Original Article

Pharmacoepidemiological study of the use of e-pharmacies by the population

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ABSTRACT

The use of e-pharmacies is a positive trend in the last decade, while this online service has its advantages and difficulties. The purpose of the work: is to conduct pharmacoepidemiological research on the usage of e-pharmacies by the population. Assess their advantages and disadvantages for consumers. Sociological survey of the population (n = 3789) using the Google Forms service. Statistical analysis (Spearman's rank correlation coefficient). The main benefits of online pharmacies (convenience, economy) are most significant for women. Men are less likely to use online services and more often note its shortcomings (lack of counseling, lack of information about shelf life, price). The most popular services are "minicen.ru," "newapteka.ru" and "apteka.ru" which are associated with their extensive retail network in the Far Eastern Federal District. When choosing a pharmacy, to receive an online order, the most important criteria are the location and schedule of work (especially for younger respondents). Online service is in demand by the population. The main loyal consumer of this service has been women. Despite the convenience and other advantages, state regulation and supervision, the use of a personal approach, and the preservation of the importance of the pharmaceutical specialist are necessary.

Keywords: E-pharmacy, Order, Respondent, Questionnaire, Correlation

Introduction

The active introduction of digital technologies and the use of online resources occur not only in the medical [1, 2] but also in the pharmaceutical industry of the healthcare sector. Telepharmacy, training [3, 4], advanced training, automated warehouse and order assembly, logistics, pharmaceutical consultation, and other opportunities are widely used by specialists around the world. In addition, new scientific areas are being developed. For example, in Denmark, personalized drug delivery systems are being studied, implying dose, dosage form, the frequency of administration and kinetics of drug release, their integration with medical platforms, interactive treatment, management of the pharmaceutical supply chain, limitations of the current mass production model [5]. In Australia, the main (67!) predictors of the search for health information (age, education, sex, health, financial income, etc.) were evaluated [6]. A meta-analysis conducted in Korea focuses on the usage of social (specialized and general) networks to participate in post-marketing studies of drugs, assessing the correlation of messages in them with regulatory decisions [7].

The purchase of medicines using online technologies has been taking place everywhere over the past 10-15 years. In the context of the spread of the new coronavirus infection, it was remote sales that made it possible to reduce the number of personal contacts, as well as the burden on specialists, reduce the possibility of ethical problems [8]. However, according to a study conducted in Spain, 82.7% of respondents knew that drugs could be ordered online, but only 4.2% used the Internet for previous purchases of drugs [9]. According to a sociological survey in India, 83.2% of participants were aware of the online pharmacy, but 81% of respondents prefer to buy medicines traditionally. The main reasons for buying the medicines online were the

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shortage and the difference in prices. Drugs, cosmetics, and nutritional supplements were most purchased. Most of the respondents preferred to consult with doctors before online purchases [10]. Data from a study, conducted in the United Arab Emirates, showed that 31.2% of respondents purchase drugs from e-pharmacies, especially during a pandemic. Factors correlating with online sales use were: male sex; unmarried; secondary school education [11]. In a similar study in Saudi Arabia, 23.1% of respondents knew about the existence of e-pharmacies, and 2.7% of them bought medicines via the Internet. 42.7% were willing to try using an online pharmacy, with 45.9% unable to tell the difference between legal and illegal e-pharmacies. The most popular products for purchase via the Internet were: medicines and cosmetics, over-the-counter [12]. The results of an interview in Malta showed that only 0.45% of respondents reported buying prescription drugs online, 4.3% purchased over-the-counter drugs, including vitamins, supplements, and herbal combinations. The main reasons for online shopping were a lack of local availability and a lower price. The main reason for the rare acquisition online was called security alertness [13].

The use of online technologies is fraught with several potential and existing problems. The multicenter systematic review (Malaysia-Brunei-Pakistan-Qatar) estimated the purchase of prescription drugs via the Internet - the share of consumers ranged from 2.3% to 13%. The main reasons were: the difficulty of obtaining a prescription for certain drugs, such as opioid analgesics; lower cost; the need to obtain drugs such as opioid analgesics and benzodiazepine for their illegal use. Thus, it was revealed that almost half of e-pharmacies are not fully regulated, and many are illegitimate [14]. In Australia, a review of information published on e-pharmacy websites was conducted. Based on the data obtained, it can be concluded that e-pharmacies operate in at least 13 countries; however, the country of origin cannot be defined for 22 websites. 19% supply prescription-only drugs without prescription. 12% of electronic pharmacies showed high-quality accreditation seals [15].

