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**COMPETITION LEVELS OF ANTIDEPRESSANTS, ANXIOLYTICS AND
ANTIPSYCHOTICS SEGMENTS IN THE MARKET OF THE REPUBLIC OF
UZBEKISTAN USING THE HERFINDAHL-HIRSCHMAN INDEX**

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ABSTRACT

Foreign experience shows that with the increase in the level of competition and the departure from the monopoly in the pharmaceutical sector, the key role is played by the regulators in this area, such as the FDA - the US Food and Drug Administration and EMA - the European Medicines Agency. These regulators, developing various simplified, accelerated registration schemes for generics and reducing information asymmetry (open data of conducted clinical trials by stages and results) indirectly help to reduce "entry barriers" to the market and thereby further increase the availability of certain drugs as price and quality. Accurate and reliable marketing data analysis of the market value in dynamics is the starting point for the development and production of antidepressants, anxiolytics and antipsychotics for the manufacturer, as well as a valuable product for the wholesale and retail segment with its efficient distribution and logistics system.

Methods. We studied and analyzed the data on the import and production of antidepressants, anxiolytics and antipsychotics in packages according to the manufacturer's company to determine the dynamics of changes in the competition level in the studied market segments using the Herfindahl-Hirschman index (HHI) in the period from 2006 to 2018.

Results. On the basis of retrospective data analysis, it was established that the anxiolytic market in the Republic of Uzbekistan is characterized by oligopoly competition, and monopolistic competition prevails for antidepressants and antipsychotics.

Conclusion. The results of the study can be used to further justification of the marketing decisions on the part of both pharmaceutical manufacturers and distributors as well.

Keywords: antidepressants, anxiolytics, antipsychotics, Herfindahl-Hirschman Index, competition level, oligopoly competition.

抽象的

国外经验表明，随着竞争程度的提高和制药行业摆脱垄断，这一领域的监管机构发挥着关键作用，如FDA——美国食品药品监督管理局和EMA——欧洲药品管理局。这些监管机构制定了各种简化、加速的仿制药注册方案，减少信息不对称（按阶段和结果公开临床试验数据）间接有助于降低市场“进入壁垒”，从而进一步提高某些药物的价格供应。动态市场价值的准确可靠的营销数据分析是制造商开发和生产抗抑郁药、抗焦虑药和抗精神病药的起点，也是批发和零售细分市场的有价值的产品，其高效的分销和物流系统。

方法。我们根据制造商的公司研究和分析包装中抗抑郁药、抗焦虑药和抗精神病药的进口和生产数据，使用赫芬达尔-赫希曼指数（HHI）确定研究细分市场中竞争水平变化的动态。

2006年至2018年期间。

结果。在回顾性数据分析的基础上，确定乌兹别克斯坦共和国的抗焦虑药市场以寡头竞争为特征，抗抑郁药和抗精神病药的垄断竞争普遍存在。

结论。研究结果也可用于进一步证明制药商和分销商双方的营销决策的合理性。

关键词：抗抑郁药、抗焦虑药、抗精神病药、赫芬达尔-赫希曼指数、竞争水平、寡头垄断竞争。

INTRODUCTION

Competition level in the market is one of the main factors, which determines the effectiveness of economic entities, prices balancing for the goods and services, the process of providing goods in adequate volumes, as well as improvement of the quality characteristics of products, and development of new modifications.

According to the canons of the economic model of market behavior, monopoly in very rare cases contributes to the qualitative growth of the above factors, which is also characteristic for oligopoly as well. One of the effective tools of quality

growth in market conditions is the creation or promotion of competition.

In a pharmaceutical environment, the increase in the competitors' number in a single pharmacotherapeutic group also leads to a qualitative improvement in the market segment and an increase in the proposed various modifications of drugs, up to the formation of so-called "sub-categories" of medications for distinctive types or characteristics of the course of the same disease. So, according to data of some foreign authors, it was established that, in monopolistic and oligopolistic conditions, to the end of time in the pharmaceutical market, both

original medicines and generics are subjected to the cost increase. But in conditions of quadrapoly (when there are four or more market players), the above phenomenon had an inversely proportional impact on the market segment. We may suggest that the generally accepted rules of the market, as well as the "laws" of economics are also applied in the pharmaceutical industry. Determination of the concentration (competition) level in such domestic market segments as antidepressants, anxiolytics and antipsychotics is one of the indicators of the studied market state used in psychiatric practice. This is due to the fact that the above-mentioned drugs are poorly studied in the Republic of Uzbekistan from the marketing point of view. Determination of the competition level of these groups of drugs provides a certain idea of market opportunities for further growth or improvement of the situation in these markets, both for the public and private sectors.

