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Descriptive overview

Comparative Analysis of Methods of Audiological Screening of the Adult Population: Global and Kazakhstani Experience

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Abstract

Hearing impairment is currently recognized as the most prevalent sensory impairment and one of the leading causes of disability worldwide. It is estimated that one in five people on Earth has at least minimal hearing loss, and more than 5% of the population has disabling hearing loss. There are many methods for screening detection of hearing impairment, and the most common ones are mobile applications, recognition of whispered speech, a portable audiometer, questionnaires, the speech intelligibility test in noise, and others. Nevertheless, the "gold standard" for hearing testing has been and remains the method of pure-tone threshold audiometry.

***The purpose of this review** is to study the currently available literature, analyze ongoing research in the field of audiological screening of adults, study the cost-effectiveness of ongoing screening activities, study the situation in Kazakhstan, and the possibility of using these screening methods in Kazakhstan.*

We selected 25 full-text articles that met the following criteria: the 2018-2023 time interval, adult population, screening methods, effectiveness, and article language (English, Russian, Kazakh).

***Conclusions.** Despite a sufficient number of hearing screening methods, their sufficient reliability, sensitivity, and specificity, and their obvious cost-effectiveness in comparison with the costs of rehabilitation of hearing impairments, none of the hearing assessment methods are included in the National Screening Program for examining adult population in any country in the world. In Kazakhstan, a screening test of hearing function using a one-question survey, the HHIA/HHIE questionnaire, a study of whispered speech at the primary health care level, and also the use of a mobile version of a hearing test as a hearing self-diagnosis are applicable.*

Keywords: hearing impairment, screening, adults, cost-effectiveness.

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Introduction

Recently, more and more attention around the world has been paid to the problem of hearing loss in adults. According to the World Health Organization (WHO), every fifth person in the world has at least minimal hearing impairment (about 1.5 billion people), and 460 million people have disabling hearing loss, 94% of whom are people over 18 years old [1]. Hearing loss in age groups is often a long-term and imperceptible process even for the patients themselves [2], and it is often detected at least in the second or third stage. These are socially significant hearing losses when a person already needs hearing aids so that the quality of life does not suffer. This indicates a lack of alertness for hearing impairment. Accordingly, time to start rehabilitation is lost, and the negative impact of hearing loss on both a patient and those close to them increases, negatively affects their psychosocial well-being, leads to social isolation, and is associated with a decline in cognitive function, including dementia [2-6]. Sensorineural hearing loss, like presbycusis, is an insidious condition, since the hearing loss occurs gradually, begins at high frequencies, and remains unnoticed for a long time at speech frequencies. And people have been living with existing/incipient hearing loss for years [7-9] attributing the resulting tinnitus and impaired speech intelligibility to fatigue and inattention. The situation is aggravated by the fact that people and their environment adapt to gradual changes. On average, it takes 7 years or more before a person asks for help [9]. Ayasse et al. (2017) identified this delay as a critical public health issue [2, 10]. Hence, by the time hearing loss is detected, the level of hearing loss will already be socially significant. In this way, it will become a burden on the state. Thus, according to WHO estimates, the unsolved problem of hearing loss costs the world $980 billion annually. This includes health care expenses (excluding the cost of hearing aids), educational assistance expenses, disability losses, and social costs. At the same time, low- and middle-income countries account for 57% of these costs [11].

