

Features of the Course and Therapy of Viral Infection Covid-19 in a Repurposed Infectious Diseases Hospital for Patients Aged 90 Years and Older

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Abstract

Background: According to WHO statistics for 2020, the risk of acute infection, which can lead to death, increases with age. The median age of patients with COVID-19 is 61 years. Mortality-after 80 years of life is 15%. The literature discusses the difficulties of timely diagnosis of Covid-19 in the elderly, which in most of them are associated with asymptomatic disease and its atypical course.

Goal and tasks: To assess the symptoms, the nature of the course of the pathology and clinical diagnostic data and mortality rates in people aged 90 years and older hospitalized with a diagnosis of COVID-19 in a repurposed emergency hospital in the city of Sochi. Moscow from April 12 to August 3, 2020

Material and methods: We retrospectively analyzed the clinical diagnostic data of 108 patients, including 23 men and 85 women aged 90-98 years, on average 92.2 ± 1.7 , admitted to the hospital for diagnosis and treatment in the period from 04/12/2020 to 12.04.2020. Until 08/03/2020 with diagnoses according to ICD-10: U07.1 U07.1 Coronavirus infection caused by the COVID-19 virus, virus identified (confirmed by laboratory testing regardless of the severity of clinical signs or symptoms); J12.9 J12.9 Community acquired pneumonia. Patients' data were archived in the city computer system DZM KIS EMIAS of the Department of Health of the city of Moscow.

Results: Pneumonia, which complicated the course of Covid-19 in patients aged 90 years and older, was characterized by a bilateral process-in 85% of them, involving 75-80% of the lung parenchyma-in 19.7% of cases, with the development of hydrothorax-in 53%, with a pathological decrease in oxygen saturation-in 67% of patients. In the treatment and prevention of cardiovascular complications in such patients, heparin therapy (in 70.4%), treatment with beta-blockers (in 41.7%), ACE inhibitors and blockers occupied a large place angiotensin receptors (in 31.5%), diuretics (in 27.8%). The use of antimalarial drugs (in 15.7%) and antiviral agents (in 9.3%) was limited due to the blurring of clinical symptoms, possible cardiotoxicity, and insufficiently substantiated drug efficacy. Lethality in patients with Covid-19 complicated by pneumonia, exceeded in patients aged 90 years and older-55%, which was closely associated with adverse cardiovascular premorbid background in 85.5% of them and required the initiation of inpatient diagnostics and therapy as soon as possible.

Conclusion: Covid-19 complicated by pneumonia in a group of people aged 90 years and older, proceeds with blurred clinical symptoms, with neurological manifestations in 20% and intestinal dysfunction in 6% of patients. High mortality rates at the same time require urgent diagnostic and therapeutic measures in stationary conditions.

Keywords: Covid-19 • Population aged 90 and over • Mortality

Introduction

The first data on the epidemic of COVID-19 in the world suggested that the coronavirus most dangerous for the elderly, and in young people it occurs mainly in a mild form. It was possible to clarify these provisions after the publication of data on disease statistics in different countries. The first data were published by Chinese epidemiologists. Thus, according to an analysis of 72,314 cases of diseases conducted by the Center for Disease Control and Prevention of China, as of February 11, 2020, 87% of cases were between the ages of 30 and 79 years, 1% were in children 9 years of

age and younger, another 1%-for children and adolescents in aged 10 to 19 years, and 3% of the cases were elderly people over the age of 80 years. The ratio of male and female was 51% to 49%, respectively. Among those who fell ill, 4% were medical workers [1-3].

Data on the course of the pandemic in the United States made it possible to establish that about a third of patients are elderly people over the age of 65. They account for nearly half of hospital admissions, 53% of intensive care transfers, and 80% of deaths among COVID-19 patients [3,4].