METHODS

One of the tools for determining the competition level is the proven methodology of the Herfindahl - Hirschman index (Formula 1). The Herfindahl - Hirschman index is actively applied in the American antitrust system when concluding mergers and acquisitions as well as monitoring certain market segments for the presence of a monopoly or oligopoly [4]. This index is defined as the sum of the squares of the sales shares of each firm in the industry, where expressed (in percentage) sales shares of firms in the industry, are defined as the ratio of the firm's sales to the total sales of the industry.

The Herfindahl-Hirschman Index (HHI) is calculated as the sum of the squares of the market shares of all significant (with a share of more than 1%) market participants.

$$HHI = S_1^2 + S_2^2 + \dots + S_n^2 \quad \mathbf{H} = \sum_{i=1}^N s_i^2$$

An index value less than 500 corresponds to a free competition. The index value from 500 to 1500 can indicate a monopolistic competition. The HHI index from 1500 to 3000 indicates an oligopoly competition. And index over 3000 to 10,000 indicates a monopoly [5].

As the source data on the import and production of drugs and medical devices (MD) in the territory of the Republic of Uzbekistan, the summary data of "Drug Audit" were used.

RESULTS AND DISCUSSION

Using the HHI index, the indicators of the competition level were identified for the three studied market segments. The results of antidepressants analysis revealed fluctuations in the concentration level indicators from 2008 to 2012. Further, for the period from 2009 to 2010 the studied market remained in a state of relatively high oligopoly competition, followed by a sharp decline to the level of monopolistic competition (2011). The situation in the segment began to stabilize in 2013 in favor of oligopoly competition at the level lower than the previously studied time periods (Fig. 1).

A slight decline towards monopolistic competition was observed in 2015 (HHI 1412). Since 2016 the concentration level began to rise again and reached the HHI indicator 1606, followed by oligopoly in 2017. In 2018 the studied market segment was characterized by monopolistic competition.

Commenting on the situation from 2008-2012, we can speak of "conscious" or "unconscious" saturation of market entities with large volumes of so-called similar goods (perhaps this happened due to lack of accurate information on the volumes of competitors for that period), that in

our case is the antidepressant by the international non-proprietary name (INN) Amitriptyline (Fig. 1). As a result, due to market oversaturation with single “type” of product, the competitive situation turned sharply from a high oligopoly (2010) into monopolistic competition (2011). For the above-mentioned periods the segment saturation was due to the activity of experimental plant GNCLS (Ukraine, 2008-2009, 22% and 37% of the market share in volumes, respectively), and further “ZENTIVA” (Czech Republic, 2010, 36%). In addition, we can speak of monopsony as a possible reason for the above-mentioned fluctuating periods, when a monopolist is the buyer himself (the state acted as a possible buyer).

In general, the antidepressants market in the Republic of Uzbekistan can be characterized as subjected to the monopolistic competition, as the products are differentiated by market segments, product brands are protected by patents, registered trademarks, and this, in fact, is manifested by competition between brands from manufacturers.

Another factor contributing to this dynamics, which also results in maintaining the market segment in monopolistic competition, rather than the transition to free competition, is the presence of certain conditions such as:

- the difference in the “real” therapeutic efficacy (due to different active ingredients, dosages, administration ways, dosage forms, etc.);
- the absence or low, declining level of historical conservatism (which was observed over the years in cases with Amitriptyline (INN)) to a specific active ingredient (AI), which would make it possible to “universalize” or “standardize” and reduce everything to one AI (during the analysis a decrease in the total share ratio of Amitriptyline was revealed in relation to other antidepressants

with a different AI from 79% in 2006 to 41% by 2018);

- the absence or low, direct, regulatory intervention of the state into the processes at the market (the studied antidepressants are not included in the “list 3” of psychotropic substances, the distribution of which in the Republic of Uzbekistan is strictly limited, and dispensing from pharmacies is carried out on a prescription). [6]

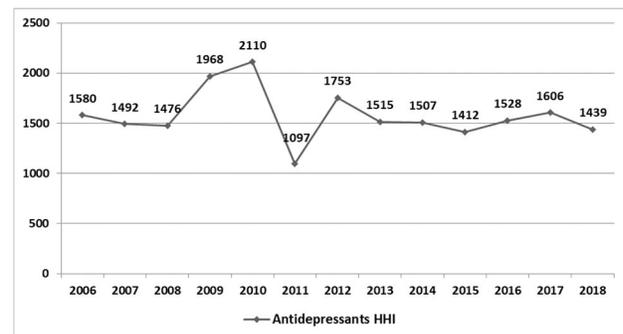


Fig. 1. Concentration levels on the antidepressant market according to the Herfindahl-Hirschman index

Figure 2 shows the main pharmaceutical manufacturers of antidepressants, the market share of which in packages exceeds 10% (figures are presented in percentages based on the number of packages for a single company in relation to the total number of packages in the studied market).