There are various reasons behind hearing loss, ranging from congenital hearing loss detected from the moment of birth through universal audiological screening and acquired hearing impairment (diseases of the ear and mastoid process, diseases of the nasal cavity and nasopharynx, auditory tube, use of ototoxic drugs, viral diseases, vascular degenerative changes in the inner ear). And, up to 60% [12] of hearing impairment can be prevented by knowing the causes, either by identifying them in the early stages to stabilize the process or in cases of conductive disorders to improve hearing until restoration to normal levels. Currently, only 33% of the adult population seek medical help for hearing problems, 30% have never had their hearing tested, and the remaining 37% are unaware of their hearing issues [13]. Consequently, relying exclusively on data from individuals seeking medical help presents an incomplete perspective of hearing loss. However, if during a routine scheduled examination performed by specialists such as a general practitioner (GP), an otorhinolaryngologist (ENT), or a pre-medical office worker, questions regarding self-assessment of hearing, daily life were asked, and a study of whispered speech was conducted, it would be possible to identify even minor hearing impairment. Accordingly, early rehabilitation would be initiated for such patients. If measures are not taken, the hearing will deteriorate and the person will join the ranks of the hearing impaired (4th degree, deafness), and this already places a burden on the state (social benefits for disability, loss of ability to work, financial costs of the state for hearing aids or cochlear implantation, postoperative rehabilitation which is a long and expensive process) [14]. In Kazakhstan, screening of the adult population for hearing impairment is not currently carried out. In the course of studying the available data, it was revealed that no studies on audiological screening of the adult population were found in the public domain. Since Kazakhstan is not an exception to the global picture regarding the state of auditory function, research in this direction is necessary.

The purpose of this review is to study the currently available literature, analyze ongoing research in the field of audiological screening of adults, study the cost-effectiveness of ongoing screening activities, study the situation in Kazakhstan, and the possibility of using these screening methods in Kazakhstan.

Methodology

Based on the above, this review aims to study the existing literature, analyze ongoing research in the field of audiological screening for adults, investigate the situation in Kazakhstan, and determine the feasibility of implementing these screening methods in Kazakhstan. Research methods: In the Google Scholar and PubMed databases, using the hearing impairment OR loss AND adult* AND screening keywords we selected 25 full-text articles that satisfied the following criteria: the 2018-2023 time period, adult population, screening methods, effectiveness, and language of the article (English, Russian, Kazakh).

Audiological screening - the global situation

Scientists worldwide are studying the advisability of conducting hearing function screening tests. Various tests and screening methods are evaluated for their specificity and sensitivity, and studies are conducted to determine the optimal frequency of screening for informative results. Thus, the American Speech-Language-Hearing Academy (ASHA) recommends hearing screening every 3 years for adults over 50 [15, 16]; but unfortunately, this is not followed by the healthcare system. Therefore, during the study period, it was revealed that the majority of studies on methods for quick, inexpensive, and informative hearing assessment are methods such as whispered speech, speech/digits in noise, one-question survey, self-assessment of hearing using various questionnaires, smartphone applications, portable audiometry, and all of them are compared with the“gold standard” for diagnosing hearing loss - classical pure-tone threshold audiometry (PTA). PTA is not applicable as a screening method since it requires a specialized soundproofing room, special expensive equipment, and trained personnel, and this procedure is time-consuming.

Recently, the digitalization of medicine and human life in general has been actively developing, especially after social isolation during the recent Coronavirus Disease 2019 (COVID-19) pandemic. The use of gadgets, including those in healthcare, the development and distribution of numerous online applications and services, telemedicine consultations, and the development of artificial intelligence systems, all significantly improve the quality of medical services, the degree of patient satisfaction with the services provided to them, and the early detection of diseases, thereby enhancing the quality of human life [17]. It was the use of mobile hearing screening that became one of the first applications on smartphones and digital health. In light of this, smartphone applications are being actively developed and implemented for mobile audiometry and testing speech intelligibility in noise (Digit in noise). WHO recommends an application such as "HearWHO" [11]. In developed countries such as England [18], Canada [2], USA [19], Turkey [20], Russia [7, 21], China [22], their own applications for hearing assessment are being developed, and those that are generally accepted are undergoing validation. In China, for example, mobile applications have long been used for self-diagnosis of changes in hearing. Now, their research is aimed at improving the accuracy of this screening method. Thereby, in January 2023, Cheng et al. published a study regarding the utilization of specialized headphones featuring an active noise reduction function. A cross-sectional study revealed that the application accuracy could be enhanced by 10% through the use of these headphones [22]. In Russia, additional features have been incorporated into standard mobile audiometry, including cross-platform functionality, the integration of a questionnaire, the capacity to attach otoscopy images, and the capability to send and evaluate data by specialists, which allows for a more comprehensive collection of a patient's history and the creation of an algorithm for routing it [23]. Data from ongoing studies demonstrate a high level of specificity and sensitivity in mobile applications for assessing hearing acuity [2,18,19,23,24] which is unquestionably inferior to classical threshold pure-tone audiometry; however, in circumstances characterized by a shortage of specialized equipment, trained personnel, and accessibility to remote areas, these methods are deemed exceptionally advantageous. Especially considering that today, individuals rely heavily on smartphones and other gadgets, which are now integral to their daily lives.