According to domestic online information sources, older people are especially at risk of contracting the coronavirus. This circumstance is associated with the fact that in the elderly there is an involution of the immune system, which is a natural phenomenon. During the aging period, an increase in susceptibility to infectious diseases is observed. They have a higher risk of complications associated with age-related pathology of the heart, vessels of the brain and lungs, the presence of diabetes, kidney failure. The risk of acute infection, which can lead to death, increases with age. The median age of patients with COVID-19 is 61 years. Mortality _ after 80 years of life is 15%. During the pandemic, 87% of patients with COVID-19 are patients in the age group of 30-79 years. The median age range for epidemic deaths is 75 years [5].

Wikipedia website "Coronavirus Monitor " provides WHO data for 2020, according to which the mortality of patients with Covid-19 in the age group

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of 90+ years is the highest and varies in different regions of the world from 21.6% (Spain), to 39.9% (Denmark), (Table 1) [6].

Table 1. Data on mortality in various age groups of patients with the Covid-19 pandemic in selected countries and regions of the world in 2020

Mortality distribution by age, %										
Age	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
Canada, April 29	0.0		0.2		0.6		5.5		17.3	
China, on February 11	0.0	0.2	0.2	0.2	0.4	1.3	3.6	8.0	14.8	
Denmark, April 30	0.2			4.5			15.9	24.8	39.9	
Germany, on May 4	0.1	0.0	0.1		1.6			17.2		26.7
Israel, April 30	0.0	0.0	0.5	0.5	1.4	2.8	9.3	24.5	33.3	27.3
Italy, April 28	0.1	0.0	0.1	0.3	0.9	2.6	9.8	24.2	29.0	24.7
Netherlands, April 25	0.0	0.3	0.1	0.2	0.5	1.5	7.6	23.2	30.0	29.3
Portugal, April 28	0.0	0.0	0.0	0.0	0.2	0.7	3.0	8.7	17.2	
South Korea, April 30	0.0	0.0	0.0	0.2	0.2	0.8	2.6	10.4	24.3	
Spain, April 29	0.3	0.4	0.2	0.3	0.6	1.4	4.7	13.7	20.8	21.6
Sweden, April 26	0.0	0.0	0.4	0.4	1.0	2.3	6.9	21.2	30.0	34.0
Switzerland, April 30	0.0	0.0	0.0	0.1	0.0	0.5	2.8	10.5	25.2	
Washington, USA, on April 25	0.0		0.2		1.3		8.9		29.9	

The literature discusses the difficulties of timely diagnosis of Covid-19 in the elderly, which in most of them are associated with asymptomatic disease and its atypical course. In an interview for the RIA Novosti agency, the director of the Russian Gerontological Research and Clinical Center of the Russian National Research Medical University named after N.I. Pirogova and chief freelance geriatrician of the Ministry of Health of Russia O.N. Tkacheva reported that very often the course of the disease in the elderly is atypical. In our center, in young patients with Covid-19, we often see the onset of the disease with high fever and severe intoxication, on the contrary, in the elderly, only in 20% of cases there is severe hyperthermia, since there is no proper response of the immune system to this infection [7].

In the specialized medical literature and the media on Covid-19, there are only a few clinical reports on the nature of the course and the clinical picture of the disease in patients of older age groups, which confirm the difficulties in diagnosing this infection [8].

Purpose and objectives of the study

To assess the symptoms, the nature of the course of the pathology and clinical diagnostic data and mortality rates in people aged 90 years and older hospitalized with a diagnosis of COVID-19 in a repurposed emergency

Table 2. Reasons for hospitalization of 108 patients aged 90 years and older with a confirmed diagnosis of Covid-19

No.	Causes	Number of cases	Frequency in %
1	Identified signs of Covid-19 and pneumonia in another hospital	39	36.1%
2	Fever and toxicity	20	18.5%
3	Loss of consciousness, disorientation, speech disorder, fall	19	17.6%
4	Shortness of breath, cough, respiratory failure	16	14.8%
5	Diarrhoea, change in stool pattern	7	6.5%
6	Epilepsy	3	2.8%
7	OKS	2	1.85%
8	Contact with sick Covid-19	2	1.85%

In this age group of patients with a diagnosis of Coronavirus infection, confirmed by PCR-method of examination of swabs from the nasal and pharyngeal mucosa, the determination of virus RNA or antibodies to the virus of the class of immunoglobulins M and G, signs of viral pneumonia in MSCT-lungs were detected in 94.4% of hospitalized patients. Patients, including 92 (85.2%)-bilateral pneumonia, 10 (9.2%)-unilateral (Table 3). In the remaining 5.6% of cases, the following were detected: Signs of resolving pneumonia in two cases (1.85%), chronic pulmonary fibrosis in one patient

hospital in the city of Sochi. Moscow from April 12, 2020 to August 3, 2020.

