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Assisted Reproductive Technologies in Kazakhstan (National Registry Data, 2021)

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ABSTRACT

Relevance: The article presents comprehensive data on assisted reproductive technology (ART) programs implemented in 2021 in infertility treatment clinics in Kazakhstan specializing in ART.

The study aimed to analyze the structure and outcomes of ART cycles conducted and registered in the Republic of Kazakhstan from January 1 to December 31, 2021.

Materials and Methods: This retrospective study analyzed the data from reports submitted by 21 ART clinics in Kazakhstan. These reports were voluntarily provided to the Kazakhstan Association of Reproductive Medicine (KARM). The reports included information on in vitro fertilization (IVF) cycles, intracytoplasmic sperm injection (ICSI), frozen embryo transfers (FET), oocyte donation (OD), surrogacy, and preimplantation genetic testing (PGT).

Results: The total number of ART cycles available for analysis in 2021 was 27,012, resulting in 6,611 newborns. The accessibility of ART treatment was 1,407 cycles per 1 million population. The analysis of ART structure revealed that 25.3% of all cycles in Kazakhstan's clinics were IVF, while 74.7% were ICSI. A combined IVF/ICSI fertilization method was used in 27.6% of cycles. FET was performed in 50.8% of cases, OD accounted for 10.6%, and PGT was conducted in 3.8% of cycles.

The pregnancy rate per oocyte in 2021 was 19.3% after IVF and 17.8% after ICSI, with implantation rates per embryo transfer of 43.3% and 41.1%, respectively. Pregnancy rates were 50.8% after FET and 51.5% after OD. The live birth rate was 32.8% after fresh IVF, 32.4% after ICSI, 37.0% after FET, and 39.3% after OD. The 1,031 PGT programs resulted in a pregnancy rate of 53.6% and a live birth rate of 41.5%, with a multiple pregnancy rate of 10.2%.

Conclusion: According to registry data, the number of ART programs in 2021 increased by 72.88% compared to the previous year. The launch of the state program "Ansagan Sabi" (Longing Baby) contributed to the improved accessibility of ART. Pregnancy and live birth rates remained stable and aligned with the average ESHRE indicators, confirming the high level of ART development in Kazakhstan.

Keywords: *2021 report, assisted reproductive technologies (ART), in vitro fertilization (IVF), ART accessibility.*

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Вспомогательные репродуктивные технологии в Казахстане (данные Национального регистра, 2021 г.)

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АННОТАЦИЯ

Актуальность: В статье представлены совокупные данные о программах вспомогательных репродуктивных технологий (ВРТ), реализованных в 2021 году в клиниках Казахстана, специализирующихся на лечении бесплодия при помощи ВРТ.
Цель исследования – анализ структуры и результатов циклов ВРТ, проведенных и зарегистрированных в Республике Казахстан с 1 января по 31 декабря 2021 года.
Материалы и методы: Произведен ретроспективный анализ данных отчетов 21 клиники ВРТ Казахстана, поданных на добровольной основе в Казахстанскую Ассоциацию Репродуктивной Медицины. Отчеты включали информацию о циклах ЭКО, ИКСИ, крио-переносах эмбрионов, донорстве ооцитов (ДО), суррогатном материнстве и преимплантационном генетическом тестировании (ПГТ).
Результаты: Общее количество включенных в отчет циклов ВРТ за 2021, составило 27 012, в результате которых родились 6 611 новорожденных. Доступность лечения с помощью ВРТ составила 1 407 циклов на 1 млн населения.
Анализ структуры применения ВРТ выявил, что доля ЭКО в клиниках РК составила 25,3% от всех циклов ВРТ, доля ИКСИ — 74,7%, смешанный способ оплодотворения ЭКО/ИКСИ применялся в 27,6% циклов; перенос размороженных эмбрионов (криоперенос) проведен в 50,8%, программа ДО была выполнена в 10,6%, ПГТ – в 3,8% циклов.
Частота наступления беременности в расчете на пункцию составила, по итогам 2021 года, в циклах ЭКО – 19,3% на трансвагинальную пункцию и 43,3% в расчете на перенос, в программе ИКСИ – 17,8% на пункцию и 41,1% на перенос, в программе FET – 50,8% на перенос, в программе ДО – 51,5% на перенос. Показатель частоты живорождения в 2021 году составил 32,8% в свежем цикле ЭКО, 32,4% в программах ИКСИ, 37,0% при FET и 39,3% при ДО.
В 2021 году в Казахстане была проведена 1031 программа ПГТ. Частота наступления беременности после использования ПГТ составила 53,6%, частота живорождения – 41,5%, частота многоплодия – 10,2%.
Заключение: В соответствии с данными Национального регистра, в 2021 году количество программ ВРТ увеличилось на 72,88% по сравнению с предыдущим годом. Запуск государственной программы «Аңсаған Сәби» способствовал росту доступности ВРТ. Частота наступления беременности и живорождения стабильна и соответствует средним показателям ESHRE, подтверждая высокий уровень развития ВРТ в Казахстане.

