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STAFFING OF THE DENTAL SERVICE IN THE REGIONS OF KAZAKHSTAN: A 2014-2024 ANALYSIS

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Abstract

Background: Dental staffing plays a key role in the quality and accessibility of dental care. In Kazakhstan, the number and distribution of dentists, their qualifications, and their level of training remain pressing issues for the healthcare system.

This study **aims** to analyze the staffing of the dental service in Kazakhstan from 2014 to 2024, identifying issues in the distribution and training of dental specialists.

Materials and methods*:* Official statistical data from the Ministry of Health of the Republic of Kazakhstan were examined. Indicators of dentist provision per 10,000 populations were extracted for 2014–2024 across all administrative regions, including newly established areas, with separate analysis of urban and rural populations. Descriptive and comparative statistical methods were applied to identify trends, disparities, and structural changes.

Results: The total number of dentists increased from 4812 in 2014 to 5213 in 2024, showing a moderate upward trend. However, significant interregional and settlement-based disparities persist. Large cities such as Astana, Almaty, and Shymkent demonstrated growth and relatively high staffing levels, whereas rural territories remained critically underserved. In 2024, urban areas had on average 3.5 dentists per 10,000 populations, compared to only 1.0 in rural areas. Regions such as Aktobe and Zhambyl showed steady improvement, while Karagandy, East Kazakhstan, and Akmola experienced a pronounced decline. Newly established regions, including Abai, Zhetysu, and Ulytau, revealed unstable dynamics, reflecting structural and organizational challenges.

Conclusion: Significant regional differences, insufficient renewal of the material and technical base in peripheral regions, and problems with the distribution of human resources require the development and implementation of targeted state programs and strategies.

Keywords: Dental workforce, staffing, provision, Kazakhstan, healthcare accessibility, human resources in dentistry.

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Резюме

КАДРОВОЕ ОБЕСПЕЧЕНИЕ СТОМАТОЛОГИЧЕСКОЙ СЛУЖБЫ В РЕГИОНАХ КАЗАХСТАНА: АНАЛИЗ ЗА 2014-2024 ГОДЫ

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Введение: Кадровое обеспечение стоматологической службы играет ключевую роль в качестве и доступности стоматологической помощи. В Казахстане актуальными вопросами для системы здравоохранения остаются численность и распределение врачей-стоматологов, их квалификация и уровень подготовки.

Целью данного исследования является анализ кадрового обеспечения стоматологической службы в Казахстане с 2014 по 2023 год, выявление проблем в распределении и подготовке стоматологических специалистов.

Материалы и методы: Были изучены официальные статистические данные Министерства здравоохранения Республики Казахстан. Показатели обеспеченности стоматологической помощью на 10 000 населения были получены за 2014–2024 годы по всем административным регионам, включая вновь образованные районы, с раздельным анализом городского и сельского населения. Для выявления тенденций, различий и структурных изменений применялись методы описательной и сравнительной статистики.

Результаты: Общее количество врачей-стоматологов увеличилось с 4812 в 2014 году до 5213 в 2024 году, демонстрируя умеренную тенденцию к росту. Тем не менее, сохраняются значительные межрегиональные и поселенческие различия. Крупные города, такие как Астана, Алматы и Шымкент, продемонстрировали рост и относительно высокий уровень кадрового обеспечения, в то время как сельские территории оставались критически недообеспеченными. В 2024 году в городах в среднем на 10 000 населения приходилось 3,5 врача-стоматолога, по сравнению с 1,0 в сельской местности. Такие регионы, как Актюбинская и Жамбылская, продемонстрировали устойчивое улучшение, в то время как Карагандинская, Восточно-Казахстанская и Акмолинская области столкнулись с выраженным спадом. Вновь созданные регионы, включая Абайскую, Жетысускую и Улытаускую, продемонстрировали нестабильную динамику, что отражает структурные и организационные проблемы.

Заключение: Значительные региональные различия, недостаточное обновление материально-технической базы в периферийных регионах, проблемы с распределением кадровых ресурсов требуют разработки и реализации целевых государственных программ и стратегий.

