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ANALYSIS OF CHANGES OF INDICATORS OF SOCIL AND ECONOMIC AVAILABILITY OF DRUGS, WHICH ARE USED IN PATHOGENETIC AND SYMPTOMATIC TREATMENT OF PEPTIC ULCER

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Abstract

Treatment of peptic ulcer, from social and economic point of view, is a high cost process, which requires significant resources. Use of efficient drugs, which peptic ulcer patients have taken for a long time, needs a substantial research of changes of their price characteristics that determine availability of providing assistance for these groups of chronic patients.

Aim: to conduct analysis of indicators of social and economic availability of drugs, which are used in pathogenic and symptomatic treatment of peptic ulcer in Ukraine.

Materials and methods. We have used data taken from national unified clinic protocol for providing assistance to peptic ulcer and duodenum patients in adults, information retrieval system "PharmXplorer"/"Pharmstandard" of the company "Proxima Research" and instructions on using drugs in peptic ulcer therapy. We have applied mathematical and statistical, organizational and economic, marketing methods of analysis, as well as a complex of general theoretical methods of research (historical, logical, comparative, graphical, hypothetical-deductive, etc).

Results of the research. It has been determined that during 2017-2020 a tendency towards the increase of drugs availability has been dominating, which have been used for peptic ulcer treatment. Data taken according to the drugs from group A02BX have been an exclusion. Other drugs for treatment of peptic ulcer and gastroesophageal reflux disease (0.87) and A02BX13-Alginic acid (0.93). During 2012-2020, a group of foreign drugs has been characterized by more intensive changes of indicators of availability for patients, as compared to national drugs. Thus, in 2016 D indicator amounted to 1.16, and according to the data in 2020 – 0.86 (the decrease amounted to 25.86%). By the group of national drugs, D indicator in 2016 was equal to 1.15, and in 2020 – 1.07 (-6.96%). Maximum number of D indicators by the group of foreign drugs amounted to 1.07 (2016), and national – 1.24 (2017). The lowest D indicators have been typical for 2014 by the range of foreign drugs (0.68) and in 2015 – for national drugs (0.84).

Conclusions.

Efficiency of equal availability of the population of Ukraine to drugs out of different pharmacotherapeutic groups, including antiulcer drugs, requires from our government implementation of the whole complex of mechanisms and approaches as to the regulation of drugs consumption according to the financial status of patients in the society and medical social importance of treatment of pathologies.

Key words: peptic ulcer, availability of drugs, pathogenic treatment of peptic ulcer, symptomatic treatment of peptic ulcer, pharmaceutical market.

Introduction

Among the diseases of gastrointestinal tract, peptic ulcer takes a special place. It is caused by the necessity of using a wide range of long-time drugs, which further on influences on the cost of treatment and prevent the relapse of this disease [1,2]. A significant influence on the increase of the drugs, which have been used for peptic ulcer treatment, has been made by the results of research that demonstrated to the world medical community a connection between the development and progression of gastritis with high acidity, peptic ulcer and stomach cancer with Helicobacter pylori [3,4,5]. Further on, international medical organizations recommended including antimicrobial drugs in the protocols of treatment of gastroenterological patients, which have been confirmed in the national systems of healthcare. By the evaluation of specialists, at the moment treatment of peptic ulcer should be regarded not only taking into account the prism of modern achievements in pharmacology, but taking into account requirements of patients as to the maintenance of high level of quality of their life during treatment, which is provided on an outpatient basis and under the conditions of specialized hospitals [6,7]. The issue of peptic ulcer relapses prevention is still actual as well as the increase of pharmacotherapy efficiency at the early stages of pathology development [8,9]. Despite of a significant success, which is observed in the process of early detection, treatment and prevention of relapses, the problem of increasing the efficiency of providing medical aid to gastroenterological patients remains open [10,11]. Unfortunately, the estimation of treatment of the above-stated groups of patients is still burdensome for many national systems of healthcare Ukraine is not an exception from this list of countries.

The implementation of new approaches to the treatment of peptic ulcer, which have taken place during the last decades, and the increase of requirements of the society to the efficiency of treatment of these patients under the conditions of limited financing in the system of healthcare, caused significant structural upheavals at the pharmaceutical market. The appearance of new drugs and increase of the range of generic drugs stipulates the necessity to deliver monitoring of their social economic availability for customers and target funds and programs financed by the government [12,13]. Especially actual in this sphere are the researches under the conditions of introducing new mechanisms of reimbursement the cost of drugs, which are used for treatment of chronic patients [14]. Thus, in Ukraine they plan to implement a mechanism of partial compensation of the cost of drugs, which are used by the patients with gastroenterological pathologies within the frames of the government program «Available drugs». This has stipulated the delivery of our researches.