Ключевые слова: *отчет 2021 года, вспомогательные репродуктивные технологии (ВРТ), ЭКО, доступность ВРТ.*

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Қазақстандағы қосалқы репродуктивті технологиялар (Ұлттық тіркелімнің деректері, 2021 ж.)

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АҢДАТПА

Өзектілігі: Бұл мақалада Қазақстандағы бедеулікті емдеуге маманданған клиникаларда 2021 жылы жүзеге асырылған қосалқы репродуктивтік технологиялар (ҚРТ) бағдарламалары туралы жиынтық деректер ұсынылған.
Зерттеу мақсаты – 2021 жылғы 1 қаңтар мен 31 желтоқсан аралығында Қазақстан Республикасында жүргізілген және тіркелген ҚРТ циклдарының құрылымы мен нәтижелерін талдау.
Материалдар мен әдістері: Қазақстандағы 21 ҚРТ клиникасының өз еркімен Қазақстан Репродуктивтік Медицина Қауымдастығына (ҚРМҚ) ұсынған есептері негізінде ретроспективті талдау жүргізілді. Есептерде экстракорпоральды ұрықтандыру (ЭКҰ), интрацитоплазмалық сперма инъекциясы (ИКСИ), мұздатылған эмбриондарды ауыстыру (FET), ооцит донорлығы (ОД), суррогат аналық және преимплантациялық генетикалық тестілеу (ПГТ) циклдары туралы мәліметтер қамтылды.
Нәтижелері: 2021 жылы талдау үшін қолжетімді ҚРТ циклдарының жалпы саны 27 012 болды, нәтижесінде 6 611 нәрестe дүниеге келді. ҚРТ арқылы емдеудің қолжетімділігі 1 миллион тұрғынға шаққанда 1 407 циклды құрады.
ҚРТ құрылымын талдау көрсеткендей, 25,3% циклдар ЭКҰ әдісімен, ал 74,7% ИКСИ әдісімен жүзеге асырылды. ЭКҰ/ИКСИ аралас ұрықтандыру әдісі 27,6% циклда қолданылды. Мұздатылған эмбриондарды ауыстыру (FET) 50,8% жағдайда жүргізілді, ооцит донорлығы (ОД) бағдарламасы 10,6% циклды қамтыды, ал преимплантациялық генетикалық тестілеу (ПГТ) 3,8% жағдайда орындалды.
Жүктілік жиілігі ЭКҰ циклында 19,3%, ал эмбрионды ауыстыруға шаққанда 43,3% құрады. ИКСИ бағдарламасында бұл көрсеткіш 17,8%, эмбрионды ауыстыруға шаққанда 41,1% болды. FET бағдарламасында жүктілік жиілігі 50,8%, ал ОД бағдарламасында 51,5%-ды құрады. Тірі туылу көрсеткіші жаңа ЭКҰ циклында 32,8%, ИКСИ бағдарламасында 32,4%, FET циклдарында 37,0%, ал ОД бағдарламасында 39,3% болды. Жалпы 1 031 ПГТ бағдарламасы жүргізіліп, жүктілік жиілігі 53,6%, тірі туылу жиілігі 41,5%, ал көпұрықты жүктілік жиілігі 10,2% болды.
Қорытынды: Тіркеу деректеріне сәйкес, 2021 жылы ҚРТ бағдарламаларының саны алдыңғы жылмен салыстырғанда 72,88%-ға артты. Мемлекеттік "Аңсаған Сәби" бағдарламасының іске қосылуы ҚРТ-ның қолжетімділігін арттыруға ықпал етті. Жүктілік пен тірі туылу көрсеткіштері тұрақты болып, ESHRE орташа көрсеткіштеріне сәйкес келеді, бұл Қазақстандағы ҚРТ дамуының жоғары деңгейін растайды.

Түйінді сөздер: *2021 жылғы есеп, қосалқы репродуктивтік технологиялар (ҚРТ), ЭКҰ, ҚРТ қолжетімділік.*

Introduction: The problem of infertility is at the center of the global health agenda, affecting millions of families around the world. According to WHO, on average, 15% of couples experience difficulties in conceiving [1]. To combat this problem, assisted reproductive technologies (ART) are being actively introduced, allowing to significantly increase the chances of successful conception and birth of a child.

Since 2008, the Kazakhstan Association of Reproductive Medicine (KARM) has been collecting data on ART cycles performed in the Association's member clinics using a special IT program proposed by the European Society of Human Reproduction and Embryology (ESHRE) and sending them to the European IVF Monitoring Consortium. These reports have been published in the journal "Reproductive Medicine (Central Asia)" (formerly "Reproductive Medicine") for the fourth year in a row.

Currently, 31 ART clinics operate in the country. They offer almost all modern technologies and methods of infertility diagnostics and treatment.

Since 2010, Kazakhstan has implemented programs within the Guaranteed Volume of Free Medical Care (GVFMC) framework. Since 2021, at the initiative of the country's President K.K. Tokayev, the state program "Ansagan Sabi" has been implemented, according to which the number of allocated quotas for IVF/ICSI programs has increased almost 7 times, reaching 7,000 per year. KARM is monitoring the implementation of this program. Over 29 years of successful ART programs in Kazakhstan, about 39,000 children have been born, of which more than 9,000 were born in quota programs (data as of 01.11.2024).

