

RESEARCH ARTICLE

LANGUAGE ADAPTATION AND VALIDATION THE FPI (VOICE HANDICAP INDEX) QUESTIONNAIRE IN UZBEK IN THE DIAGNOSIS OF VOICE DISORDERS IN PARKINSON'S DISEASE

Sultonova Umida Fakhriddinovna

Department of Otorhinolaryngology, Tashkent Medical Academy, Tashkent, Uzbekistan,
Uzbekistan

Khaydarova Gavkhar Saidakhmatovna

Department of Otorhinolaryngology, Tashkent Medical Academy, Tashkent, Uzbekistan,
Uzbekistan

Abdukhalikova Nigora Fakhriddinovna

Department of Normal and Pathological Physiology, Tashkent Medical Academy,
Tashkent, Uzbekistan

Abstract: This study was aimed at adapting the MMPI questionnaire into Uzbek and studying the voice of patients with Parkinson's disease and syndrome. We examined 120 patients, 100 of whom were with PD and the remaining 20 were healthy. Upon completion and calculation of the VHI-uz questionnaire data, participants even with many years of experience of Parkinsonism syndrome found that voice and speech disorders in these patients were insignificant and the VHI-uz data did not have significant violations and corresponded to the norm. Therefore, special attention was paid to the study of complaints from patients with PD. And when they filled out the VHI-uz questionnaire, it was found that more than 50% of patients with Parkinson's disease and their relatives reported changes in their voice due to their disease and the relationship between the severity of the disease and the questionnaire (and its 3 domains: physical, functional and emotional) was established.

Key words: Dysphonia, Parkinson's disease, VHI-uz questionnaire data, pathophysiology.

INTRODUCTION

Dysphonia is a speech disorder diagnosed by a clinician, often used interchangeably with complaints of hoarseness, which is a symptom of altered voice quality. Despite the fact that many patients experience dysphonia and perceive it as a natural part of the aging process, it can be a symptom of a serious underlying disease. Clinicians should recognize that when patients suffer from dysphonia for longer than a month and/or when it is associated with other risk factors or other relevant signs and

symptoms, further examination is required [1][2][3].

The pathophysiology of dysphonia can be characterized by both an increase and decrease in tone in the vocal folds, incomplete closure of the glottis, tonic muscle spasm of the larynx and convulsive convergence of tense vocal folds, discoordination in the work of external and internal muscles of the larynx, vibrating voice, confusion of speech breathing, discomfort in the throat, occurs as a result

RESEARCH ARTICLE

of organic or functional disorders of the central or of peripheral origin [4]. Over the years, the connection of various neurological conditions to the human vocal apparatus has been established more and more. For example, Parkinson's disease (PD) is the second most common neurodegenerative disease in the world after Alzheimer's disease (1). This is caused by the gradual death of many neural systems, especially dopaminergic neurons in the compact part of the substantia nigra. The most important risk factor for PD is "age". With increasing age, the prevalence of PD increases. The ratio of men to women is 3:2. PD leads to hypokinetic dysarthria, which affects all aspects of speech such as breathing, phonation, articulation and prosody. Almost 90% of patients have impaired oral communication, but the "voice" is affected more often and earlier than other speech subsystems. One third of patients with Parkinson's disease suffer from dysphonia, and their most debilitating disadvantage is a hoarse and monotonous voice, causing the greatest part of the restrictions in the patient's daily life. Voice disorders consist of several different aspects, so different measurement and diagnostic methods should be used. Clinical assessment of the voice includes perceptual, acoustic, laryngostroboscopic and aerodynamic assessments, assessment of the conditions of the muscular framework of the vocal system, which are very useful and informative in the clinical assessment of disorders of vocal formation. But, unfortunately, neither voice objective scales, such as video/auditory or perceptual assessment, allow us to assess the degree of disability that a patient experiences as a result of a voice disorder. Examination of patients may add some necessary additional information to the biological and physiological data related to the pathophysiology of voice disorders. Quality

of life (QOL) characterizes the physiological, psychological, emotional and social problems that arise in a patient under the influence of a disease. The study of patients' QOL is one of the most popular areas of modern medicine. As a rule, various questionnaires are used to study QOL.[5] The VHI questionnaire is very popular in the study of voice disorders and the quality of life of patients with dysphonia.

