



Analysis of the domestic market of compressor and ultrasonic nebulizers

T. S. Brytanova *^{A,B,D,F}, A. V. Samko ^{C,E}

Zaporizhzhia State Medical University, Ukraine

A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation; D – writing the article; E – critical revision of the article; F – final approval of the article

The aim of the work is to organize informational files about compressors and ultrasonic nebulizers determination of actuality and availability in marketing analysis of the domestic market.

Materials and methods. Data from the Apteka.UA and the official website of Tabletki.ua were used to analyze the brand and assortment structure of ultrasonic and compressor nebulizers. The search analytical, systematic, comparative, and statistical methods and methods of mathematical and logical analysis were used in the work.

Results. The analysis of the market of assortment and brand structures of the compressor and ultrasonic nebulizers was carried out. The obtained results showed the presence on the market of 16 manufacturers from 10 countries in the world of compressor nebulizers and 9 manufacturers from 7 countries in the world of ultrasonic nebulizers. Among them, the largest suppliers were identified, such as Omron Healthcare (Japan) and LLC Medhouse Swiss GmbH (Ukraine). The calculated stress coefficient indicated greater competition between compressor manufacturers ($K_{vi} = 0.94$) compared to ultrasonic ($K_{vi} = 0.88$) nebulizers. The level of monopolization was determined using the Herfindahl–Hirschman index. The results indicated a moderately concentrated market for both types of nebulizers. Analysis of socio-economic affordability by indicators of price liquidity ratio and solvency adequacy noted low availability of this group of goods for consumers of pharmacies.

Conclusions. The results of the company structure research indicated the vast majority of manufacturers of foreign companies and a wide range of both ultrasonic and compressor nebulizers. In the course of the work, the available commodity positions in pharmacies in Ukraine were investigated. According to the calculations of the coefficient of tension and the level of monopolization. It was possible to determine the competitiveness among manufacturing firms. The results of the assessment of the liquidity ratio and the adequacy of solvency made it possible to assess the purchasing power of the population in this group of goods.

Key words: pharmaceutical preparations, marketing, ultrasonic nebulizers, compressor nebulizers, analysis, pricing.

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Аналіз вітчизняного ринку компресорних та ультразвукових небулайзерів

Т. С. Британова, А. В. Самко

Мета роботи – формування інформаційного масиву про компресорні й ультразвукові небулайзери, визначення актуальності їхньої доступності на підставі маркетингового аналізу вітчизняного ринку.

Матеріали та методи. Для здійснення аналізу фірмової та асортиментної структури компресорних та ультразвукових небулайзерів використали дані «Щотижневика АПТЕКА» та офіційного сайту Tabletki.ua. Застосували системно-аналітичний, математико-статистичний і порівняльний методи аналізу.

Результати. Здійснили аналіз ринку асортиментної та фірмової структур компресорних та ультразвукових небулайзерів. У результаті встановили наявність на ринку 16 фірм-виробників компресорних небулайзерів із 10 країн світу, а також 9 фірм-виробників ультразвукових небулайзерів із 7 країн світу. Визначили найбільших постачальників: Omron Healthcare (Японія) і ТОВ «Медхаус Свіс ГМБХ» (Україна).

Розрахований коефіцієнт напруженості вказав на більшу конкуренцію між виробниками компресорних небулайзерів ($K_{vi} = 0,94$) порівняно з ультразвуковими ($K_{vi} = 0,88$). Рівень монополізації встановили, використавши індекс Херфіндаля–Хіршмана. Результати свідчать про помірноконцентрований ринок для обох типів небулайзерів. Аналіз соціально-економічної доступності за показниками коефіцієнта ліквідності цін та адекватності платоспроможності показали низьку доступність цієї групи товарів для споживачів аптечних закладів.

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*E-mail: goculyats@gmail.com

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Висновки. Результати досліджень фірмової структури показали переважання виробників іноземних компаній на ринку і чималий асортимент і ультразвукових, і компресорних небулайзерів. Під час роботи дослідили доступні товарні позиції в аптечних закладах України. У результаті розрахунків коефіцієнта напруженості та рівня монополізації вдалося визначити конкурентоспроможність серед фірм-виробників. Визначення коефіцієнта ліквідності та адекватності платоспроможності дали змогу оцінити купівельну спроможність населення в цій групі товарів.

