dolnych dróg oddechowych (61%), zaostrzenie chorób przewlekłych (31%), zapalenie mięśnia sercowego (8%). W analizie regresji logistycznej asfiksja, świszczący oddech i trzeszczenia były związane z większym ryzykiem powikłania grypy. **Wnioski:** Powikłany przebieg grypy istotnie częściej występuje u pacjentów z licznymi chorobami współistniejącymi, w tym otyłością, chorobami tarczycy i wątroby. Objawy kliniczne związane z ryzykiem powikłań to asfiksja, świszczący oddech i trzeszczenia.

Słowa kluczowe: grypa, powikłania, zapalenie płuc, zapalenie mięśnia sercowego, POChP

INTRODUCTION

Influenza is an acute infectious disease caused by viruses of the Orthomyxoviridae family. It is spread through droplets or by touching an infected surface, and the incubation period is one to four days. If there are no complications, the disease lasts approximately seven days. The clinical picture of influenza includes symptoms of the upper or lower respiratory tract infection accompanying general symptoms, such as fever, headaches, muscle pain, weakness, and sometimes digestive complaints⁽¹⁾.

The influenza virus is classified into three types: A, B, and C, based on antigenic variations in nucleoprotein (NP) and the M protein. Type A virus is characterised by significant variability in surface antigens: haemagglutinin and neuraminidase. Therefore, immunity after influenza is not permanent. Influenza caused by the type A virus is more severe clinically; this type is most typically responsible for epidemics and pandemics⁽²⁾.

During epidemics, about 20% of the population acquires the infection. Influenza mortality rate is low (0.1%). Death in the course of influenza can be caused by complications: pneumonia or exacerbation of chronic respiratory diseases, heart diseases or neurologic complications⁽³⁾. The condition can become severe, particularly in seniors, young children, and patients with chronic respiratory, circulatory and other immunity-impairing diseases. Infection with the influenza virus may lead to exacerbation of chronic diseases^(3,4). Influenza complications most often affect the respiratory system and can be divided into four categories: primary pneumonia caused by the influenza virus, secondary bacterial pneumonia, secondary pneumonia caused by an atypical pathogen or pneumonia in patients with compromised immunity and a more acute course of chronic lung diseases⁽⁵⁾.

This study aims to evaluate the frequency and factors associated with the development of influenza complications in patients reporting to their general practitioner (GP) with a focus on medical history and clinical symptoms.

MATERIALS AND METHODS

The study included a total of 631 adult patients with symptoms of respiratory infection who visited a family physician from January 2019 to April 2020. The study was conducted among patients of the Family Doctor's Clinic in Gostyń, Wielkopolska Province. Participation in the study was voluntary and confirmed with the patient's written consent. The participants were included consecutively. Patient interview, physical examination, additional test results, and medical history were analysed. The history data were taken during the patients' visit at their GP practice. The author of the study conducted the physical examination.

Based on the history and clinical findings, the studied group was subjected to 356 rapid influenza tests. Of them, 90 patients were diagnosed with influenza viral infection,

confirmed with an Actim Influenza A&B test (Medix Biochemica) from the nasopharyngeal swab (sensitivity 77%, specificity 95%).

Patients complaining of respiratory tract symptoms were selected for participation in the study. Particular attention was paid to the clinical symptoms suggestive of influenza, i.e. sudden onset fever + ≥ 1 clinical symptom of the respiratory system, such as cough, sore throat, rhinitis or a feeling of blocked nose + ≥ 1 general systemic symptom, such as headache or muscle pain, sweating or shaking, tiredness lasting <72 hours. If the symptoms resembled influenza, a rapid antigen test was performed. Patients presenting with the above symptoms and a positive antigen test result were diagnosed with influenza.

Other patients, with clinical symptoms not suggestive of influenza or with ambiguous symptoms and a negative antigen test result, were included in the group with respiratory tract infection of probably another viral or bacterial aetiology. The clinical picture of the whole study group has been described in a previous publication⁽⁶⁾.

The clinical symptoms, final diagnosis, and probable aetiology were summarised based on the study variables including age, gender, influenza vaccination status, smoking, and comorbidities. The following comorbidities were taken into consideration: hypertension, obesity, heart failure, IGT (impaired glucose tolerance), diabetes, thyroid disease, liver disease, hypercholesterolaemia, bronchial asthma, and chronic obstructive pulmonary disease (COPD). Obesity was defined as a state of excessive accumulation of adipose tissue. The diagnostic criterion was the patients' body mass index (BMI) ≥ 30 kg/m². The frequencies of the diseases in the study group are presented in Tab. 1.