Ключевые слова: *Стоматологические кадры, кадровое обеспечение, обеспеченность, Казахстан, доступность здравоохранения, кадровые ресурсы в стоматологии.*

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Түйіндеме

ҚАЗАҚСТАН АЙМАҚТАРЫНДАҒЫ СТОМАТОЛОГИЯЛЫҚ ҚЫЗМЕТТІҢ КАДРЛЫҚ ҚҰРАМЫ: 2014-2024 ЖЫЛДАРҒА ТАЛДАУ

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Кіріспе. Стоматологиялық кадрлармен қамтамасыз ету стоматологиялық көмектің сапасы мен қолжетімділігінде шешуші рөл атқарады. Қазақстанда тіс дәрігерлерінің саны мен таралуы, олардың біліктілігі мен дайындық деңгейі денсаулық сақтау жүйесі үшін өзекті мәселелер болып қала береді.

Бұл зерттеудің **мақсаты** – 2014-2023 жылдар аралығындағы Қазақстандағы стоматологиялық қызметтің кадрлық қамтамасыз етілуіне талдау жасау, стоматологиялық мамандарды бөлу мен оқытудағы проблемаларды анықтау.

Материалдар мен әдістер: Қазақстан Республикасы Денсаулық сақтау министрлігінің ресми статистикалық мәліметтері зерттелді. 2014-2024 жылдарға 10 000 тұрғынға шаққандағы стоматологпен қамтамасыз ету көрсеткіштері қала және ауыл тұрғындарын бөлек талдау арқылы жаңадан құрылған аудандарды қоса алғанда, барлық әкімшілік аймақтар бойынша алынды. Трендтерді, диспропорцияларды және құрылымдық өзгерістерді анықтау үшін сипаттамалық және салыстырмалы статистикалық әдістер қолданылды.

Нәтижелер: Тіс дәрігерлерінің жалпы саны 2014 жылы 4812-ден 2024 жылы 5213-ке дейін өсті, бұл қалыпты өсу үрдісін көрсетті. Дегенмен, аймақаралық және елді мекендерге негізделген елеулі айырмашылықтар сақталуда. Астана, Алматы және Шымкент сияқты ірі қалалар өсу мен салыстырмалы түрде жоғары кадрлық деңгейлерді көрсетті, ал ауылдық аумақтар өте төмен қызмет көрсету деңгейінде қалды. 2024 жылы қалалық жерлерде 10 000 халыққа орташа есеппен 3,5 тіс дәрігері болса, ауылдық жерлерде 1,0 ғана болды. Ақтөбе және Жамбыл сияқты

облыстарда тұрақты жақсару байқалса, Қарағанды, Шығыс Қазақстан және Ақмолада айтарлықтай құлдырау байқалды. Жаңадан құрылған аймақтар, соның ішінде Абай, Жетісу және Ұлытауда құрылымдық және ұйымдастырушылық қиындықтарды көрсететін тұрақсыз динамика анықталды.

Қорытынды: Елеулі өңірлік айырмашылықтар, шеткері аймақтардағы материалдық-техникалық базаның жеткіліксіз жаңартылуы, адам ресурстарын бөлу проблемалары мемлекеттік мақсатты бағдарламалар мен стратегияларды әзірлеуді және іске асыруды талап етеді.

Түйін сөздер: *Стоматологиялық персонал, кадрлық қамтамасыз ету, қауіпсіздік, Қазақстан, денсаулық сақтаудың қолжетімділігі, стоматологиядағы адам ресурстары.*

Дәйексөз үшін:

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Introduction

Dental service staffing is a key factor in determining the quality and accessibility of dental care for the population [15]. The optimal number of specialists, their professional training, and rational distribution across regions ensure the timeliness and effectiveness of dental services [2, 5].

Experiences from overseas highlight key challenges in ensuring equitable access to dental services, particularly in rural and remote areas [18]. Australian federal programs addressing inequalities have encountered low uptake rates and inefficiencies, suggesting that financial support alone is insufficient to improve access [16]. These further highlights systemic issues in workforce distribution and health infrastructure.

In all cases, dentists' care is targeted to communities and populations that experience inequalities in dental care and have historically had difficulty accessing treatment [1].

The dental workforce in developed countries is diverse and these roles support preventive and comprehensive care [4]. However, gaps in service provision, particularly for children and underserved populations, persist [17]. These findings highlight the importance of strategic workforce planning and policy adjustments to ensure equitable distribution of dental professionals across regions [7].

In Kazakhstan, issues of dental service staffing remain relevant, as there are significant differences in the number of dentists per capita across different regions and heterogeneity in their professional qualifications. Despite efforts to improve the medical education system, including regular professional development and revisions to accreditation standards, problems persist, such as disparities in workforce allocation, a shortage of medical staff in rural regions, and the outflow of professionals to the private sector.