The goal of the research was to conduct the analysis of indicators, which characterize social economic availability of drugs, which are used in pathogenic and symptomatic treatment of peptic ulcer patients.

Materials and methods

Peptic ulcer is a polyetiological disease [15,16]. Therefore, organization of efficient treatment of this disease requires a complex use of the whole range of drugs, which are represented in different pharmacotherapeutical groups (antisecretory, antacid and enveloping, gastroprotective, antihelicobacterial drugs and combined drugs). At the previous stage of research, the issue was raised as to the definition of a group of drugs according to which we would deliver the investigation [17,18]. Thus the key stage of our researches was the selection of antiulcer drugs, which were planned to investigate further on as to changing their social and economic availability for the population. The above-stated selection of drugs was formed by us according to the analysis of international requirements to treatment of peptic ulcer, and data taken from national unified clinical protocol of primary, secondary (specialized) medical aid for patients with peptic ulcer and duodenum in adults, which was confirmed by the decree of the Ministry of Healthcare of Ukraine as of 03.09.2014 № 613 with changes and amendments. Moreover, we have analyzed data of open informational sources, where instructions for using drugs in pathogenic systematic treatment of peptic ulcer were presented.

By ATC–classification system (3rd level) the following drugs were taken from these groups:

- A02-Drugs for acid-dependant diseases;
- A02A-Antacids;
- A02B-Drugs for peptic ulcer and gastroesophageal reflux disease;
- A02X-Other drugs for acid-dependant diseases.

Further on, according to the data of retrieval system "PharmXplorer"/"Pharmstandard" of the company "Proxima Research" and due to the codes of drugs by ATC-classification system, we have formed the total number of drugs by trade names, which have been represented at the pharmaceutical market of Ukraine during 2017-2020. Then we have calculated average retail prices for all trade names of drugs taking into account all forms of their production in the dynamic of years. The required formulas for calculation of indicators, which have been used in the analysis, are shown in Table 1.

Under the term «social and economic availability» (conventional sign of indicator D) we understand the opportunity to satisfy the demand of the population in the whole or some categories of patients to buy drugs to provide therapy In case of average income of the patients in Ukraine and without significant material expenses. All necessary macro-economic indicators, which are used for D calculations, have been obtained from official website of State Committee of Statistics of Ukraine, which are an open source of information. The analysis of dynamics of D indicators has been done with the help of calculation of chain indexes, which have been delivered first for each separate trade name including the form of production (individual index), and then for each drug according to their international non-proprietary names (group indexes) (Table 1). Taking into account a significant influence of financial indicators, first of all, currency exchange rate for USD, on pricing characteristics of drugs, especially by the segment of foreign drugs, we have delivered a research of changes for D indicators by the parameters «national-foreign» during the period 2012 - 2020.

In the investigations, except for mathematical and statistical, organizational and economic, and marketing methods of analysis, general theoretical methods (historical, logical, comparative, graphical, hypothetical-deductive, etc) were used as well. All the necessary statistical data processing was performed by using the modern licensed software (StatSoft. Inc., 2014; STATISTICA version 12.7, May 2015), also standardized tables of variation statistics. A value of $p < 0.05$ was considered statistically significant.

Results and discussion

Results of the research of D indicators are shown in Table 2, and dynamics of their changes during 2017-2020 – in Table 3.

During the analysis of dynamics of changes of D indicators, it is necessary to take into account the following. If D indicator was ≥ 1.0, we could state about relative availability of drugs for an average citizen at the internal pharmaceutical market. If D indicator was ≤ 1.0, we could make a conclusion that drugs from this group, by international non-proprietary names, were not available from social economic point of view for an average citizen at the pharmaceutical market of Ukraine [19]. According to the statement, we have conducted the analysis of changes of D indicators in the dynamics of years.

By the results of the research delivered, one can state that in 2020, as compared to 2017 by the group A02A-Antacids, a general tendency towards the increase of D indicators has been observed. Thus, the highest D indicators have been observed in 2020 in the group of drugs A02AB03-Aluminum phosphate (1.25). In the group of drugs A02B-Drugs for peptic ulcer and gastroesophageal reflux disease, the highest D indicators have been in the drugs A02BC02-Pantoprazole (1.16). In the group A02B-Drugs for peptic ulcer and gastroesophageal reflux disease, the highest D indicators have been observed in the drug A02BC06- Dexlansoprazole (1.25).

