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AN INNOVATIVE MULTIDISCIPLINARY STUDY OF THE AVAILABILITY OF CORONAVIRUS VACCINES IN THE WORLD

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Abstract. The article presents the results of the search for innovative technologies in a multidisciplinary study of the availability of COVID-19 vaccines of any type in the world. In the context of the coronavirus pandemic, multidisciplinary health research brings together the interdisciplinary links of scientists from around the world in medicine, pharmacy, law, economics on good medical practice, pharmaceutical provision and vaccination availability for all contingent of patients and postcovid health disorders. The aim of the research was to search for innovative technologies for the study of medically approved vaccines against COVID-19 in countries around the world using a multidisciplinary and integrated approach in the application of traditional and new methods of analysis. Content analysis was performed according to the range of licenses, permits for medical use and manufacturers by grouping them using the Sturgess formula, followed by construction of a discrete series of variations and distribution polygon. The results show satisfactory availability of vaccines against COVID-19 of any type. Doctors have a choice of appropriate vaccines and the manufacturer that corresponds to the social personalized vaccination taking into account the individual characteristics of patients.

Keywords: COVID-19, coronavirus epidemic, vaccines, innovative technologies, multidisciplinary research, evidence-based medicine, evidence-based pharmacy, content analysis, personalized vaccination.

Introduction. In the context of the coronavirus pandemic, multidisciplinary health researches bring together interdisciplinary links from scientists from around the world in the fields of medicine, pharmacy, law, economics on good medical practice, pharmaceutical provision, and availability of drugs of clinical, pharmacological, classification and legal groups, nomenclature, and legal groups for all contingents of patients on the background of covid, longcovid and postcovid health disorders [1-6].

On the background of the COVID-19 pandemic, an important point is that the platform for preventing the spread of this dangerous disease is vaccination with vaccines that are in circulation in the health care sectors around the world [7].

The experience of health care in counteracting the pandemic in the United States, France, Israel, China, and other countries needs to be studied [8-13]. According to Anthony Fauci [14], the new strain of COVID-19 "Omicron" is now spread in at least ten US states (New Jersey, Pennsylvania, Missouri, Maryland, Nebraska, etc.). There is an "absolute" spread among the population and in the coming days the number of

cases of COVID-19 will only increase. Therefore, US health professionals have already decided that all adults (18 years of age and older) who have received at least Pfizer-BioNTech or Moderna should be revaccinated six months after the second dose. However, since April 2021, EU administrations have discussed and suggested the possibility of accelerating booster vaccinations, but recommended that it is important to distinguish between overdose for people with weakened immune systems and booster doses for people with normal immune systems. For example, in France, the official authorities emphasize that booster vaccination is available to all citizens over the age of 18, 5 months after receiving the second dose, i.e. - until mid-January 2022. The elderly has until mid-December 2021 to receive revaccination, otherwise citizens risk losing their sanitary pass (French passport for COVID-19).

Doctors in Israel have organized the process in such a way that more than 40% of citizens have already been vaccinated with the third dose [15]. A study published in the Lancet [16] also shows that revaccination with the 3rd dose is 81% more effective in preventing death than those who received only 2 injections at least 5 months later. It has been noted that SARS-CoV-2 infections are on the rise in many countries, despite successful vaccination campaigns, which are thought to be due to higher infectivity of the Delta variant and reduced immunity after earlier vaccination. Regardless of the cause, these early results suggest that a third dose of mRNA vaccine is effective in reducing the severe outcomes associated with COVID-19 for patients who received two doses at least 5 months earlier.

According to Barbash Gabi [17], Israel again needs to introduce mandatory masks for citizens not only indoors but also outdoors. He stressed the following measures, namely: the importance of introducing stricter checks when people from other countries arrive at Ben Gurion International Airport; impose severe penalties on those who have a forged vaccination or immunity certificate; require those who have been in contact with confirmed cases to be quarantined, even if the citizen is fully vaccinated, because half of those who are currently in critical condition in the country's hospitals have received both doses of the vaccine.

The COVID-19 pandemic and its consequences have three characteristic features of traumatic events [18]: unpredictability, uncontrollability, threat of death or serious injury according to ICD-11 (International Classification of Diseases) and DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition). Patients with COVID-19 tended to be at high risk for mental and social health problems. Although the epidemic apparently affected their overall health, leading to negative emotions or fears, it also had a positive effect, such as a more positive view of their relationships with families or other people and the emergence of more thoughts and views. for life. The study encouraged medical staff to take their time listening to patients and to pay more attention to specific psychological and social health problems in future treatment.

