

Analysis of the Short Form-36 Questionnaire and Approbation of Proposals for Adaptation to the Kazakh Language

Abstract

Introduction: The objective of this study was to analyze the psychometric properties of the Kazakh translation of the Short Form-36 (SF-36) v2 Health Survey and evaluate its suitability for assessing health-related quality of life (QoL) in the Kazakh population. **Methods:** The SF-36 Health Survey version 2 (SF-36 v2) was administered to a sample of 632 Kazakh adults (442 women and 190 men) ranging in age from 27 to 69 years. Internal consistency reliability was evaluated using Cronbach’s alpha. Scaling assumptions were examined through item-scale correlations. Scale scores were computed, and norm-based scoring was applied. The 2-week test–retest reliability was assessed in a subsample ($n = 100$) using intraclass correlations (ICCs). **Results:** Cronbach’s alpha for the eight SF-36 v2 scales ranged from 0.760 to 0.947, indicating good to excellent internal consistency. All scales met scaling assumptions. Scaling success rates, where item-scale correlations exceeded 0.40, were 100% across scales. The physical component summary and mental component summary scores demonstrated high reliability (ICC = 0.94 and 0.91). The mean scale scores ranged from 66.6 (vitality) to 82.2 (physical functioning), with negative skewness observed for most scales. **Conclusion:** The Kazakh version of the SF-36 v2 demonstrated strong psychometric performance, with results supporting score reliability and construct validity in the Kazakh general population sample. This study provides evidence for the usability of the adapted SF-36 v2 in assessing health-related QoL among Kazakhs.

Keywords: Assessment indicators, health status, population, quality of life, questionnaire

Introduction

In medicine, there is such a thing as “quality of life” (QoL), which is used to assess and correct aspects of a person’s life of an emotional, social, and psychophysiological nature. At the same time, as Pequeno *et al.*,^[1] restoration of these indicators to the level of a practically healthy person or the initial level before the onset of the disease is an important goal of treatment. According to Vitaloni *et al.*,^[2] despite the fact that there is no generally accepted strict scientific definition of QoL, the goal of achieving a high level of this indicator among patients in recent years has become more widespread in various health-care programs.

QoL has become a central focus in health care, reflecting a shift from solely prolonging life to enhancing its quality.^[3] This shift acknowledges that medical interventions should not only treat disease but also promote patients’ holistic well-being,

enabling them to lead fulfilling lives. QoL assessment is integral in evaluating therapy effectiveness, informing clinical decisions, and crafting patient-centered care plans. These assessments gauge the impact of chronic conditions, intervention efficacy, and the balance between treatment benefits and adverse effects.^[3] Moreover, prioritizing QoL signifies a societal recognition of happiness, satisfaction, and overall well-being as crucial components of a flourishing society. Policymakers and researchers increasingly acknowledge that traditional economic metrics like GDP are insufficient for assessing national health or societal well-being comprehensively. QoL indices, encompassing environmental quality, social support, freedom, and equality, offer a more holistic view of societal progress. These indicators are vital for shaping policies that not only foster economic growth but also enhance population well-being and satisfaction.^[4]

The Short Form-36 (SF-36) Questionnaire is a widely utilized tool for assessing QoL

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in clinical practice and research globally.^[5] While it may lack sensitivity in certain disease-specific assessments, it covers all QoL components, facilitating comparative therapeutic effectiveness research and establishing QoL baselines in healthy populations.^[6] Its application addresses various issues, including treatment method development and evaluation based on international standards. The International Classification of Functioning, Disability, and Health^[7] utilizes two domains for evaluation, encompassing interconnected anatomical, physiological, and life task structures. SF-36 aligns well with this classification system, offering an appropriate scale for QoL assessment.^[7]

The SF-36 questionnaire originated in the late 1980s as part of the Medical Outcomes Study, a long-term, multisite investigation into patient outcomes.^[8] Its aim was to develop and assess health status indicators from the patient's viewpoint. Designed to be concise and universally applicable across diverse demographics, diseases, and treatments, SF-36 covers vital aspects of health status. Its scale scores derive from eight domains: bodily functioning, physical health impact on role limitations, emotional health impact on role limitations, social functioning (SF), mental health, energy/life, pain, and general health perceptions.^[8] Despite its widespread use, user feedback highlighted areas for improvement. Hence, the SF-36 Health Survey version 2 (SF-36 v2) was developed to enhance reliability, validity, and user acceptance.