The frequency of infertile marriages in the Republic of Kazakhstan ranges from 12.0 to 15.5% [2]. Infertility has a significant impact on demographic indicators, psycho-emotional and physical health of the population, as well as the socio-economic development of the country. The increase in the frequency of infertility is accompanied by an increase in the need to use ART. This trend is characteristic not only of Kazakhstan but also of most countries in the world, emphasizing the importance of introducing advanced methods of treatment and diagnosis of infertility.

The study aimed to analyze the structure and results of ART cycles conducted and registered in the Republic of Kazakhstan from January 1 to December 31, 2021.

Materials and Methods: A retrospective analysis of the data from ART clinic reports submitted voluntarily to KARM was conducted. The reports included data on IVF cycles, ICSI, embryo cryotransfers, surrogacy, preimplantation genetic testing (PGT), and oocyte donation (OD). Due to the lack of a mandatory state ART registry, some IVF clinics did not provide their data, so this publication contains information on 97% of all ART cycles performed in Kazakhstan in 2021.

To compare the data in the report, we used the preliminary results of ESHRE for 2021, published in the journal « Human Reproduction » [3].

Data collection for this registry was carried out using the format recommended by ESHRE.

The availability of ART for citizens of the country was calculated by dividing the number of cycles by the country's population. The pregnancy and live birth rates were calculated by dividing the total number of pregnancies or births by the number of transvaginal punctures or embryo transfers.

Registry participants, number of ART cycles

The 2021 report included 21 out of 28 (90%) ART clinics operating in Kazakhstan during this period. Of the 21 clinics in the report, 6 were in Astana, 6 in Almaty, 3 in Shymkent, 2 in Aktobe, and 1 in Taraz, Atyrau, and Karaganda.

The total number of ART cycles available for analysis performed in ART centers of the Republic of Kazakhstan in 2021 was 27,012 (in 2020 – 17,743 cycles; + 72.88%). In total, data on 116,900 ART cycles have been collected since 2010.

As of January 1, 2021, according to the Statistics Committee of the Republic of Kazakhstan, the population of the Republic of Kazakhstan was 19,186,015 people [4]. Per 1 million population, 1,407 ART cycles were performed.

Results:

Structure of ART cycles

An analysis of changes in the structure of ART cycles in the Republic of Kazakhstan over 12 years reveals a significant redistribution in preferences for the use of ART methods. The share of IVF cycles decreased from 78.7% in 2010 to 25.3% in 2021, while the share of ICSI cycles consistently increased, reaching 74.7% by the end of the specified period. These changes reflect a steady transition to more technologically sophisticated approaches with higher chances of success.

In 2021, the distribution by method was as follows: ICSI accounted for 67.7% of cycles, IVF - 32.3%, and a combined method (50/50 ratio of IVF and ICSI) was used in 27.6% of cases. This is comparable with the ESHRE data, where the share of ICSI cycles is 39.7% and IVF - 16.2%, highlighting regional differences in approaches (Figure 1).