In the group A02X – Other drugs connected with acidity disorders, during 2017-2020 we have observed a tendency towards the domination of relatively low availability of drugs. Thus, by the data of 2017 the drugs from this group have been relatively available (1.08), and further on D indicators were ≤1,0. So, one can state that in the whole, in the group of drugs which are used for gastroenterological patients, in 2020 the drugs demonstrated a positive tendency towards the increase of D indicators for average citizens. As we

see from Table 3 in all groups of drugs, except for the drugs from group A02BX-Other drugs for peptic ulcer and gastroesophageal reflux disease, and A02BX13-Alginic acid in 2020, as compared to 2019, we have observed the increase of D indicators. In the drugs from the above-stated groups, the group index of changes D indicators in 2020 was equal to 0.87 and 0.93 correspondingly. One should notice that D indicators for the drugs from the group A02BX03- Pirenzepine have increased twice.

Taking into account a significant import dependence of national pharmaceutical market and social economic role of the development of national production of available drugs for the population under the conditions of limited financing of healthcare, an important stage of our research was the deliver of analysis of changes of group indicators of drugs availability by the parameter «Domestic drugs -Imported drugs» [21,22]. Results of analysis of average group D indicators in the dynamics of years by the range of national and foreign antiulcer drugs are shown in Picture 1.

It is worth mentioning that foreign drugs were characterized by a more intensive decrease of D indicators since 2017. Thus, in 2016 the D indicator was equal to 1.16, and by the data of 2020 it was 0.86. That is, the decrease of D indicators was 25.86%. as compared to foreign drugs, in 2016 D indicator was 1.15, and in 2020 – 1.07, the decrease was 6.96%. One should state that maximum D indicators by foreign range of drugs was 1.07 (2016), and by national – 1.24 (2017). In turn, the lowest D indicators have been observed in 2014 by the range of foreign drugs (0.68), and in 2015 by the range of national drugs (0.84). So, one can prove that national and foreign drugs had different D indicators during 2011-2020, and they also differed by the character of their changes in the dynamics of years at the internal pharmaceutical market.

So, one can state that the efficiency of government regulation of the indicators of drugs availability should meet not only the humanistic dominants of the development of society, but also take into account actual trends of medicine and pharmacy development. First of all, we should develop and introduce not only the programs for support socially important pathologies, for example, cardiovascular, bronchial asthma, diabetes, oncological pathologies [14,22]. For the last years, pathologies, which require significant financial aid are becoming more and more important, especially taking into account the necessity of chronic patients to take drugs during a long period of time. In the perspective, taking into account modern tendencies of transition from hospital to outpatient assistance, the issue of providing efficient medical aid and pharmaceutical provision of chronic acid-dependent patients under the supervision of pharmacist is becoming more and more important. In turn, a complicated character of changes of indicators, which characterize social and economic availability of antiulcer drugs, causes the necessity to introduce government target programs and events, which are focused on the financial and economic support of patients with acid-dependent pathologies, including peptic ulcer, as soon as possible.

Conclusions

1. By the results of the research of dynamics of changes of D indicators by the drugs, which are used for treatment of acid-dependent pathologies (group A02 by the classification system ATC) in 2020, a tendency towards the increase of drugs availability has been observed. The data by the drugs from group A02BX-Other drugs for peptic ulcer and gastroesophageal reflux disease (0.87) and A02BX13-Alginic acids were an exception (0.93).
2. By comparing the results of analysis of D indicators during 2011-2020 by the group of foreign and national drugs, one can state that foreign drugs are characterized by more intensive changes of data. Thus, in 2016 the D indicator was equal to 1.16, and by the data of 2020 – 0.86 (the decrease was 25.86%). By the group of national drugs, the D indicator in was 1.15, and in 2020 – 1.07 (the decrease was 6.96%).
3. It was proved that maximum D indicators by the group of foreign drugs was equal to 1.07 (2016), and national – 1.24 (2017). The lowest D indicators have been in 2014 by the range of foreign drugs (0.68), and in 2015 – for national drugs (0.84).
4. By summarizing the results of the researches, one can state that the efficiency of the equal availability of the population of Ukraine to drugs from different pharmacotherapeutic groups, including antiulcer drugs, requires from the

government the implementation of the whole complex of mechanisms and approaches to the regulation of the consumption of drugs according to the financial status of patients in the society and medical social importance of pathologies treatment.