In addition, the introduction of innovative treatment methods, driven by the development of digital technologies and the growing need for an integrated approach to dental care, requires adapting personnel training systems and revising resource management strategies in the industry [3]. In this regard, an urgent task is to assess the current state of staffing of the dental service in Kazakhstan, identify key problems and develop recommendations for their solution.

This study aims to analyze the staffing of the dental service in Kazakhstan from 2014 to 2023, identifying issues in the distribution and training of dental specialists.

Materials and methods.

We used bibliographic, information-analytical, and statistical research methods. The primary source of information was the official statistical data published by the Ministry of Health of the Republic of Kazakhstan in the annual statistical compendia “Health of the Population of the Republic of Kazakhstan and the Activities of Healthcare Organizations” [9-14]. We extracted indicators of the provision of dentists to the population for 2014-2023 for each region and for rural-urban differences. The study encompassed the entire population of the Republic of Kazakhstan, focusing on the provision of dental services by dentists at the national, regional, and local (urban vs. rural) levels. The unit of analysis was the number of practicing dentists per 10,000 population.

A descriptive statistical analysis was performed to identify dynamics and trends in the provision of dental services from 2014 to 2023. Comparative analysis was conducted to reveal differences across regions and between urban and rural populations. Time-series analysis was applied to assess changes over the 10 years and to detect anomalies or abrupt shifts in the data (e.g., sudden decreases that may be associated with administrative or methodological modifications). Data consistency and reliability were cross-checked with demographic indicators of the national population, using information from the Bureau of National Statistics of the Republic of Kazakhstan.

The study relied exclusively on publicly available aggregated statistical data. No personal or sensitive information was collected. Therefore, ethical approval was not required.

Results

Regional differences in dentist provision.

However, despite the overall growth, the distribution of dentists across the country remains heterogeneous, with significant interregional and urban-rural disparities (Table 1).

The analysis of regional data reveals several distinct patterns. Some territories are characterized by consistent growth and relatively favorable dynamics. For instance, in the Aktobe Region, the number of dentists rose from 280 in 2014 to 418 in 2024, making it one of the leading regions in terms of workforce expansion. Similar positive dynamics were observed in the Zhambyl Region, where provision increased from 175 to 266 over the same period, and in the Kyzylorda Region, which more than doubled its capacity (62 to 130 dentists). The Turkestan Region, where statistics are available only from 2020, showed continuous growth, reaching 343 dentists by 2024. Major urban centers also demonstrated a gradual increase: in

Astana, the number of dentists rose from 509 in 2014 to 539 in 2024, while in Shymkent it grew from 297 in 2018 to 389 in 2024. These trends likely reflect the attractiveness of larger cities and developing regions for medical professionals due to better infrastructure, professional opportunities, and higher demand for dental services.

In contrast, several regions demonstrate declining or unstable trajectories. The Karagandy Region experienced a steady decrease, from 588 dentists in 2014 to 403 in 2024, reflecting either migration of specialists to other regions or insufficient replacement of retiring professionals. A similar downward trend is evident in the East Kazakhstan Region, where the number of dentists dropped from 445 in 2014 to 288 in 2024. Particularly critical is the situation in the Akmola Region, where after relatively stable values in 2014–2018 (around 118–139 dentists), the indicator plummeted to 28 in 2019. Although a minor recovery occurred by 2024 (39 dentists), the provision remains extremely low. The Almaty Region demonstrated instability, with a peak of 477 dentists in 2017, followed by a dramatic decline to 165 in 2024.

Table 1

Provision of the population with dentists for 2014-2024.

Regions	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Kazakhstan Republic	4812	4717	5528	4993	5089	4799	5081	4963	4911	4 957	5 213
Abai Region	-	-	-	-	-	-	-	0	118	96	107
Akmola	124	118	118	139	139	28	29	26	24	33	39
Aktobe	280	252	239	247	322	316	325	340	348	398	418
Almaty	277	293	401	477	430	430	422	382	152	161	165
Atyrau	110	110	103	97	96	98	103	96	86	96	94
West Kazakhstan	85	91	95	89	102	112	128	126	140	136	142
Zhambyl	175	176	194	195	212	198	203	195	236	245	266
Zhetysu Region	-	-	-	-	-	-	-	0	206	142	110
Karagandy	588	559	545	534	525	509	512	490	407	405	403
Kostanay	213	215	207	256	236	237	221	204	190	192	193
Kyzylorda	62	70	81	87	72	92	73	91	97	112	130
Mangistau	99	157	162	199	227	260	270	233	236	114	181
Pavlodar	220	211	221	199	195	199	203	200	189	200	252
North Kazakhstan	118	119	123	114	121	124	118	110	103	111	114
South Kazakhstan	624	464	504	518	174	191	-	-	-	-	
Turkestan	-	-	-	-	-	-	211	217	248	300	343
Ulytau Region	-	-	-	-	-	-	-	-	53	65	72
East Kazakhstan	445	472	471	454	465	397	419	382	270	282	288
Astana City	509	514	449	456	550	532	526	487	531	537	539
Almaty City	883	896	1615	932	926	782	960	940	937	987	968
Shymkent City	-	-	-	-	297	294	358	444	340	345	389