The United States has conducted an interesting study on the acquisition of prescription drugs outside the country over the past 12 months. The estimated prevalence of drug purchases outside the United States was 1.5%. Correlating factors include age > 64 years; Latin American or immigrant populations; higher education; lower household income; lack of insurance; online health information search behavior or online pharmacy use; low adherence; the delayed filling of the prescription [16]. Another study assessed the illegal acquisition of tramadol. The main reasons were the inability to adjust the dose through legal health care channels, the lack of funds to pay the doctor and fill the prescription, the lack of insurance, and the ability to remain anonymous. These patients had a higher incidence of drug-induced adverse events, including reports about seizures [17]. Another interesting design study in the USA-Canada was devoted to comparing the cost of purchasing drugs in American and Canadian e-pharmacies. Americans could save an average of about 24% per unit of the drug if they buy their drugs from Canadian online pharmacies, according to the findings. 41 of the 44 brand-name drugs investigated were less expensive in Canada. The maximum savings were provided by the purchase of Zyprexa (olanzapine), Actos (pioglitazone), and Nexium (esomeprazole) [18]. The goal of another social media study, already in the US, was to assess the use of Twitter to illegally access prescription drugs. According to the results, 75.7% of tweets with URLs included a hyperlink to an online marketing branch that is directly linked to an illegal online pharmacy advertising the sale of Valium without a prescription [19]. In another study, 117 websites were found in COVID-19 conditions: "30 selling dexamethasone (63% illegal), 39 selling hydroxychloroquine (56% illegal), and 48 selling lopinavir-ritonavir (69% illegal). The analysis included 89 unique online pharmacies: 70% were fraudsters, 22% were unapproved, and 8% were considered legitimate. Prescriptions were not required among 100%, 61%, and 50%. Illegitimate pharmacies were more likely to offer massive discounts, discounts on the price, but dexamethasone and hydroxychloroquine were more expensive online. An inexpensive universal version of lopinavir-ritonavir, which is not allowed for use in the United States, was available online with delivery" [20]. Another common problem with the online purchase of drugs is the risk of purchasing counterfeit, illegal, or unapproved products. Enforcement of laws on the sale of drugs over the Internet is often complicated by the offshore location of legal entities [21].

E-pharmacies are also actively used in the Russian Federation. Scientific research, including comparative research, is being carried out. This is how the data for July-August 2020 from February-March 2021 were compared. The number of respondents fully supporting the legalization of online drug trading has increased. A more loyal attitude to online drug sales was observed in the age group from 18 to 25 years old. The greatest advantage of this form of purchase was called accessibility for disabled people. The importance of pharmaceutical consultation decreased [22].

At the same time, there is a lack of data on research conducted in geographically remote and sparsely populated regions, for example, in the Far Eastern Federal District, which is the largest in the country. Therefore, the purpose of the work is to conduct a pharmacoepidemiological study of the use of e-pharmacies by the population. Assessment of their advantages and disadvantages for consumers.