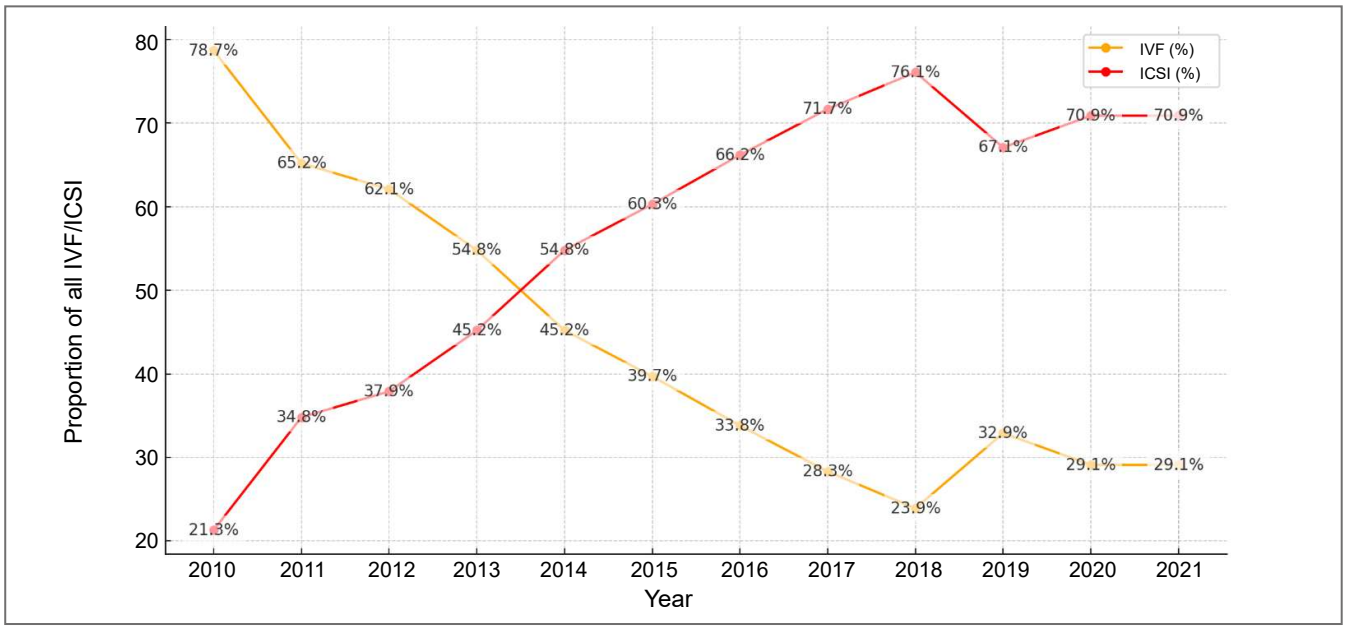


Figure 1 – Changes in the proportion of IVF and ICSI cycles, 2010-2020

The IVF method was used in 12% of all ART cycles, which shows a slight increase compared to 2020 (11.9%). The ICSI method was used in 35.5% of cycles (33.4% in 2020). IVF/ICSI programs accounted for 13.0% of the total cycles. These changes may be due to improved technological capabilities and patient and physician preferences.

The number of ART programs implemented in Kazakhstan has steadily grown in recent years. In 2021, there was a significant jump in the number of cycles performed under the OSHI program, which led to an increase in the total number of programs. Between 2010 and 2019, the increase in the number of programs remained stable. In 2020, there was a decline amid the COVID-19 pandemic. The following growth of 97.2% in 2021 could be due to the expansion of state support.

The rate of ART cycles per million population increased yearly, reaching 676 in 2021. This indicates a growing demand for ART services and increased availability of these technologies for the country's population.

The share of DO and CM programs in the total number of implemented ART programs demonstrated opposite trends. Thus, the share of DO programs remained relatively stable, with peaks in 2013 (11.8%) and 2021 (10.6%). At the same time, a steady decline in the share of CM programs (from 6.8% in 2010 to 1.3% in 2021) may reflect changes in clinical practice and patient preferences.

In 2021, the volume of programs implemented using donor sperm was 2% (488 cycles), which exceeded the absolute numbers of the figure for 2020, when 382 programs were performed (2.1%). In 154 cases (0.6%), surgically obtained sperm were used, which is significantly higher than in 2020, when they were used in 91 cases (0.6%).

Within the framework of the DO program, 1,553 embryo transfers were performed in 2021, which is slightly less than in 2020 (1,586 cycles). Pregnancy occurred due to 824 donor oocyte transfers, which amounted to 53.1% per transfer (50.6% in 2020). Of the total number of pregnancies, 608 resulted in childbirth (39.2% in 2021 and 42.9% in 2020). The conducted analysis demonstrates a significant increase in the popularity of the ICSI method in Kazakhstan and its dominance over traditional IVF.

An analysis of data from 2010 to 2021 shows a significant increase in the use of assisted reproductive technologies (ART) in Kazakhstan. The total number of cycles increased from 2,095 in 2010 to 16,051 in 2021, a 7.7-fold increase. The largest increase in the number of ARTs compared to last year was observed in 2021 (+92.23%), which could be due to the expansion of the state program "Ansagan Sabi" ((Longing Baby). A decrease of 20.36% in 2020 was due to restrictions during the COVID-19 pandemic. The ART availability indicator (cycles per 1 million population) increased from 129.3 to 849.3, reflecting improved infrastructure and accessibility of services.

IVF/ICSI dominated among the ART methods; their number increased from 1630 to 12837 cycles per year. Programs using DO also demonstrate a steady increase (from 298 to 2874 cycles), which is associated with an increase in demand for alternative methods in the presence of age and pathological restrictions. Surrogacy cycles varied in the range of 167-366, with a peak in 2019 and a decrease to 219 in 2020, which probably reflects the influence of socio-economic factors. This dynamic emphasizes the technological shift towards more complex methods while maintaining the variability of approaches depending on the clinical and demographic demand of reproductive specialists and the population (Table 1).

Table 1 – Comparative dynamics of new ART programs implemented in the Republic of Kazakhstan (2010-2021)

Year	IVF/ICSI	Oocyte donation	Surrogacy	Total number of cycles	Annual growth (%)	Cycles per 1 million population
2010	1630	298	167	2095	-	129.3
2011	2737	302	262	3301	57.57%	200.8
2012	2866	358	323	3547	7.45%	212.8
2013	3102	591	252	3945	11.22%	233.3
2014	3409	484	279	4172	5.75%	243.1
2015	3799	600	274	4673	12.01%	268.3
2016	3955	633	288	4876	4.34%	275.9
2017	5818	995	257	7070	45.00%	394.5
2018	6510	1187	347	8044	13.78%	441.3
2019	8348	1771	366	10485	30.35%	56.0
2020	6510	1621	219	8350	-20.36%	444.6
2021	12837	2874	340	16051	92.23%	849.3