The conflict of interests.

There is no conflict of interest.

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Table 1.

Order of calculation for indicator of availability (D) **and individual and group indexes of their changes in the dynamic of years**

Indicator of analysis and objects of analysis	Formula of calculation	Order of calculation for indicators, which have been used in the analysis
Average retail price (for trade names of drugs including forms of their production)	$P_i = \frac{\sum p_i \times f_i}{\sum f_i}$,	p_i – retail price of 1st antiulcer drug (trade names including certain form of production); f_i – frequency of using this drug by this price during certain period of time (2017-2020) [18].
Availability (for trade names of drugs including forms of production and drugs by international non-proprietary names)	$D = \frac{Ix \times Z\min}{Is \times Vk}$,	*Ix* – index of changing average salary during certain period of time in Ukraine (2017-2020); *IS* – consolidated index of prices for drugs, which are included in the National list of main drugs (MD), which is valid at the time of calculation; *Zmin* – indicator of minimum salary in the country during a certain period of time in Ukraine (2017-2020); *Vk* – cost of consumer basket in the period which is investigated, that is during 2017-2020 [19]
Chain index of prices (I_p) changes D (for trade names of drugs including forms of production)	$I_p = \frac{\overline{P_i}}{\overline{P_{io}}}$,	$\overline{P_i}$ – indicator of availability of 1st drug in the current period; $\overline{P_{io}}$ – indicator of drug availability in the previous period [19].
Chain group index (I_g) changes D (for trade names of drugs including forms of production and drugs by international non-proprietary names)	$I_g = \frac{1}{n}\sum_{i=1}^{n} Ip$	I_p – chain index of change of drugs availability; n – number of antiulcer drugs, which is investigated by the appropriate group, first of all, by international non-proprietary names [19]

Table 2

Analysis of dynamics of changes of D indicators by the group of drugs, which have been used for treatment of gastroenterological pathologies (group A02-drugs for acid-dependent diseases) for 2017-2020

Drug by INPN	D			
	2017	2018	2019	2020
A02-Drugs for acid-dependent diseases **A02A-Antacids**				
A02AB03-Aluminum phosphate	0,99	0,85	0,65	1,25
A02AB10-Combinations	0,82	1,08	0,79	1,02
A02AD01-Ordinary salt combinations	1,02	1,02	0,73	0,94
A02AD02-Magaldrat	0,81	1,07	0,97	1,07
A02AF-Antacids with antiflatulents	1,07	0,87	-	-
A02AF02-Ordinary salt combinations with antiflatulents	0,97	0,95	0,84	1,00
A02AX-Antacids, other combinations	1,06	1,00	0,79	0,99
A02B-Drugs for peptic ulcer and gastroesophageal reflux disease				
A02BA02-Ranitidine	0,98	0,98	0,88	0,89
A02BA03-Famotidine	1,03	0,94	0,78	1,05
A02BB01-Misoprostol	1,05	1,06	0,88	1,05
A02BC-Inhibitors of proton pump	0,95	1,04	0,78	0,91
A02BC01- Omeprazole	1,10	1,05	0,81	0,79
A02BC02-Pantoprazole	1,18	0,98	0,73	1,16
A02BC03-Lansoprazole	1,01	0,97	0,97	0,97
A02BC04-Rabeprazole	1,06	1,07	0,78	1,05
A02BC05-Ezomeprazole	1,04	1,11	0,79	1,06
A02BC06- Dexlansoprazole	-	-	-	1,25
A02BD- Combinations for eradication	0,92	1,075	0,88	0,99
A02BX-Other drugs for peptic ulcer and gastroesophageal reflux disease	0,97	0,97	0,92	0,79
A02BX02-Sucralfate	1,03	0,95	0,55	1,04
A02BX03-Pirenzepine	1,05	0,92	0,53	1,24
A02BX05 – Bismuth subcitrate, combinations	1,03	0,96	0,68	1,08
A02BX13 – Alginic acid	0,99	0,94	0,83	0,77
A02X-Other drugs for acid-dependent diseases				
A02X– Other drugs for diseases connected with acidity disorders	1,08	0,99	0,82	0,96

Table 3
Dynamics of changes of D data for drug from group A02-drugs for acid-dependent diseases