Materials and Methods

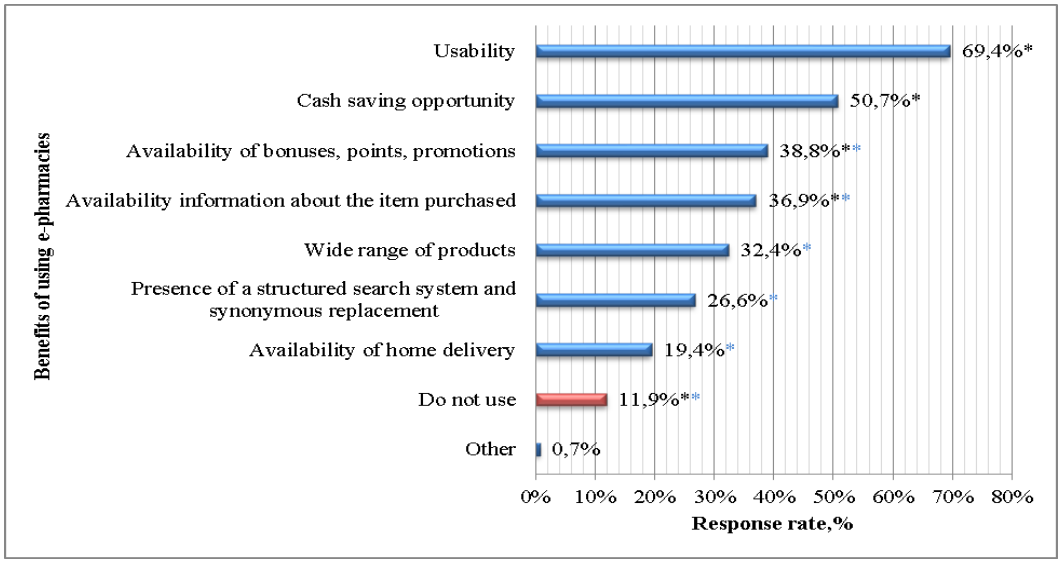
The survey of the population was carried out based on the Far Eastern State Medical University in March-April 2022. To minimize the risks associated with the spread of new coronavirus infections, the survey was conducted online using the Google Forms service (https://docs.google.com/forms/). The sample was 3789 respondents. Sampling error with 95% confidence and 50% trait share was 1.6%. Mathematical data calculation was carried out using Microsoft Excel 365 software package "Data Analysis." The responses received were coded. Statistical analyses were performed using the IBM SPSS Statistic 25

program. Paired correlations of respondents' responses were calculated using Spearman's Rank correlation coefficient. A significant correlation was considered at a two-sided significance of $p < 0.05$. To check the reliability of the questionnaire, the Cronbach Alpha coefficient was used. The value was 0.7, which is sufficient for a sociological study.

The sample was 3789 respondents, of which 72% were women. Age distribution of respondents: 18-25 years old - 61%, 26-35 years old - 14%, 36-50 years old - 18%, over 50 years old - 7%. The majority of respondents (52%) were students or pupils, 40% were working, 4% were unemployed and 3% were pensioners.

Results and Discussion

According to the results of a sociological survey, 81.4% of respondents used Internet pharmacy services. No significant correlation with age or gender was identified. The questionnaires indicated the most significant benefits for them of using e-pharmacies. The distribution of respondents' responses is presented in **Figure 1**. The significance of the identified correlation is presented in **Table 1**.

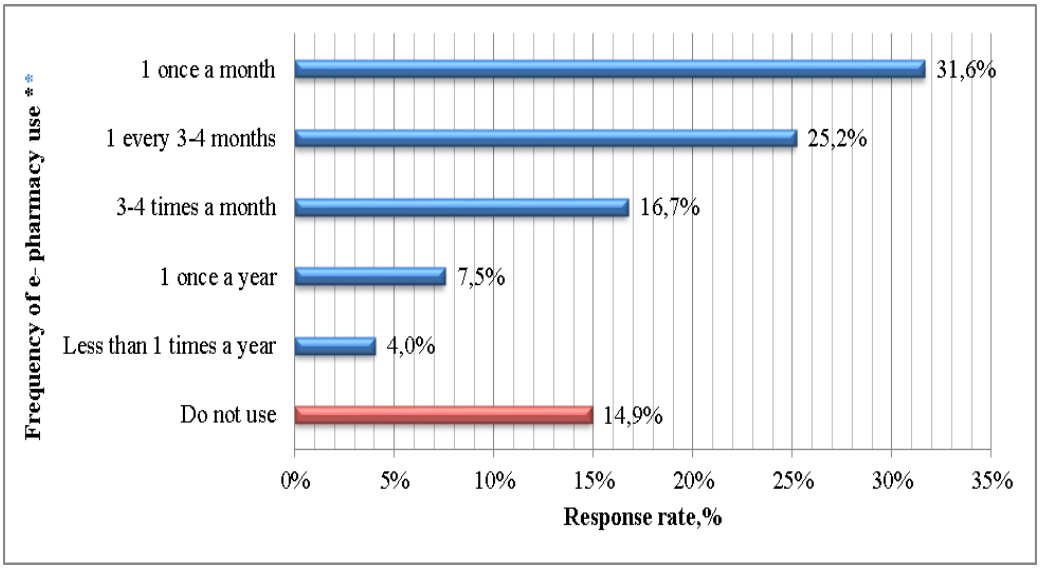


* - p≤0,05 correlation with gender is significant * - p≤0,05 correlation with age is significant

Figure 1. Distribution of responses on the benefits of using e-pharmacies

The most common answers were ease of use, the ability to save cash, the availability of bonuses, promotions, and the availability of information. The advantages of e-pharmacies were most often noted by women and young respondents.