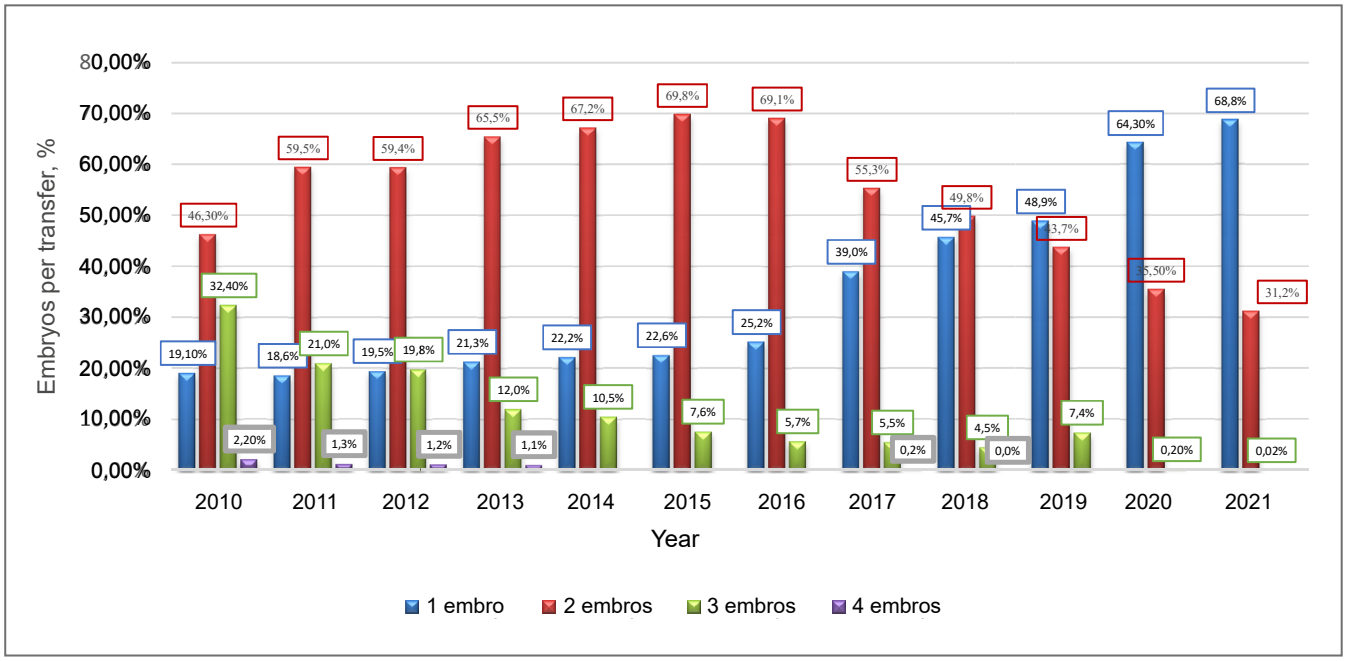
Number of embryos transferred

Figure 2 shows the dynamics of the number of embryos transferred in ART cycles in Kazakhstan from 2010 to 2021. A steady increase in selective single embryo transfer (SET) use is noticeable: from 20.0% in 2010 to 68.8% in 2021. This reflects the transition to a practice that reduces the risks of multiple pregnancies. The share of two embryo transfers decreased from 70.0% to 31.2%, which aligns with global recommendations for optimizing ART protocols. The transfer of three embryos was recorded sporadically (peaking at 5.1% in 2015), and the use of four embryos has not been observed since 2016, which is consistent with changes in the regulatory framework limiting the maximum number of embryos that can be transferred.

The sharp increase in the SET share in 2021 (+5.7 pp compared to 2020) may be due to the introduction of new clinical protocols and increased cryopreservation efficiency. The decrease in the share of double embryo transfer in 2020 (-5.5 pp) correlated with the COVID-19 pandemic when priority was given to minimally invasive approaches. The data presented illustrate the evolution of ART practices towards increased safety and compliance with international standards.

According to ESHRE data for 2020, in fresh cycles, one embryo was transferred in 50.7% of cases, two embryos in 45.1%, three embryos in 3.9%, and four embryos in 0.3% of cases. The SET share in Kazakhstan (68.8% in 2021) is higher than the ESHRE average (62.1%). The transfer of two embryos in Kazakhstan (31.2%) is lower than in ESHRE (32.3%), and the use of ≥3 embryos is minimal (0.02% vs. 2.5% in ESHRE).

Figure 2 – Comparison of the number of embryos transferred in ART cycles (2010-2021)



Pregnancy Rate

According to the results of 2021, 8,932 pregnancies were registered. In IVF programs, the pregnancy rate per transfer was 19.3% per puncture and 14.6% per puncture (vs. 22.2% and 16.2% in 2020 and 26.2% and 43.3% according to ESHRE). In ICSI programs, the pregnancy rate per transfer was 17.8% per puncture and 13.6% per puncture (vs. 21.1% and 38.1% in 2020 and 23.9% and 45.7% according to ESHRE). In frozen embryo transfer, the pregnancy rate per transfer was 50.8% (vs. 43.9% in 2020 and 36.2% according to ESHRE). In PGT cycles, the pregnancy rate per transfer was 53.6% (vs. 52.2% in 2020).