A technical document from the United Nations Health Agency for Member States has become the WHO's strongest warning about a new strain of coronavirus found in South Africa. The agency reported that preliminary evidence increases the likelihood that an unprecedented number of "adhesive mutations" may increase the

strain's ability to spread among the population [19]. Health authorities in some countries (UK, Germany, Italy, Belgium, Israel, Spain, the Netherlands, Portugal, Sweden, Scotland, Austria, Canada, Denmark, Hong Kong) have already identified a new strain of Omicron and strengthened quarantine measures [20].

The World Health Organization presented a new edition of the International Classification of Diseases (ICD-11) at the World Health Assembly on May 20, 2019 in Geneva. ICD-11 is the most complete, systematic list of known and recognized evidence-based diseases and conditions. ICD-11 will enter into force after consultation with all WHO countries. WHO notes that the implementation of ICD-11 involves the interaction of classification with the rule of law, laws, national policies, health systems and information infrastructure of each country. Training methods need to be developed for a wide range of international health professionals [21, 22].

In these conditions, the relevance of multidisciplinary innovative studies of the treatment of vaccines against coronavirus in the world for the selection of personalized vaccination of patients is growing.

The purpose of the work was to conduct multidisciplinary and comprehensive studies on the availability of vaccination in the context of the coronavirus pandemic, taking into account the production and availability of permits for the medical use of COVID-19 vaccines in the world.

Materials and methods. Innovative approaches to the study of vaccines in the prevention of COVID-19 consisted in the multidisciplinary and integrated application of traditional and new research methods. The multidisciplinary comprehensive study was based on the regulatory framework of health care, including regulatory norms of medical and pharmaceutical legislation, principles of evidence-based medicine, evidence-based pharmacy, forensic pharmacy, clinical pharmacy, pharmacy, marketing, management for different groups of patients [23-30].

The methodological basis of the study was based on the paradigm of organizational and legal, clinical, and pharmacological standards: ICD-11; international and national medical and technological documents on standardization of medical care; normative documents (standards of medical care, clinical protocols, forms of medicines, National list of essential medicines, instructions for medical use); scientific publications on the topic of work.

More than 700 legislative, normative, and legal, instructive, and methodical documents have been processed. The study was conducted from January 15, 2021 to February 20, 2022. The study focused on 33 vaccines in the world (197), which were approved, authorized, licensed, authorized for emergency use or provided for use outside clinical trials in any way by a regulatory body, national authority, or other organization as of January 2022.

The information base of the study consisted of scientific works of foreign and domestic scientists on the topic of the article. The review of scientific sources of literature was carried out taking into account the recommendations of the Cochrane Society for PICO: P (population) – the population suffering from vaccines against COVID-19 of any type; I (intervention) – vaccination and personification of patients; C (comparison) – comparison in research technology, innovative experimental study;

O (outcomes) – research results. Based on a review of published qualitative strategy and management research, the author identifies highly innovative academic articles, that is, a study that demonstrates substantial novelty in every part of the research process. Author works through these articles in detail to demonstrate their novelty, highlighting concrete ways in which scholars have innovated three interconnected parts of the research process: data generation, data analysis, and presentation of findings. These principles are engaging in holistic innovation, being excruciatingly clear in the presentation of methods, developing theory and method together, and being reflexive in innovating methods. Our model demystifies the largely implicit process of innovating research methods [31-39].

Among the traditional research methods used are regulatory, documentary, normative and legal, retrospective, clinical and pharmacological, marketing, comparative, system, forensic and pharmaceutical and graphic.

In addition, content analysis was used. For the content analysis, the method of selection developed by the Department of Medical and Pharmaceutical Law, General and Clinical Pharmacy of the Kharkiv Medical Academy of Postgraduate Education was used. The methodology of content analysis was to qualitatively and quantitatively monitor the turnover of the COVID-19 vaccine market, taking into account our previous studies [40-42].

Microsoft Excel 2010 (descriptive characteristics: minimum and maximum value, average value) was used to process the results and determine the consistency between the studied parameters.

To conduct the analysis, for the first time developed its own method of content selection of vaccines against COVID-19, which included seven stages, presented in Fig. 1.