When assessing the frequency of use of e-pharmacies, the most common response was 1 once a month **(Figure 2)**.

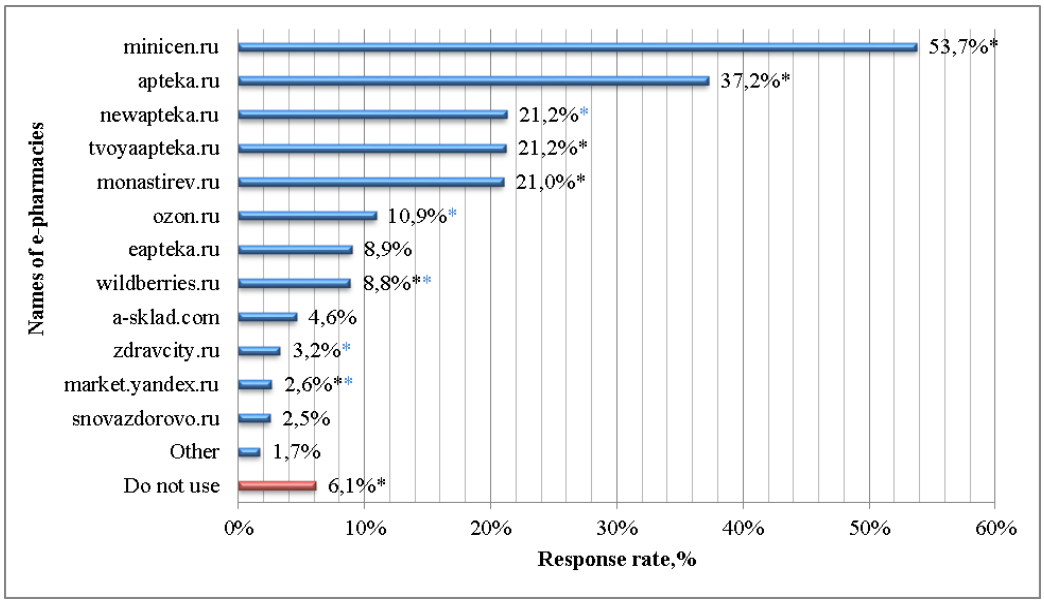


* - p≤0,05 correlation with gender is significant * - p≤0,05 correlation with age is significant

Figure 2. Distribution of responses on the frequency of use of e-pharmacies

This option was chosen by more than 30% of respondents. About a quarter of the respondents chose the 1 option once every 3-4 months. More often, women and respondents of the older age category used Internet pharmacies **(Table 1)**.

Further, the participants indicated the specific names of the Internet pharmacies used **(Figure 3)**.



* - p≤0,05 correlation with gender is significant * - p≤0,05 correlation with age is significant

Figure 3. Distribution of responses on the use of specific names of e-pharmacies

The main contingent participating in this sociological survey were residents of the Far Eastern Federal District, therefore, the most frequent answers, in addition to federal services (for example, apteka.ru), were regional pharmaceutical companies (Minicen, Newapteka, Monastyrev, etc.). More than half of the respondents used minicen.ru. Despite the partial presence of a pharmacy assortment in popular marketplaces (Ozon, Wildberries, etc.), the preferences of the respondents were on the side of specialized services. The correlation with the female sex was in the names: wildberries.ru, monastirev.ru, tvoyaapteka.ru, apteka.ru minicen.ru. Correlation with age was observed in young respondents for the names: market.yandex.ru, wildberries.ru, ozon.ru, newapteka.ru.

The use of specific names of e-pharmacies reflects the distribution of responses regarding the presence of active Internet subscriptions **(Figure 4)**.