In addition, these applications are freely available and free of charge. Yet, the issue lies in the lack of awareness among people regarding the availability of such straightforward methods for self-assessing hearing. For this method to be effective, information about screening must be accessible (through mass media, the Internet, targeted invitation of individuals who are indicated for screening) and understandable to the population/target groups.

In October 2023, Kairong Wang et al. published a meta-analysis on the diagnostic accuracy of a mobile audiometry application for screening hearing loss in adults [24]. The purpose of these studies is to determine the overall sensitivity and specificity of the mobile version of audiometry and the mobile speech recognition test (SRT), (O'Brayn, 1904) and compare the results obtained with classical audiometry, which serves as the "gold standard" of hearing examination. Given its high diagnostic accuracy, accessibility, convenience, and cost-effectiveness, mobile hearing screening demonstrates enormous potential, particularly in primary health care (PHC) settings, regions with insufficient staffing, and situations where there is a constant lack of time for in-person doctor visits [24].

There are studies examining the use of a portable audiometer [18,19,25]. Sensitivity and specificity range 70%-94%.

The next most frequently studied and used method for screening and diagnosing hearing function is self-assessment of hearing through various questionnaires. Therefore, there is a survey with one question (Do you have a hearing impairment? Have you noticed that your hearing has become worse?) [18, 19] in different variations. Additionally, specialized audiological questionnaires such as the Health Utilities Index Mark 3 (HUI3) questionnaire [2], and The Hearing Handicap Inventory for the Adults (HHIA-S) and The Hearing Handicap Inventory for the Elderly (HHIE- S) [18,19,21,25] screening forms are used. Analysis of these methods shows relatively high sensitivity and specificity: the overall sensitivity and specificity when surveyed with one question range within 58-88% [19], while the use of the HHIE-S questionnaire gives the overall sensitivity of 34-81% and the overall specificity of 55-83% [19]. This range of indicators is a consequence of different levels of hearing loss determination, including mild (20-25 dB) and moderate (35-40 dB) hearing loss. Despite these results in sensitivity and specificity, data obtained from questionnaires are cheaper, faster, and more convenient to collect compared to classical PTA. Consequently, they can be widely used in clinical practice and epidemiological research. There is also an association between audiometrically measured hearing loss and self-reported hearing status, primarily to assess agreement between the two. It was found that hearing loss detected during an objective examination (PTA) often came as a surprise to an individual, as they did not perceive any hearing loss based on self-assessment [2, 18]. This further supports the idea that a person may not notice the onset of hearing loss for a long time, as they adapt to changes in auditory function (e.g., increasing the volume of the TV and listening devices, using speakerphone on the phone, and learning to read lips). For this reason, increasing awareness of unrecognized hearing loss may enhance the potential benefits of regular screening, early detection of hearing loss, and intervention.

That is, relying solely on data from people seeking help may result in a loss of valuable time for hearing rehabilitation. The late detection, lack of treatment, or delayed treatment of hearing loss can impact an individual's quality of life. In general, regular hearing testing allows for additional precautions (for instance, when listening to music at high volumes for long periods with in-ear headphones or in cases of occupational hearing loss) to protect against and prevent or delay further hearing loss.

