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Pharmacogenetics and its Role Understanding by Future Pharmacists: Gender Specificity

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ABSTRACT

Pharmacogenetics is one of the areas of genetics, the ground of modern personalized medicine and an educational discipline (or its part) for specialists training in different fields of pharmacy. With the aim of awareness studying in the area of pharmacogenetics, the students questioning, specializing in pharmacy, has been carried out for the first time in Ukraine. It has been stated that, more than70% of questioned got the information about pharmacogenetics in University for the first time. However, only more than one-third of respondents (37.7% males and 43.9% females) correctly understand the idea of this discipline. About half of questioned students thought that, pharmacocorrection of hereditary diseases is impossible, while 16.7 % of males and 13.4 % of females did not have a definite opinion as to this question. Thus, the awareness increasing of future pharmacists, as a link between a physician and a patient, about genetic aspects of pharmococorrection is an important problem that requires an immediate reaction.

Keywords: pharmacogenetics, personalized medicine, Ukraine.

INTRODUCTION

Pharmacogenetics is a field of genetics, which studies the peculiarities of body's reaction to medical preparations, depending on genetic characteristics of an organism. It is well known that medical preparations may not have proper effect on 30-60 % of patients according to a number of reasons, including genetic polymorphism of pharmacodynamics and pharmacokinetic human systems. Taking this fact into consideration, in modern medicine it is very important to use individual approaches to treatment, based on genetic testing, and define the treatment regimen on the base of organism genetic characteristics [1, 2]. This approach to treatment is a part of personalized medicine. According to the literature data, just patient genetic peculiarities are determined to 50 % of all atypical pharmacological responses. Recently, the investigations of personalized medicine are especially intensively conducted in former Soviet Union and beyond [4, 7], single studies are known in Ukraine [3]. A pharmacist plays an important role in

pharmacogenetics introduction in to health care practice. He/she is a link between a physician and a patient [5, 6].

The aim of the present work is an analysis of students of National University of Pharmacy (NUPh) awareness as to pharmacogenetics.

MATERIALS AND METHODS

Field investigations have been used in this work. Questioning of NUPh students (Kharkov, Ukraine) have been carried out. The questionnaire consisted of two parts: socio-demographic and basic. In socio-demographic part of questionnaire there was information about sex, age, address, educational level, respondents' profession and presence in his/ her family persons, working in the field of health care system. The basic part of questionnaire consisted of questions, directed on genetic factor role understanding during pharmocorrection. Only some questions of basic part of a questionnaire have been used for current analysis.

The material analysis has been carried out on the base of questioning of 637 NUPh students (1-4 year of studying), specializing in pharmacy. According to specific character of studying, contingent selection has been shifted to female side. Among the questioned students, there were 557 females (87.4%) and 80 males (12.6%). The age of questioned students is from 17 to 23 years old. In different age groups females and males were presented in such way: 17 years old – 7.5% and 11.5%, 18 years old – 31.2% and 25.0%, 19 years old – 28.7% and 25.3%, 20 years old – 18.7% and 27.5%, 21 years old – 10% and 10.2%, 22 years old – 2.5% and 0,5%, 23 years old – 1.2% and 0% respectively. 98.8% of questioned males and 99.5% of females lived in Ukraine (the rest respondents lived in Russia and Kazakhstan or stayed in Ukraine temporarily).

Among males, 46.4% lived in large cities with population of more than 1 million people, 34.5% – in big towns (population 250-500 thousand) and in towns (population 100-250 thousand), and 19.1% – in small towns (up to 50 thousand) and in rural areas. Among females questioned, 41.7% lived in large cities, 38.5% in big towns and 19.8% – in small towns and rural areas.

38.1% of questioned males and 42.4% of questioned females have family members, who work in the field of medicine and pharmacy.

Information gathering has been conducting, taking into consideration the ethical requirements during working with a person. All the participants of investigation gave informed consent to anonymous questioning.

The connection between qualitative characteristics has been evaluated, using the criterion χ^2. Conclusion as to statistic hypotheses has been performed at a significance level $p \leq 0,05$.

Data basis has been formed on the program Microsoft Excel. Calculations have been carried out in Microsoft Excel and Statistica 6 software.

RESULTS AND DISCUSSION

According to basic socio-demographic characteristics of males and females selection were put together, that is why any significant differences could be stipulated only by sexual factor.

As the basis for many atypical human reactions as to medical preparations there is a genetic factor; it is reasonable to include the question about possibility understanding of hereditary conditions (diseases) pharmacocorrection. The results of investigation showed that the majority of males questioned believed that it is impossible to correct hereditary diseases by medical preparations (51.2%). Females, who thought that hereditary diseases cannot be corrected by pharmaceutical preparations, divided approximately equally – 41.4% and 45.2 % (Fig.1). Any significant differences between females and males answer peculiarities to this question haven't been detected ($\chi^2 = 2.70$, $\nu = 2$, $p = 0.26$).