The Voice Impairment Index (VHI) is a common questionnaire used for a wide range of voice disorders, and it is the most applicable subjective self—assessment questionnaire for patients who have a feeling of voice impairment. It shows the impact of disability caused by a voice defect on quality of life (QOL). It can be used as a tool for perceptual analysis of voice quality, which shows us the impact of voice problems on the quality of life of patients with various voice and speech pathologies. As with other neurodegenerative diseases, the severity of PD progresses over time, so timely preventive measurement of its severity by the vocal apparatus is an urgent topic for dynamic assessment of the quality of life of patients with Parkinson's disease. This Questionnaire consists of 30 statements classified into three categories of 10 statements each. Category P indicates physical disorders that occur in the patient and are caused by voice disorders, category F indicates functional disorders, category E indicates emotional disorders. Each of the statements of the questionnaire is evaluated in a point system from 0 to 4. The degree of severity of these disorders is determined by the sum of the points. The maximum scale is 120 points. According to B. Jacobson et al., a VHI exceeding 60 points corresponds to significant violations of QOL, 40-60 points – disorders of moderate severity. Less than 40 points indicate mild disorders [5].

METHODS

RESEARCH ARTICLE

The procedure for creating a linguistic cultural Uzbek version of the questionnaire as a whole was reduced to 3 directions:

- consecutive translation;
- translation expertise;
- Improving translation.

It is known that the language version of the questionnaire is eligible for use in international research only if the adaptation procedure is performed in accordance with international standards. The questionnaire version is recognized as legitimate after the results of adaptation and validation are presented. The linguistic and cultural adaptation of the VHI questionnaire, according to international standards, included several successive stages. The 1st stage is a direct translation of the questionnaire from the original language (2 independent translations of the original version were carried out). At this stage, certain requirements were imposed on the translators – they (2 people): 1) the translators were native Uzbek speakers who had experience translating special medical literature; 2) were previously unfamiliar with this questionnaire; 3) were native speakers of the original language of the questionnaire. A number of important aspects were taken into account when making the transfer:

- avoided literal translation;
- we tried to convey the meaning of the question as accurately as possible;
- A simple and understandable language was used.

At the end of the first stage, a test version of the questionnaire was created with the most appropriate formulations proposed by the translators, taking into account the ethnic and linguistic characteristics of the population.

The 2nd stage is approval. An expert committee from Lingvo Services, a translation agency, created a preliminary version of the questionnaire based on 2 direct translations. At the same time, all discrepancies with the use of the alternative translation method were eliminated. The expert committee also included a translator, a specialist in the field of otorhinolaryngology, and a native Uzbek speaker. At the same time, each expert carried out an independent assessment according to the prescribed protocol. Spelling and grammatical editing was also carried out at this stage. The translator had to carry out a linguistic and cultural adaptation of the VHI "Index of voice disorders" questionnaire. The following requirements were imposed on the translator: 1) had a higher medical education; 2) was previously unfamiliar with this questionnaire and did not participate in its direct translation; 3) was a native English speaker and a native Uzbek speaker; 4) did not participate in the work at previous stages. As practical recommendations to the translator, they mentioned the need for:

- strive to convey the meaning of the question;
- list all the values of the question;
- Use simple language.

As a result, a preliminary version was created.

The 3rd stage is the reverse transfer. The working document at this stage was the preliminary version, and the result was the creation of 2 reverse translations of the preliminary version. At this stage, the requirements for translators (2 people) were as follows: 1) had a higher medical education; 2) were native English speakers who spoke Uzbek; 3) did not participate in the work at previous stages and were not

RESEARCH ARTICLE

familiar with this questionnaire. Independently of each other, the translators translated the previous version into English in order to compare the received versions with the original questionnaire and thereby identify semantic, conceptual and experimental identity. As a result of the above transformations, a trial Uzbek version of the questionnaire was obtained. As a result, an Uzbek-language test version of the FPI questionnaire was created.