Materials and Methods

We retrospectively analyzed the clinical diagnostic data of 108 patients, including 23 men and 85 women aged 90-98 years, on average 92.2 ± 1.7 , admitted to the hospital for diagnosis and treatment in the period from April 12, 2020 until 08/03/2020 with ICD-10 diagnoses: U07.1 Coronavirus infection caused by the COVID-19 virus, virus identified (confirmed by laboratory testing regardless of the severity of clinical signs or symptoms); J12.9 Community-acquired pneumonia Patients' data were archived in the city computer system DZM KIS EMIAS of the Department of Health of the city of Moscow.

Results

The most common reason for hospitalization in the group of patients was the symptomatology of an acute viral infection with damage to the upper respiratory tract and lungs-in 69.4% (Table 2). More rare causes were: Acute neurological symptoms and epilepsy syndrome-in 20.4% of patients, diarrhea and stool disorders-in 6.5% and acute coronary syndrome-in 1.85% (Table 2).

(0.9%), COPD in 3 (2.7%). The severity of lung damage according to MSCT data (CT grade 3-4) within 75%-80% of the lung tissue volume was detected in 20 out of 102 patients (19.7%) of this group. Variants with a lesion volume in the range of 25%-40% (CT grade 2) were most often detected-in 56 (51.9%) patients. More than half of the patients in 58 (53.7%) were diagnosed with hydrothorax at admission, including bilateral in 56 (51.8%) and unilateral in 2 (1.85%). In 8 cases (7.4%), MSCT of the lungs revealed pulmonary embolism with a source of thrombosis in the deep veins of the

lower extremities. The indicators of oxygen saturation upon admission to the hospital were reduced in 62 out of 108 (67.3%) patients, including 10 (9.3%)-were below 90%. Clinical signs of respiratory failure of the 1st degree were detected in 10 (9.2%) patients, 2nd degree-in 4 (3.7%) patients. In 4 patients out of 108 (3.7%), mechanical ventilation was required (Table 3).

Table 3. The nature and frequency of lung lesions detected in the hospital, gas exchange parameters according to MSCT and oxygen saturation studies in 108 patients with a confirmed diagnosis of Covid-19 aged 90 years and older

Number	patients	Number of cases	Percentage of total	
1	Pneumonia : Bilateral unilateral	92	85.2%	
		10	9.2%	
2	Pneumonia in resolution phase	2	1.85%	
3	Fibrosis of the lungs	1	0.9%	
4	COPD	3	2.8%	
5	Hydrothorax: Bilateral unilateral	56	51.8%	
		2	1.85%	
6	TELA	8	7.4%	
7	The severity of pneumonia according to the volume of lung tissue damage according to MSCT: CT 1	29	28.4%	
		CT 2	53	51.9%
		CT 3	16	15.8%
		CT grade 4	4	3.9%
8	Respiratory failure : 1st degree	10	9.2%	
		2 walls	4	3.7%
9	Initial oxygen saturation:			
	99-95	46	42.6%	
	94-90	52	48.1%	
	Less than 90	4	3.7%	
10	Carrying out IVL	4	3.7%	

In 7 patients out of 108 diagnosed with Covid-19 and pneumonia, surgical interventions of various profiles were required, for medical reasons, including two patients with atrioventricular blockade and a rare heart rhythm-implantation and reimplantation of the pacemaker in two more patients during mechanical ventilation-performed the operation of imposing a tracheostomy (Table 4). The operation of PTCA and stenting of the coronary artery was performed in one patient with acute coronary syndrome with ST elevation on the ECG (Table 4).