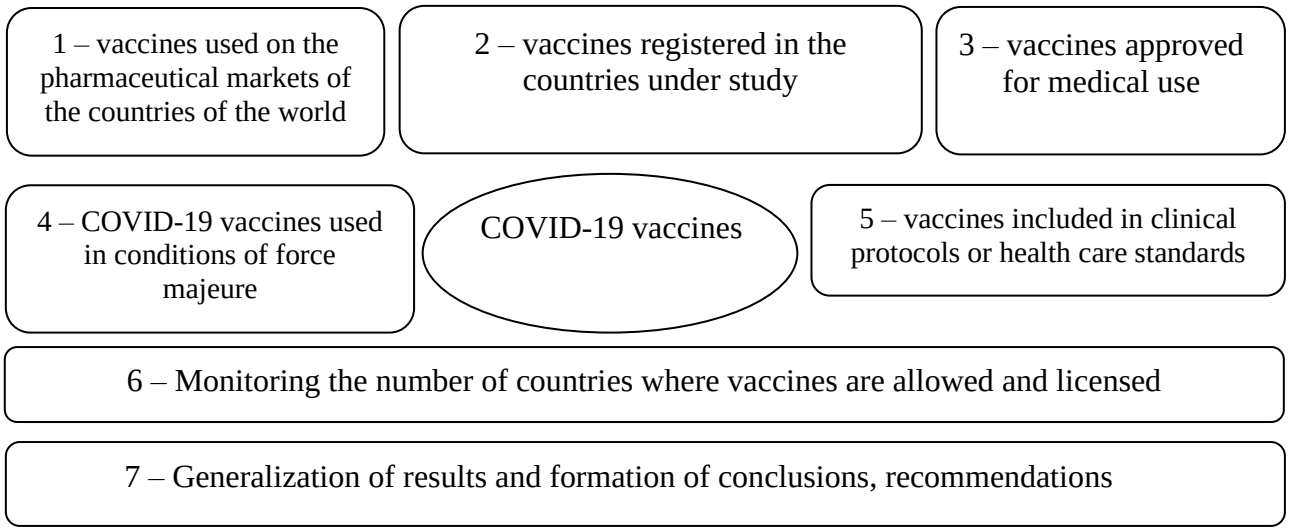

Fig. 1. Selection criteria for COVID-19 vaccines for research (source: own development).

Content analysis was performed by grouping vaccines according to the number of countries where they are approved. Consider the criteria for selecting vaccines for research in detail. At the first phase, we studied the turnover of vaccines against

COVID-19 in the pharmaceutical markets of the world, selected countries for inclusion in the study. A total of 33 vaccines against COVID-19 in the pharmaceutical markets of 11 countries were studied. On the second phase, the registration of COVID-19 vaccines was monitored in selected countries. In the third phase, the availability of permits for the use of COVID-19 vaccines in selected countries was analyzed. On the fourth phase, force majeure was studied when, in emergencies, COVID-19 vaccines were authorized for medical use outside of clinical trials. During the Phase 5, we studied which COVID-19 vaccines were included in clinical protocols and treatment standards in the countries selected for the study. On Phase 6, the number of countries where COVID-19 vaccines were authorized and licensed was monitored. At the 7th phase, the results of the research were systematized and generalized to form conclusions and proposals [43].

The grouping indicator refers to the number of countries where they have been approved, authorized, licensed, authorized for emergency use or granted for use outside clinical trials by any regulatory body, national authority, or other organization [44].

The research of the article is a fragment of research work of the Kharkiv Medical Academy of Postgraduate Education on "Improving the organizational and legal procedure for providing patients with drugs from the standpoint of forensic pharmacy, organization and management of pharmacy" (state registration number 0116U003137, terms 2016-2020) and "Pharmaceutical and medical law: integrated approaches to the system of drug circulation from the standpoint of forensic pharmacy, organization and management of pharmacy" (state registration number 0121U000031, terms 2021-2026).