The analysis of the internal structure of antidepressants assortment by manufacturers, whose market share in the segment exceeds 10%, revealed both stable and variable manufacturers of the pharmaceutical market. For the whole studied period starting from 2006 to 2012, the major three stakeholders, whose market share in the aggregate reached 60 - 70%, had the portfolio of companies mainly consisting of antidepressant - Amitriptyline (exception is the local manufacturer FE “Nobel Pharmsanoat” LLC

(Uzbekistan), whose brand portfolio consisted of Fluoxetine).

Beginning with 2013 (Fig. 2) the pharmaceutical manufacturer GNCLS(Ukraine) for the entire studied period showed itself as losing its dominant market positions in terms of volume. So if this manufacturer in 2009 occupied 37% of the antidepressants segment, then by 2017 this indicator was already 13% (only 5% by the end of 2018).

A similar situation occurred with the representative of the foreign manufacturer "DAROU PAKHSH" Pharmaceutical Mfg Co. (Iran). If this manufacturer occupied 32%, then by 2018 this indicator was zero.

The Latvian manufacturer "GRINDEX" became the contender for leadership in the segment and in the operational occupation of the market share (Fig. 2). During the analysis, it was revealed that this manufacturer began to occupy more than 10% of the market share since 2013 (18%), at the same time having achieved significant stable volumes by 2017-2018. (32% and 26% respectively).

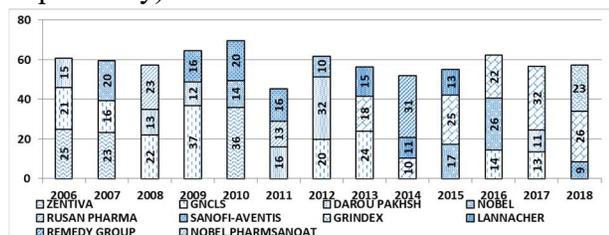


Fig. 2. Market shares of major pharmaceutical manufacturers of antidepressants

At the next stage we performed the analysis of the anxiolytics segment. Of three studied segments, the anxiolytic one showed a slightly different, more distinct dynamics of "following" to the market rules and competition level (Fig. 3). So from 2006 to 2010, the anxiolytics segment was on highly oligopolistic level of competition,

keeping the HHI index 2500-3000. We revealed a one-time transition to the monopoly level, but for less high indicators of this value (HHI 3068) in 2011 for the entire studied period. Further, indicators of this segment of the market had already begun to decline, from high oligopoly since 2012 (HHI 2167), sharply and systematically maintaining decreasing trend until 2018 (HHI 1804).

In general, market entities with a dominant position might be tried to return to their normal positions and market sharing between the players, as can be noted in 2013 (HHI 2491) and 2016 (HHI 2244). The market tried to get back into a multi-year "corridor" of concentration, but the balance was broken and the studied market segment moved to lower values of the oligopoly. The market segment of anxiolytics is subjected to oligopoly for several reasons:

- state regulation of the anxiolytics distribution in the territory of the Republic of Uzbekistan;
- additional licensing of pharmaceutical activities related to the distribution of narcotic drugs, psychotropic substances and precursors;
- treatment standards, as well as a certain conservatism in prescribing in medical practice;
- addictive effect after taking this kind of drugs;
- state monopoly on the purchase of psychotropic drugs, which affects pricing, etc. [6].

All above factors will form so-called "entry barrier" to the market segment and, as a consequence, overcooling in the development of the market segment. Naturally, there is a separate issue for discussing the problems associated with the drugs abuse, which requires special attention. Actually, this is a dilemma of the pharmaceutical market.

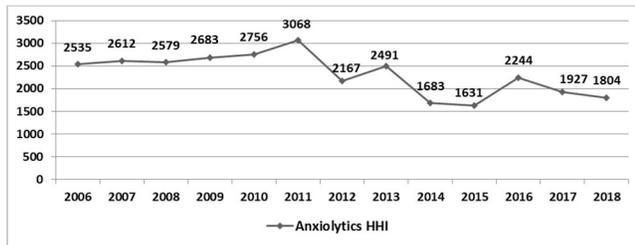


Fig. 3. Concentration levels in the segment of anxiolytics according to the Herfindahl-Hirschman index

The general picture of oligopolization of the anxiolytic segment shows that there are quite a few pharmaceutical companies engaged in the supply and production in this segment, when compared with the same segments as antidepressants and antipsychotics with greater number of suppliers. Thus, this segment in more than 80% of share was controlled mainly by four stakeholders until 2014 (in some periods, this indicator reached 90% of the market share in 2008 - 2009 and 2011-2012). And the period from 2014 to 2018 was characterized by a gradual decline.