Table 4. The nature and frequency of operations performed in a hospital during current hospitalization in 108 patients with a confirmed diagnosis of Covid-19 aged 90 years and older

No.	Operation name	Number of cases	Percentage of total
1	Drainage of a sub-diaphragmatic abscess	1	0.92%
2	Tracheostomy _	2	1.85%
3	EX-implantation	2	1.85%
4	percutaneous transluminal angioplasty and stenting of the coronary artery	1	0.92%
5	Nephrostomy installation	1	0.92%

6	Total operations	7	6.5%
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The specificity of drug treatment of this group of patients was the high frequency of heparin use-in 76 (70.4%) patients-due to the risk of developing thrombotic complications and combined antibiotic therapy-in 43 (39.8%)-due to a tendency to long-term, recurrent course of pneumonia (Table 5). On the contrary, the frequency of prescribing such groups of drugs for pathogenetic therapy of Covid-19 was low, such as antimalarial drugs in 17 (15.7%) patients, antiviral and interferons in 10 (9.3%) patients. Relatively often in the group, such means of symptomatic therapy of cardiovascular pathology as beta-blockers were prescribed-in 45 (41.7%), ACE inhibitors and blockers angiotensin receptors-in 34 (31.5%), diuretics-in 30 (27.8%), statins-in 24 (22.2%) and nootropics-in 23 (21.3%) (Table 5).

Table 5. The nature of the therapy in the hospital during the current hospitalization in 108 patients with a confirmed diagnosis of Covid-19 aged 90 years and older

No.	Drug group	Number of cases	Percentage of total
1	Heparins	76	70.4%
2	Expectorant and mucolytic	47	43.5%
3	Beta blockers	45	41.7%
4	Antibiotic combination and antibiotic change	43	39.8%
		42	38.9%
5	One antibiotic	42	38.9%
6	ACE inhibitors and ARBs	34	31.5%
7	Diuretics	30	27.8%
8	Statins	24	22.2%
9	Nootropics	23	21.3%
10	Steroid hormones	18	16.7%
11	Antimalarial drugs	17	15.7%
12	oxygen therapy	16	14.8%
13	Folic and ascorbic acid	13	12%
14	NSAIDs and aspirin	12	11.1%
15	Iron preparations and vitamin B-12	12	11.1%
16	Antivirals and interferons	10	9.3%
17	Vasopressors	10	9.3%
18	Hemostatics	9	8.3%
19	IVL	4	3.7%

Mortality in the group of patients aged 90 years and older was high and amounted to 55.6% (60 cases out of 108), (Table 6).

Table 6. Causes of death and design of clinical diagnosis in 60 out of 108 patients with a confirmed diagnosis of Covid-19 and pneumonia aged 90 years and older

Number	Diagnosis design	Number of cases	Percentage of total
A. Main diagnosis: Covid-19+pneumonia			
1	Primary: Covid-19, pneumonia Competing: TsVB.X IGM. Consequences of stroke	7	11.7%

2	Primary: Covid-19, pneumonia Competing: CAD: PIR	5	8.3%
3	Primary: Covid-19, pneumonia	4	6.7%
4	Primary: Covid-19, pneumonia Competing: encephalopathy unspecified .D EP.	3	5%
5	Primary: Covid-19, pneumonia Competing: HD with cardiac and renal insufficiency	2	3.3%
6	Primary: Covid-19, pneumonia Competing: Tubulo-interstitial nephritis	1	1.7%
7	Primary: Covid-19, pneumonia Competing: Cancer of the right breast 3 tbsp.	1	1.7%
8	Primary: Covid-19, pneumonia Competing: TsVB. X IGM.	1	1.7%
9	Primary: Covid-19, pneumonia Competing: TsVB. X IGM.	1	1.7%
10	Primary: Covid-19, pneumonia Competing: chronic erosive hemorrhagic gastritis	1	1.7%
Total:		26	43.3%
B. Diagnosis: Covid-19+pneumonia-competitive with the main diagnosis			
1	Main: CVD, CIGM, decompensation. Competing: Covid-19, pneumonia	20	33.3%
2	Main: CWB: CCI. P consequences of a stroke. Competing: Covid-19, pneumonia	4	6.7%
3	Primary: Hypertension with heart failure Competing: Covid-19, pneumonia	3	5%
4	Main: Degenerative calcification of the aortic valve. Heart failure 2 tbsp. Competing: Covid-19, pneumonia	3	5%
5	Main: Closed fracture of the neck of the right femur Competing: Covid-19, pneumonia	2	3.3%
6	Primary: Stomach cancer Competing: Covid-19, pneumonia	1	1.7%
7	Main: Rak trachea, bronchi, lung. Competing: Covid-19, pneumonia	1	1.7%
Total:		34	66.7%