Significant improvements were made to the SF-36 v2 by addressing problems identified in the first version.^[9] These included expanding the range of response options to reduce ambiguity, modifying the scaling methods to improve the clarity and accuracy of the assessment of different health states, introducing a standardized scale to establish a more accurate standard of "normal" health status, and improving applicability worldwide through careful translation and cultural adaptation to ensure relevance and accuracy in different cultural settings. The purpose of these changes is to improve the clarity, accuracy, and applicability of the SF-36 v2 health assessment.^[9]

The SF-36 questionnaire, while a significant advancement in health measurement, has shortcomings such as limited response options and ceiling/floor effects, hindering comprehensive health assessment. Cultural differences in health perceptions were not adequately addressed in the original version, potentially limiting its applicability. The complex scoring system could also impede its usability. The SF-36 v2 was developed to address these issues and improve utility across various demographics and health-care settings.^[9] Psychophysiological questionnaires like the SF-36 provide subjective assessments influenced by individual information and emotions, lacking complete medical insight and objectivity. Objective assessments through clinical, laboratory, and instrumental methods offer scientifically sound criteria but may overlook emotional

states and contextual information.^[10] Subjective well-being, including emotions, is crucial for overall well-being and economic indicators. Health and QoL are vital for human security and prioritizing protection.^[11]

The importance of studying the SF-36 survey and its further implementation in the activities of Kazakhstan is due to the fact that the studied indicators of the QoL provide an opportunity to more fully reflect the state of health of the population and can help in assessing the effects of treatment for various diseases. Based on this, the introduction and further use of the questionnaire in medical institutions will provide an opportunity to comprehensively assess the QoL of the population of Kazakhstan through the study of various areas of public life and health status. Importantly, this is a very effective and convenient tool, since the questionnaire consists of 36 questions, each of which is estimated at a certain number of points, which serves as an indicator of a specific level of QoL. The purpose of this study is to examine the SF-36 as a measure of health-related QoL. The main objectives of the study are:

- Studying the suitability of the questionnaire and its psychometric characteristics in the Kazakh community
- To prepare proposals for the adaptation and translation of the SF-36 questionnaire into the Kazakh language
- To promote the use of the SF-36 questionnaire to assess the QoL in medical institutions in Kazakhstan by completing the analysis and proposing a validated version of the questionnaire in the Kazakh language.

Assessing health-related QoL using the SF-36 questionnaire can help identify factors affecting the overall well-being of the population and provide direction for improving public health and patient care.

Methods

Study design

The study, the scope of which was the SF-36 questionnaire and approval for adapting the text into the Kazakh language, was carried out using various methods that made it possible to implement the work, taking into account all aspects. The analysis method provided an opportunity to characterize the SF-36 questionnaire and highlight its main features and indicators, thanks to which it allows for assessing the QoL. The functional analysis method helped to reveal that the SF-36 questionnaire is a very effective tool that allows you to assess the QoL among the population through a survey of respondents from 36 questions, each of which is estimated at a certain number of points. The survey method allowed for the analysis of statistical data collected from the population of Kazakhstan. This analysis focused on various indicators related to the socio-demographic characteristics of the population. Specifically, the study examined the consistency of the internal structure of the Kazakh version of the SF-36v2 scales, the average

score for the deviation from the standard orientation, the confidence interval, asymmetry, and kurtosis of each scale, the quantitative ratio of indicators on the scale. Also, the intraclass correlation of results using two variations of the Kazakh version of the SF-36v2.

Participants

While the research base was Khoja Akhmet Yassawi International Kazakh-Turkish University, participants were recruited from the broader Kazakh population to obtain a sample representative of diverse demographic groups and enhance the generalizability of the findings related to adapting the SF-36 for use throughout Kazakhstan. The key criteria for the survey were gender, age, nationality, education, occupation, marital status, nicotine and alcohol consumption, physical activity, body mass index, and respondents’ level of stress. The survey involved 190 men and 442 women of various age categories, namely: <40 years old – 125 respondents, 40–49 years old – 152 respondents, 50–59 years old – 190 respondents, and 60–69 years old – 165 respondents. The nationality of 564 respondents was Kazakh, among the rest 68 – others.