The easiest, most accessible, and practically inexpensive method of testing hearing is the whisper test. The overall sensitivity of this method's items ranges from 30% to 100%, and the overall specificity ranges from 79% to 100% [19]. There are different variations of this test. In Russia, V.I. Martyusheva proposes using

a whispered speech analyzer for the rapid diagnosis of hearing impairment at speech frequencies of 40 dB and PTA [7] to eliminate the influence of human factors (whisper volume, speech impediment, and articulatory apparatus features) on the study results.

The key aspect of these methods is their applicability at the PHC level, where individuals first seek medical assistance. This means that regardless of the complaints a person presents to a GP, they will be interviewed and examined for hearing loss. Given the strong associations between hearing loss and depression, dementia, social isolation, and frequent hospitalizations [25], testing hearing acuity would be advisable. This could significantly reduce the costs to the state and the global community for treating and rehabilitating people with hearing loss and related conditions.

As a result, no single method can be unequivocally favored as a universal screening tool, given the significant variability in data on specificity and sensitivity.

The work of Brandão et al. (2023) is of interest. This review includes 26 articles from 2016 to May 2022 [26]. The study revealed that 50% of all articles from this period are at the lower levels of the evidence pyramid: 16 cross-sectional study articles, 6 validation articles, 2 cohort study articles, and 2 exploratory studies. This review highlights the lack of scientific publications on screening for hearing loss in adults and older adults both nationally and internationally, emphasizing the need for high-quality research in this area. Various screening methods were used, including mobile applications (7 articles), whisper speech test (3), portable audiometer (2), HHIE questionnaire (2), HHIE-S (8), SHSE (2), and speech intelligibility test (2), which makes it difficult to compare the results. Accordingly, a methodology for future research on this topic is needed. For the inclusion of screening for a specific disease in the national programs list, serious, large-scale, randomized controlled studies are required [27].

Cost-effectiveness of screening measures

Concurrently, there is an active investigation into the economic efficiency of screening examinations for the adult population and associated rehabilitation measures.

There are many screening methods, but are they all cost-effective? Hence, it is estimated that over $194 billion is spent annually on the treatment of hearing impairment and related diseases [28]. Costs can be reduced by introducing relatively inexpensive screening methods. Thus, Judy R. Dubno et al. [15] studied the direct and indirect costs of screening activities at the primary health care level among three groups of individuals screened at the age of 65-75 years: at home, at home with a nurse, and in primary care. Costs in each group were the following: the average cost per patient was $73.60 for group 1, $43.56 for group 2, and $201.85 for group 3. The average costs per patient not undergoing hearing screening are $413.58, $237.95, and $418.83, respectively, indicating that screening is clearly cost-effective.

Morris et al. [29] examined the cost-effectiveness of screening adults aged 60-70 years in the UK for bilateral hearing loss ≥35 dB compared with no screening and concluded that regardless of screening method in adults, hearing testing is cost-effective compared with lack of it; similar results were obtained for 50-70-year-old patients in the Netherlands [30]. A 2021 systematic review by Amber K. Hsu et al. found that all studies reporting detailed costs of hearing loss rehabilitation, including the provision, installation, and maintenance of hearing aids, demonstrated that the costs associated with managing and rehabilitating patients with socially significant hearing loss exceeded those of any screening test [31]. It was also concluded that screening is more cost-effective than not screening. The incremental cost-effectiveness ratios (ICERs) for all screening methods across all studies ranged from $1.801 to $22.106 per quality-adjusted life-year (QALY) compared with no screening. ICER for hearing testing, which was found to be the most cost-effective in studies, ranged from $1801 to $4567 per QALY. A pattern was also revealed that screening at a younger age (from 50 years old) and with a frequency of 1 time every 3-5 years results in higher economic efficiency. Moreover, based on the studies conducted, it was found that using applications on smartphones is more economical than conducting hearing examinations with portable devices and classical PTA.

Additionally, it can be concluded that if patients are aware of their condition and take action to correct or mitigate it, this leads to a gradual improvement in their quality of life, which in turn improves the QALY indicators, an index that allows for the comparison of the value and benefits of interventions for various conditions.

