УДК: 616-002.5:613.956
DOI 10.56834/26631504_2022_1_29

A.E. Aidarbek, https://orcid.org/0000-0003-1386-1734
A.E. Erlan, https://orcid.org/0000-0002-3508-6532
D.D. Chunkayeva, https://orcid.org/0000-0003-2466-9860
NCJSC "Semey Medical University",
Semey city, Republic of Kazakhstan

TUBERCULOSIS IN ADOLESCENTS IN MODERN CONDITIONS

Resume: *Tuberculosis in adolescents is an extremely important problem. The article presents a comparative analysis of the structure of tuberculosis in adolescents of the Semey region for 2011-2015 and 2016-2020. Attention is drawn to drug-resistant forms of the disease and the effectiveness of treatment.*
Keywords*: tuberculosis, adolescents, morbidity, effectiveness of treatment*

А.Е. Айдарбек, А.Е. Ерлан, Д.Д. Чункаева
«Семей медицина университеті» КеАҚ,
Семей қаласы, Қазақстан Республикасы

ҚАЗІРГІ ЖАҒДАЙДАҒЫ ЖАСӨСПІРІМДЕРДЕГІ ТУБЕРКУЛЕЗ

Түйін: Жасөспірімдердегі туберкулез аса маңызды мәселе болып табылады. Мақалада 2011-2015 жж. және 2016-2020 жж. Семей өңірінің жасөспірімдеріндегі туберкулез құрылымына салыстырмалы талдау жүргізілді. Аурудың дәріге төзімді түрлеріне және емдеу тиімділігіне назар аударылды.
Түйінді сөздер: туберкулез, жасөспірімдер, аурушаңдық, емдеу тиімділігі

А.Е. Айдарбек, А.Е. Ерлан, Д.Д. Чункаева
НАО «Медицинский университет Семей»,
город Семей, Республика Казахстан

ТУБЕРКУЛЕЗ У ПОДРОСТКОВ В СОВРЕМЕННЫХ УСЛОВИЯХ

Резюме: Туберкулез у подростков является чрезвычайно важной проблемой. В статье проведен сравнительный анализ структуры туберкулеза у подростков Семейского региона за 2011-2015 гг. и 2016-2020 гг. Обращено внимание на лекарственно-устойчивые формы заболевания и эффективность лечения.
Ключевые слова: туберкулез, подростки, заболеваемость, эффективность лечения

Relevance: According to the estimates of the World Health Organization (WHO), the morbidity and mortality rates from tuberculosis (TB) have been declining very slowly in recent years [1]. The TB problem affects all age categories of the population, to a significant extent, adolescents. Thus, half a million estimated cases of adolescent TB occur annually in the world [2].

Adolescents (15-17 years old) are at risk for TB due to anatomical, physiological and psychological age characteristics [3]. Socially, adolescents represent a heterogeneous group: they are high school students, college and first-year university students, working and unemployed [4]. Unorganized adolescents are also vulnerable to TB, as they are not easily accessible to preventive anti-tuberculosis measures [5]. Currently, there is an insufficient amount of statistics and evidence on various aspects of TB in adolescents in medical databases, which leads to serious gaps in the field of strategies and measures to combat TB in this age category [6, 7].

In the Republic of Kazakhstan in the period from 2009 to 2018, a 2.4-fold decrease in the incidence of TB was recorded from 117.1 to 47.9 cases per 100 thousand population. At the same time, the situation differs and this indicator is higher than the republican level in the following areas: Atyrau (137.1), West Kazakhstan (52.9), Kyzylorda (85.0), Kostanay (60.2), Aktobe (93.6), Mangystau (91.2) and the city of Nur-Sultan (55.7) [8].

According to the results of 2018, in the city of Semey, the incidence of adolescent TB was 54.8 cases per 100 thousand population, which exceeds the regional indicator by more than 2 times (East Kazakhstan region - 24.6 cases per 100 thousand population).

The purpose of the study: to conduct a comparative analysis of the structure of tuberculosis in adolescents of the Semey region over the past decade.