Ключові слова: фармацевтичний ринок, ультразвукові небулайзери, компресорні небулайзери, аналіз, цінова кон'юнктура.

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A nebulizer is an aerosol-generating device that contains fine particles. Today nebulizer therapy is based on modern technology, which is successfully used around the world and increases the effectiveness of treatment of many diseases [1–3]. Nebulizer therapy is gaining increasing recognition among both physicians and patients. Nebulizer inhalation is one of the most reliable, simple, and effective treatments. Previously, this therapy was possible only in the hospital. Now the nebulizer can be purchased at any pharmacy. The nebulizer is needed by a family where children often suffer from SARS, bronchitis, especially with bronchoobstructive syndrome, as well as children with chronic respiratory diseases (bronchial asthma, cystic fibrosis).

There are several types of nebulizers. Compressor and ultrasonic are considered to be the most common in Ukraine. Although ultrasonic nebulizers are more compact and silent, a number of drugs (hormones, antibiotics, etc.) are destroyed by the ultrasound, which reduces the effectiveness of treatment. Another disadvantage of these inhalers is their high cost.

Compressor nebulizers, in turn, are recognized as the “gold standard” of inhalation treatment due to their reliability, ease of disinfection, and the breadth of drugs used. They are designed for any inhalation solutions, do not affect hormonal drugs and medications that are afraid of high temperatures. Apparently, the only drawback of the compressor nebulizer is the noisy operation. Although in modern devices, such as Japanese nebulizers the noise level is only 45 dB, which allows you to do inhalation even during sleep [4,5].

All standard inhalation solutions manufactured by pharmaceutical companies in a ready-to-use form can be used in compressor nebulizers. However, the use of ultrasonic nebulizers is gaining pace today.

Aim

The aim of the work is to organize informational files about compressors and ultrasonic nebulizers determination of actuality and availability in marketing analysis of the domestic market.

Materials and methods

Data from the Apteka.UA and the official website of Tabletki.ua were used to analyze the brand and assortment structure of compressor nebulizers.

The search analytical, systematic, comparative, and statistical methods and methods of mathematical and logical analysis were used in the work [6,7].

Results

The first stage of the work was to study the geography of manufacturers of ultrasonic and compressor nebulizers supplied to pharmacies in Ukraine. It was established that the retail market of compressor nebulizers was represented by 16 companies from 10 countries (Table 1).

The market for ultrasonic nebulizers was characterized by a small number of companies, namely 9 companies from 7 countries (Table 2). The analysis of the number of nebulizers supplied to the pharmaceutical market of Ukraine showed that the number of product items, both compressor, and ultrasonic nebulizers, was formed at the expense of Ukrainian manufacturers.

Market conditions require maintaining a high level of competitiveness – one of the main components of the company’s success in domestic and international markets.

To determine the level of competition between manufacturers of compressor and ultrasonic nebulizers calculated the stress factor K_{vi} according to the formula

$$K_{vi} = \frac{n-1}{n} \quad (1)$$

where n – number of all competing counterparts of firms [8,9].

The results of the obtained indicator of competitiveness of compressor ($K_{vi} = 0.94$) and ultrasonic nebulizers ($K_{vi} = 0.88$) indicated significant competition between manufacturers of this category of goods.

Among the indicators that characterize the level of market monopolization the most widespread was the Herfindahl–Hirschman Index (HHI), which was defined as the sum of squares of shares of all enterprises operating in the market:

$$HHI = \sum_{i=1}^N S_i^2 \quad (2)$$

Our calculations showed that the Herfindahl–Hirschman index among the manufacturers of compressor nebulizers on the Ukrainian market was $HHI = 1048.80$. Analysis of the level of monopolization among the manufacturers of ultrasonic nebulizers presented on the Ukrainian market it was $HHI = 1481.19$.

Since the calculated values are within $1000 < HHI \leq 1800$, the level of monopolization among the manufacturers of both types of nebulizers was moderately concentrated [10].