The analysis included the results of additional tests, such as the Actim Influenza A&B rapid antigen test (Medix Biochemica) for influenza virus infection, radiologic tests, and laboratory tests, as ordered. The main indications for a chest x-ray in the study group included chest pain, shortness of breath, and persistent cough. The diagnoses were based on the ICD-10 international disease classification.

Influenza was treated with oseltamivir in patients with risk factors for severe disease course if treatment could start in up to 48 hours from the onset of the first symptoms^(7,8).

Asphyxia was diagnosed when, in addition to infection symptoms, signs of hypoxia were seen, such as tachycardia, tachypnoea, blue lips, blue nails, confusion, dizziness or headaches, and anxiety.

The statistical analysis was performed with the STATISTICA software. The quantitative variables were analysed with the Mann-Whitney test, following the analysed normal distribution in the Shapiro-Wilk test. The qualitative variables were compared with the chi-squared test. The values of $p < 0.05$ were deemed statistically significant. Further analysis was performed using logistic regression. The parameters with a statistically significant difference were included in the univariate analysis, and the parameters with significant differences in the univariate analysis were included

Variables of the study group					
Parameter	Patients with influenza	Influenza patients without complications	Influenza patients with complications	<i>p</i>	OR (95% CI)
Group size	90	77 (86%)	13 (14%)	-	-
Median age (IQR) (years)	45 (32–56)	45 (33–56)	51 (46–64)	0.0776	-
Women – number (%)	49 (54%)	40 (52%)	9 (69%)	0.386	-
Men – number (%)	41 (46%)	37 (48%)	4 (31%)		
X-ray diagnostics – number of patients (%)	17 (19%)	6 (8%)	11 (85%)	0.00001*	65.01 (11.634–364.095)
Current smokers – number of patients (%)	18 (20%)	13 (17%)	5 (38%)	0.0825	-
Past smokers – number of patients (%)	13 (14%)	11 (14%)	2 (15%)	0.5975	-
Number of patients with five or more comorbidities	38 (42%)	29 (38%)	9 (69%)	0.0343*	3.724 (1.051–13.192)
Number of days of absence from work	5–62	5–7	10–20		
Vaccination against influenza – number of patients (%)	1 (1%)	1 (1%)	0	0.852	-
Applied treatment					
Administered drug	Patients with influenza	Influenza patients without complications	Influenza patients with complications	<i>p</i>	OR (95% CI)
Antibiotic – number of patients (%)	19 (21%)	6 (8%)	13 (100%)	0.00001*	-
Oseltamivir – number of patients (%)	69 (77%)	59 (77%)	10 (77%)	0.6444	-
Glucocorticosteroid – number of patients (%)	6 (7%)	1 (1%)	5 (38%)	0.0002*	47.500 (4.921–458.534)
NSAIDs – number of patients (%)	87 (97%)	74 (96%)	13 (100%)	0.6227	-
Symptoms					
Symptom	Patients with influenza	Influenza patients without complications	Influenza patients with complications	<i>p</i>	OR (95% CI)
Fever – number of patients (%)	84 (93%)	71 (92%)	13 (100%)	0.3808	–
Cough – number of patients (%)	78 (87%)	68 (88%)	10 (77%)	0.3705	–
Total fever days (days) – median (IQR)	3 (2–4)	3 (2–4)	3 (2–4)	0.9063	–
Number of fever days before visiting primary healthcare (days) – median (IQR)	2 (1–2)	2 (1–2)	1 (1–2)	0.7239	–
Increased body temperature – number of patients (%)	6 (7%)	6 (8%)	0	0.3808	–
Ear pain – number of patients (%)	9 (10%)	7 (9%)	2 (15%)	0.3843	–
Headaches – number of patients (%)	59 (66%)	49 (64%)	10 (77%)	0.2746	–
Muscle aches – number of patients (%)	88 (98%)	75 (97%)	13 (100%)	0.7306	–
Chest pains – number of patients (%)	50 (56%)	40 (52%)	10 (77%)	0.0827	–
Breathing disorders – number of patients (%)	34 (38%)	27 (35%)	7 (54%)	0.1627	–
Abnormalities in physical examination					
Abnormality	Patients with influenza	Influenza patients without complications	Influenza patients with complications	<i>p</i>	OR (95% CI)
Tachycardia – number of patients (%)	54 (60%)	47 (61%)	7 (54%)	0.4218	-
Enlarged cervical lymph nodes – number of patients (%)	8 (9%)	5 (6%)	3 (23%)	0.0867	-
Red throat – number of patients (%)	52 (58%)	45 (58%)	7 (54%)	0.4927	-
Shallow/irregular breathing – number of patients (%)	12 (13%)	7 (9%)	5 (38%)	0.0129*	6.250 (1.603–24.374)
Hypoxia symptoms – number of patients (%)	5 (5%)	1 (1%)	4 (31%)	0.0013*	33.778 (3.394–336.129)
Increased work of accessory respiratory muscles – number of patients (%)	12 (13%)	7 (9%)	5 (38%)	0.0129*	6.250 (1.603–24.374)
Tachypnoea – number of patients (%)	24 (27%)	16 (21%)	8 (62%)	0.0046*	6.100 (1.755–21.198)
Reduced vesicular breath sound – number of patients (%)	23 (26%)	21 (27%)	2 (15%)	0.2972	-
Wheezing – number of patients (%)	9 (10%)	2 (3%)	7 (54%)	0.00001*	43.750 (7.393–258.899)
Pathological bronchial breath sound – number of patients (%)	9 (10%)	7 (9%)	2 (15%)	0.3843	-
Dry rales – number of patients (%)	11 (12%)	3 (4%)	8 (62%)	0.00001*	43.750 (7.393–258.899)
Crackles – number of patients (%)	6 (7%)	1 (1%)	5 (38%)	0.00001*	47.500 (4.921–458.534)
Comorbidities					
Comorbidity	Patients with influenza	Influenza patients without complications	Influenza patients with complications	<i>p</i>	OR (95% CI)
Hypertension – number of patients (%)	28 (31%)	21 (27%)	7 (54%)	0.0592	-
Obesity – number of patients (%)	30 (33%)	22 (29%)	8 (62%)	0.0244*	4.000 (1.179–13.574)
Heart failure – number of patients (%)	4 (4%)	2 (3%)	2 (15%)	0.0982	-
IGT – number of patients (%)	8 (9%)	7 (9%)	1 (8%)	0.6748	-
Diabetes – number of patients (%)	8 (9%)	5 (6%)	3 (23%)	0.0867	-
Thyroid diseases – number of patients (%)	10 (11%)	6 (8%)	4 (31%)	0.0345*	5.259 (1.243–18.478)
Liver diseases – number of patients (%)	8 (9%)	4 (5%)	4 (31%)	0.0138*	8.111 (1.723–38.188)
Hypercholesterolaemia – number of patients (%)	25 (28%)	19 (25%)	6 (46%)	0.1056	-
Bronchial asthma – number of patients (%)	3 (3%)	2 (3%)	1 (8%)	0.3773	-
COPD – number of patients (%)	10 (11%)	7 (9%)	3 (23%)	0.1547	-