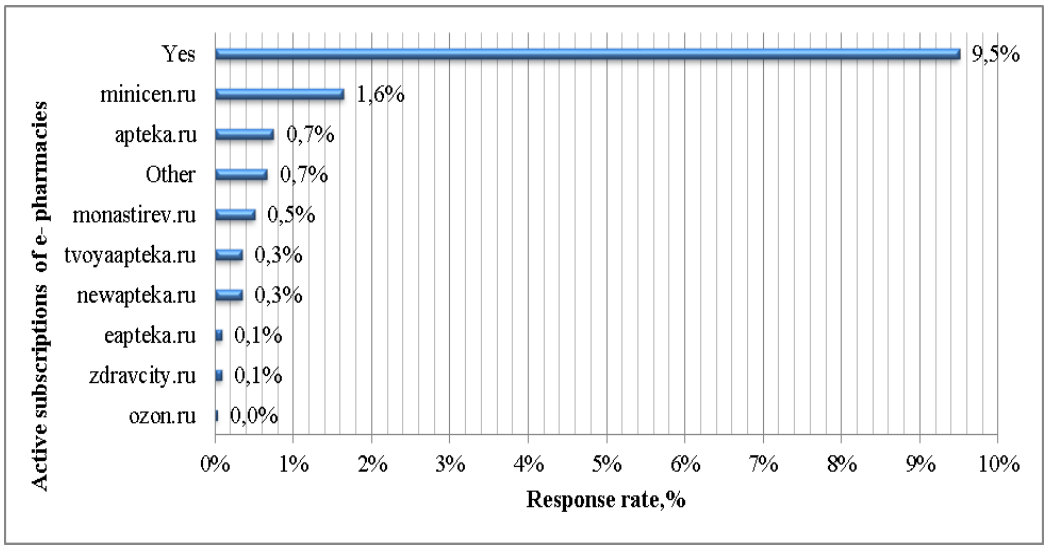
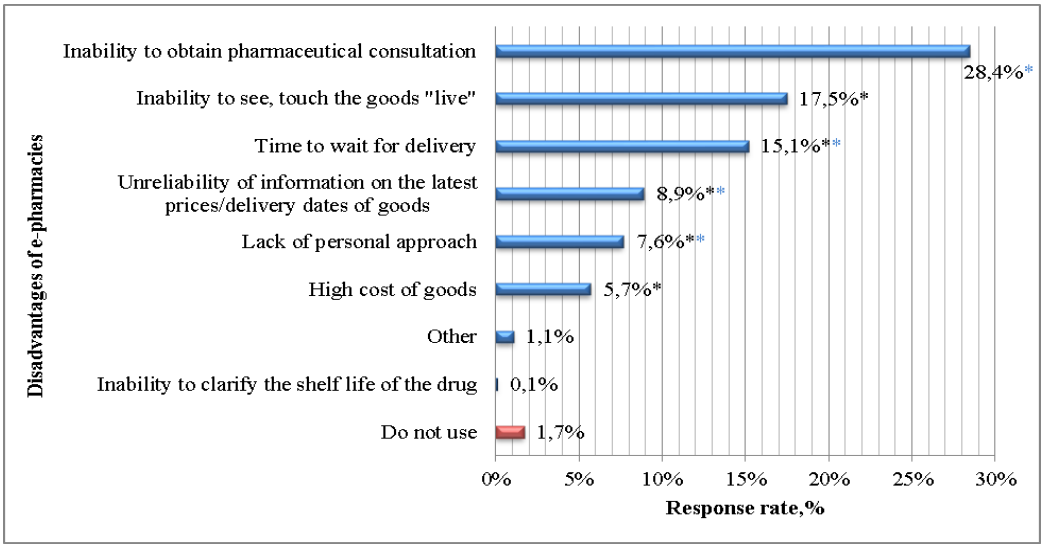


Figure 4. Distribution of responses on the availability of subscriptions to information from e-pharmacies

90.5% of respondents answered that they do not have active subscriptions to news/shares of e-pharmacies, more often by younger respondents. The most common response was to have a subscription to an online pharmacy minicen.ru.

In addition to the advantages, respondents were asked to express their opinion on the existing shortcomings of this format of service provision **(Figure 5)**.