Next, the share of the regional pharmaceutical market segment occupied by each of the manufacturers of compressor and ultrasonic nebulizers was calculated.

The calculation was performed according to the formula:

Table 1. Data on pharmaceutical companies that provide compressor nebulizers to the pharmaceutical market of Ukraine

#	Manufacturer	Country	Number of product items	Ratio to total, %	Market segment share (dij)
1.	LLC Medhouse Swiss GmbH	Ukraine	13	20.00	0.5000
2.	LLC Dopomoga-I		1	1.54	0.0153
3.	LLC Yuri-Pharm		3	4.62	0.0462
4.	LLC Dolphi-Ukraine		1	1.54	0.0153
5.	Dongguan Aidisy Machinery & Electronic Equipment Co. Ltd	China	6	9.23	0.0923
6.	MEDHIT		1	1.54	0.0153
7.	Heaco Medical Technology	Great Britain	1	1.54	0.0153
8.	Longevita		3	4.62	0.0462
9.	Microlife	Switzerland	2	3.08	0.0307
10.	B.Well Swiss AG		4	6.16	0.0615
11.	Beurer GmbH	Germany	3	4.62	0.0462
12.	A&D Company Limited	India	3	4.62	0.0462
13.	Rossmax International Ltd	Taiwan	5	7.70	0.0769
14.	Little Doctor International Pte. Ltd	Singapore	7	10.77	0.1076
15.	Norditalia Group S.r.l.	Italy	2	3.08	0.0307
16.	Omron Healthcare	Japan	10	15.38	0.1538
			65	100	

Table 2. Data on pharmaceutical companies that provide ultrasonic nebulizers to the pharmaceutical market of Ukraine

#	Manufacturer	Country	Number of product items	Ratio to total, %	Market segment share (dij)
1.	LLC Medhouse Swiss GmbH	Ukraine	2	22.22	0.250
2.	VAPO Healthcare Co. Ltd	China	1	11.11	0.125
3.	Heaco Medical Technology	Great Britain	1	11.11	0.125
4.	Beurer GmbH	Germany	1	11.11	0.125
5.	Little Doctor International Pte. Ltd	Singapore	1	11.11	0.125
7.	Omron Healthcare	Japan	1	11.11	0.250
8.	A&D Company. Limited		1	11.11	0.125
9.	Oromed	Poland	1	11.11	0.125
			9	100	

Table 3. Results of analysis of indicators of socio-economic availability of compressor nebulizers of a retail pharmacy chain Ukrainian

#	The name of the medical device	Manufacturer	Retail price, max, UAH	Retail price, min, UAH	K/lq	Average retail price, UAH	Ca.s.
1.	Gamma Effect Max	LLC Medhouse Swiss GmbH	1364.00	782.90	0.74	1073.45	0.074
2.	Gamma Effect New		1987.65	898.00	1.21	1443.83	0.099
3.	Gamma Nemo		1610.70	1185.30	0.36	1398.00	0.096
4.	Dr. Frei turbo mini		3085.00	1105.90	1.79	3314.95	0.227
5.	Dr. Frei turbo train		2126.30	1652.90	0.23	1889.60	0.129
6.	Dr. Frei turbo Car		2994.20	1150.00	1.60	2072.10	0.142
7.	Dr. Frei turbo base		1836.70	878.00	1.09	1357.35	0.093
8.	Dr. Frei turbo pro		2945.30	1449.90	1.03	2197.60	0.151

Cont. of Table 3.

