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Assessment of the Epidemiological Situation on the Dermatomycosis Incidence during Covid-19 Pandemic

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Abstract

BACKGROUND: The relevance of the study of skin fungal diseases is due to their wide prevalence. Dermatomycosis affects more than 40% of the world's population, while onychomycosis (tinea unguium), representing a global health problem, is about 18–40%.

AIM: Assessment of the epidemiological situation on dermatomycosis incidence during the pandemic of coronavirus infection in the Karaganda region.

MATERIALS AND RESEARCH METHODS: The study used statistical data for the period 2009-2020.

RESULTS: Analysis of the long-term dynamics of dermatomycosis incidence for the period 2009-2020 revealed the uneven course of the epidemic process in the Karaganda region. The overall abundance of fungi that cause dermatomycosis prevails among the male population. The analysis of data by age showed that most often the incidence was registered among persons under the age of 35. Dermatomycosis was more often detected in adolescents and children under the age of 14 compared to adults. An analysis of risk factors for dermatomycosis development in the population showed that the incidence associated with fungal infection in 59.2% of cases was due to contact with animals.

CONCLUSION: The prevalence of severe forms of dermatomycosis was in 1.4 times higher among the urban population than among rural residents. Men suffer from dermatomycosis 1.64 times more often than women. The factors influencing the spread of infectious dermatoses were noted. These were the climatic features of the central region of the republic, which contribute to the accumulation of the pathogen in the foci of infection, as well as untimely seeking medical help, self-treatment, low awareness of this pathology, in particular, and preventive measures.

Introduction

The COVID-19 pandemic in 2020 has been a unique and amazing event for the global community. Society actually entered a new era of social and medical restrictions that were ubiquitous and everyday. There is widespread information that SARS-CoV-2 can also affect the skin during a pandemic. It is not yet known whether seriously ill patients with COVID-19 are prone to fungal infections [1], [2].

The number of patients with severe mycoses in the era of a new coronavirus infection, unfortunately, has increased. Severe coronavirus infection is characterized by strong immunosuppression, a violation of not only local but also systemic mechanisms of immune defense. In this case, serious life-threatening infections can occur due to specific pathogens, including micromycetes. The situation is aggravated by the widespread use of systemic glucocorticosteroids and biological immunosuppressors [3], [4], [5].

In recent years, there has been a trend towards an increase in the incidence of superficial skin mycoses (SCM) not only in adults but also in children [6], [7]. The deterioration of the socio-economic and environmental situation, the poor sanitary and hygienic condition of saunas, baths, showers, fitness clubs, and swimming pools also contribute to an increase in the incidence of fungal infection. Adolescents involved in contact sports (wrestling, karate, judo, aikido, etc.) in sports sections are also susceptible to mycotic infection [8], [9].

The dermatomycosis prevalence in the Republic of Kazakhstan differs depending on regional characteristics, especially in the southern regions, with a certain upward trend [10], [11], [12], [13]. The investigated Karaganda region is located in the Central part of the Republic of Kazakhstan.

Purpose

Assessment of the epidemiological situation on dermatomycosis incidence during the pandemic of coronavirus infection in the Karaganda region.

Materials and Research Methods

Statistical data on dermatomycosis incidence of persons registered in the Karaganda Regional Dermatovenerological Center. Statistical collections "Health of the population of the Republic of Kazakhstan and the activities of healthcare organizations for 2010-2020," Astana 2010-2020. A retrospective epidemiological analysis of dermatomycosis incidence for the period 2009-2020 and statistical analysis of data were carried out.

Research Results

Analysis of the long-term dynamics of dermatomycosis incidence for the period 2009-2020 revealed the uneven course of the epidemic process in the Karaganda region (Figure 1). A high incidence rate was recorded in 2011, 2012, and 2013 (56.2; 42.9 and 37.5 cases per 100,000 population, respectively). Low levels were registered in 2015, 2016, and 2017 (17.4; 15.7 and 17.1 cases per 100,000 population, respectively). Since 2018 and in subsequent years, there has been a slight increase in the incidence rate. In 2020, the incidence rate reached 27.5 cases per 100,000 population. The expressed cyclicity with 4 years duration was observed from 2010 to 2014 in the long-term dynamics of dermatomycosis incidence in the Karaganda region.