Regardless of the screening methods used for hearing loss, key questions always arise: Does screening for hearing loss in asymptomatic adults improve quality of life? Is screening harmful to health? How accurate are screening methods? Are there differences in medical outcomes for people with and without screening? The following results were obtained: no articles indicated that screening is harmful to the health of a subject; various screening methods effectively identify hearing loss in the adult population; early detection of hearing loss significantly improves a person's quality of life [19], and early detection of changes in auditory function allows for appropriate measures to be taken (such as treating conductive and mixed forms of hearing loss and using hearing aids). As a result, the earlier a hearing impairment is detected, the lower the financial costs incurred by both the individual and the state.

Audiological screening in Kazakhstan

According to the Standard for organization of otorhinolaryngology and surdology care in the Republic of Kazakhstan, which encompasses a set of medical services aimed at prevention, timely detection, diagnosis, treatment, and hearing aid provision for people with hearing impairments in consultative and diagnostic, inpatient, or outpatient settings [32], audiological care is provided in several stages: 1) the first stage involves annual universal audiological screening (UAS) in primary health care organizations to detect hearing impairment in all children up to three years of age and at six years of age using evoked otoacoustic emission and short-latency auditory evoked potentials as per the order of the Minister of Healthcare

of the Republic of Kazakhstan dated September 9, 2010, No. 704 [33]; 2) the second stage is an in-depth hearing examination; 3) the third stage is hearing aid provision (medical rehabilitation); 4) the fourth stage is correctional and developmental education; 5) the fifth stage is the replacement of medical devices that compensate for impaired hearing function [34].

We found several public domain studies analyzing current universal audiological screening [36-41]. Medeulova A.R. et al. covered the problematic issues of the pediatric audiology service and concluded that, despite the positive dynamics, measures are required to improve the quality of UAS.

The main direction of audiological screening is aimed at neonatal, early childhood, and school age; for adults, audiological screening is not carried out either in the form of a survey and/or questionnaire or in the form of acoumetry by specialists at the PHC level regarding hearing impairment at the pre-medical stage and GP examination.

According to order No.175 of 2020 [35], the 055/u form (preventive examination/screening card) mandates a screening questionnaire and preventive examination for the adult population at the pre-medical stage, during which nursing staff interviews the patient about socially significant diseases such as cardiovascular diseases (CVD) and visual impairment, measures height and weight parameters, takes blood samples for cholesterol and sugar testing, checks intraocular pressure, and collects a smear for oncocytology. However, there are no questions about hearing impairment. Consequently, another issue arises: the necessity of including hearing loss in the list of socially significant diseases. This once again underscores that without thorough research, the Republic of Kazakhstan risks encountering significant losses linked to a rise in the number of individuals affected by varying degrees of hearing loss.

In Kazakhstan, the situation with the identification of hearing impairment in adults mirrors that of the rest of the world. According to WHO, more than 5% of the global population has hearing impairment (with rates of 19% in Canada [2] and 4% in Turkey [20]). In Kazakhstan, according to the Bureau of National Statistics, the population as of November 2023 was 20 million people, hence, it can be estimated that around 1 million people in Kazakhstan must be registered for hearing impairment. Based on the "Electronic Register of Dispensary Patients" medical information system (MIS), there are 18.240 people with hearing impairment in the Republic of Kazakhstan, including 5,358 children, which is believed to be significantly lower than the actual number of people affected by hearing impairments. Numerous patients receive care at private medical institutions and therefore are not accounted for in the MIS of the Republic of Kazakhstan. We analyzed medical reporting forms, such as form 052/U (loose sheet No. 9), form 055/U, and form 054/U in accordance with order No. 175/2020 [35]. Over 5 years, ranging from 2018 to 2023, it was determined that the collective incidence of ear and mastoid diseases averaged 250 thousand cases, with acute and chronic otitis media accounting for 40 thousand cases. No data regarding the prevalence of hearing loss (classified under ICD-10 codes: H90.0-H90.8), including conductive, sensorineural, and mixed types, were covered in the reports for this period. Yet, considering the etiology of hearing impairment, it is plausible to assume that all these 250 thousand cases could potentially result in changes in hearing. This is data on visits to medical institutions for medical care. After conducting simple mathematical calculations, it can be determined that an additional 750 thousand people with undiagnosed hearing impairments can and should be identified to facilitate early hearing rehabilitation.