Results and discussion. Innovative technologies in this study were used in a multidisciplinary and integrated approach using traditional and new methods of analysis. Among the latter, content analysis was applied. Content analysis is a systematic procedure aimed at objectively analyzing the content of any text. Americans are rightly considered inventors and leaders of content analysis. Content analysis was first used in 1640 in Sweden. Already in the late 1960s, content analysis became the most common methodology in research papers defended at American universities, and still remains the most popular methodology in the United States. Unlike questionnaires, content analysis does not measure what respondents write in the questionnaires, but what they actually did. Thus, with the help of content analysis, it is possible to conduct research of any document or set of documents in order to study both the laws of internal structure of the document, and what gave rise to it and what it is intended for. In general, it can be noted that today no study of the document can be carried out without the use of the method of content analysis. This method continues its development and combines the best features of qualitative methods with the advantages of formalized, quantified analysis. The essence of the method of content analysis is to list the quantitative indicators of textual information, as well as to quantify the data obtained. The specificity of the method of content analysis is the division of content analysis into quantitative and qualitative. It has been established that quantitative content analysis must include standardized procedures for calculating selected categories. Quantitative values are crucial for drawing conclusions, the bulk of the calculations of which can

be performed using computer programs. Qualitative content analysis is aimed at in-depth meaningful study of textual material, including in terms of the context in which the selected categories are presented. The results are formulated here taking into account the relationships of content elements and their relative importance (rank) in the structure of the text.

Depending on the objectives of the study, qualitative content analysis can be supplemented by some elements of quantitative content analysis. Also, content analysis can be divided into search, control, directed, undirected, direct, indirect, structural. The main types of documents for content analysis: text or mixed documents (texts with graphs, charts, tables), which analyze only textual materials in order to identify relevant information; mixed documents or tabular data that can be obtained from documents such as reports, statements, etc. The main characteristic of this type of documents is that they have a lot of tabular materials, on the basis of which secondary data are formed, which are part of various reports and other analytical materials (data are accompanied by textual materials). It should be noted that content analysis can be used in pharmacy, medicine, and other sciences, firstly, as an independent research method; secondly, in combination with other methods; thirdly, as an auxiliary method of processing data obtained by other methods.

It is possible to allocate kinds of application of the content analysis: 1) for processing and specification of the data received by other methods in researches; 2) to study the scientific literature [45-48].

There are three approaches to conduct content analysis: conventional, directed, and summative. All three approaches are used to interpret meaning from the content of text data and, hence, adhere to the naturalistic paradigm. The major differences among the approaches are coding schemes, origins of codes, and threats to trustworthiness. In conventional content analysis, coding categories are derived directly from the text data. With a directed approach, analysis starts with a theory or relevant research findings as guidance for initial codes. A summative content analysis involves counting and comparisons, usually of keywords or content, followed by the interpretation of the underlying context [49-54].

Consider the indicators of vaccination, approval, and testing of vaccines against COVID-19 of any type in the world [43, 44]. The availability of COVID-19 vaccines of any type was monitored in official reports from countries that publicly announce the approval of at least one COVID-19 vaccine of any type. Patients who received all the doses recommended by the vaccination schedule were considered fully vaccinated. We monitored licenses, approvals and permits for medical use of vaccines against COVID-19 of any type from official reports of state health authorities. The indicator "approved vaccines" included vaccines that have been approved, licensed, authorized for medical use, have received emergency use status or are available for use outside of clinical trials in any way. The indicator "clinical trials of vaccines against COVID-19 of any type" included countries in which at least one clinical trial of a vaccine against COVID-19 of any type was registered. The "vaccine trials" indicator included those that have not yet been officially registered, whose trials are ongoing, completed or suspended.

An innovative study of vaccines against COVID-19 included the use of content analysis using the Sturgess formula, followed by the construction of discrete series of variations and the distribution polygon. The Sturgess formula used to calculate the number of vaccine groups against COVID-19 vaccines is as follows:

$$n = 1 + 3.322 \lg N, \quad (1)$$

where n is the number of variations; N is the number of COVID-19 vaccines.

The step limits of certain groups of drugs were determined by the following formula:

$$h = \frac{X\,\max - X\,\min}{n}, \quad (2)$$

where h is the magnitude of the step of the group;
X_{max} is the maximum number of countries where COVID-19 vaccines have been approved;
X_{min} is the minimum number of countries where COVID-19 vaccines are approved.

As the primary data for content analysis, COVID-19 vaccines were selected that passed the stages 1-6 of the study, met the requirements of regulatory authorities, national authorities, or other organizations responsible for the circulation and medical use of COVID-19 vaccines in the national legislations of 14 selected countries. After further processing of these data, a roll of vaccines was stockpiled, which is available in 33 names in 11 manufacturing countries (Table 1).