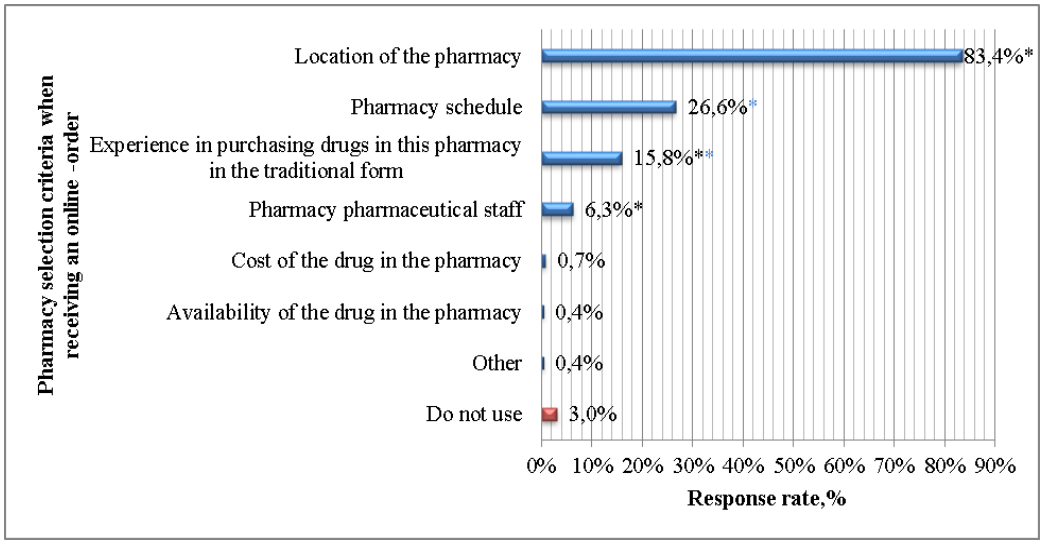


* - p≤0,05 correlation with gender is significant * - p≤0,05 correlation with age is significant

Figure 5. Distribution of answers about the disadvantages of using e-pharmacies

40.1% of respondents did not note the shortcomings of the remote ordering of pharmacy products. The most significant drawback, according to the respondents, is the lack of the possibility of obtaining a full-fledged pharmaceutical consultation. Correlation with age was observed for young patients **(Table 1)**. The inability to see the ordered goods "live" and the high cost were most often noted by men, the duration of waiting for an order, the unreliability of information about the price/expiration date, the lack of a personal approach - young respondents and men.

When ordering prescription drugs online, the order is received directly from the pharmaceutical organization. Therefore, the following questionnaire question was devoted to pharmacy selection criteria **(Figure 6)**.



* - p≤0,05 correlation with gender is significant * - p≤0,05 correlation with age is significant

Figure 6. Distribution of responses about the criteria for choosing a pharmacy for issuing an online order

The most popular reason for choosing a pharmacy organization is its location - more than 80% of respondents. A significant correlation with the female sex was observed **(Table 1)**. Pharmacy schedule is more important for young patients. Prior acquisition experience in the traditional form and trust in the organization's personnel were more often chosen by men.

Table 1. Correlation of responses with gender and age of questionnaires

Parameter	Correlation with respondent gender (Po Spearman`s)	Correlation with respondent age (Po Spearman`s)
Benefits of using e-pharmacies		
Do not use	0,000 (men)	0,002 (young)
Availability of home delivery	0,778	0,000 (young)