The economic impact resulting from the implementation of screening activities can be characterized by a decrease in government expenditures for disability-related social benefits (due to a reduction in the number of disabled individuals, rehabilitation costs following cochlear implantation, costs of the cochlear implantation procedure itself, and expenses related to providing hearing aids (to disabled individuals at the state's expense). Thus, according to the analysis (A.R. Medeulova, 2018, calculation for a 10-year forecast with a 3% discount rate), it was found that the cost of reimbursement for preoperative services is 23.659.90 tenge in the first stage, 4.535.981.0 tenge in the second stage (the cost of a cochlear implant), and 6.763.082.49 tenges in the third stage (averaging 40.715.26 tenges per year; the main cost includes replacing a speech processor at 2.500.000 tenge every five years) [14]. On the part of the Ministry of Labor and Social Development, expenses include a monthly allowance for a child (48.681 tenge as of July 1, 2023) and for the maintenance of a person caring for a disabled child (65.313 tenge as of July 1, 2023), totaling approximately 113.994 tenge per month on average. Over 10 years, the expenses can reach 13.679.280 tenge. And these are the costs associated with cochlear implantation alone. The growth in the proportion of people with hearing impairment increases the financial losses of the state as a whole, the economic burden on the state rises, labor productivity declines, and the share of the working-age population decreases.

Conclusions

To summarize, it can be concluded that all of the above studies demonstrate the need for screening measures in the adult population; nonetheless, due to the use of various methods, it is not possible to unequivocally identify a single method as the preferred choice. Therefore, it is essential to conduct rigorous research, longitudinal randomized studies, and develop a unified methodology for audiological screening, similar to what has been implemented in developed countries for neonatal audiological screening. The primary conclusion that can be drawn from the literature analysis is the necessity of early detection of mild and moderate hearing loss, as well as unilateral hearing loss. In Kazakhstan, as in many countries around the world, the problem of hearing loss is underestimated due to its imperceptible impact. It is necessary to draw public attention to the fact that individuals themselves and those around them often fail to recognize the causal relationships between inattention, absent-mindedness, the habit of asking for repetition, and hearing loss; in addition, there is the stigmatization of the population. It is advisable to consider including hearing loss in the list of socially significant diseases, alongside conditions such as CVD, glaucoma, and others. In Kazakhstan,

screening tests for hearing function, such as one-question surveys, the HHIA/HHIE questionnaire, whispered speech testing at the primary health care level, and the use of a mobile version of the hearing test for self-assessment, are applicable.

Thus, regardless of the audiological screening methods used in different countries, they all aim to enhance a person's quality of life through early detection of hearing impairment and subsequent rehabilitation.

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Ересек тұрғындарға аудиологиялық скрининг жасау әдістерінің салыстырмалы талдауы: Әлем елдерінің және Қазақстанның тәжірибесі

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Түйіндеме

Есту қабілетінің бұзылуы қазіргі уақытта ең таралған сенсорлық бұзылыс және бүкіл әлемде мүгедектіктің жетекші себептерінің бірі ретінде танылады. Жер бетіндегі әрбір бесінші адамның есту қабілетінің кем дегенде ең аз деңгейде төмендеуі және халықтың 5%-дан астамында есту қабілетінің жоғалуы кездеседі деп есептеледі. Есту қабілетінің бұзылуын анықтаудың көптеген скринингтік әдістері бар. Олардың ең көп таралған түрлері - мобильді қосымшалар, сыбырлап сөйлеу арқылы бағалау, портативті аудиометр, сауалнамалар, шу кезінде сөйлеудің анықтығын тексеру және т.б. Дегенмен, есту қабілетін тексерудің «алтын стандарты» таза тонды шекті аудиометрия әдісі болып келді және болып қала береді.