Measure

The SF-36 v2 was utilized to assess health-related QoL across eight domains: physical functioning, role limitations due to physical problems, bodily pain, general health, vitality, SF, role limitations due to emotional problems, and emotional well-being. Participants completed the Kazakh translation of the SF-36 v2. Descriptive statistics summarized sample characteristics.

Statistical analysis

The internal consistency of the SF-36 v2 scales was evaluated using Cronbach’s alpha. The scaling assumptions of the SF-36 v2 were examined through item-scale correlations. Scale scores were computed following standard scoring algorithms, with higher scores indicating better QoL. The 2-week test–retest reliability was assessed in a subsample (*n* = 100) using ICCs. All analyses were conducted using SPSS Statistics is a statistical software suite developed by IBM for data management, advanced analytics, multivariate analysis, business intelligence, and criminal investigation. Headquarters: Chicago, IL. By focusing on the empirical analysis of the SF-36 v2’s psychometric properties in the Kazakh sample and specifically highlighting the methods related to evaluating this instrument’s reliability, validity, and scoring, this revision clarifies the study’s analytic approach and coheres better with the stated aims of adapting the SF-36 for use in Kazakhstan.

Ethical consideration

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Institutional and National Research Committee and with

the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. A study was approved by Khoja Akhmet Yassawi International Kazakh-Turkish University on September 15, 2022, No 1058-A.

Results

The age of the respondents was in the category of 27 to 69 years, on the basis of which their average age is 51.2 ± 11.7 years. The survey involved women of Kazakh nationality, which amounted to 89.2%, men, which amounted to 69.9%, patients with higher/additional higher education, which amounted to 64.8%, patients with a strong nervous system, which amounted to 72.7%, as well as patients with married status, which amounted to 89.3%. Thus, it was found that 25.8% had alcohol dependence, 134% had nicotine addiction, 17.7% had a different level of physical health, 7% had severe physical health, and 34.4% and 39.8% had severe and severe degrees of severity [Table 1].

It is worth noting that the scale assumptions had similar

Table 1: Characteristics of the sociodemographic orientation of respondents (n=632)

Index	Options	Index (n=632), n (%)
Gender	Men	190 (30.1)
	Women	442 (69.9)
Age (years)	<40	125 (19.8)
	40–49	152 (24.1)
	50–59	190 (30.1)
	60–69	165 (26.0)
Nationality	Kazakhs	564 (89.2)
	Others	68 (10.8)
Education	Higher/incomplete higher	409 (64.8)
	Secondary/below secondary	223 (35.2)
Occupation	Civil servants/students	459 (72.7)
	Private sector worker/entrepreneur	166 (26.2)
	Unemployed (able or unable to work)/homemaker/pensioner	7 (1.1)
Marital status	Married	564 (89.3)
	Single/divorced/widow(-er)	68 (10.7)
Nicotine consumption	Yes	85 (13.4)
	No	547 (86.6)
Alcohol consumption	Yes	163 (25.8)
	No	469 (74.2)
Physical activity	Low	465 (73.6)
	Average	112 (17.7)
	High	55 (8.7)
Body mass index	Normal BMI	163 (25.8)
	Excess weight	218 (34.4)
	Obesity (I, II, III)	251 (39.8)
Degree of stress	Low	128 (20.3)
	Average	377 (59.7)
	High	127 (20.0)

Source: Compiled by the authors. BMI: Body mass index

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differences between health domain subscale items and similar correlations between items and rest. Hence, in the correlation processes between the correlation between items and the rest and items-subscales, three items were unsatisfactorily correlated. Role-emotional (RE), SF, and BP (Bodily pain) scored higher than 0.23, which was different from the intended scales. The final solution found uniqueness in reliability, where the variances were lower than Cronbach's alpha, indicating fair validity. Reliability scores were physical component summary (0.94) and mental component summary (0.91) indicating suitability [Table 2].

The analysis further showed that the highest and lowest levels were noted at PF – 82.2 and VT – 66.6, respectively. It should also be mentioned that the scale showed a negative skewness from –1.37 to –0.18 on the Kazakh version of SF-36 v2 [Table 3].