The 4th stage is conducting pilot testing, or pretesting. The analysis of the results of the pilot study makes it possible to bring the concept of the questionnaire as close as possible to the cultural and linguistic traditions and characteristics of the population. At this stage, the following tasks were set: 1) assessment of the understanding of the questionnaire questions by patients; 2) the essence of the shortcomings in translation.

120 patients participated in the pilot study. The pilot testing consisted of interviewing patients with Parkinson's disease. Senile and elderly patients found it difficult to understand the issues, for example, due to poor eyesight. For this reason, they received additional assistance from a medical professional or a relative who was present at the reception. The interview was conducted to find out how well the questions met criteria such as clarity, plausibility and acceptability. During validation, an analysis of the reliability, validity and sensitivity of this QOL assessment tool was carried out.

To check the reliability of the questionnaire, the internal constancy of the questionnaire was calculated by determining the Cronbach's alpha coefficient [7]. The Cronbach's alpha value for Uz-VHI was 0.93, which indicates that the elements in our set are very consistent and reliable and have excellent internal consistency. The Pearson

and Spearman correlation coefficient was used to study the relationship between the overall VHI-uz score and its 3 related areas.

The total Uz-VHI scores and each point are significantly higher in the group of patients with Parkinson's disease than in the healthy group ($P < 0.05$). Considering that for all scales of the questionnaire, the values of the α Kronbach coefficient were greater than 0.9, this indicated a very good level of reliability of the scales of the questionnaire and the instrument as a whole. In a comprehensive assessment of the validity (the ability of the questionnaire to reliably measure the main characteristic that it should measure) and sensitivity (the ability to give reliable changes in QOL scores in accordance with changes in the respondent's condition) of the questionnaire, it was found that the created version of this questionnaire is a valid and sensitive tool for assessing QOL in patients with voice disorders with Parkinson's disease. After the linguistic and cultural adaptation of the VHI questionnaire, as well as the verification of the psychometric properties of the instrument (validation), the final version of this questionnaire was created (table).

Below is a list of symptoms and conditions that can be observed in patients with various forms of dysphonia, according to patients with laryngeal diseases. Please circle one number in each line that most accurately reflects how you have experienced this symptom.

Voice handicap index (VHI)

Ovozdagı buzılış indeksi

Sana:

F.I.O.:

Tashxis:

Mutahasislik:

RESEARCH ARTICLE

	Men aksariyat hollarda ... soʻzlashuv ovozimdan foydalanaman	ishda								
		Dam olayotganda								
		Oddiy muloqot chogʻida								
	Men aksariyat hollarda ... vocal ovozimdan foydalanaman	Ishda								
		Dam olayotganda								
		Yuqoridag sanalganlarning xech biri, men kuylamanman								
	Suhbatlashish qobiliyatimni quyidagicha baholayman (iltimos, krest belgisi bilan belgilang)									
	1	2	3	4	5	6	7	8	9	10
	Kamgap nihoyatda sergapman							oddiy suhbatdosh tinglovchi		

Quyida ba'zi odamlarning o'z ovozi va uning hayotiga ko'rsatgan ta'sirini tavsiflash uchun ishlatadigan umumiy hulosalari keltirilgan. Iltimos, shunga o'xshash vaziyatlarga qanchalik tez-tez duch

kelganingizni ko'rsatib beruvchi javoblarni krestcha bilan belgilang (hech qachon, kamdan-kam hollarda, ba'zan, tez-tez, doimo)

	Javoblar: 0 = hech qachon, 1 = kamdan-kam hollarda, 3= ba'zan, 4 = tez-tez, 5 = doimo.	Hech qachon	Kamdan-kam	Ba'zan	Tez-tez	doimo
F1	Odamlarga meni ovozimni qabul qilish og'ir.	0	1	2	3	4