* $p < 0.05$.

95% CI – confidence interval; COPD – chronic obstructive pulmonary disease; IGT – impaired glucose tolerance; IQR – interquartile range; NSAIDs – non-steroidal anti-inflammatory drugs; OR – odds ratio.

in the multivariate analysis. Thus, the parameters without significance were gradually excluded from the model until only significant parameters remained. The results were presented as the odds ratio (OR) and 95% confidence interval (95% CI). All results with CI not including 1.0 were considered statistically significant.

Prior to the study, consent was obtained from the Bioethical Committee at the Poznan University of Medical Sciences (10 January 2019, Resolution No. 84/19).

RESULTS

In the study group of 631 patients with respiratory tract infections, antigen tests for influenza were performed 356 times in total, of which 90 were positive and 266 negative. Ninety people were confirmed as infected with the influenza virus based on the Actim Influenza A&B (Medix Biochemica) test. Therefore, the study group comprised a total of 90 patients – 49 women and 41 men. The disease course was uncomplicated in 77 patients (86%).

In contrast, a total of 13 patients (14%) had complications, and consequently, the disease lasted longer, most often necessitating a modification in treatment, adding an antibiotic, or performing diagnostic imaging procedures. Four patients required hospitalisation (Tab. 2). The median age of the patients with uncomplicated and complicated influenza was 45 and 51 years, respectively. Among the patients with post-influenza complications, women were predominant (69%). The percentage of women and men in the group without complications was comparable (Tab. 1). The difference was not statistically significant.