ART results vs. the number of embryos transferred

The pregnancy rate in IVF/ICSI cycles was 41.1% after one embryo transfer (vs. 37.3% in 2020), 45.9% after two embryo transfer (42.0%), and 100% after three embryo transfer (1 pregnancy per transfer) (55.6%). In frozen embryo transfer (FET) cycles, the pregnancy rate was 48.5% after one embryo transfer (vs. 42.6% in 2020) and 56.0% after two embryo transfer (42.4%). In donor programs, the pregnancy rate was 51.5% per one embryo transfer (vs. 50.2% in 2020) and 57.3% per two embryo transfer (63.0%).

ART results vs. the age of women

In the group of women aged 35-39, the pregnancy and live birth rates were 17.6% and 13.6% in IVF programs (vs. 22.6% and 18.6% in 2020) and 17.3% and 12.9% in ICSI programs (vs. 21.0% and 18.3%). In women below 34, these rates amounted to 23.3% and 17.9% after IVF (vs. 28.9% and 22.8% in 2020) and 21.6% and 15.7% (vs. 27.0% and 20.8%) after ICSI. In women over 40, the pregnancy and live birth rates were twice as low: 14.1% and 8.9% (vs. 8.4% and 6.2% in 2020) in IVF cycles and 11.9% and 8.3% (vs. 8.0% and 6.2%) in ICSI cycles.

In FET programs, the pregnancy and live birth rates were higher than in IVF and ICSI cycles. Thus, for women below 34, these rates were 47.7% and 34.8% (vs. 48.4% and 39.6% in 2020); for women aged 35 to 39, it was 54.5% and 40.1% (vs. 38.6% and 30.2%), and for women over 40, it was 42.7% and 27.5% (vs. 32.4% and 21.7%).

According to ESHRE, in IVF cycles, the pregnancy rate was 30.8% for women below 34, 25.4% for women aged 35 to 39, and 13.6% for women over 40. The live birth rate for those age groups was 25.1%, 19.0%, and 7.8%, respectively. In ICSI cycles, the pregnancy rate was 27.9%, 22.3%, and 11.2%, and the live birth rate was 22.1%, 16.1%, and 6.3%.

High pregnancy rates were noted in all age groups in the DO program: 57.8%, 54.6%, and 49.3%, respectively. However, the influence of age remained: births were completed in 42.4%, 41.2%, and 34.0% of cases, respectively (according to ESHRE data, the pregnancy rates were 43.6%, 44.9%, 43.2%, and the live birth rates were 33.4%, 33.2%, 29.5%) (Figures 3, 4).

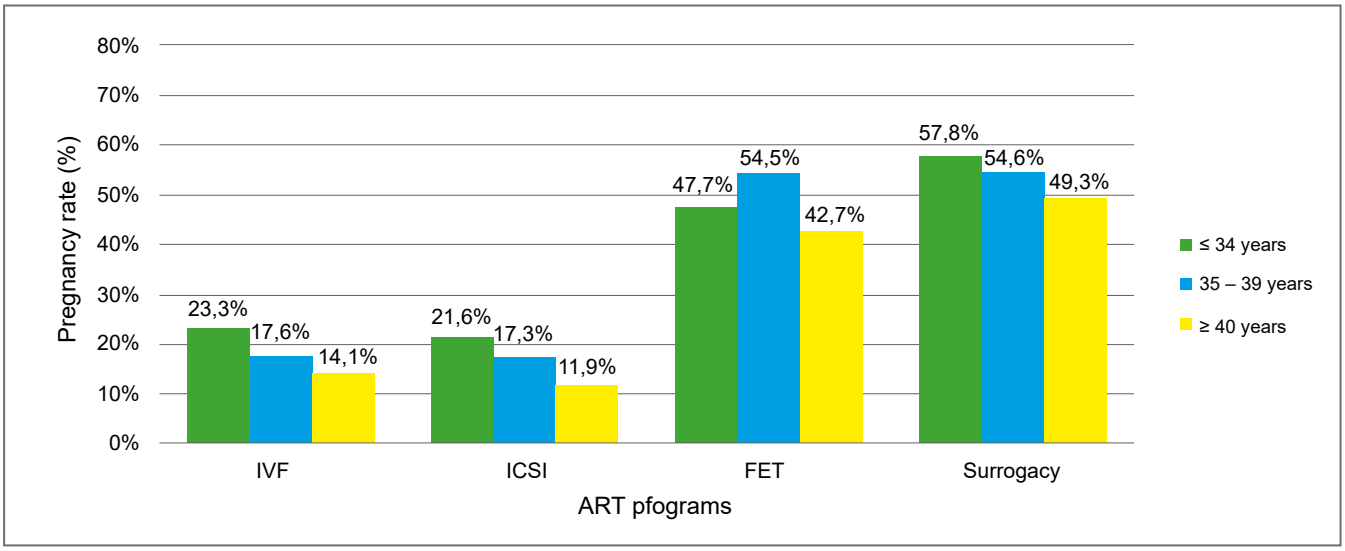


Figure 3 – Pregnancy Rates by Age Group (2021)