RESEARCH ARTICLE

P2	So'zlayotganimda menga havo yetishmay qoladi.	0	1	2	3	4
F3	Shovqinli xonada odamlar meni tushunushga qiynaladi.	0	1	2	3	4
P4	Ovozimning jaranglashi kun davomida o'zgarib boradi.	0	1	2	3	4
F5	Uyda oila a'zolarimni chaqirganimda, ular meni deyarli eshitmaydilar.	0	1	2	3	4
F6	Men telefondan o'zim xohlaganimdan kamroq foydalanaman.	0	1	2	3	4
E7	Ovozim sababli menga boshqa odamlar bilan suhbatlashish zo'riqishga to'g'ri keladi.	0	1	2	3	4
F8	Ovozim ko'pchilikni g'ashiga tegadi.	0	1	2	3	4
E9	Ovozim tufayli ko'pchilik yig'ilgan joydan o'zimni chetga olaman.	0	1	2	3	4

RESEARCH ARTICLE

P10	Odamlar: “Ovozingizga nima bo’ldi?”- deb so’raydilar.	0	1	2	3	4
F11	Ovozim sababli do’stlarim, qo’shnilarim, qarindoshlarim bilan kamroq muloqot qilaman.	0	1	2	3	4
F12	Suhbat chog’ida aytganlarnimni takrorlashimni so’raydilar.	0	1	2	3	4
P13	Ovozim noxush xirrillagan va g’ijillagan eshitiladi.	0	1	2	3	4
E14	Menimcha, ovozimdan foydalanganimda menda zo’riqish sodir bo’ladi.	0	1	2	3	4
P15	Mening fikrimcha, boshqalar ovozim bilan bog’liq muommolarimni tushunmaydilar	0	1	2	3	4
F16	Ovozim bilan bog’liq muommolar shaxsiy hayotimda meni cheklaydi	0	1	2	3	4

RESEARCH ARTICLE

P17	Gapirishdan oldin ovozim qay darajada tiniq chiqishini bilmayman	0	1	2	3	4
P18	Ovozimni boshqacha yangrashi uchun uni shunga qarab o'zgartirishga harakat qilaman	0	1	2	3	4
F19	Ovozim tufayli, men o'zimni go'yoki suhbatdan chetlatilgandek his etaman	0	1	2	3	4
F20	Gapirayotganimda men o'zimni zo'riqtirishim kerak	0	1	2	3	4
P21	Kechki payt ovoz bilan muommo yanada chuqurlashadi	0	1	2	3	4
F22	Ovozim bilan muommolar sabab men daromadlarimmi yoqotmoqdaman	0	1	2	3	4
E23	Ovozim bilan bog'liq muommolar meni nihoyatda ranjitadi	0	1	2	3	4

RESEARCH ARTICLE

E24	Ovozim tufayli odamlarga ochilib muloqot qilolmayman	0	1	2	3	4
E25	Ovozim bilan bog'liq muommolarni men cheklov deb hisoblayman	0	1	2	3	4
P26	Gap o'rtasida ovozim pand berib qo'ymoqda	0	1	2	3	4
E27	Mendan biror gapni takrorlashni so'rganlarida bu meni asabiylashtiradi.	0	1	2	3	4
E28	Gapimni takrorlashimni so'rganlarida, men hijolat bo'laman.	0	1	2	3	4
E29	Ovozim tufayli men o'zimni to'kis emasdek his qilaman.	0	1	2	3	4
E30	Ovozim bilan bo'g'liq muommo borligidan uyalaman.	0	1	2	3	4
	0 = yaxshi, 1= biroz buzilish bor, 2 = o'rtacha darajali buzilish					

RESEARCH ARTICLE

	bor, 3 = og'ir buzilish bor.					
	Bugungi kunda siz o'z ovoizingizni qanday baholaysiz?	0	1	2	3	

The questions are divided into three subscales. The points of the functional subscale (F) reflect statements that describe the impact of a person's voice impairment on their daily activities. The emotional subscale (E) consists of statements reflecting a person's emotional (for example, sensual) reactions to a voice disorder. The points that make up the physical sub-school are statements reflecting self-perception, laryngeal discomfort, and characteristics of speech output.