The diagnosed influenza complications included secondary bacterial infections of the lower respiratory tract (eight patients; 61%), exacerbation of chronic lung diseases – bronchial asthma and COPD (four patients; 31%), and myocarditis (one patient; 8%). In four cases of influenza

complications, the patients needed hospitalisation: one patient with exacerbated COPD, two with pneumonia, and one with myocarditis and pneumonia (Tab. 2).

In 90 patients with influenza, pulmonary x-ray examinations were performed in 17 patients (19%), of which three (3%) were diagnosed with pneumonia. All these patients required hospitalisation. No inflammatory changes in the lungs were found in the patients with exacerbation of COPD and bronchial asthma.

Patients with influenza complications more commonly required additional tests and antibiotic therapy. They more frequently underwent diagnostic x-ray examinations (85% vs. 8%) and were treated with antibiotics (100% vs. 8%) and glucocorticoids (38% vs. 1%) in comparison with patients without influenza complications.

Complicated influenza was observed in people with numerous (≥ 5) comorbidities statistically more commonly (69% vs. 38%). Symptoms involving the lower respiratory tract were associated more often with the complicated course of influenza. These included: shallow and irregular breathing (38% vs. 9%), asphyxia (31% vs. 1%), increased work of the respiratory muscles (38% vs. 9%), tachypnoea (62% vs. 20%), wheezing (54% vs. 3%), dry rales (62% vs. 4%), and crepitations heard over the lung fields (38% vs. 1%). Patients with complications were more often obese (62% vs. 29%) and had thyroid diseases (31% vs. 8%) and liver diseases (31% vs. 5%). Furthermore, they required adding antibiotics to treatment more frequently. The hospitalisation rate was also higher in this group of patients due to secondary bacterial bronchitis, pneumonia, myocarditis or exacerbation of COPD.

Patients with influenza complications needed more frequent check-ups (four appointments on average) at primary care facilities than those without complications (one or two appointments). The absence from work based on sick leaves due to influenza was five to seven days. In patients

Patient	Age	Sex	Diagnosis	Features of secondary bacterial infection of the lower respiratory tract	Exacerbation of chronic lower respiratory tract diseases	Known cardiac complications	Hospitalisation
1	46	F	Influenza. Acute bronchitis	Yes	No	No	No
2	60	M	Influenza. Bronchial asthma – exacerbation	Yes	Yes	No	No
3	48	M	Influenza. Viral myocarditis. Pneumonia	Yes	No	Yes	Yes
4	51	F	Influenza. Acute bronchitis	Yes	No	No	No
5	74	F	Influenza. Acute bronchitis	Yes	No	No	No
6	65	F	Influenza. Pneumonia	Yes	No	No	Yes
7	43	F	Influenza. Acute bronchitis	Yes	No	No	No
8	62	F	Influenza. COPD – exacerbation	Yes	Yes	No	No
9	49	F	Influenza. Chronic bronchitis – exacerbation	Yes	Yes	No	No
10	47	M	Influenza. Acute bronchitis	Yes	No	No	No
11	78	F	Influenza. Pneumonia	Yes	No	No	Yes
12	72	F	Influenza. COPD – exacerbation	Yes	Yes	No	Yes
13	27	M	Influenza. Acute bronchitis	Yes	No	No	No

COPD – chronic obstructive pulmonary disease.

Tab. 2. Characteristics of patients with a complicated course of influenza (n = 13)

Clinical parameter tested	Odds ratio (OR)	Confidence interval (95% CI)
Symptoms of hypoxia	75.553	5.782–987.217*
Wheezing	75.323	10.218–5.404*
Crackles	14.258	1.313–155.611*

* $p < 0.05$.

Tab. 3. Multivariate logistic regression analysis of clinical parameters associated with probability of complications in the course of influenza

with influenza complications, it was 10 to 20 days on average, with one patient absent from work for a total of 62 days, including hospitalisation.

Only one person diagnosed with influenza had previously received a seasonal influenza vaccine in the whole group. Most patients approached annual influenza vaccinations somewhat dismissively, and some were unwilling to accept them. Of 631 examined patients with symptoms of respiratory tract infections in the 2019–2020 infection season, only 37 patients (6%) were vaccinated against influenza. In the vaccinated group (37 patients, i.e. 6% in total), 11 patients were found eligible for the antigen test for influenza, of which one patient was positive and the remaining 10 were negative.