Drug by IAPN	D change index (chain)		
	2018/2017	2019/2018	2020/2019
A02-Drugs for acid-dependent diseases **A02A-Antacids**			
A02AB03- Aluminum phosphate	0,86	0,77	1,91
A02AB10-Combinations	1,32	0,73	1,24
A02AD01- Ordinary salt combinations	0,99	0,71	1,31
A02AD02- Magaldrat	1,36	0,91	1,14
A02AF- Antacids with antiflatulents	0,81	-	-
A02AF02- Ordinary salt combinations with antiflatulents	0,99	0,90	1,20
A02AX- Antacids, other combinations	0,94	0,79	1,29
A02B- Drugs for peptic ulcer and gastroesophageal reflux disease			
A02BA02-Ranitidine	1,02	0,91	1,10
A02BA03-Famotidine	0,94	0,78	1,79
A02BB01- Misoprostol	1,01	0,83	1,19
A02BC- Inhibitors of proton pump	1,1	0,75	1,16
A02BC01-Omeprazole	0,97	0,77	1,11
A02BC02- Pantoprazole	0,89	0,76	1,68
A02BC03- Lansoprazole	0,97	0,99	1,26
A02BC04-Rabeprazole	1,09	0,91	1,96
A02BC05-Ezomeprazole	1,05	0,77	1,37
A02BC06- Dexlansoprazole	-	-	-
A02BD- Combinations for eradication	1,17	0,81	1,47
A02BX- Other drugs for peptic ulcer and gastroesophageal reflux disease	1,02	0,97	0,87
A02BX02- Sucralfate	0,93	0,57	1,89
A02BX03- Pirenzepine	0,88	0,57	2,38
A02BX05 – Bismuth subcitrate, combinations	0,94	0,72	1,57
A02BX13 – Alginic acid	0,95	0,91	0,93
A02X- Other drugs for acid-dependent diseases			
A02X– Other drugs for diseases connected with acidity disorders	1,00	0,91	1,24

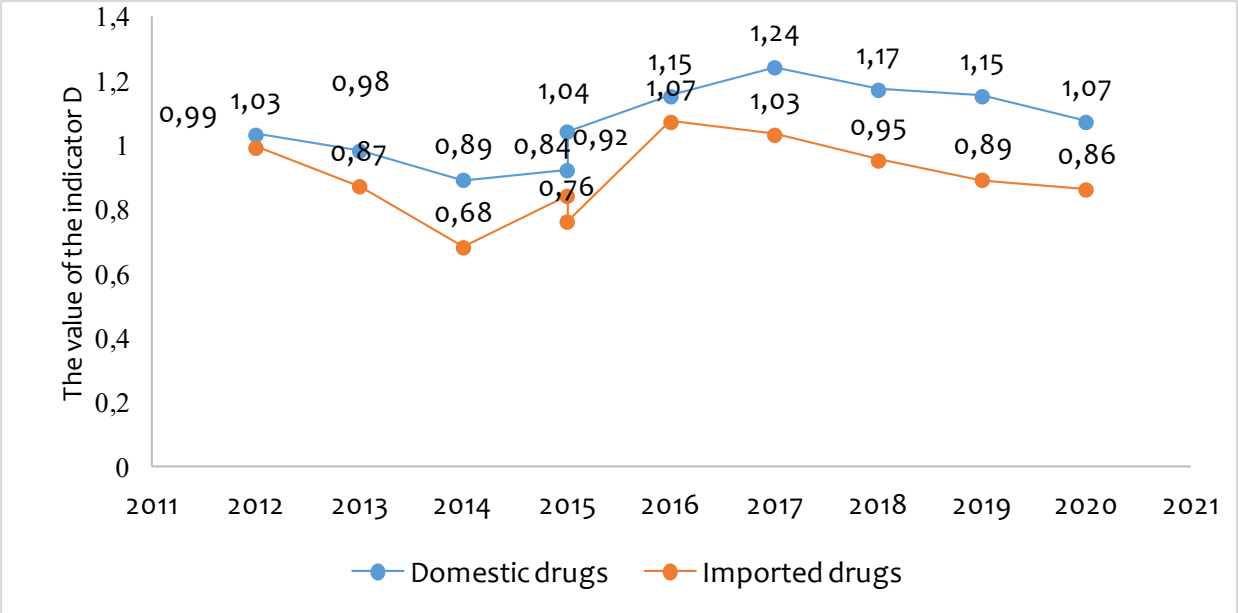

Figure 1. Results of comparative analysis of D indicators by the group of drugs A020-Drugs, which are used for acid-dependent diseases during 2012-2020.