For the VHI assessment, the answer "Always" is estimated at 4 points, the answer "Never" is 0 points. The remaining options are rated from 1 to 3 points. We calculated the number of points for each of the sub-scales, and also calculated the total cumulative score. And compare the patient values with the published norms (Jacobson et al., 1997) obtained from 65 adult patients observed in the voice clinic at Henry Ford Hospital.

From January 2023 to April 2024, a survey was conducted of 120 participants who were fluent in Russian and Uzbek, and also did not have any inflammatory pathologies on the part of the vocal apparatus. One hundred survey participants were patients with Parkinson's disease and 20 healthy ones. We divided patients with Parkinson's disease into 3 groups according to the duration of the disease: group 1 - the duration of the disease is up to 5 years, group 2 - from 5 to 10 years, group 3 - the

duration of the disease is more than 10 years. As well as patients from each group were divided into 4 more subgroups by age: 1 - subgroup of people 70-80 years old, 2-subgroup 61-70 years old, 3-subgroup 51-60 years old, 4- subgroup 41-50 years old.

VHI-uz was evaluated by an otolaryngologist who performed a stroboscopy of the larynx, inviting participants to fill out a VHI-uz questionnaire, and another conducted an acoustic analysis of the participants' voices, followed by filling out the developed Uzbek version of the VHI questionnaire from the participants of this study.

The participants were asked to answer the questionnaire on their own, in isolated cases, when it was difficult to answer questions and evaluate, the researchers conducted an explanation, it took about 5-10 minutes to answer the questionnaire. It should be noted that participants and their relatives, especially those with 5-10 years of experience with Parkinson's disease, noted more complaints after filling out than when collecting complaints orally.

Calculation and statistical analysis: Statistical analysis was carried out using Microsoft office Excel computer programs.

Internal consistency was measured using Cronbach's α . A value greater than 0.9 is considered excellent, more than 0.8 is good, and more than 0.7 is satisfactory. And temporal stability using the intra-class

RESEARCH ARTICLE

correlation coefficient ($P < 0.05$). The distributions of the groups were analyzed according to the criteria of disease duration, age of patients and type of disorders. The average values of the group were analyzed using independent samples to assess the reliability of VHI-uz.

RESULT & DISCUSSION

First of all, the VHI standards were defined. The maximum value of VHI in healthy adults is 27 points, the minimum is 0 points.

During the study, it was found that the total score of the survey results in patients, depending on age, has an increasing curve

from 40 to 70 years, regardless of the duration of the disease, and a decreasing curve in patients in advanced old age (70 years and older). For example, patients of the youngest age group with a disease duration of 10 years or more have 56 points ± 6.1 . The group of patients from the oldest age group had the lowest scores. Patients from the 50-60-year-old group had the highest score of the voice impairment index. It should also be noted that the score has an increasing appearance depending on the duration of the disease, regardless of the age category. For example, the average score in patients aged 40-50 years (Fig.1).