#	The name of the medical device	Manufacturer	Retail price, max, UAH	Retail price, min, UAH	Kliq	Average retail price, UAH	Ca.s.
9.	Dr. Frei turbo flow	LLC Medhouse Swiss GmbH	-	-	-	-	-
10.	ProMedica Briz		2328.55	907.79	1.57	1618.17	0.111
11.	Vega VN-420 Aero		1752.70	909.90	0.93	1331.30	0.091
12.	Vega Family CN-01W		1462.10	1005.90	0.45	1234.00	0.085
13.	Vega CN-02 WX Samy		1615.30	849.00	0.90	1232.15	0.085
14.	Vega VN-420 Aero		1752.70	909.90	0.93	1331.30	0.091
15.	Ulaizer Home CN-02MY	LLC Yuri-Pharm	1858.00	629.16	1.95	1243.58	0.085
16.	Ulaizer Air+		2351.00	973.70	1.41	1662.35	0.114
17.	Ulaizer first aid CN-02MQ		1354.45	600.99	1.25	977.72	0.067
18.	Medicare	LLC Dopomoga-I	947.16	929.92	0.02	938.54	0.064
19.	Microlife NEB 200	Microlife	2005.00	1123.00	0.79	1564.00	0.107
20.	Microlife NEB 400		1626.10	1288.90	0.26	1457.50	0.099
21.	B.Well PRO-115	B.Well Swiss AG	1722.00	1106.00	0.56	1414.00	0.097
22.	B.Well PRO-110		1368.00	999.00	0.37	1183.50	0.081
23.	B.Well MED-121		1499.00	-	0	1499.00	0.103
24.	B.Well MED-120		1699.80	1618.90	0.05	1659.35	0.114
25.	AND CN-233	A&D Company Limited	2071.00	1250.50	0.66	1660.76	0.114
26.	AND CN-234		2554.00	1762.00	0.45	2158.00	0.148
27.	AND CN-231		2438.00	2098.00	0.16	2268.00	0.156
28.	Beurer IH 21	Beurer GmbH	1799.00	1503.85	0.20	1651.43	0.113
29.	Beurer IH 26		2680.00	1799.00	0.49	2239.50	0.154
30.	Beurer IH 58		2580.00	2298.00	0.12	2439.00	0.167
31.	Heaco WNE211	Heaco Medical Technology	993.40	899.00	0.11	946.20	0.065
32.	Little Doctor LD-221C	Little Doctor International Pte. Ltd	1365.00	850.00	0.61	1107.50	0.076
33.	Little Doctor LD-212C		1739.60	1225.13	0.35	1482.37	0.102
34.	Little Doctor LD-211C		1980.80	1290.00	0.54	1635.40	0.112
35.	Little Doctor LD-212C		1158.95	1112.00	0.04	1135.48	0.078
36.	Little Doctor LD-211C		1980.80	1322.00	0.50	1651.40	0.113
37.	Little Doctor LD-210C		2394.90	1819.00	0.32	2106.95	0.145
38.	Little Doctor LD-220C		1031.00	-	0	1031.00	0.071
39.	Longevita CNB69012 Blue	Longevita	1202.00	597.20	1.01	899.60	0.062
40.	Longevita Classic CNB69008		1119.80	788.80	0.42	954.30	0.065
41.	Longevita CNB69012 Pink		1201.40	900.00	0.33	1050.70	0.072
42.	MEDHIT Master	MEDHIT	1471.00	786.90	0.87	1128.95	0.078
43.	Nord Italia Arianne Power	Norditalia Group S.r.l.	1600.30	779.60	1.05	1189.95	0.082
44.	Norditalia Drop		1401.90	716.10	0.95	1059.00	0.073
45.	Omron C101 ESSENTIAL (NE-C101-E)	Omron Healthcare	1306.50	1000.00	0.31	1153.25	0.079
46.	Omron C102 Total (NE-C102-E) 2-B-1		2520.70	1854.90	0.36	2187.80	0.150
47.	Omron NE-C803		1834.30	1314.00	0.40	1574.15	0.108
48.	Omron NE-C801		2783.30	750.00	2.71	1766.65	0.121
49.	Omron CompAir NE-C24 Kids		2990.00	797.00	2.75	1893.50	0.129
50.	Omron NE-C28P		3568.75	1397.40	1.55	2483.08	0.170

Cont. of Table 3.