Table 1. List of vaccines against COVID-19, manufacturers, and countries of origin as of January 2022 [44].

No.	Vaccine	Manufacturer	Country
1.	Covaxin	Bharat Biotech (BBIL)	India
2.	Corbevax	Biological E Limited	India
3.	Convidecia	CanSino Biologics	China
4.	Abdala	Center for Genetic Engineering and Biotechnology (CIGB)	Cuba
5.	KoviVac	Chumakov Center	Russia
6.	Aurora-CoV	CoV	Russia
7.	EpiVacCorona	FBRI	Russia
8.	Sputnik Light	Gamaleya	Russia
9.	Sputnik V	Gamaleya	Russia
10.	Turkovac	Turkish Health Institutes	Turkey
11.	Soberana 02	Instituto Finlay de Vacunas Cuba	Cuba
12.	Soberana Plus	Instituto Finlay de Vacunas Cuba	Cuba
13.	Ad26.COV2. S	Janssen (Johnson&Johnson)	USA
14.	QazVac	Kazakhstan RIBSP	Kazakhstan
15.	MVC-COV1901	Medigen	Taiwan

16.	KCONVAC	Minhai Biotechnology Co	China
17.	Spikevax	Moderna	USA
18.	Recombinant SARS-CoV-2 Vaccine (CHO Cell)	Razi Vaccine and Serum Research Institute	Iran
19.	Nuvaxovid	Novax	USA
20.	FAKHRAVAC (MIVAC)	Defense Innovation and Research Organization	Iran
21.	Vaxzevria	Oxford/AstraZeneca	UK
22.	BioNTech	Pfizer	USA
23.	Razi Cov Pars	Razi Vaccine and Serum Research Institute	Iran
24.	Covishield (Oxford/ AstraZeneca formulation)	Serum Institute of India	India
25.	COVOVAX (Novavax formulation)	Serum Institute of India	India
26.	COVIran Barekat	Shifa Pharmed Industrial Co	Iran
27.	Covilo	Sinopharm (Beijing)	China
28.	Inactivated (Vero Cells)	Sinopharm (Wuhan)	China
29.	CoronaVac	Sinovac	China
30.	TAK-919 (Moderna formulation)	Takeda	Japan
31.	SpikoGen	Vaxine/CinnaGen	Australia
32.	ZyCoV-D	Zidus Kadila	India
33.	ZF2001	Anhui Zhifei Longcom	China

For content analysis, the studied vaccines were distributed according to the indicator for calculating the number of producing countries and countries in which their medical use is allowed in the context of a coronavirus pandemic [43, 44, 53, 54].

To conduct a content analysis of vaccines by the number of countries in which they are approved, primary data on the number of countries where vaccines are approved from the list were selected and processed (Table 2).

Table 2. Primary data for content analysis of COVID-19 vaccines of any type by number of countries where they are approved.

No.	Vaccine	Number of countries where the vaccine is approved
1.	Vaxzevria	137
2.	BioNTech	137
3.	Ad26.COV2.S	106
4.	Covilo	88
5.	Spikevax	85
6.	Sputnik V	74
7.	CoronaVac	53

8.	Covishield (Oxford/ AstraZeneca formulation)	47
9.	Nuvaxovid	32
10.	Sputnik Light	24
11.	Covaxin	13
12.	Convidecia	10
13.	Abdala	6
14.	EpiVacCorona	4
15.	Soberana 02	4
16.	KoviVac	3
17.	COVOVAX (Novavax formulation)	3
18.	ZF2001	3
19.	QazVac	2
20.	MVC-COV1901	2
21.	KCONVAC	2
22.	Inactivated (Vero Cells)	2
23.	Corbevax	1
24.	Aurora-CoV	1
25.	Turkovac	1
26.	Soberana Plus	1
27.	Recombinant SARS-CoV-2 Vaccine (CHO Cell)	1
28.	FAKHRAVAC (MIVAC)	1
29.	Razi Cov Pars	1
30.	COVIran Barekat	1
31.	TAK-919 (Moderna formulation)	1
32.	SpikoGen	1
33.	ZyCoV-D	1
	Total	848

The Table 2 shows that 33 vaccines are used for coronavirus vaccination, which are approved by countries in the range of 1 to 137 positions.