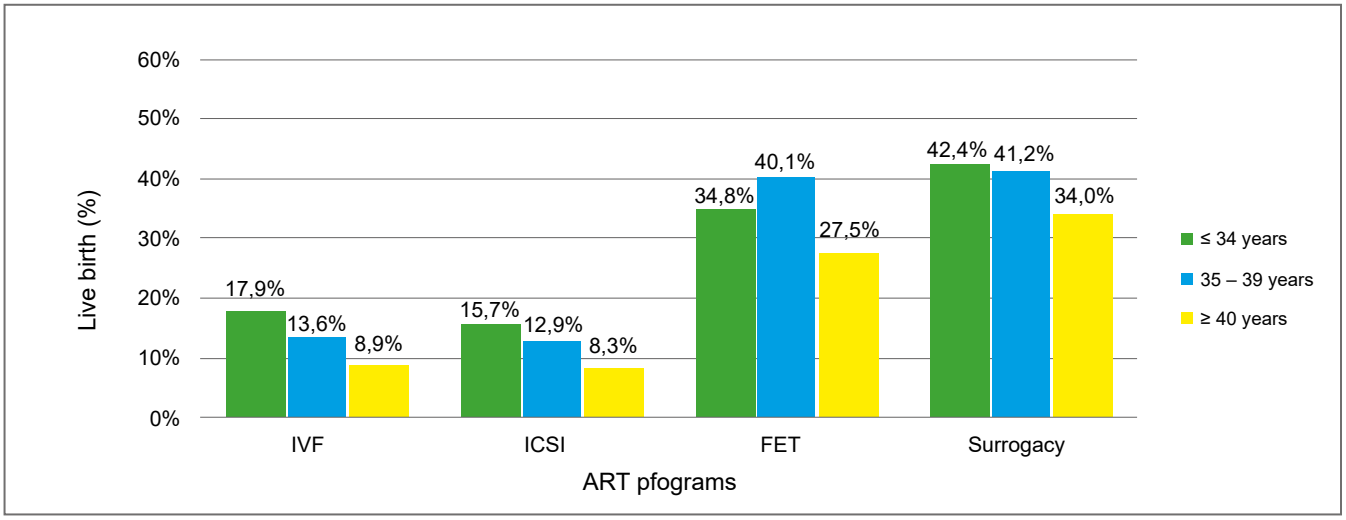


Figure 4 – Live birth rate by woman's age (2021)

Surrogacy

A total of 340 surrogacy programs were implemented in 2021, accounting for 1.2% of all ART cycles. They resulted in 180 (52.9%) pregnancies, of which 121 (35.6% of all transfers) ended in birth at 22 weeks or more.

Childbirth and other pregnancy outcomes

In the reports, all terminations of pregnancy starting from 22 full weeks were classified as "childbirth." Thus, 6,611 pregnancies (vs. 5,932 in 2020) resulted in childbirth at 22 weeks or more, amounting to 1.5% of all births in the Republic of Kazakhstan (the total number of births in 2021 was 446,491 [5].

Multiple pregnancies

Multiple births in IVF and ICSI programs in 2021 included 10.2% of twins (vs. 8.3% in 2020) and 0.02% of triplets of all known births. In FET programs, the frequency of multiple births reached 8.4% of twins (vs. 9.8% in 2020) and 0.1% of triplets. In DO programs, multiple births were 5.9% of twins and 0.1% of triplets. In surrogacy programs, multiple births were 9.1% (vs. 13.4% in 2020).

In ESHRE reports, the frequency of twins was 12.4% in fresh IVF and ICSI cycles and 9.4%in FET programs.

Preimplantation genetic testing (PGT)

In 2021, PGT in ART centers was performed in 1031 cycles (vs. 920 in 2020). Of them, 553 cases (53.6%) resulted in pregnancy (vs. 53.1% in 2020), and 428 (41.5%) pregnancies ended in birth at 22 weeks or more (vs. 42.1%).

Discussion: This study analyzed the structure and outcomes of ART cycles registered in the Republic of Kazakhstan in 2021. The findings were compared with the 23rd annual report from the European IVF-Monitoring (EIM) Consortium for ESHRE, combining the 2021 data on ART and intrauterine insemination from 39 European countries.

In IVF, the pregnancy rate was 19.3% per transfer and 19.3% per puncture (vs. 22.2% and 16.2% in 2020; ESHRE — 26.2% and 43.3%). In ICSI programs, the pregnancy rate was 17.8% per transfer and 13.6% per puncture (vs. 21.1% and 38.1% in 2020; ESHRE — 23.9% and 45.7%). In Kazakhstan, the pregnancy rate after own oocyte cryopreservation reached 50.8% (vs. 43.9% in 2020), 14% higher than in Europe (36.2%, according to ESHRE). In programs with donor oocytes, the Kazakh data was similar to the European – 53.1% per transfer. The pregnancy rate per puncture in the RK was lower than in ESHRE, possibly due to an increase in delayed transfer programs.