#	The name of the medical device	Manufacturer	Retail price, max, UAH	Retail price, min, UAH	Kliq	Average retail price, UAH	Ca.s.
51.	Omron A3 Complete NE-C300-E	Omron Healthcare	3459.35	2183.40	0.58	2821.38	0.194
52.	Omron DuoBaby NE-C301-E		2425.85	2105.00	0.15	2265.43	0.155
53.	Omron Nami Cat		2268.50	1820.40	0.23	2044.45	0.140
54.	Omron CompAir Eco Kids NE-C302-E		-	-	-	-	-
55.	Paramed Compact Plus	Dongguan Aidisy Machinery & Electronic Equipment Co. Ltd.	1216.60	542.49	1.24	879.55	0.060
56.	Paramed Air Plus		1465.04	830.00	0.77	1147.52	0.079
57.	Paramed Assistant		1436.80	781.70	0.84	1109.25	0.076
58.	Paramed Puppy		2016.00	861.90	1.34	1438.95	0.099
59.	Paramed Compact		1043.00	650.00	0.60	846.50	0.058
60.	Paramed Air Pro		1440.00	981.00	0.47	1210.50	0.083
61.	Rossmax NE100	Rossmax International Ltd.	1698.40	1020.00	0.67	1359.20	0.093
62.	Rossmax NA100		2152.20	1172.91	0.83	1662.56	0.114
63.	Rossmax NB500		2544.40	1827.00	0.39	2185.70	0.150
64.	Rossmax NF60 Dog Kids		2435.80	1327.48	0.83	1881.64	0.129
65.	Rossmax NB100		1317.75	-	-	1317.75	0.090

Table 4. The results of the analysis of socio-economic indicators of ultrasonic nebulizers of retail pharmacy networks of Ukraine

#	The name of the medical device	Manufacturer	Retail price, max, UAH	Retail price, min, UAH	Kliq	Average retail price, UAH	Ca.s.
1.	AND UN-233	A&D Company. Limited	4479.25	2864.60	0.56	3671.93	0.25
2.	Omron MicroAir U-100	Omron Healthcare	7517.10	5238.75	0.43	6377.93	0.44
3.	Omron MicroAir NE-U22 Compact		-	-	-	-	0
4.	Heaco NE-M01	Heaco Medical Technology	1299.00	1087.30	0.19	2386.30	0.16
5.	Little Doctor LD-207U	LD Little Doctor International Pte.	2884.80	2189.00	0.32	2536.90	0.17
6.	Beurer IH 40	Beurer GmbH	2910.00	2391.08	0.22	2650.54	0.18
7.	Oromed ORO-Mesh	Oromed	2175.60	-	-	2175.60	0.15
8.	ProMedica Air Pro Mesh	LLC Medhouse Swiss GmbH	2021.80	1218.85	0.66	1620.33	0.11
9.	Vega VN-300		1930.70	1381.06	0.40	1655.53	0.11
10.	Breather AirOx VP-M3	VAPO Healthcare Co. Ltd	3270.85	1749.99	0.87	2510.42	0.17

$$d_{ij} = \frac{n_{ij}}{\sum n_{ij}} \quad (3),$$

where n_{ij} – the number of nebulizers of the j -th company in the i -segment;

$\sum n_{ij}$ – total number of nebulizers of the i -th segment registered in Ukraine S_i – market share of the company;

n – the number of all companies;

$i = 1 \dots n$; n is the number of market participants [8,9].

According to the results which was shown in Table 1. It was seen that the largest share in the segment of compressor nebulizers falls on LLC Medhouse Swiss GmbH ($d_{ij} = 0.5000$). In second place was Omron Healthcare ($d_{ij} = 0.1538$). Third place went to Little Doctor International Pte. Ltd ($d_{ij} = 0.1076$). Among the manufacturers of ultrasonic nebu-

lizers (Table 2). LLC Medhouse Swiss GmbH ($d_{ij} = 0.250$) and Omron Healthcare ($d_{ij} = 0.250$) had the largest share.

Subsequently, some socio-economic indicators that characterize the availability of medical devices for consumers were studied. Thus, for the analysis of the price situation and to determine the availability of nebulizers of both types, the liquidity ratio ($Kliq$) and the solvency ratio of the population ($Ca.s$) were calculated.

The liquidity ratio $Kliq$ was shown the ratio between the maximum and minimum price of a particular product in a given period of time in a particular pharmaceutical market, calculated by the formula: The liquidity ratio was calculated by the formula:

$$K_{liq} = \frac{P_{max} - P_{min}}{P_{min}} \quad (4),$$

where K_{liq} – price liquidity ratio;

P_{max} – maximum price;

P_{min} – minimum price.