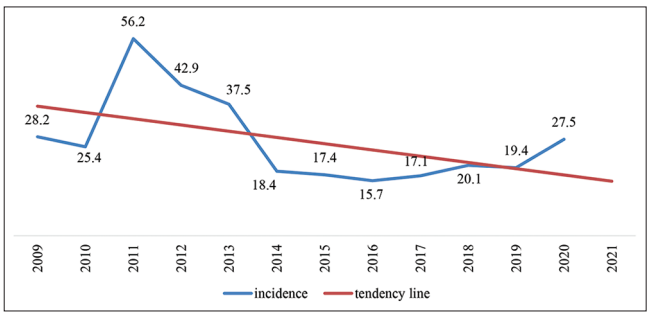

Figure 1: Long-term dynamics of dermatomycosis incidence in Karaganda region for the period 2009-2020

The growth rate of dermatomycosis incidence according to the gradation proposed by V. D. Belyakov was -0.0003% and was assessed as stable to increase. The incidence rate in 2020 increased by 1.75 times compared to the minimum level in 2016. The predicted theoretical incidence rate was 15.6 cases per 100,000 population in 2021. Evaluating the obtained data, we can assume that if the trend noted for the previous period continues by 2021, then this year the incidence can take on any value ranging from $12.8^0/_{0000}$ to $21.2^0/_{0000}$.

The data in Figure 2 show the uneven course of the epidemic process of dermatomycosis in the

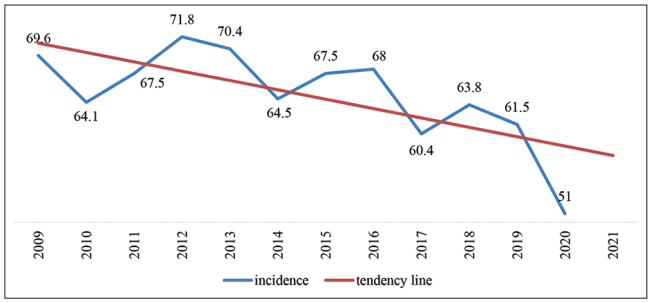

Figure 2: Long-term dynamics of dermatomycosis incidence in the Republic of Kazakhstan for the period 2009-2020

Republic of Kazakhstan. Thus, there were periods of rise and fall. High incidence rates were recorded in 2012, 2013, 2015 and 2016 (71.8; 70.4; 67.5 and 68.0 cases per 100,000 population, respectively). All rises were replaced by a decrease in the incidence in 2010, 2014, 2017, and 2020 (64.1; 64.5; 60.4 and 51.0 cases per 100,000 population, respectively).

Regular fluctuations in the incidence of dermatomycosis in the population over many years have been noted. The cyclicity of the epidemic process with an interval of 2–4 years was registered. Cyclicity is determined by social, natural conditions and phases of the functioning of parasitic systems. Most of the manifestations of cyclicity are explained by the infectious-immunological relationships between the populations of the parasite and the specific host.

The rate of decrease in dermatomycosis incidence according to the gradation proposed by V. D. Belyakov was -0.85% and was estimated as stable to decrease. The incidence rate in 2020 decreased by 1.36 times compared to 2009. The predicted incidence rate in 2021 was 57.8 cases per 100,000 population. Evaluating the obtained data, it can be assumed that if the trend noted for the previous period continues by 2021, then the incidence can take on any value ranging from $40.5^0/_{0000}$ to $61.8^0/_{0000}$.

A comparative analysis of the long-term dynamics of dermatomycosis incidence in the Republic of Kazakhstan and in the Karaganda region for the period 2009-2020 showed that the incidence rate in the country was higher than the regional indicator. So in 2009, the difference in the incidence rate in the republic compared with the Karaganda region was 2.47 times, in 2010–2.52, in 2011–1.2, in 2012–1.67, in 2013–1.88, in 2014–3.5, in 2015–3.87, in 2016–4.34, in 2017–3.53, in 2018–3.17, in 2019–3.17 and in 2020–1.85. Therefore, the maximum difference in incidence was noted in 2016 (4.34 times), the minimum–in 2011 (1.2 times).

An analysis of age indicators found that in children aged 0–14 years the incidence rate in the republic was 80.0 per 100 thousand children, in the Karaganda region–54.8, respectively, which was in 1.5 times lower than the republican value. Among adolescents in the republic, the incidence of dermatomycosis was 51.0/100 thousand adolescents,

in the Karaganda region–73.0, respectively. Therefore, the regional indicator was 1.4 times higher than the republican rate among adolescents.

In 2020, 92 patients with a severe form of dermatomycosis were hospitalized at the Karaganda Regional Dermatovenerological Center (Table 1). Of these, 59% lived in urban areas, 41%–rural residents. By age, adults, as well as children from 0 to 14 years old, accounted for 39% each, adolescents from 15 to 18 years old–22%. 62% of those hospitalized were men, 38% were women.