Materials and methods: A retrospective study based on the use of data from the medical information system "National Register of Tuberculosis Patients" State-owned public enterprise with the rights of economic management "Regional Center of phthisiopulmonology and Rehabilitation" Health Department of the East Kazakhstan region for 2011-2020. Inclusion criteria: adolescents from 15 to 18 years of age, pulmonary tuberculosis. Exclusion criteria: children from 0 to 15 years old, adults 18 years and older, tuberculosis of extrapulmonary localization. A total of 187 adolescents were included in the study by the continuous sampling method. For comparison, 2 groups were formed: 138 adolescents who were diagnosed with TB in 2011-2015 (the first group) and 49 adolescents who were diagnosed with TB in 2016-2020 (the second group). Statistical analysis was carried out using the StatTechv program. 2.5.9 (developer - Stattech LLC, Russia).

Results: Significant differences between the groups by gender composition were revealed: boys (57.2%)

prevailed in the first group, girls (65.3%) in the second (p=0.007). The proportion of urban residents was higher in the second group and amounted to 85.7% versus 68.8% (p=0.022). The analysis of the social status of adolescents also showed significant differences. In the second group, the proportion of unorganized adolescents was significantly lower (8.2% vs. 18.1%), while the proportion of students was higher (36.7% vs. 20.3%) (p=0.038). Contact with a TB patient was established in 16.3% (first group) and 16.7% (second group) of adolescents (p=0.956). Contact with a known source of MDR-TB was 2 times more common in the second group (5.1% and 10.2%, respectively), but the difference between the groups is unreliable (p=0.305). Repeated TB cases in the first group were 12.3%, in the second - 6.1% (p=0.391). In most cases, infiltrative TB was diagnosed (86.2% and 93.9%, respectively), tuberculoma was equally diagnosed (2.2% and 2.0%), more often in the first group - focal TB (11.6 vs. 4.1%) (p=0.307). Destruction of lung tissue was observed in 22.5% and 36.7% of adolescents, drug resistance of MBT was laboratory proven in 35.5% and 36.7% (p=0.051 and p=0.878, respectively). Bacterial excretion by microscopy was confirmed in the first group in 20.3% of adolescents, in the second - in 36.7% (p=0.022).

Taking into account the presence of drug resistance in almost every third teenager of the analyzed groups, we conducted a detailed study of the results of drug susceptibility testing. Drug susceptibility testing was carried out to the first (5) and second-row anti-tuberculosis drugs (8) using the automated BACTEC MGIT-960 system. Drug susceptibility testing analysis showed differences in MBT resistance groups to 6 out of 13 drugs: pyrazinamide, levofloxacin, moxifloxacin, kanamycin, capreomycin and protionamide (p<0.05). The increase in drug resistance to these anti-tuberculosis drugs in the second group is explained on the one hand by the improvement of laboratory diagnostics, on the other - by the widespread use of fluoroquinolones and aminoglycosides in MDR-TB chemotherapy regimens in recent years.

The drug resistance profile of MBT in adolescents of the second group, compared with the first group, was characterized by a decrease in strains with polyresistance and multidrug resistance (MDR), an increase in strains with monoresistance and extensively drug-resistant (XDR) (the difference between the groups is unreliable, p>0.05) (Table 1).

Table 1- MBT drug resistance profile in adolescents, Semey region, 2011-2015 and 2016-2020

Drug resistance profile	1 group (n=138)		2 group (n=49)	
	absolute number	%	absolute number	%
Monoresistance	4	2,9	4	8,2
Polyresistance	16	11,6	4	8,2
MDR	27	19,6	7	14,3
Pre-XDR	2	1,4	2	4,1
XDR	-	-	1	2,0
Total	49	35,5	18	36,7

In the Semey region, the introduction of molecular genetic testing based on PCR-Xpert MTB/RIF was launched in 2015, as a result, the coverage of the Xpert MTB/RIF study in the first group was 38.4%, in the second - 100% of cases. The detection rate of TB in the second group compared to the first was 4 times higher and statistically significant (61.2% vs. 14.5%, p=0.001).

76.8% of adolescents in the first group received treatment in the drug-sensitive TB regime, 71.4% in the second group, 23.2% and 28.6% of adolescents in the drug-resistant TB regime, respectively. The effectiveness of treatment was without significant differences and amounted to 96.4% in the first group, 96.0% in the second (p=0.529) (Table 2).