In the present study, factors with significant differences identified in the univariate logistic regression analysis (Tab. 1) were included in the multivariate logistic regression model. The results, including only factors of statistical significance, are presented in Tab. 3. In the multivariate logistic regression analysis, asphyxia, wheezing, and crackles were linked to a higher risk of complicated influenza. None of the comorbidities were found to be a significant factor in the multivariate analysis.

DISCUSSION

Based on the findings of this study, complicated influenza occurs significantly more frequently in patients with numerous comorbidities, such as obesity, thyroid, and liver diseases. Clinical symptoms associated with complications include asphyxia, wheezing and crackles. The treatment of complicated influenza is prolonged, often requiring modifications, adding antibiotics, and causing extended absence from work, and occasionally hospitalisation.

The study was performed on a limited population consisting of patients treated at a single primary healthcare centre for two consecutive year-long periods of increased incidence of respiratory tract infections before the COVID-19 pandemic. The results provide useful clinical characteristics of the patient population in a primary care setting with additional factors predisposing to potential complications, i.e. comorbidities. The study population was practically unvaccinated against influenza.

The known risk groups for influenza complications include children aged <2 years and patients aged >65 years, pregnant women and women up to two weeks after giving

birth, and patients with comorbidities, particularly asthma, COPD, cystic fibrosis, neurologic, heart, haematological, endocrine, kidney and liver diseases, metabolic dysfunctions (congenital metabolic disorders, mitochondrial diseases), patients with immunodeficiencies, morbid obesity (BMI ≥ 40 kg/m²), and residents of long-term care facilities^(5,9,10). Pulmonary complications, including primary influenza and secondary bacterial infections, are the most common. Both may cause pneumonia, presenting with a distinct clinical picture. Neuromuscular and cardiac complications are unusual but can occur in people of any age⁽¹¹⁾.

The examined group of adult patients with post-influenza complications significantly more often included patients with multiple (≥ 5) comorbidities, mainly arterial hypertension, obesity, and thyroid and liver diseases. These patients were older than those without complications (median age – 51 vs. 45 years, respectively), but the difference was statistically insignificant. No residents of care facilities were included in the study group. All patients with influenza complications were treated with oseltamivir. In line with the Centers for Disease Control and Prevention guidelines, antiviral therapy is recommended in all patients with an existing risk of influenza complications in whom influenza is suspected, regardless of influenza testing^(12,13). In addition to antiviral treatment, patients with influenza complications more often required adding antibiotics to their treatment regimen. They were also admitted to the hospital more frequently due to the secondary bacterial bronchitis, pneumonia, myocarditis or exacerbation of COPD.

Published studies describe a complicated course of influenza in patients >49 years old, with comorbidities including hypertension, diabetes mellitus, chronic kidney disease, and chronic obstructive pulmonary disease⁽¹⁴⁾. Liver and thyroid gland diseases are less commonly named as risk factors for a severe course of influenza in the published studies⁽¹⁵⁾. Nevertheless, patients with chronic liver diseases were at greater risk of influenza-related hospital admission, decompensation or collateral organ damage^(16,17). Single-case reports also describe the thyroid crisis triggered by influenza⁽¹⁸⁾.

In our previous publications, symptoms including fever, cough, myalgia, tachypnoea, chest pain, and respiratory disturbances were more frequently observed in patients with influenza than other infections⁽¹⁹⁾. Abnormalities in physical examination indicating inflammation of the lower respiratory tract and dyspnoea were found significantly more commonly in the group with a complicated influenza course. The symptoms included: shallow and irregular breathing (38% vs. 9%), asphyxia (31% vs. 1%), increased work of the accessory respiratory muscles (38% vs. 9%), tachypnoea (62% vs. 20%), wheezing (54% vs. 3%), crepitations (38% vs. 1%), and crackles (62% vs. 4%) over the lung fields.

According to the published reports, the clinical picture and duration of influenza encompass a broad spectrum.

Nevertheless, secondary bacterial pneumonia is a common complication of severe influenza⁽²⁰⁾. The study of Winternitz et al. showed that the epithelium of the trachea, bronchi and alveoli was among the primary sites of replication of the influenza virus^(21,22). The higher incidence of features characteristic of lower respiratory tract inflammation in patients with a severe course of influenza observed in this study confirms the data in the literature.