Figure 4 shows the major pharmaceutical manufacturers of anxiolytics, market share of which in packages exceeds 10% (figures are presented in percentages based on the number of packages for a single company in relation to the total number of packages in the studied market). Generally, in the anxiolytics segment we may point permanent leaders according to the market shares (Fig. 4). These are foreign pharmaceutical companies "EGIS" (Hungary) and "OLAINFARM" (Latvia).

The manufacturers which left the dominant positions were "SOLVAY PHARMA" (2006 - 36%, 2007 - 44%, 2008 - 37%); "HOFFMANN-LA ROCHE" (2006 - 15%); "RUSAN PHARMA" (2007 - 17%, 2012 - 28%).

The manufacturers with significantly decreased market share were: "MOSCOW ENDOCRINE"

(2008 - 27%, 2009 - 40%, 2010 - 46%, 2011 - 29%, 2014 - 15%, 2015 - 12%, 2016 - 12%); "HEALTH TO THE PEOPLE" (2009 - 21%, 2012 - 26%, 2013 - 16%, 2014 - 15%, 2015 - 21%, 2016 - 24%, 2017 - 22%).

Besides, a production ramp-up of the manufacturer "PHARMSTANDARD" (Russia) in the segment was noted with the drug "Aphobazolum tab. 10mg No. 60" (according to INN - Fabomotizole, 2018 - 15%).

The analysis of the internal products portfolio of drugs from the studied segment by leaders revealed rather interesting picture. So, the pharmaceutical company "OLAINFARM", having a history of "specialization" in the segment since 2007, increased the volume of supplies for Mebicar (INN) containing anxiolytic (Adaptol tab. 300mg and 500mg No. 20). Of the 14.6% share of the market segment occupied by this manufacturer (2007), 38% of the assortment imported by them in volumes was related to Adaptol. Further, this picture systematically changed towards increasing in the share of Adaptol and by 2018 it made 93% of the product portfolio in the segment (at that time, 31.4% of the market share of anxiolytics in the Republic of Uzbekistan belonged to "OLAINFARM").

A similar situation occurred with the other manufacturer "EGIS" (Hungary).

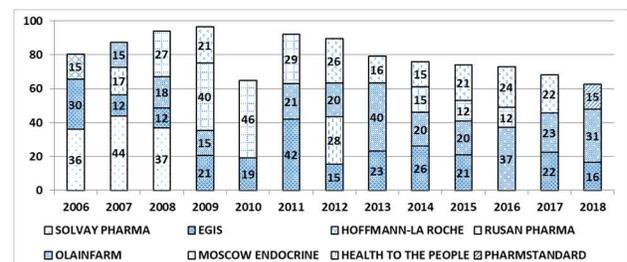


Fig. 4. Main pharmaceutical manufacturers of anxiolytics

For the entire period of study, "EGIS" exclusively presented products range by "Grandaxin tab. 50mg No. 20" (INN Tofisopamum). It should be noted that the anxiolytic drugs "Aphobazolum", "Adaptol" and "Grandaxin" are not included in the so-called "List 3" on the territory of the Republic of Uzbekistan [6], which can be considered as a decrease in the above-mentioned "entry barrier" in the segment of anxiolytics.

Manufacturers "HEALTH TO THE PEOPLE" (Ukraine) and "MOSCOW ENDOCRINE" (Russia) mainly specialized in the supply of anxiolytic drugs Sibazon tab. 0.005g No. 10 and Sibazon solution 0.5% 2ml No. 10 (INN Diazepamum).

At the final stage of our research, we analyzed the indicators of the antipsychotics segment. During the analysis of the competition level in the antipsychotics segment, it was revealed that this group of drugs is characterized by monopolistic competition. Since over the entire 13-year analysis period the market segment has stably kept the concentration range of HHI 1000-1500, which corresponds to monopolistic competition. 2018 became an exception, when the antipsychotics segment exceeded the above range and turned into an oligopoly. We can suggest, that this phenomenon is temporary and possibly in 2019-2020 the situation with competition will return to its original historical value (Fig. 5).