When calculating the number of coronavirus vaccines according to the number of countries in which they are approved, according to the formula No. 1, determined the number of groups: $n = 1 + 3{,}322 \lg N = 1 + 3{,}322 \lg 33 = 6{,}05$. We accept n=6 groups. According to the formula No. 2, the step of the group was determined. We accept h=22. The distribution of the step according to the groups is shown in Table 3.

Table 3. Determining the boundary of the step of groups of COVID-19 vaccines in the generalization of manufacturers *(source: own development)*.

Group No.	Initial step value	Final step value
1st group	0	22
2nd group	23	45

3rd group	46	68
4th group	69	91
5th group	92	114
6th group	115	137

According to calculations, the studied COVID-19 vaccines divided by the number of countries where they are approved into six groups, as indicated in the Table 4.

Table 4. Coronavirus vaccines by the number of countries in which they are approved *(source: own development).*

No.	Manufacturer	Number of registrations and licenses of COVID-19 vaccines approved for medical use
1st group		
1.	Covaxin	13
2.	Convidecia	10
3.	Abdala	6
4.	EpiVacCorona	4
5.	Soberana 02	4
6.	KoviVac	3
7.	COVOVAX (Novavax formulation)	3
8.	ZF2001	3
9.	QazVac	2
10.	MVC-COV1901	2
11.	KCONVAC	2
12.	Inactivated (Vero Cells)	2
13.	Corbevax	1
14.	Aurora-CoV	1
15.	Turkovac	1
16.	Soberana Plus	1
17.	Recombinant SARS-CoV-2 Vaccine (CHO Cell)	1
18.	FAKHRAVAC (MIVAC)	1
19.	Razi Cov Pars	1
20.	COVIran Barekat	1
21.	TAK-919 (Moderna formulation)	1
22.	SpikoGen	1

23.	ZyCoV-D	1
	Total	**65**
2nd group		
1.	Nuvaxovid	32
2.	Sputnik Light	24
	Total	**56**
3rd group		
1.	CoronaVac	53
2.	Covishield (Oxford/ AstraZeneca formulation)	47
	Total	**100**
4th group		
1.	Covilo	88
2.	Spikevax	85
3.	Sputnik V	74
	Total	**247**
5th group		
1.	Ad26.COV2.S	106
	Total	**106**
6th group		
1.	Vaxzevria	137
2.	BioNTech	137
	total	**274**

Based on the data obtained in the Table 4, we can analyze the pharmaceutical market of COVID-19 vaccines by country of origin. The first group included 23 vaccines from 23 manufacturers with 65 registrations and licenses authorized for medical use.

The range of the second group includes two vaccines from two manufacturers, which are approved for medical use in 56 countries.

Based on the data in the Table 4, the third group also includes 2 vaccines from 2 manufacturers, which are approved for medical use in 100 countries. This indicates that 2 manufacturers can manufacture COVID-19 vaccines in 100 countries that have been licensed CoronaVac and Covishield (Oxford/AstraZeneca formulation).

The fourth group includes three vaccines from three manufacturers, which have 247 licenses and registrations for medical use in the world.

The fifth group is represented by one vaccine (Ad26.COV2.S) from one manufacturer, which is used in 106 countries.

The sixth group is represented by two vaccines from two manufacturers with 274 licenses for medical use. At this stage, it can be concluded that the two COVID-19 vaccines of the sixth group Vaxzevria and BioNTech have the largest number of registrations and licenses for medical use in the world (each in 137 countries).

At the next stage of the study, the results of the content analysis of COVID-19 vaccines on the quantitative indicators of manufacturers and licenses for registration

for medical use are systematized and summarized. Based on the received data statistical processing of results of research by construction of discrete variational series and polygons of distribution of the received data is carried out. Discrete variation range of the COVID-19 vaccines shown in table. 5.

Table 5. Discrete variation series of vaccines against COVID-19 *(source: own development).*

Group No.	Group range	Frequency, f_i
1	0-22	23
2	23-45	2
3	46-68	2
4	69-91	3
5	92-114	1
6	115-137	2

The discrete variation series of vaccines against COVID-19 is an ordered division of units of the studied population into groups (based on the results of grouping using the Sturgess formula) by a certain variable (number of vaccines against COVID-19 produced by pharmaceutical companies and the number of approved, authorized, licensed issued authorizations for use in emergencies or granted for use outside clinical trials in any way by a regulatory authority, national authority or other organization). The obtained discrete variation in the distribution of vaccines against COVID-19 indicates that the studied quantitative indicator of vaccines approved in the world varies within the first group (range from zero to 22) with the highest frequency (f_i=23). Graphically discrete variation series of the studied vaccines are presented in Fig. 2 in the form of a distribution polygon.