Presence of a structured search system and synonymous replacement	0,323	0,000 (young)
Wide range of products	0,176	0,000 (young)
Availability information about the item purchased	0,000 (women)	0,000 (young)
Availability of bonuses, points, promotions	0,000 (women)	0,000 (young)
Cash saving opportunity	0,000 (women)	0,051
Usability	0,001 (women)	0,990
Frequency of e-pharmacy usage	0,000 (women)	0,000 (elderly)
Names of e-pharmacies		
Do not use	0,032 (men)	0,166
market.yandex.ru	0,002 (men)	0,004 (young)
zdravcity.ru	0,184	0,038 (elderly)
wildberries.ru	0,033 (women)	0,000 (young)
ozon.ru	0,988	0,000 (young)
monastirev.ru	0,000 (women)	0,052
tvoyaapteka.ru	0,000 (women)	0,719
newapteka.ru	0,263	0,000 (young)
apteka.ru	0,000 (women)	0,176
minicen.ru	0,002 (women)	0,267
No subscription to e-pharmacy information	0,175	0,000 (young)
Disadvantages of e-pharmacies		
Inability to see the goods "live"	0,005(men)	0,265
Inability to obtain pharmaceutical consultation	0,944	0,000 (young)
Time to wait for delivery	0,001(men)	0,000 (young)
Unreliability of information on the latest prices/delivery dates of goods	0,001 (men)	0,018 (young)
Lack of personal approach	0,000 (men)	0,000 (young)
High cost of goods	0,000 (men)	0,427
The absence of shortcomings in e-pharmacies	0,000 (women)	0,012 (elderly)
Pharmacy selection criteria when receiving an online order		
Pharmacy location	0,000 (women)	0,403
Experience in purchasing drugs in this pharmacy in the traditional form	0,001 (men)	0,000 (young)
Pharmacy pharmaceutical staff	0,000 (men)	0,065
Pharmacy schedule	0,062	0,014 (young)

The data obtained demonstrate the relevance and demand for e-pharmacy services among the population. The distribution of respondents' responses can be explained by the combination of advantages of this retail format: convenience, accessibility, and clarity. The impact of restrictions that were implemented due to the spread of a new coronavirus infection (COVID-19), with the maximum usage of remote sales, remains a significant trend. Even despite the preservation of the traditional format of work of pharmacy organizations.

The distribution of respondents' answers about the benefits of online pharmacies, correlation with female sex, and young age can be explained by the target budget and the desire to save money, due to the limited funds for students, as well as concern for a family cost for women. Ease of the usage of services, allows you to purchase pharmacy products without interruption from your main work/housework/childcare. The availability of an adaptive search system, a wide range of products, and the availability of information is more significant for young patients due to the active usage of gadgets.

The higher frequency of use of e-pharmacies by women and older respondents can also be explained by the concern for family members/children, older relatives/friends/loved ones who, due to various circumstances, cannot independently use resources or visit a pharmacy organization.

The popularity of newapteka.ru services, apteka.ru, minicen.ru can be explained by many pharmacy organizations/points of issue in the Khabarovsk Kray and the prevalence in other regions of the Far Eastern Federal District. The low demand for the marketplaces is probably due to the narrow range of pharmacy goods, and the lack of prescription drugs. The greatest demand for a news subscription among minicen.ru can be explained by the frequent usage of this e-pharmacy by respondents.

A large proportion of respondents, who noted the absence of shortcomings when using e-pharmacies, confirms the demand and the need for this service for the population. The drawbacks indicated in the questionnaires of the lack of information on shelf life can be eliminated by automation and the inclusion of this tab in the product description. Another way to resolve this problem is to automatically inform the expiration date of drugs, when the

order is assembled, especially given the introduction of new drug labeling requirements. The duration of delivery of goods can be reduced by optimizing logistics flows and/or introducing reservation of drugs that are available in local pharmacy organizations, which is already actively used by many pharmacy chains. The lack of pharmaceutical consultation and a personal approach seems to be more relevant for large federal services. One of the options for its solution is the conclusion/expansion/amendment of contracts between legal entities for the provision of the service required by the visitor.

The location of the pharmacy organization, for most of the respondents, is the determining criterion, when choosing the organization for issuing an internet order. Of course, the convenience of location to home/work, and step/transport accessibility are important, as it determines the time costs of patients. Interest in the pharmacy schedule is important for younger respondents due to the availability of an educational and/or work schedule, which is again determined by the availability of time. The significance of the experience and the staff of the pharmacy for men is natural, due to the more frequent use of Internet services by women and, accordingly, the less usage by men, which corresponds to the data obtained in previous questions of the poll.

Conclusion

E-pharmacies are a popular way to purchase pharmaceutical goods among the population. The main loyal consumer of this service has been women. The disadvantages are more significant for men. Despite the convenience and other advantages, full state regulation and supervision, the use of a personal approach, and the preservation of the importance of the pharmaceutical specialist in this process are necessary. One of the possible areas of further research may be to assess the structure of the purchase of pharmacy products through online orders and compare it with the traditional format of purchase of goods.

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