There are no preconditions for transition to oligopoly and/or monopoly for the antipsychotics segment. At least it can be explained by that this group of drugs is not as strictly regulated by the state as is typical for anxiolytics. Considering the absence of factors restraining the further growth of competition in the antipsychotics segment, this group of drugs

has all potential to rise to the competition level typical for the pharmaceutical sector, called "monopolistic competition".

As this type of competition is characterized by the following market indicators:

- relatively small number of manufacturers (10-25);
- leaders have 10-15% of the market share, other participants - 3-5%;
- goods are differentiated by the market segments;
- product brands are protected by patents, registered trademarks;
- market entry barriers are high;
- information is distributed unevenly;
- market stakeholders have exclusive information sources, up to their own services of information transmission channels.

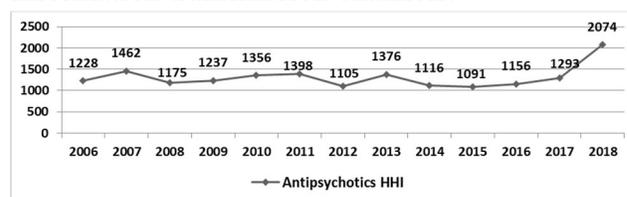


Fig. 5. Concentration levels in the market for antipsychotics according to Herfindahl-Hirschman

In general, "monopolistic competition", speaking shortly, is the competition between trademarks and brands [5].

The internal analysis of the leaders of the antipsychotics segment revealed stable and retired leaders of the studied market. Relatively stable positions were occupied by companies "TEKHNOLÓG" (Ukraine), "VALENTA PHARM" (Russia) and partially "PROMED" (Czech Republic). Among those companies who lost their dominant positions were "DARNITSA" (Ukraine), "HEALTH TO THE PEOPLE", "ARTERIUM" (Ukraine), "GEDEON

RICHTER" (Hungary) and "RUSAN PHARMA" (India).

The pharmaceutical manufacturer "TECHNOLOG" in the brand portfolio of antipsychotics presented a specialization in the supply of exclusively (INN) clozapinum-containing drug Azaleptol tab. 0.1g and 0.025g No. 50. (9% of the market share in the segment for 2018).

The situation with "VALENTA PHARM" was similar with the previous manufacturer, with the exception of the following points:

- forming its product portfolio policy mostly on the antipsychotic drug Chlorpromazinum (INN) (Aminazine pills 0.1g, 25mg, 50mg No. 10);
- for 2018 Aminazine pills 0.1g and 50mg No. 10 saved its positions, having 41% of the share of the total antipsychotics market in volumes.

The company "PROMED" beginning with 2013 in its product portfolio presented drug Prosulpin tab. 50mg 200mg №30 (INN Sulpiridum) and had 17.8% of the market share for that period. Further, that trend continued until 2018 without significant changes with the same brand portfolio of antipsychotics (Fig. 6).

According to the market segment of antipsychotics in the Republic of Uzbekistan, for the entire analyzed period the following drugs entered the domestic pharmaceutical market under INN: Aripiprazole, Chlorpromazinum, Clozapinum, Droperidol, Fluphenazine, Haloperidol, Levomepromazinum, Olanzapine, Paliperidonum, Prochlorperazinum, Periciazinum, Quetiapine, Risperidone, Sertindolum, Sulpirid, Thioridazinum, Tiapridum, Trifluoperazinum, Zuclopenthixolum.

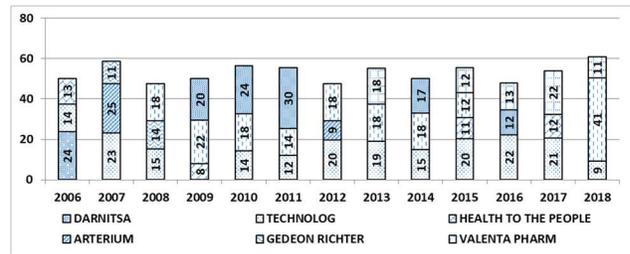


Fig. 6. Major pharmaceutical manufacturers of antipsychotics, the market share of which in packages exceeds 10% (figures are indicated in percentage based on the number of packages for a particular company in relation to the total number of packages in the studied market)

CONCLUSION

The study showed that from the analyzed three market segments, each one has its own pharmaceutical manufacturers-"specialists" who hold its dominant positions for a rather long time. The results of the analysis also signified the role and influence of the state as an important regulator of the competition level, which subsequently impacts on pricing, distribution and predetermining factors for further development of a particular market in the long term, identified on the example of three groups.

The study determined that the antidepressants and antipsychotics segments are characterized by monopolistic competition, and the anxiolytics segment is characterized as oligopoly.

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CONFLICT OF INTEREST

No conflict of interest was declared by the authors.

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