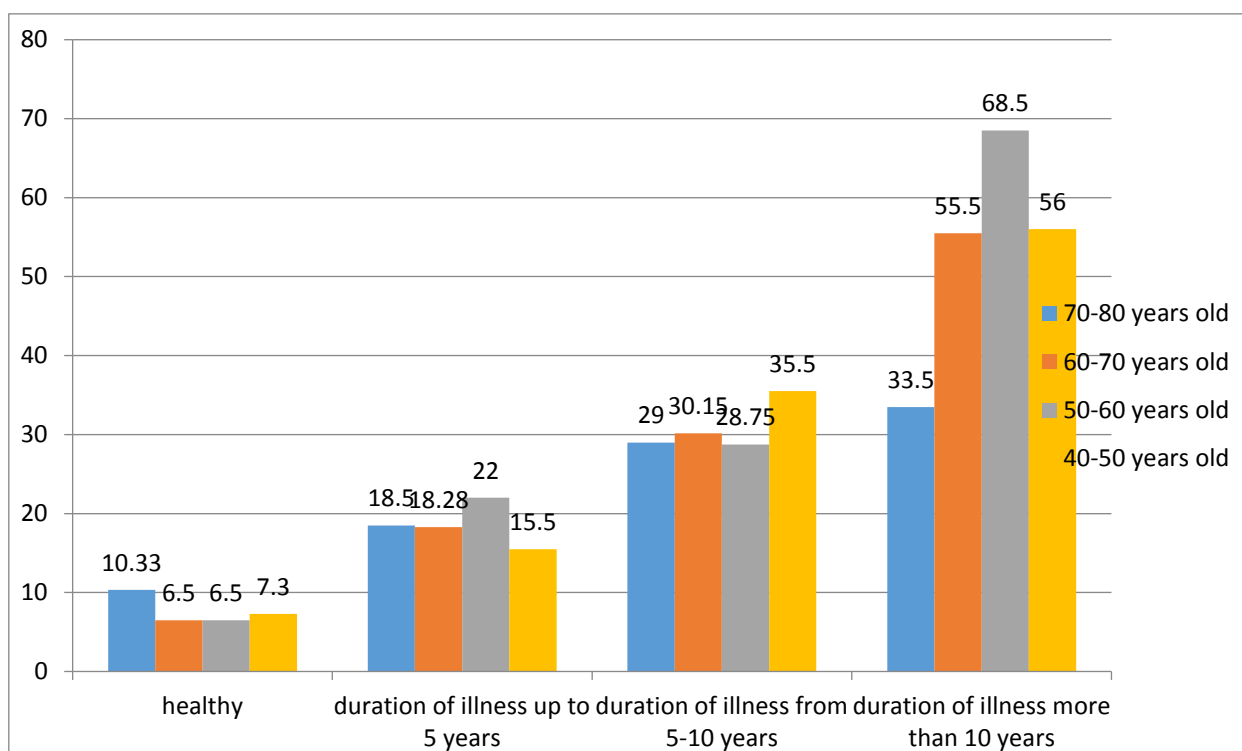


Fig.1. Note: $P < 0.05$ is the difference compared to the healthy group.

At the end of this study, it was found that patients with a disease duration of 10 years or more have a sharp increase in the index of voice disorders. For example, subgroups of patients aged 40-50 years old at the onset of the disease, the score of the index of voice disorders was 15.5 points and every 5 years

it is possible to observe an increase in the index by 2 times. Patients from this age group with a disease duration of more than 10 years had a voice impairment index of 56. The most significant changes in the index of voice impairment were shown by patients aged 50-60 years. In the first 5 years of the

RESEARCH ARTICLE

disease, ING was 22 points, in the period of illness from 5 to 10 years, ING was 28.75 points and in the period from 10 years or more, ING was 68.5 points. This group of patients showed a sharp increase during the disease period of 10 years or more. According to the results obtained, it can be assumed that patients with early onset of the disease after about 10 years will feel a sharp deterioration in their voice, affecting their quality of life. Then, it can also be consistently established that in patients with a later onset of the disease, the increase in the index (signs) of voice formation disorders occurs more smoothly and insignificantly.

The next indicator for which the study was planned was the type of effects of voice disorders on the patient's quality of life. To determine this indicator after completing the questionnaire and calculating the total index of voice impairment, each sub-scale of the questionnaire (Functional, Emotional and physical) voice impairment was calculated. The highest score according to the questionnaire was scored by patients with a disease duration of 10 years or more on a functional and emotional sub-scale of 16.6 ± 4.3 and a physical sub-scale of 14.1 ± 4.8 points. There were no significant changes in the voice of individuals with a duration of illness in the group up to 5 years, in the group from 5 to 10 years (Fig.2).