In Almaty City, the dynamics were marked by an anomalous spike in 2016 (1615 dentists), which most likely resulted from changes in reporting methodology rather than real growth; since then, the number has stabilized around 968 in 2024. These regions highlight the systemic challenges of uneven workforce retention and redistribution.

The newly established administrative units also reveal mixed trends. In the Abai Region, the number of dentists increased slightly from 96 in 2023 to 107 in 2024, indicating a positive trajectory despite the relatively low starting point. The Zhetysu Region, however, showed a significant decline from 206 dentists in 2022 to 110 in 2024, suggesting structural instability or possible migration of specialists. The Ulytau Region recorded modest but positive growth from 53 in 2022 to 72 in 2024, while the Mangistau Region demonstrated recovery after a sharp reduction in 2023 (114 dentists) to 181 in 2024.

Overall, these findings underscore a persistent imbalance in the distribution of dentists across Kazakhstan. Regions with strong urbanization and better-developed healthcare systems continue to accumulate human resources, whereas peripheral, rural, and newly established regions face difficulties in maintaining stable staffing levels. This uneven distribution not only reflects demographic and economic differences but also highlights the need for targeted national policies to strengthen the dental workforce in underserved areas.

Urban-rural disparities.

The comparative analysis of urban and rural indicators highlights the persistence of disproportions in the

accessibility of dental care. In 2024, urban areas had on average 3.5 dentists per 10 000 population, whereas in rural areas the provision was only 1.0 per 10 000 (Figure 1). This threefold gap emphasizes the unequal distribution of human resources in dentistry, which continues to be one of the most acute problems in Kazakhstan's healthcare system.

The highest levels of staffing in urban settings were observed in the Aktobe Region (5.8), West Kazakhstan Region (5.4), Almaty City (4.3), and Astana (3.9). These regions and cities are characterized by relatively high levels of urbanization, a concentration of medical universities and training centers, and a more developed private sector, which attracts dental professionals with better working conditions and higher income opportunities. In contrast, the lowest urban indicators were recorded in the Akmola Region (0.5), Atyrau Region (1.9), Abai Region (2.2), and Turkestan Region (2.3), reflecting the challenges of professional outmigration, insufficient incentives for work in peripheral territories, and underdeveloped healthcare infrastructure.

The situation in rural areas is even more critical. The Ulytau Region (0.2), Aktobe Region (0.3), and Akmola Region (0.4) demonstrated extremely low provision, suggesting that dental care is practically inaccessible in remote settlements. By comparison, relatively better indicators were observed in the Zhambyl Region (1.6) and the East Kazakhstan Region (1.1), which may be associated with the presence of public dental offices and state-supported facilities in rural localities. Nevertheless, even these values remain below the threshold considered sufficient for ensuring adequate population coverage.

The imbalance between urban and rural provision reflects broader socio-economic and demographic trends. Larger metropolitan areas not only accumulate dental professionals but also offer opportunities for continuing education, specialization, and integration into modern private practices. In contrast, rural areas remain less attractive due to lower wages, limited professional growth prospects, and insufficiently developed social and medical infrastructure. The absence of targeted state programs to retain and redistribute specialists exacerbates this imbalance.

Overall, despite the increase in the absolute number of dentists in Kazakhstan by 2024, the territorial disproportions in their distribution remain pronounced. Large metropolitan areas such as Almaty, Astana, and Shymkent continue to concentrate the majority of the dental workforce, while peripheral, rural, and newly established regions remain underserved. This structural inequality creates a persistent challenge for ensuring equitable access to dental care across the country. It highlights the need for comprehensive policy interventions, including incentive programs for rural practice, development of mobile dental teams, and integration of teledentistry to bridge the urban-rural gap.