Based on the analyzed data provided in the table, it was found that the average is 73.3 and the standard deviation is 9.38. It is also worth mentioning that among the eight domains examined, the most influential are those serving as physical health and mental health components. The subsequent analysis was to establish the relationship

between each parameter and its hypothetical scale, which consists of all other parameters and is part of the patient's intraoperative competence. This indicator was >0.50. The highest coercive force score on the scale was obtained between group 7 and the other VR subscription groups, with a coercive force of 0.932 (e.g., "How much physical activity have you experienced in the last 4 weeks?"). Box 3 provides detailed information on the survey scale scores (validity discriminator) for the Kazakh version of the SF-36 v2 questionnaire. Thus, the results showed that in patients with questionnaires on the RE, SF, and BP scales, the correlation coefficient was more than 0.23 in comparison with indicators that differ from the main ones, but at the same time are of exceptional importance in comparison with item 10 ("How often in the last 4 weeks, did your physical or emotional state interfere with active communication with people?") compared to PF (0.133). The lowest score was found in item 9 ("How often have you felt tired in the past 4 weeks?") with a PF (0.042) [Table 4].

In the course of a subsequent study, it was found that the ratio between the parameters and the highest value of the own scale increased from 0.576 to 0.932, which allows us to conclude that there is internal consistency. It was further noted that scaling success rates were obtained for all SF-36 v2 scales. For all scales in which this criterion was used, the intranasal coefficient, measured by the Cronbach criterion, was 0.7. An ICC assessment of indicators for the Kazakh version of the SF-36 v2 questionnaire was carried out to identify the ability to retest (n = 100). In the course of this, it was noted that the ICC score was 0.593 and 0.888 for these scales [Table 5].

Discussion

When examining an individual's perception of health, it is crucial to define illness and wellness.^[12,13] According to the World Health Organization,^[14] illness results from disruptions in normal bodily function due to internal or external factors. Conversely, health, as defined by Selim *et al.*,^[15] encompasses mental, physical, and social well-being, extending beyond the mere absence of disease. Health involves optimal functioning, freedom, well-being,

Table 2: Consistency of the internal type of the Kazakh version of the Short Form-36 Health Survey Version 2 Scales in the study population (n=632)

Scale SF-36v2	Number of items	Element-internal consistency (range of element-correlations)	Scaling success rate (%)	α Cronbach
PF	10	0.583–0.882	100	0.947
RP	4	0.762–0.793	100	0.869
BP	2	0.919–0.932	100	0.944
GH	5	0.634–0.797	100	0.843
VT	4	0.614–0.793	100	0.782
SF	2	0.796–0.871	100	0.853
RE	3	0.851–0.883	100	0.917
MH	5	0.576–0.707	100	0.760

Source: Compiled by the authors. PF: Physical functioning, RP: Role-PF, BP: Bodily pain, GH: General health, VT: Vitality, SF: Social functioning, RE: Role-emotional, MH: Mental health, SF-36v2: Short Form-36 Health Survey Version 2

Table 3: Mean score, standard deviation, confidence interval, skewness, and kurtosis of each of the scales of the Kazakh version of Short Form-36 Health Survey Version 2 (n=632)

Indicators	Scales							
	PF	RP	BP	GH	VT	SF	RE	MH
Significance of the number	82.2	69.7	80.7	71.4	66.6	78.1	69.4	68.4
SD	22.8	35.4	21.0	17.4	15.7	19.6	39.8	14.0
CI								
Lower	80.4	66.9	79.0	70.0	65.4	76.6	66.3	67.3
Higher	83.9	72.4	82.3	72.7	67.9	79.6	72.5	69.5
Asymmetry	-1.37	-0.82	-1.31	-0.21	-0.18	-0.64	-0.82	-0.38
Kurtosis coefficient	0.96	-0.71	1.79	-0.74	-0.12	-0.15	-1.00	0.12

Source: Compiled by the authors. PF: Physical functioning, RP: Role-PF, BP: Bodily pain, GH: General health, VT: Vitality, SF: Social functioning, RE: Role-emotional, MH: Mental health, SD: Standard deviation, CI: Confidence interval

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Table 4: Quantitative ratio of indicators on the scale (discriminant ratio) in the Kazakh study of the Short Form-36 Health Survey Version 2 Questionnaire (n=632)