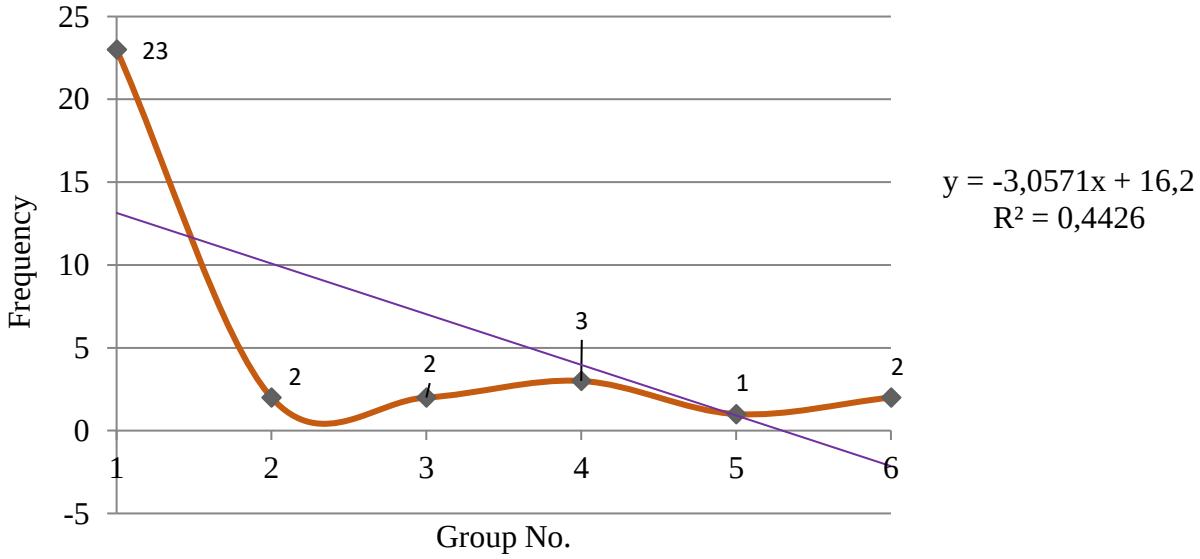

Fig. 2. Range of distribution of the studied vaccines against COVID-19 of any type according to the number of countries in which they are approved *(source: own development).*

The data of Fig. 2 shows, however, that we have six groups of COVID-19 vaccines of any type. Vaccine availability is divided from the group No. 1 with a frequency of 23 (highest vaccine count) to the group No. 6 with a frequency of 2 (highest rate of countries where two vaccines allowed for medical use – 137).

Conclusions. An innovative multidisciplinary study of the availability of vaccines of any type for personalized vaccination of patients, taking into account their individual characteristics in the world was conducted. It was substantiated that in the context of the coronavirus pandemic, multidisciplinary health research combines interdisciplinary links between scientists from around the world in medicine, pharmacy, law, economics, good medical practice, pharmaceutical supply, and vaccination availability for all patients of covid, longcovid and postcovid health disorders. The experience of counteracting the pandemic in the field of health care in the United States, France, Israel, China, and other countries has been studied. The multidisciplinary comprehensive study was based on the regulatory framework of health care, including regulatory norms of medical and pharmaceutical legislation, principles of evidence-based medicine, evidence-based pharmacy, forensic pharmacy, clinical pharmacy, pharmacy, marketing, management for different patient groups. On the basis of the received data statistical processing of results of research by construction of discrete variational series and polygons of distribution of the received data is carried out. The obtained discrete variation range of COVID-19 vaccines of any type indicates that the studied quantitative indicator of vaccines approved in the world varies within the first group (range from zero to 22) with the highest frequency (f_i=23). Vaccine availability ranges from the group No. 1 with a frequency of 23 (highest and most available) to the group No. 6 with a frequency of 2 (two vaccines are approved for medical use in 137 countries each). The results show satisfactory availability of vaccines against COVID-19 of any type. The health of the countries of the world gives doctors the opportunity to decide on the choice of vaccination based on the individual characteristics of patients.

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