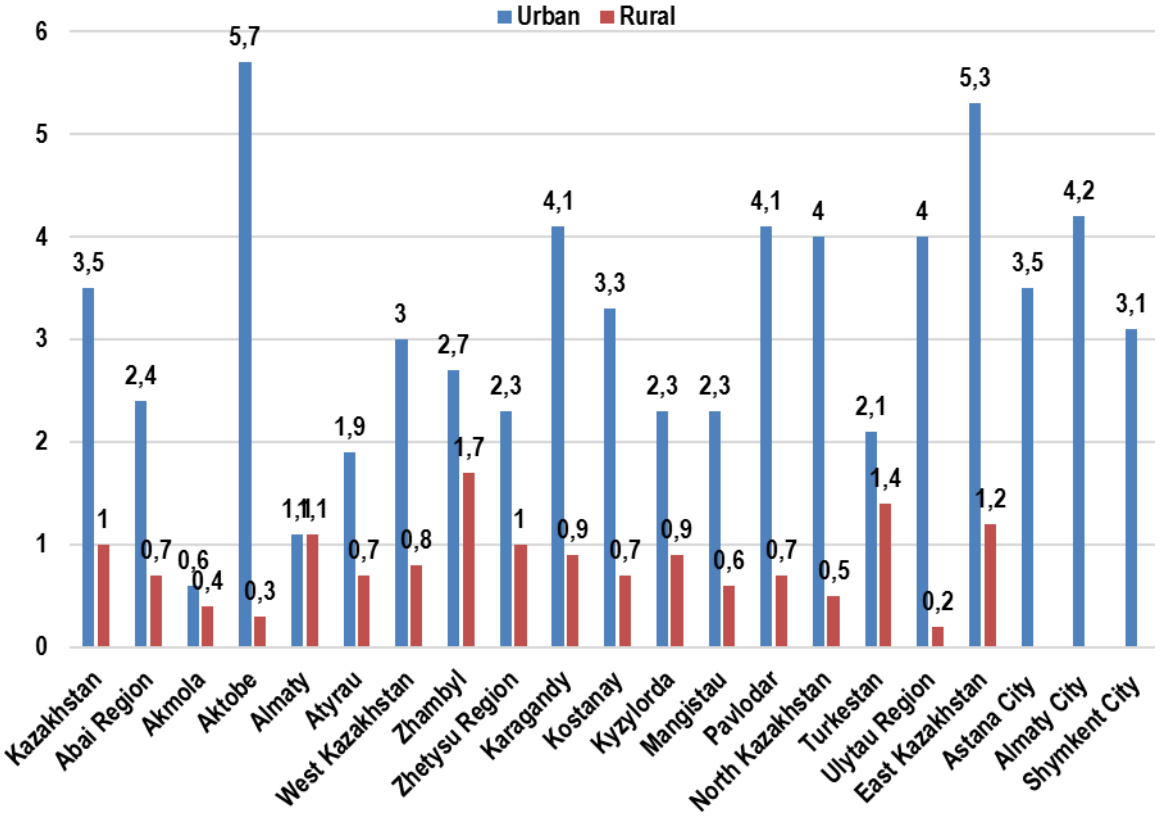

Figure 1. Dentist provision per 10,000 people.

Discussion

An analysis of the data on the number of dentists in Kazakhstan from 2014 to 2024 revealed significant regional differences in the provision of specialists to the population. In some regions, the number of dentists is growing, while in others, their numbers are declining or unstable. These differences may be due to various factors, including demographic changes, economic development, healthcare reforms, and specialist migration.

The growth in the number of dentists in regions such as Aktobe (from 280 in 2014 to 418 in 2024) and Zhambyl (from 175 to 266) indicates positive changes in staffing.

These trends may be associated with an increase in the number of medical graduates, improved working conditions, and the growth of the private dental services sector.

However, instability is observed in Almaty, where a sharp increase in indicators was recorded in 2016 (1615 dentists), which is likely due to a change in the accounting methodology or temporary changes in the staffing. In subsequent years, the figure stabilized at around 987 specialists. Similar fluctuations are observed in the Mangystau region, where the number of dentists reached 270 in 2020, but then dropped to 114 in 2023, which may indicate changes in the regional healthcare system.

The decline in dentists in the Karagandy and East Kazakhstan regions warrants a more in-depth investigation into its underlying causes. Potential factors may include the migration of specialists to other regions or abroad, shifting healthcare system priorities, or a reduced appeal of the dental profession. A particularly steep drop is seen in the Akmola region, where the number of dentists fell dramatically from 139 in 2018 to just 39 in 2024. This fact may indicate a reorganization of the healthcare system, changes in reporting, or other structural processes.