Table 2 - Effectiveness of TB treatment in adolescents, Semey region, 2011-2015 and 2016-2020

Outcome	1 group (n=138)		2 group (n=49)	
	absolute number	%	absolute number	%
Recovery	133	96,4	47	96,0
Ineffective treatment	3	2,2	1	2,0
The result is not evaluated	1	0,7	1	2,0
The diagnosis is removed	1 (Echinococcosis of the lungs)	0,7	-	-

Conclusions: The incidence of TB among adolescents in the Semey region over the past decade has a favorable downward trend. In the structure of TB among adolescents in the period 2016-2020, compared with 2011-2015, the number of female persons, urban residents, and students increased. A high proportion of destructive and drug-resistant forms of the disease remains. To improve the epidemiological situation in the region, it is necessary to implement high-quality measures for the diagnosis, prevention and treatment of the disease among the adolescent population, taking into account the latest WHO recommendations and regulatory documents on TB control in the Republic of Kazakhstan.

REFERENCES

1 Global'nyi otchet po tuberkulezu 2020 g.: rezyume [Global tuberculosis report 2020: executive summary]. Zheneva: Vsemirnaya organizatsiya zdravookhraneniya; 2020. Litsenziya: CC BY-NC-SA 3.0 IGO.

2 Multidrug-resistant tuberculosis in children and adolescents in the WHO European Region, Expert opinion.

Copenhagen: WHO Regional Office for Europe; 2019. Licence: CC BY-NC-SA 3.0 IGO.
3 Ovsyankina E.S., Panova L.V., Khiteva A.Yu., Viechelli E.A. Prichiny pozdnei diagnostiki tuberkuleza u podrostkov. Rossiiskiivestnikperinatologii i pediatrii. 2019;64(1):76-80.
4 Kopanova G.K., Efendiev I.M. Osobennosti tuberkuleza u detei i podrostkov // Vestnik KazNMU. 2020. №1.
5 Szkwarko D, Mercer T, et al. Implementing intensified tuberculosis case-finding among street-connected youth and young adults in Kenya. Public Health Action. 2016 Jun 21;6(2):142-6. doi:10.5588/pha.16.0021. PMID: 27358809; PMCID: PMC4913678.
6 Moscibrodzki P, Enane LA, Hoddinott G, et al. The Impact of Tuberculosis on the Well-Being of Adolescents and Young Adults. Pathogens. 2021;10(12):1591. Published 2021 Dec 8. doi:10.3390/pathogens10121591.
7 Sant'Anna C, March MF, et al. Pulmonary tuberculosis in adolescents: radiographic features. *Int J Tuberc Lung Dis* 2009*;* 13*:* 1566–1568.PubMedGoogle Scholar
8 Statisticheskii obzor po tuberkulezu v Respublike Kazakhstan // Natsional'nyi nauchnyi tsentr ftiziopul'monologii Ministerstva zdravookhraneniya Respubliki Kazakhstan - Almaty, 2019, 63 p.

Authors' Contributions. All authors participated equally in the writing of this article.

No conflicts of interest have been declared.
This material has not been previously submitted for publication in other publications and is not under consideration by other publishers. There was no third-party funding or medical representation in the conduct of this work. Funding - no funding was provided.

Авторлардың үлесі. Барлық авторлар осы мақаланы жазуға тең дәрежеде қатысты.
Мүдделер қақтығысы – мәлімделген жоқ.
Бұл материал басқа басылымдарда жариялау үшін бұрын мәлімделмеген және басқа басылымдардың қарауына ұсынылмаған. Осы жұмысты жүргізу кезінде сыртқы ұйымдар мен медициналық өкілдіктердің қаржыландыруы жасалған жоқ. Қаржыландыру жүргізілмеді.

Вклад авторов. Все авторы принимали равносильное участие при написании данной статьи.
Конфликт интересов – не заявлен.
Данный материал не был заявлен ранее, для публикации в других изданиях и не находится на рассмотрении другими издательствами. При проведении данной работы не было финансирования сторонними организациями и медицинскими представительствами. Финансирование – не проводилось.

Information about the authors:

№	Full name	Post	Contacts	Email
1	Aidarbek Aisha-Bibi	6th year, School of Postgraduate Education, NCJSC SMU	+77476994965	aidarbekova-2011@mail.ru
2	Erlan Almas	7th year, School of Postgraduate Education, NCJSC SMU	+77074962580	almaseyevich@mail.ru
3	Chunkayeva Dina	Assistant of the Department of Cardiovascular and Thoracic Surgery named after B.S. Bulanov, NCJSC SMU	+77054440240	dchunkayeva@mail.ru