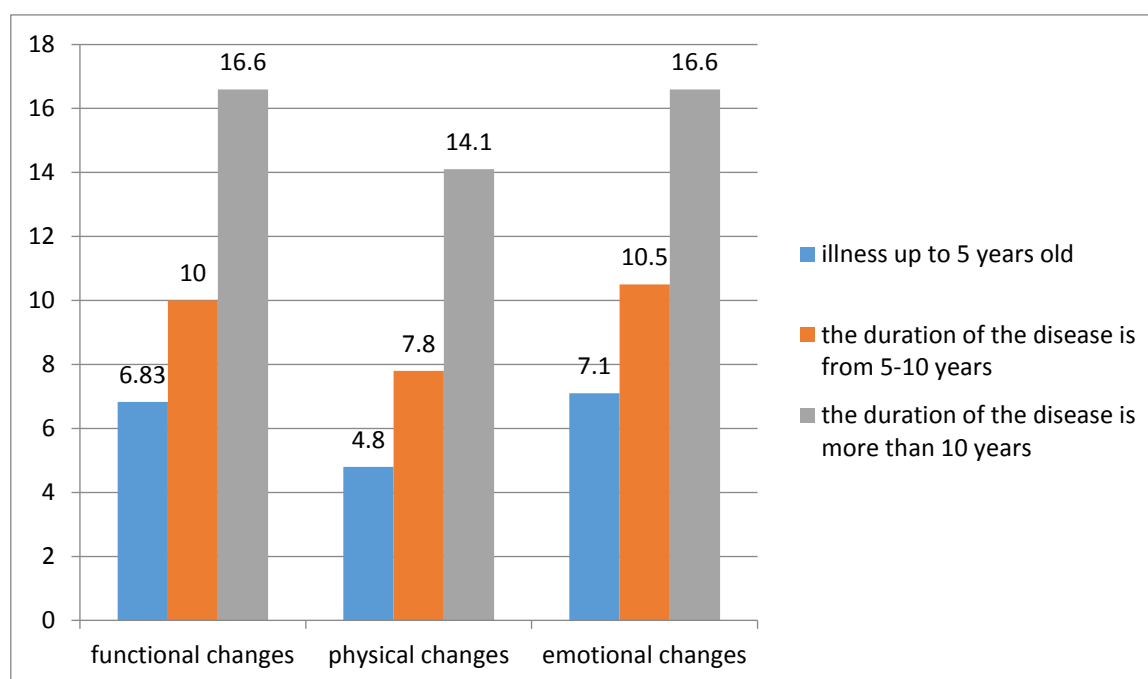


Fig.2. Note: $P < 0.05$ is the difference compared to the healthy group.

Functional disorders of the voice reflect the fact that changes in the voice affect a person's daily activities. The emotional sub-scale shows that voice disorders have an affective state (that is, on the sphere of emotions) and finally the physical component includes discomfort occurring

in the organ itself, that is, in the human larynx, which should be accepted and considered as discomfort affecting the pronunciation of speech.

CONCLUSION

RESEARCH ARTICLE

Parkinson's disease is one of the most poorly studied pathologies in the world. And the identification of a specific (key) type of speech disorder can be used in the differential diagnosis of various diseases in neurolaryngological practice among themselves. And identifying the type of disorders in this studied pathology will give a certain visibility to the neurologist about the psycho-emotional state and quality of life and further tactics of introducing the patient. We also assume that in this neurodegenerative pathology, this figure may be significantly higher, and the initially underestimated indicators are associated with the characteristics of the sample in this study. The problem was that patients were selected from a specialized appointment, which they got to, having a referral for a consultation and through commercials on social networks. Due to the extremely low quality of diagnosis of this disease, the proportion of these patients in the general structure of the appointment of an otorhinolaryngologist turned out to be significantly lower compared to the expected figures and significantly inferior to other disorders of the patients' vocal and speech apparatus.