Another important aspect is the difference in the provision of dentists between the urban and rural populations. The average rate in Kazakhstan is 3.4 dentists per 10,000 people in urban areas and only 0.9 in rural areas. This indicates significant imbalances in access to dental care, especially in remote and rural areas. The largest differences are observed in Aktobe (5.6 vs. 0.3) and West Kazakhstan (5.3 vs. 0.8) regions. The shortage of personnel in rural areas may be due to the low attractiveness of work in remote areas, a lack of incentives, and limited infrastructure.

Thus, the results of the study highlight the need to develop strategies to equalize territorial disparities in the provision of dentists. This may include introducing programs to support young professionals, improving working conditions, incentivizing the private sector, and developing mobile dental teams for rural areas [4]. Future research should prioritize identifying the factors that affect the distribution of dentists and evaluating the effectiveness of current strategies aimed at strengthening the human resources capacity for dental services in Kazakhstan. Analysis of the diagram confirms the existence of significant regional differences in the provision of dental services, which necessitates comprehensive solutions at the healthcare level in Kazakhstan.

The shortage of dentists in rural areas necessitates the development of programs to attract and retain doctors in these areas, including benefits, salary increases, and housing support. It is essential to develop telemedicine and mobile dental teams, particularly in regions experiencing a critical personnel shortage, such as the Ulytau, Aktobe, and West Kazakhstan regions. It is necessary to strengthen educational programs and target the distribution of medical university graduates to areas with low availability of dentists [3]. It is essential to develop private dentistry in underdeveloped regions, possibly through the creation of conditions that facilitate business and public-private partnerships.

The analysis identified the main problems and factors affecting the effectiveness of dental care in the Republic of Kazakhstan. Compared to other post-Soviet and OECD countries, Kazakhstan lags in the equitable distribution of dental professionals. For example, countries like Estonia and Lithuania have successfully implemented incentive programs to attract dental professionals to rural areas, including student loan forgiveness, higher rural salaries, and improved professional infrastructure [18]. Similarly, government-led public-private partnerships have expanded access to care in underserved communities in Poland and Hungary. At the same time, Scandinavian countries have leveraged mobile clinics and tele-dentistry to bridge geographic gaps [6,7,8].

Kazakhstan can benefit from adopting similar strategies — enhancing digital infrastructure, introducing regional incentive packages, and expanding postgraduate training tailored to the needs of underserved areas. Comparative analysis highlights the potential effectiveness of such measures in reducing territorial imbalances and improving the overall efficiency of dental service delivery.

The strength of this study lies in its comprehensive approach to analyzing the staffing situation in Kazakhstan's dental service. The work utilizes official statistics, as well as the results of surveys and interviews with practicing dentists, which enabled a deeper examination of the factors affecting staffing.

However, the study has several limitations. First, the analysis is based on available statistics, which may not account for dentists' informal employment in the private sector. Second, the study does not include a detailed analysis of dentists' satisfaction with working conditions, which could provide a more complete picture of the causes of staffing imbalances.

In the future, it is advisable to expand the study by including a comparative analysis with other Central Asian countries and an assessment of the impact of government incentive programs on attracting specialists to sparsely populated regions. Additionally, it is crucial to examine the impact of digital technologies and telemedicine on enhancing the efficiency of dental services.

Thus, the presented study not only identifies existing staffing problems in dentistry in Kazakhstan but also suggests possible directions for their solution, which can serve as the basis for further reforms in the healthcare sector.

Conclusion

The current state of dental care in the Republic of Kazakhstan is characterized by significant success in modernizing infrastructure and introducing new technologies in large cities, which contributes to a high level of service provision. However, substantial regional differences, insufficient updating of the material and technical base in peripheral regions and problems with the distribution of human resources require the development and implementation of targeted state programs and strategies. A comprehensive approach that includes investment in infrastructure, continuous professional development of specialists, and organizational reforms is essential for ensuring consistent quality in dental care and enhancing the population's overall health.

Authors contribution:

Syzdykova Azhar initiated the study. Syzdykova Aiman and Bekkazinova D. collected data and Ruzuddinov T. contributed statistical analysis. Seiduanova L. and Qumar A.B. designed the

study and wrote the manuscript. All authors read and approved the final manuscript.

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