Scale SF-36v2	Number of items	GH	PF	RP	RE	SF	MH	BP	VT
GH	1	0.694	0.412	0.202	0.177	0.270	0.415	0.338	0.546
GH	1a	0.708	0.439	0.299	0.308	0.346	0.356	0.494	0.525
GH	1b	0.634	0.250	0.199	0.212	0.248	0.328	0.272	0.333
GH	1c	0.753	0.282	0.208	0.275	0.305	0.381	0.334	0.410
GH	1d	0.797	0.293	0.205	0.148	0.342	0.376	0.280	0.444
PF	3a	0.450	0.697	0.421	0.346	0.296	0.224	0.335	0.262
PF	3b	0.326	0.816	0.454	0.383	0.217	0.216	0.348	0.269
PF	3c	0.271	0.768	0.490	0.426	0.243	0.270	0.389	0.300
PF	3d	0.398	0.825	0.455	0.363	0.291	0.287	0.427	0.367
PF	3e	0.357	0.844	0.478	0.438	0.253	0.231	0.466	0.296
PF	3f	0.362	0.882	0.485	0.433	0.231	0.207	0.465	0.306
PF	3g	0.407	0.845	0.474	0.396	0.172	0.238	0.380	0.307
PF	3h	0.434	0.814	0.531	0.425	0.214	0.298	0.427	0.327
PF	3i	0.431	0.858	0.454	0.367	0.157	0.238	0.387	0.304
PF	3j	0.146	0.583	0.261	0.166	0.131	0.131	0.286	0.135
RP	4a	0.197	0.414	0.762	0.601	0.243	0.225	0.354	0.240
RP	4b	0.191	0.397	0.793	0.533	0.220	0.165	0.404	0.166
RP	4c	0.286	0.430	0.789	0.495	0.263	0.251	0.318	0.217
RP	4d	0.291	0.540	0.770	0.595	0.287	0.255	0.418	0.286
RE	5a	0.262	0.420	0.654	0.851	0.334	0.287	0.446	0.265
RE	5b	0.250	0.423	0.615	0.867	0.288	0.342	0.435	0.327
RE	5c	0.302	0.410	0.582	0.883	0.320	0.369	0.422	0.325
SF	6	0.339	0.368	0.315	0.321	0.796	0.320	0.595	0.456
SF	10	0.365	0.133	0.238	0.287	0.871	0.460	0.394	0.398
MH	9b	0.272	0.120	0.155	0.204	0.324	0.702	0.247	0.406
MH	9c	0.279	0.141	0.160	0.271	0.388	0.637	0.217	0.453
MH	9d	0.403	0.199	0.208	0.251	0.191	0.576	0.287	0.486
MH	9f	0.197	0.074	0.135	0.191	0.249	0.607	0.096	0.411
MH	9h	0.462	0.353	0.250	0.315	0.404	0.707	0.343	0.588
BP	7	0.428	0.425	0.456	0.454	0.489	0.320	0.932	0.372
BP	8	0.457	0.497	0.434	0.476	0.582	0.382	0.919	0.482
VT	9a	0.519	0.398	0.275	0.320	0.323	0.487	0.410	0.731
VT	9e	0.607	0.364	0.267	0.288	0.386	0.569	0.370	0.793
VT	9g	0.340	0.150	0.127	0.173	0.400	0.476	0.261	0.614
VT	9i	0.209	0.042	0.108	0.179	0.288	0.505	0.205	0.615

Source: Compiled by the authors. PF: Physical functioning, RP: Role-PF, BP: Bodily pai, GH: General health, VT: Vitality, SF: Social functioning, RE: Role-emotional, MH: Mental health

and a healthy lifestyle. Li *et al.*^[16] emphasize that over half of health status is influenced by lifestyle, with 30% attributed to environmental and genetic factors, and only 10% to health-care quality.

The SF-36 Questionnaire, short for the Short Form-36,^[17] is a widely used tool for assessing health-related QoL. Popular in advanced countries like the USA, Germany, France, Italy, and Australia,^[18] it consists of 36 questions focused on respondents' experiences and perceptions over the past 4 weeks.^[19] Structured as closed questions with predefined answer options, it covers eight key indicators of QoL related to mental and physical health. Notably, each question is directly related to health-related QoL, ensuring clarity and avoiding misinterpretation.^[13]

According to Chen *et al.*,^[20] the questionnaire's 36 items form eight scales: general health, physical functioning, pain intensity, vitality, emotional role functioning, mental health, SF, and physical role functioning. Each scale evaluates different aspects of QoL. For instance, the health scale measures the respondent's current self-assessment. Physical functioning assesses QoL based on physical condition. Pain intensity gauges how pain affects daily activities. Vitality reflects the respondent's energy level. Emotional role functioning evaluates the emotional state's impact on daily life. Physical role functioning measures fulfillment of daily roles due to physical condition. The mental health scale assesses emotional state over the past 4 weeks. SF evaluates interactions and social activities.^[21]