This study was aimed at adapting the VHI questionnaire into Uzbek and studying the voice of patients with Parkinson's disease and syndrome. We examined 120 patients, 100 of whom were with PD and the remaining 20 were healthy. Upon completion and calculation of the VHI-uz questionnaire data, participants even with many years of experience of Parkinsonism syndrome found that voice and speech disorders in these patients were insignificant and the VHI-uz data did not have significant violations and corresponded to the norm. Therefore, special attention was paid to the study of complaints from patients with PD. And when they filled out the VHI-uz

questionnaire, it was found that more than 50% of patients with Parkinson's disease and their relatives reported changes in their voice due to their disease and the relationship between the severity of the disease and the questionnaire (and its 3 domains: physical, functional and emotional) was established [8]. And there was no specific difference between men and women in the first place, which is due to the fact that dopamine deficiency and related motor symptoms play a leading role in the pathophysiology of speech disorders, rather than damage to speech centers and other structures of the larynx. Dysarthria is characteristic of speech disorders in parkinsonism, which is one of the main signs for differentiating various forms of parkinsonism. Thus, early spastic dysarthria suggests the presence of atypical parkinsonism in the patient (for example, progressive supranuclear palsy). Pronounced dysarthria with trembling pronunciation of words and high timbre of voice accompanies multisystem atrophy, but usually develops at a later stage of the disease. Hypophonia and bradykinesia are the most common speech disorders in Parkinson's disease. At the same time, there is a loss of expressiveness, a violation of diction and a decrease in the volume of speech, at the advanced stages of the disease, speech is monotonous, indistinct, incomprehensible [8].

Currently, there is no gold standard for the diagnosis of Parkinson's disease and its effect on the larynx has not been fully studied.

The VHI-uz questionnaire is a simple and affordable method of diagnosing the disease at an early stage, it makes it possible to identify symptoms that patients do not say when collecting complaints and it can be used not only by otorhinolaryngologists, but also by general practitioners and

RESEARCH ARTICLE

neurologists. The use of the VHI-uz questionnaire is advisable for further management of patients with suspected nodose formations of the vocal cords, paresis of the vocal cords, as well as neuro-laryngological lesions of the larynx. The VHI questionnaire is used in many languages to identify symptoms and study the quality of life of patients with pathological conditions of the vocal cords, as well as to assess the effect of therapy. In our study, the first verified Uzbek version of VHI-uz was created, which showed strong internal consistency, high reliability of retesting and optimal clinical validity.

REFERENCES

1. Reghunathan S., Bryson PC. Components of Voice Evaluation. *Otolaryngol Clin North Am.* 2019 Aug;52(4):589-595.
2. Stachler RJ, Francis DO, Schwartz SR, Damask CC, Digoy GP, Krouse HJ, McCoy SJ, Ouellette DR, Patel RR, Reavis CCW, Smith LJ, Smith M, Strode SW, Woo P, Nnacheta LC. Clinical Practice Guideline: Hoarseness (Dysphonia) (Update). *Otolaryngol Head Neck Surg.* 2018 Mar;158(1_suppl):P1-P42.
3. Francis D.O., Smith L.J. Hoarseness Guidelines Redux: Toward Improved Treatment of Patients with Dysphonia. *Otolaryngol Clin North Am.* 2019 Aug;52(4):597-605.
4. Kraimer KL, Husain I. Updated Medical and Surgical Treatment for Common Benign Laryngeal Lesions. *Otolaryngol Clin North Am.* 2019 Aug;52(4):745-757.
5. Filatova E. A. / QUALITY OF LIFE IN ADULT VOICE DISORDERS/ *journal. Russian Otolaryngology*, No.1(56), 2012. pp.174-178.
6. Kuznetsov IA, Maikov SV, Salikhov MR, etc. Linguistic, cultural adaptation and validation of the Kujala questionnaire among patients with pain in the anterior knee joint. *Scientific and practical rheumatology.* 2017;55(4):388-392
7. Nukusbekova G.I, Toguzbayeva D.E../Language Adaptation and Verification of the Index of Reflux Symptoms in the Kazakh language./ Almaty, Kazakhstan. DOI: 10.1016/J.jvoice.2022.07.004.
8. Nikitina M.A., Alifirova V.M. NEURODEGENERATIVE DISEASES. A study guide. 2021