In to the published findings, the frequency of heart muscle involvement in patients with influenza is evaluated differently by various authors, who report values ranging from 0% to over 50%, which significantly depends on the study group and the methods applied⁽²³⁾. One of the analyses involved a group of patients who required hospitalisation in the intensive care department due to H1N1 influenza, with echocardiographic features of right ventricle insufficiency found in 48% of patients. In comparison, systolic dysfunction of the left ventricle was found in 17% of them⁽²⁴⁾. According to case studies, infection with the H1N1 virus may sometimes have a dramatic course, with signs of severe myocarditis, pericardial effusion, heart tamponade and insufficiency, and refractory disease course, ultimately leading to death⁽²⁵⁾. In our study, the patient with the most severe and prolonged influenza complication in the form of myocarditis, pericardial effusion, and secondary bacterial pneumonia was 48 years old. The patient suffered from mild arterial hypertension, had a very stressful lifestyle, did not smoke and was unvaccinated against influenza. Additional tests performed in the outpatient clinic included laboratory tests (high levels of inflammatory markers), a chest x-ray (bilateral pneumonia – L>R) and an electrocardiogram (an elevated ST-segment w II, III, avF, inverted T wave w III, J point elevation in V6). Because of cardiac and lung complications, the patient required hospitalisation followed by a long period of absence from work. Other patients with influenza complications also required additional tests and scans to confirm lung changes. Finally, they were treated with antibiotics. Two patients diagnosed with pneumonia needed hospitalisation. No deaths due to influenza were found in the study group.

The observed low percentage of vaccinated patients is a negative phenomenon, as multicentre studies indicate that influenza vaccinations are highly effective. Of 90 patients diagnosed with influenza, only one patient was vaccinated. Of the remaining 540 patients with other respiratory tract infections, 36 were vaccinated⁽¹⁹⁾. The percentage of vaccinated patients in the group of 631 study participants was 6%. The efficacy of influenza vaccinations estimated by clinical research and confirmed in laboratory tests among healthy adults aged <65 is 70–90%, and aged ≥65 in care facilities is 50–60%; for children aged >2 is 60–90%^(26,27). According to data from the NIZP-PZH (National Institute of Public Health–National Institute of Hygiene), in 2019/2020, only 4.12% of Polish citizens were vaccinated against influenza.

In the season before, the percentage was 3.9%. According to the World Health Organization (WHO) recommendations, the vaccination rate in seniors aged >65 in the European region should be 75%. Based on the data on the vaccination status in this population group in the European Union, the average vaccination rate is 44% and it varies greatly across the countries, from over 75% in the Netherlands to 43% in Denmark, 68% in the UK or about 10% in Poland⁽²⁸⁾.

Oseltamivir was used in the treatment in both evaluated groups of patients with influenza with a similar frequency. If implemented early, the therapy is reported to reduce the duration of flu symptoms, which is particularly visible in older patients with more comorbidities⁽²⁹⁾.

In the available literature reports, the group of patients with influenza complications included cases of exacerbation of chronic diseases, such as bronchial asthma or COPD. Viral or bacterial infections may worsen their clinical course. These patients should be regularly vaccinated against influenza and periodically against pneumococci. As indicated by research, patients with COPD vaccinated against influenza showed a 38% reduction in the hospitalisation rate due to exacerbation caused by influenza compared to non-vaccinated patients. Moreover, those who did need hospitalisation due to influenza died more often than those with exacerbation of different aetiology⁽³⁰⁾. In the presented study, COPD was not proven to be a significant factor for the development of influenza complications. Complicated influenza was more common in patients with obesity and thyroid and liver diseases. Furthermore, most patients with influenza complications presented with complex comorbidities (≥5). Influenza in patients with multiple chronic diseases generally lasted longer and required more intensive treatment.

In conclusion, complicated influenza occurs at a significantly greater frequency in patients with numerous comorbidities, including obesity, thyroid diseases, and liver diseases. Clinical symptoms associated with influenza complications include asphyxia, wheezing, and crackles. Influenza may lead to the development of pneumonia and myocarditis or exacerbations of underlying conditions. Myocarditis may occur in younger patients without comorbidities and lead to a severe clinical course of the disease, requiring hospitalisation. The percentage of patients vaccinated against seasonal influenza in the study population was extremely low, and inadequate vaccination rates is a problem that calls for better health education of patients. The treatment of complicated influenza is a prolonged process. It often requires a modification in treatment, such as adding antibiotics, and causes extended absence from work, and sometimes hospitalisation.

Conflict of interest

The authors do not report any financial or personal connections with other persons or organisations that could adversely affect the publication's content and claim the right to this publication.

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