Table 1: Severe form of dermatomycosis disease

Indices	Absolute values	Intensive indicator per 100,000	Extensive indicator 100%
Urban population	54	3.9	59
Villager	38	2.8	41
Including:			
Adults	36	2.6	39
Teenagers 15–18 years old	20	1.4	22
Children aged 0–14	36	2.6	39
Men	57	4.1	62
Women	35	2.5	38

An analysis of the territorial distribution of the incidence of dermatomycosis severe forms among the population of Karaganda region found that the intensive rate among urban residents was 3.9/100,000 population, rural–2.8, respectively. Consequently, severe forms of dermatomycosis are 1.4 times more likely to be recorded among people living in the city.

The male population suffering from severe forms of dermatomycosis was in 1.64 times higher than the female. An analysis of risk factors for dermatomycosis development in the population showed (Table 2) that the leading causes were contact with bovine animals–19.4%, with a domestic cat–15.1%, with a stray cat–10.5%, with a stray dog–4.5%. The causes of dermatomycosis were unknown in 34.3% of cases. Thus, the incidence associated with fungal infection in 59.2% of cases was due to contact with animals.

Table 2: Factors that caused the disease onset in patients (per 100 thousand of population)

Factors	%
Swimming pool visit	3
Sauna visit	1.5
Public bath visit	1
Fitness room visit	1
Contact with a stray dog	4.5
Contact with a stray cat	10.5
Contact bovine animals	19.4
Contact with a domestic dog	4.5
Contact with a domestic cat	15.1
Contact with a cat in a special shelter	5.2
Unknown	34.3

The dermatomycosis incidence among children and adolescents was 1.5 times higher than among adults. An analysis by age showed that most often the incidence was registered among people under the age of 35 years. Thus, it was found that among persons receiving treatment in a hospital, 2.4% were children aged 0–14 years, 2.7% were adolescents aged 15–18 years, 1.67% were adults aged from 19 to 35 years, 0.2% were 36–50 years old, 0.07% were 51–60 years old and 0.15% were 60 years old and older.

Discussion

Local socio-economic conditions, cultural practices, population migration, lifestyle changes, injuries, shoes, pets (cats, dogs, hamsters), sports (swimming, running, wrestling) are some of the many risk factors for dermatomycosis development. The fact that the prevalence of dermatomycosis varies depending on age and sex has been established by many scientists in their studies and has been proven as a result of our studies [14], [15], [16], [17], [18]. We have found that dermatomycosis has a higher prevalence among men than among women. Men are more likely to play sports and have a high physical activity, can become infected through contact with animals, as well as in public pools or showers with a high pathogen load and sufficient humidity.

After the fungal pathogen has infected the skin of the feet, it can be easily transferred to other parts of the body, such as the hands and nails, body, head, internal organs, in particular the intestines. Depending on age, a high registration of ringworm is observed among people under the age of 35, which is associated with the above risk factors. We also note that dermatomycosis is more often detected in adolescents and children under the age of 14 compared to adults. Children of preschool and primary school age are the most sensitive group due to the peculiarities of skin structure. This may be due to the lack of naturally occurring protective fatty acids synthesized in the skull skin of children before puberty. Various studies by the authors also explained the fungal infection of the skin, which is often recorded in children [9], [19], [7], [20], [21], [22], is associated with contact and games with pets, and with the fact that the appropriate hygiene skills have not yet been formed.

The most likely reason for the wide distribution of dermatomycosis among the urban population is the large presence of plots with individual buildings in the city, including the regional center, and the significant spread of the population of domestic and stray cats and dogs.

Thus, the cyclic trend of the long-term dynamics of dermatomycosis incidence, the predominance of warm days and drought, as well as the climatic features of the central region of the republic contribute to the accumulation of the pathogen in the foci of infection. Untimely seeking medical help, self-treatment, low awareness of this pathology and preventive measures lead to the spread of fungal infections among the population.

Conclusion

1. The comparative analysis of the long-term dynamics of dermatomycosis incidence in the

Republic of Kazakhstan and in the Karaganda region for the period 2009-2020 showed that the incidence rate in the country was higher than the regional indicator. The predicted theoretical incidence rate in 2021 in the Karaganda region will be 15.6 cases per 100,000 population, in the republic–57.8, respectively

2. The prevalence of severe forms of dermatomycosis is 1.4 times higher among the urban population than among rural residents, men are 1.64 times more likely to get sick than women. The incidence is 1.5 times more frequently recorded among children and adolescents, than in adults. The dermatomycosis incidence in 59.2% of cases is due to contact with animals.

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