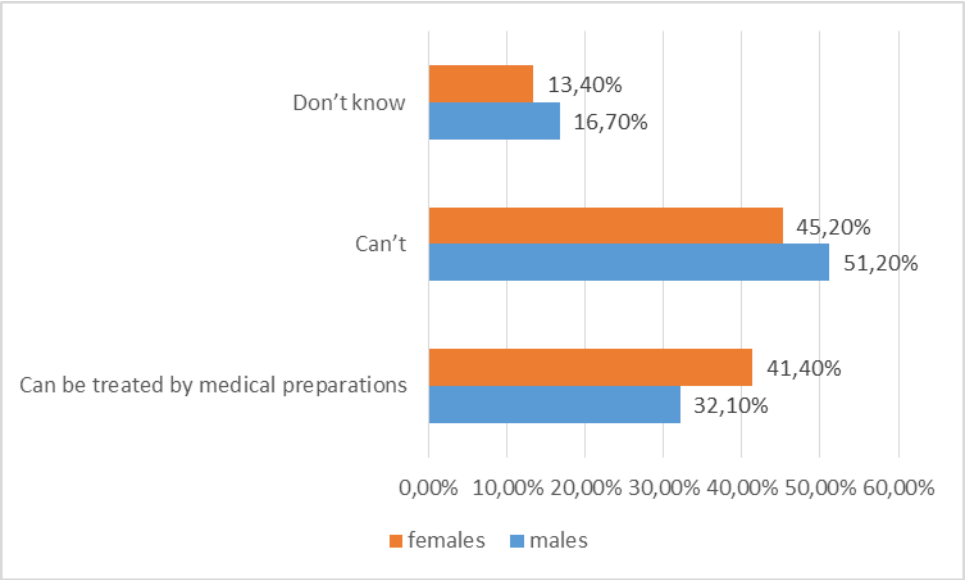

Fig.1. **Analysis of pharmacocorrection possibility of hereditary diseases among males and females.**

Analyzing answers to the question about idea of pharmacogenetics, it has been shown , that this trend was understood differently by males and females (Table 1), and obtained differences are statistically important ($\chi^2 = 13.84$, $\nu = 6$, $p = 0.03$). Thus, 11.8% of questioned males and 6.4% females didn't hear anything about pharmacogenetics. 14.1% of males and of females

25.2% have heard about it, but couldn't get to know exactly what pharmacogenetics studied. Right answer about the idea of pharmacogenetics was given by one – third of questioned males (37.7%) and females (43.9%).

Table 1

The distribution of answers to the question "What does pharmacogenetics study?" among respondents of different sex

Sex	What does pharmacogenetics study?						
	Don't know	Have heard, but can't say exactly	Hereditary diseases	The influence of medical preparations on human	Gene impact on medical preparations	The possibility of gene mutations appearance as a result of medical preparations taking	Organism response on medical preparations due to its genetic peculiarities
Male	11.8%	14.1%	17.6%	3.5%	4.7%	10.6%	37.7%
Female	6.4%	25.2%	9.7%	4.5%	3.6%	6.7%	43.9%

Note. χ^2=13.84, ν =6, p=0,03.

It has been stated, that females – future pharmacists were more progressive as to awareness of pharmacogenetics ideas. Consequently, just females are more informed about genetic peculiarities of organism and its reaction to medical preparations, and they probably will advise chemist's visitors to conduct these tests in future. Besides, females, as a subject of a pharmaceutical market, potentially more often can be consumers of this production themselves (pharmacogenetics tests), and less likely will have side effects due to incorrect treatment. In connection with this, male population can get into potential risk group of increased frequency of atypical reactions.

During studying the information sources about pharmacogenetics, it has been shown that most students received information about this trend in the University.Moreover, any significant differences between males and females has not been detected ($\chi 2$ = 2.23, ν = 5 , p = 0.82). In particular, the curriculum for the discipline "Biology with genetics fundamentals" for the 1st year students of "Pharmacy" specialty in NUPh pays some attention to pharmacogenetics, when considering topics related to population genetics and hereditary diseases. According to the

questionnaire data, 70.7% of males and 72.9% of female respondents heard about pharmacogenetics superficially in University. In 13.4% of males and 10.5% of females information about this trend was not set aside (Table 2).

Table 2

The distribution of answers to the question "Where did you get information about pharmocogenetics?" among males and females

Sex	The source of information about pharmogenetics				
	Don't have any information	Have heard in University (superficially)	Studied in University (as a discipline)	Got to know from friends	Got to know from media
Male	13.4%	70.7%	3.7%	3.7%	8.5%
Female	10.5%	72.9%	5.6%	4.9%	6.1%

Note. $\chi^2 = 2.23$, $\nu = 5$, $p = 0.82$.

The conducted analysis showed that, even in the sphere of future pharmacists, the awareness about pharmacogenetics and its role in personalized medicine is not satisfactory. Thus, it is necessary to pay more attention to pharmacogenetics aspects during preparing competent specialists in the field of pharmacy, who are up to date. Effective development of corresponding infrastructure at pharmacogenetics testing introduction among the population of Ukraine is also necessary.

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CONCLUSIONS

1. The analysis of future pharmacists 'awareness in the field of pharmacogenetics, which pointed out problem aspects of this trend understanding and their sexual specific, have been carried out for the first time in Ukraine.
2. It has been stated that, more than 70% of questioned got the information about pharmacogenetics in University for the first time. However, only more than one-third of respondents (37.7% males and 43.9% females) correctly understand the idea of this

discipline. About half of questioned students thought that, pharmacocorrection of hereditary diseases was impossible.

3. It has been shown that, on the whole females were more informed about pharmacogenetics than males. So they can become more active persons of pharmaceutical market in future.

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