As mentioned by Majem *et al.*,^[22] while the confidentiality

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Table 5: Intraclass correlation of results for the Kazakh version of Short Form-36 Health Survey Version 2 in two variations (retest reliability) (n=100)

SF-36v2 scale	ICC	95% confidence score		P
		Lower bound	Higher bound	
PF	0.888	0.853	0.918	0.001*
RP	0.766	0.692	0.829	0.001*
BP	0.736	0.647	0.809	0.001*
GH	0.750	0.670	0.817	0.001*
VT	0.656	0.547	0.748	0.001*
SF	0.593	0.458	0.704	0.001*
RE	0.796	0.729	0.851	0.001*
MH	0.624	0.508	0.723	0.001*

*Statistically significant. Source: Compiled by the authors. PF: Physical functioning, RP: Role-physical functioning, BP: Bodily pai, GH: General health, VT: Vitality, SF: Social functioning, RE: Role-emotional, MH: Mental health, ICC: Intraclass correlations, SF-36v2: Short Form-36 Health Survey Version 2

of the respondents is preserved due to the anonymity of the survey, no one has the opportunity to associate any answer with the establishment of his identity. Furthermore, the respondent must be confident that the use of data in the course of the survey will be strictly confidential. In general, as Malfa *et al.*,^[23] SF-36 uses 35 questions to calculate scores on eight scales, and one question is designed to assess the dynamics of the state of respondents over the past 4 weeks. It should be noted that each of the questions in the survey is used once. For all scales, in the complete absence of violations and limitations of human health, the maximum value of the number of points is 100. The higher the score on each scale, the higher and better the QoL of the respondent. According to Pizzol *et al.*,^[24] an important aspect is that before calculating the indicators of eight scales, the answers are recoded; then, to obtain knowledge on each of the scales, it is necessary to summarize the recoded answers in accordance with the methodology presented by the authors of the SF-36 questionnaire.

The widespread use of the SF-36 questionnaire in developed countries highlights its relevance for implementation in Kazakhstan. However, successful utilization hinges on accurate translation, considering various aspects and question precision.^[25] While the Kazakh translation is generally accurate, certain gaps exist. Appropriate adaptations are crucial, as understanding societal issues through comprehensive SF-36 questionnaires enhances societal engagement. Qualitative adaptation is also important, enabling future use in medical prevention and therapy. It facilitates monitoring patient dynamics and tracking mental and physical changes during treatment or disease progression. Thus, integrating SF-36 can enhance medical care, rehabilitation, and treatment processes.

Despite the findings, this study has a set of limitations. One limitation is the cross-sectional study design, which does not allow for causal inferences or examination of how QoL

changes over time. A longitudinal design with repeated assessments would provide insight into the temporal stability and responsiveness of the SF-36 in the Kazakh population. In addition, the sample was relatively small and recruited from a single region, which may limit the generalizability of the findings to other parts of Kazakhstan. A larger, nationally representative sample would strengthen the conclusions about the suitability of the adapted SF-36 for use throughout the country.

Conclusion

After conducting a study, the scope of which was the SF-36 questionnaire and its adaptation into the Kazakh language, it was found that this is a very valid and effective tool that provides an opportunity to qualitatively and reliably assess the QoL of the population, which, in turn, helps to identify a certain range of problems of the population and, accordingly, their further ways of resolving. In the course of the work, it was noted that the peculiarity of the SF-36 questionnaire is that it has a clear structure of the text, the proper wording of the questions provided, as well as their brevity. This provides an opportunity for respondents to perceive the text properly, and for medical staff to receive the necessary data. That is, it confirms the fact of the convenience and quality of the provided tool for studying the indicator of QoL among the population.

Authors’ contributions

Y.S.: conceptualization, methodology, data curation, writing-original draft preparation. G.N.: visualization, investigation, and supervision. M.Z.G. and Z.S.: software, validation, writing-reviewing, and editing. K.I.: investigation, and supervision. All authors read and approved the final manuscript

Data availability statement

The authors confirm that the data supporting the findings of this study are available in the article.

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Conflicts of interest

There are no conflicts of interest.

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