In the subgroup of deceased patients with the main diagnosis of Covid-19+pneumonia (subgroup A), the most common competing diseases were lesions of the central nervous system, including CVD with the consequences of a stroke-11.7%, encephalopathy with symptoms of dyscirculation (dyscirculatory encephalopathy, DEP)-5% and CVD with chronic cerebral ischemia (CCI)-1.7%. In total, these forms of pathology accounted for 18.4% of the dead. The second place in frequency was coronary heart disease and post infarction atherosclerosis-8.3%, the third-kidney damage

and renal failure: In 3.3%-hypertension with renal and heart failure, tubulo-interstitial nephritis-in 1.7% and chronic kidney disease of the 5th degree-in 1.7%, in total-6.7%. In subgroup B of deceased patients with a competing diagnosis of Covid-19+pneumonia, the main form of pathology, also most often, were lesions of the central nervous system: CVD: CCI-in 33.3% and CVD: Consequences of a stroke-in 6.7%, in total-in 40%. The second most common place was chronic forms of heart pathology, including hypertension with heart failure stage 2 A-B-in 5% and heart disease-degenerative calcification of the aortic valve with stenosis-in 5%, in total-10% of all causes. The third place in terms of frequency was occupied by terminal forms of oncological pathology-cancer of the stomach and lungs, 1.7% each, in total-3.4%.

Discussion

A study in patients aged 90 years and older, hospitalized in our hospital with suspected Covid-19 infection and pneumonia, made it possible to confirm the diagnosis of lung damage in 94.4% of them. In almost 70% of them, the disease began with typical symptoms of Covid-19 infection in the form of fever, intoxication, unproductive cough, and shortness of breath. In 30% of patients, the disease proceeded atypically, including 20.4% with neurological symptoms in the form of loss of consciousness, disorientation, impaired speech, falls, refusal to eat, and epileptic seizures. Of the other atypical manifestations of the disease-6.5%-were dysfunction of the large intestine and diarrhea.

Our data confirm the reports of other researchers about the frequent atypical course of Covid-19 infection. So according to J. Graham, elderly patients with this pathology may not have such typical symptoms as fever, non-productive cough, shortness of breath, instead their behavior changes, they may sleep more than usual or stop eating, may appear unusually lethargic or drowsy, losing orientation in your surroundings. In addition, there may be dizziness, fatigue, which will lead to falls [8]. According to the director of the Russian Gerontological Research and Clinical Center of the Russian National Research Medical University named after Pirogov and the chief freelance geriatrician of the Ministry of Health of Russia O.N. Tkacheva, the course of the disease is very often atypical in the elderly. If in young people very often Covid-19 begins with high fever and severe intoxication, then in the elderly, only in 20% of cases there is a fever, that is, there is no proper report of the immune system to this infection [7].