Бұл шолудың мақсаты заманауи әдеби көздерді зерделеу арқылы ересектердің аудиологиялық скринингі бағытында жүргізіліп жатқан зерттеулерді талдау, сондай-ақ скринингтік іс-шаралардың экономикалық тиімділігін зерттеу. Қазақстандағы жағдайды зерттеу және осы шолуда талданған скрининг әдістерін елде қолдану мүмкіндігін бағалау болып табылады.

Біз келесі критерийлерге сәйкес келетін 25 толық мәтінді мақаланы таңдадық: 2018-2023 жылдар арасында жарияланған зерттеулерді қамту, ересек тұрғындар, скрининг әдістері, экономикалық тиімділігі; қазақ, орыс және ағылшын тілдерінде мақалалар зерделенді.

Қорытынды. Естудің скринингтік әдістерінің сан түрлеріне, олардың сенімділігіне, сезімталдығы мен спецификасына және есту қабілеті бұзылған тұрғындарды оңалтуға жұмсалған шығындармен салыстырғанда айқын экономикалық тиімділігіне қарамастан, есту қабілетін бағалау әдістерінің ешқайсысы әлемнің бір де бір елінде Ұлттық скринингтік бағдарлама аясында есту қабілетін бағалау үшін енгізілмеген. Қазақстанда бір сұрақтан тұратын сауалнама, HHIA/HHIE сауалнамасы, медициналық-санитарлық алғашқы көмек деңгейінде сыбырлап сөйлеу арқылы зерттеу, сондай-ақ өз-өзінің есту қабілетін бағалау үшін есту тестінің мобильді нұсқасын пайдалану секілді әдістер арқылы диагностика жүргізіледі.

Түйін сөздер: есту қабілетінің бұзылуы, скрининг, ересектер, экономикалық тиімділік.

Сравнительный анализ методов аудиологического скрининга взрослого населения: Мировой и казахстанский опыт

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Резюме

Нарушения слуха в настоящее время признаны наиболее распространенным сенсорным нарушением и одной из ведущих причин инвалидности во всем мире. Считается, что у каждого пятого человека на Земле есть как минимум минимальная потеря слуха, а более 5% населения имеют инвалидизирующую потерю слуха. Существует множество методов скринингового выявления нарушений слуха, наиболее распространенными из которых являются мобильные приложения, распознавание шепотной речи, портативный аудиометр, анкетирование, тест разборчивости речи в шуме и другие. Тем не менее, «золотым стандартом» проверки слуха был и остается метод тональной пороговой аудиометрии.

Целью данного обзора является изучение текущих исследований в области аудиологического скрининга взрослых, а также изучение экономической эффективности проводимых скрининговых мероприятий, оценка ситуации в Казахстане и возможностей использования этих методов скрининга в стране, используя доступную литературу.

Мы отобрали 25 полнотекстовых статей, которые соответствовали следующим критериям: временной интервал 2018-2023 гг., взрослое население, методы скрининга, экономическая эффективность; мы проанализировали статьи на казахском, русском и английском языках.

Выводы. Несмотря на достаточное количество методов скрининга слуха, их достаточную надежность, чувствительность и специфичность, а также очевидную экономическую эффективность по сравнению с затратами на реабилитацию нарушений слуха, ни один из методов оценки слуха не включен в Национальную программу скрининга для обследования взрослого населения ни в одной стране мира. В Казахстане применимы скрининговое исследование слуховой функции с помощью одновопросного опросника, анкета HHIA/HHIE, исследование шепотной речи на уровне первичной медико-санитарной помощи, а также использование мобильной версии слухового теста в качестве самодиагностики слуха.

Ключевые слова: нарушение слуха, скрининг, взрослые, экономическая эффективность.