A comparison of Kazakhstan data with ESHRE reports shows a steady trend toward transferring fewer embryos in Europe, which reduces the risk of multiple pregnancies. In European countries, one embryo is transferred in 60.2% of cases, two – in 34.8%, and three – in 1.8%. A trend is the same in Kazakhstan: one embryo is transferred in 68.8% of

cases, two – in 31.2%, three – in 0.2%, and four or more embryos are not transferred.

A constant increase in the number of ART cycles, supported by the State program of compulsory medical insurance, confirms the importance of the development of reproductive technologies for improving the demographic situation and health of the population. A comparison with ESHRE indicators proves Kazakhstan's competitiveness in ART. However, further adaptation and implementation of international standards could improve the results [6].

Thus, the effectiveness of ART in Kazakhstan generally corresponds to European data and even exceeds in some aspects, such as the frequency of pregnancy after cryopreservation. However, the frequency of multiple pregnancies remains high, which requires further implementation of international standards for optimizing embryo transfer. This emphasizes the need to develop and improve reproductive technologies in Kazakhstan.

Conclusion: Kazakhstan demonstrates impressive success in developing ART due to state support, the introduction of modern technologies, and active participation in international research. However, there are still areas for improvement, such as increasing the frequency of successful outcomes in fresh cycles and expanding the use of SET. Comparison with ESHRE data highlights the need for further integration of international standards to improve the efficiency and accessibility of ART.

The 2021 report involved 21/30 ART clinics operating in the Republic of Kazakhstan, which is 70%. The total number of ART cycles performed in 2021 was 27,012, 72.88% more than in 2020. Since 2021, the "Ansagan Sabi" program has been in effect, contributing to the growth in the number of programs performed.

The share of transfers of more than three embryos within ART programs decreases annually; in 2021, it was 0.02%. It should be noted that during the specified period, the Order of October 30, 2009, No. 627, "On approval of the rules for conducting assisted reproductive methods and technologies" of the Ministry of Health allowed the transfer of three embryos, provided that the patient gives the appropriate consent. The Order of the Ministry of Health of December 20, 2021, No. 21816, "On approval of the rules and conditions for conducting assisted reproductive methods and technologies," allows the transfer of no more than two embryos.

The registry data can be used to objectively assess the results of reproductive medicine in the country and to forecast its development. The next step in developing the country's ART registry should be its mandatory prospective management.

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REFERENCES:

1. World Health Organization. *Infertility prevalence estimates,* 1990-2021 [Internet] . Geneva: WHO; 2023 [cited 2024 February 21]. 98p.
https://www.who.int/publications/i/item/978920068315
2. Lokshin V, Omar M, Karibaeva Sh, Dzhusubaliev a T, Baikoshkarova S, Akhmetova A, Pokotilo L, Dyusembinov K, Tararaka S, Magzumov G. Assisted reproductive technologies in Kazakhstan in 2018: A brief report on effectiveness and accessibility. Reproductive Medicine . 2021 ; 2(47) :6-10 .
https://repromed.kz/index.php/jour n al/article/view/27
3. Smeenk J, Wyns C, Geyter ChDe, Bergh C, Cuevas I, de Neubourg D, Kupka MS, Rezabek K, Baldani D, Tandler-Schneider A, Goossens V. O-121 Assisted Reproductive Technology (ART) in Europe 2021 and development of a strategy of vigilance: Preliminary results generated from European registers by the ESHRE EIM Consortium. Hum Reprod. 2024; 39(Suppl 1): deae108.136.
https://doi.org/10.1093/humrep/deae108.136
4. Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan. Population Census 2021 [Internet]. *Stat.gov.kz.* 2021 [Access date: 19.02.2025]. Access address:
Bureau of national statistics Agency for strategic planning and reforms of the Republic of Kazakhstan. Population census 2021 [Internet]. *Stat.gov.kz.* 2021 [Date of access: 2025 February 19]. Russian/Kazakh/English. Available from:
https://stat.gov.kz/ru/national/2021/
5. Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan. On the birth rate in 2022 [Internet]. *Stat.gov.kz*; 2023 April 21 [Access date: 21.01.2025]. Access address :
Bureau of National Statistics Agency for Strategic Planning and Reforms of the Republic of Kazakhstan. On birth rates in 2022 [Internet]. *Stat.gov.kz*; 2023 April 21 [cited 2025 January 21]. Russian/Kazakh/English. Available from:
https://stat.gov.kz / ru/news/o-rozhdaemosti-v-2022-godu/
6. Lokshin V, Omar M, Karibaeva S. Assisted Reproductive Technologies in the Republic of Kazakhstan: A 6-Year Trend Analysis from Efficacy to Availability. *J Reprod Infertil.* 2022;23 (1):61-66.
https://doi.org/10.18502/jri.v23i1.8454

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