Data from the site Tabletki.ua as of February 2022 were used for analysis [11].

The obtained results showed that compressor nebulizers had a liquidity ratio >0.15 , which confirmed a fairly large range between their minimum and maximum price. However, the exceptions were the following items: B.Well MED-120 (Switzerland), Beurer IH 58 (Germany), Little Doctor LD-212C (Singapore), Medicare (Ukraine) and Omron DuoBaby NE-C301-E (Japan) (Table 3). Among the ultrasonic nebulizers available to consumers in retail pharmacy chains $K_{liq} > 0.15$ (Table 4). This indicates a lack of influence of regulators on the pricing of medical devices and was unethical for patients in terms of social responsibility of pharmaceutical market players.

The coefficient of adequacy of the solvency of the population characterizes the dynamics of the ratio between the price of goods and the solvency of the population. calculated by the formula:

$$K_{a.s.} = \frac{P}{W_{a.w.}} \times 100 \% \quad (5),$$

where $K_{a.s.}$ – solvency adequacy ratio;

P – the average price of the drug for a certain period of time (February 2022);

$W_{a.w.}$ – average salary for a certain period (according to the State Statistics Service of Ukraine).

As of January 2022 the average salary was UAH 14577 [11].

It was believed that the lower the value of the coefficient of availability, the more accessible to the population was the product. The results showed that the values of the solvency adequacy ratio for compressor nebulizers range from 0.058 (Paramed Compact, China) to 0.194 (Omron A3 Complete NE-C300-E, Japan) (Table 3). For ultrasonic nebulizers, the calculated figure showed low affordability for consumers and was in the range of 0.11 to 0.25 (Table 4).

Discussion

The results of the company structure research indicated the vast majority of manufacturers of foreign companies and a wide range of both ultrasonic and compressor nebulizers. In the course of the work, the available commodity positions in pharmacies in Ukraine were investigated. According to the calculations of the coefficient of tension and the level of monopolization. It was possible to determine the competitiveness among manufacturing firms. The results of the assessment of the liquidity ratio and the adequacy of solvency made it possible to assess the purchasing power of the population in this group of goods.

Conclusions

1. The brand and assortment structure of compressor and ultrasonic nebulizers, the vast majority of which were of foreign origin were analyzed.

2. It was established that the largest supplier of compressor and ultrasonic nebulizers to the Ukrainian market was LLC Medhouse Swiss GmbH (Ukraine).

3. The calculated market monopolization index showed that the market of compressor ($HII = 1048.80$) and ultrasonic nebulizers ($HII = 1481.19$) was moderately concentrated.

4. The determined level of competition of compressor nebulizers ($K_{vi} = 0.94$) was higher in comparison with ultrasonic nebulizers ($K_{vi} = 0.88$) which indicates greater competition between manufacturers of compressor nebulizers.

5. The analysis of determining the socio-economic accessibility of nebulizers by liquidity ratio (K_{liq}) and solvency adequacy ratio ($K_{a.s.}$), was showed low availability of this group of goods for consumers of pharmacy chains.

Conflicts of interest: authors have no conflict of interest to declare.

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Information about authors:

Brytanova T. S., PhD, Teaching Assistant of the Department of Organic and Bioorganic Chemistry, Zaporizhzhia State Medical University, Ukraine.

ORCID ID: [0000-0003-1805-4552](https://orcid.org/0000-0003-1805-4552)

Samko A. V., PhD, Senior Lecturer of the Department of Management and Pharmacy Economics, Medical and Pharmaceutical Law, Zaporizhzhia State Medical University, Ukraine.

ORCID ID: [0000-0002-3182-5588](https://orcid.org/0000-0002-3182-5588)

Відомості про авторів:

Британова Т. С., канд. фарм. наук, асистент каф. органічної та біоорганічної хімії, Запорізький державний медичний університет, Україна.

Самко А. В., канд. фарм. наук, старший викладач каф. управління та економіки фармації, Запорізький державний медичний університет, Україна.

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