It is possible that a more severe course of pneumonia in patients in the age group of 90 years and older was associated with an insufficient immune response. We noted that in them, much more often than in young patients, Covid-19 infection was complicated by the development of bilateral pneumonia-in 85% (in patients aged 30 years and younger-in 53%) and proceeded with impaired oxygen metabolism, with a decrease in oxygen saturation-in 67.3% of patients (in persons aged 30 years and younger-in 7%). One of the distinguishing features of pneumonia in elderly patients with Covid-19 was the frequent complication of pneumonia with hydrothorax, including 51.8%-bilateral. In our opinion, two factors are of primary importance in its development-massive inflammatory infiltration of the lung tissue and an increase in pressure in the capillaries of the pulmonary artery due to aggravation of left ventricular failure. According to the diagnostics in the hospital, 38.4% of them had signs of atherosclerosis of various origins, complicated by chronic heart failure of 2 A-B degrees. On this occasion, 27.8% of patients underwent course diuretic and ACE inhibitor therapy.

Only a small number of patients aged 90 years and older with Covid-19 and pneumonia were treated with antiviral (9.3%) and antimalarial drugs (15.7%). This can be explained by two circumstances, firstly, the absence of high fever and intoxication in most patients, with an atypical course of the disease, and secondly, the unproven effectiveness of antimalarial drugs in the treatment of Covid-19.

From the literature data, it is known that in 2020, clinical trials of the

antimalarial drugs chloroquine and hydroxychloroquine, oral antimalarial drugs that are also used in the treatment of certain autoimmune disorders, were conducted. Both drugs have previously shown efficacy against the virus "in vitro." Compared to chloroquine, hydroxychloroquine had fewer side effects. These drugs are named in the clinical guidelines of Italy and China for the treatment of Covid-19, but do not yet have a sufficient clinical research base to confirm their effectiveness [9]. The results of the use of these drugs for the treatment of Covid-19 are known according to a randomized study of authors from the USA (Washington, Seattle, Atlanta). The study did not find a significant difference in the rate of elimination of the virus from the body between the group of patients in which hydroxychloroquine was used and the control group in the treatment of COVID-19 [10]. Another American randomized trial noted higher mortality in patients with Covid-19 treated with high doses compared with the low-dose chloroquine group diphosphate. Against the background of a high dose of the drug, there was an increase in the QTc interval of more than 500 ms in 18.9% of patients, in the low dose group, this figure was 11.1% [11].

The mortality rate in the group of patients with Covid-19+ pneumonia studied by us at the age of 90 years and older exceeded 55% and was higher compared to international statistics published in WHO materials in 2020, according to which mortality in groups of patients 90+ with Covid-19 was the highest in the Scandinavian statistics of Denmark-39.9% and Sweden-34% [12]. Such a high mortality in patients with Covid-19 and senile pneumonia in this study, in our opinion, is associated with an unfavorable premorbid background in the form of various forms of cerebrovascular disease, including after stroke, with chronic cerebrovascular insufficiency complicated by dementia and cognitive impairment, with discirculatory encephalopathy, with chronic coronary heart disease, including after myocardial infarction, with the development of chronic heart failure, with terminal stages of hypertension and kidney damage with chronic renal failure and, to a lesser extent, with terminal stages of oncological forms of pathology-in the vast majority studied patients.

Conclusion

- Pneumonia, which complicated the course of Covid-19 in patients aged 90 years and older, was characterized by a bilateral process-in 85% of them, involving 75%-80% of the lung parenchyma-in 19.7% of cases, with the development of hydrothorax-in 53%, with a pathological decrease in oxygen saturation-in 67% of patients.
- In the treatment and prevention of cardiovascular complications in such patients, heparin therapy (in 70.4%), treatment with beta-blockers (in 41.7%), ACE inhibitors and blockers occupied a large place. angiotensin receptors (in 31.5%), diuretics (in 27.8%). The use of antimalarial drugs (in 15.7%) and antiviral drugs (in 9.3%) was limited due to the blurring of clinical symptoms, possible cardiotoxicity and insufficiently substantiated drug efficacy.
- Mortality in patients with Covid-19 complicated by pneumonia

exceeded 55% in patients aged 90 years and older, which was closely associated with adverse cardiovascular events. Premorbid background in 85.5% of them and required the initiation of inpatient diagnostics and therapy as soon as possible.

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Conflicts of Interest

The authors do not have possible relationships with industrial and financial organizations that could lead to a conflict of interest in connection with the material presented in the manuscript.

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