

**Preserving reproductive health – the importance of attitudes and
information in health education**

Thesis

Dr. Andrea Párduczné Szöllősi

Gál Ferenc College

Faculty of Health and Social Sciences



Doctoral School of Clinical Medicine

Faculty of Medicine

University of Szeged

Doctoral advisors:

Prof. emeritus Dr. György Bártfai professor, Doctor of Science (DSc)

Department of Obstetrics and Gynecology, Faculty of Medicine, University of Szeged

Dr. habil. Dezső Virok associate professor, PhD

Department of Medical Microbiology and Immunology

Faculty of Medicine

University of Szeged

Szeged

2020

Publications forming the basis of the thesis

- Márta Szűcs, Andrea Párduczné Szöllősi, György Bártfai: Knowledge and attitudes of pharmacists regarding over-the-counter emergency contraception in South-Eastern Hungary
The European Journal of Contraception and Reproductive Health Care, October 2010; 15:336-342 (IF:1,616)
- Szűcs M., Bitó T., Csikos C, Párducz Szöllősi A., Furau C., Blidaru I., Kapamadzija A., Sedleczyk K., Bártfai G: Knowledge and attitudes of female university students on menstrual cycle and contraception.
Journal of Obstetrics and Gynecology 37: (2) 2017, pp. 210-214. (IF: 0,629)
- Andrea Szöllősi, Tímea Rafai, Anita Bogdanov, Valéria Endrész, László Párduc, Ferenc Somogyvári, László Janovák, Katalin Burián and Dezső P. Virok
Correlation between detergent activity and anti-herpes simplex virus-2 activity of commercially available vaginal gels
BMC Research Notes 2020. (IF: 1,34)

Publications related to the subject of the thesis

- Párduczné Szöllősi Andrea, Lukács Anita, Párducz László: A Humán Papillomavírussal kapcsolatos ismeretek Békés megyei fiatalok körében
Egészségfejlesztés LIII.:(1-2) pp. 28-35. 2012
- Párduczné Szöllősi Andrea: A kortársoktatás szerepe az egészségnevelésben
Egészségfejlesztés LIII.:(5-6) pp. 10-13. 2012
- Párducz László, Ostorházi Eszter, Párduczné Szöllősi Andrea, Rozgonyi Ferenc: A reprodukciót befolyásoló fiatalkori bakteriális STD fertőzések
Nőgyógyászati és Szülészeti Továbbképző Szemle 15. évf. 3. szám 2013
- Párducz László, Párduczné Szöllősi Andrea: A hosszú ciklusú fogamzásgátlás non-contraceptive előnyei
A Magyar Gyermeknőgyógyász Társaság XXXVIII. Kongresszusa, 2018 ISBN 978-963-306-628-7
- Párduczné Szöllősi A., Párducz L., Raffai T., Virok D: Kereskedelmi forgalomban levő hüvelyi gélek Herpes simplex vírus-2 ellenes hatásának vizsgálata
Az Erdélyi Múzeum- Egyesület Orvos- és Gyógyszerésztudományi Szakosztályának XXIX. Tudományos Ülésszaka, Orvostudományi értesítő 92. kötet, 2.különszám 2019 ISSN 1453-0953
- Párduczné Szöllősi Andrea: A kortársoktatás szerepe a reprodukciós egészségvédelemben
In: Egészségfejlesztés és nevelés, A kortársoktatás pedagógiai módszertana elméletben és gyakorlatban (Szerk.: Feith H., Falus A.) Akadémiai Kiadó, Budapest, 2019. 158-162.
- Párducz László, Párduczné Szöllősi Andrea: Határtalan (kortárs) oktatás
Reprodukciós egészségmegőrzés, határon innen és túl. Zenta, 2020.02.21. ISBN 978-615-5817-52-6
- Párduczné Szöllősi Andrea, Párducz László, Virok Dezső: Kereskedelmi forgalomban kapható hüvelyi gélek hatása a herpesz szimplex vírus-2 szaporodására in vitro.
Reprodukciós egészségmegőrzés, határon innen és túl. Zenta, 2020.02.21. ISBN 978-615-5817-52-6

Introduction

The World Health Organization (WHO) defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (1948). The concept of reproductive health also occupies a prominent place in the complex interpretation of health. "Reproductive health is a state of physical, mental and social well-being in all matters relating to the reproductive system and to its functions and processes and it is not merely the absence of disease, dysfunction or disability. Accordingly, reproductive health implies that people are able to have a satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so" (U.N. General Assembly res. 49/128, 1994). Everyone has the right to a wide range of health care services, including access to birth control methods, diagnosis and treatment of infertility and sexually transmitted diseases. From a social point of view, maintaining reproductive health is of paramount importance, because this is the only way to ensure the appropriate level of total fertility rate (TFR) (> 2.1), which is necessary to maintain the size of a population. The health status of an individual, and thus his or her reproductive health, is influenced and threatened by a number of factors: unhealthy lifestyle and behavior, adverse environmental effects, poor health culture, and inadequate prevention activities.

The sexual activity of adolescents in Hungary is also steadily increasing, which is characterized by early initiation of sexual activity, irresponsible relationships, and inadequate protection. All of these factors are associated with young people's lack of knowledge about reproductive health. The two most common unintended consequences of early sexual activity are acquiring sexually transmitted infections and having unwanted pregnancies. Therefore, the protection of the reproductive health of women and men of reproductive age, especially adolescents, and providing adequate knowledge for them is crucial. For young people, concomitant use of contraceptive pills and condoms is recommended to provide protection against pregnancy and sexually transmitted diseases at the same time. Despite these recommendations, even nowadays, a lot of people use different methods of contraception in many different ways that are known to be less reliable, e.g., the calendar method, interrupted intercourse, or vaginal douching.

Nowadays, the number of occasional, unprotected intercourses among young people is high. The resulting unwanted pregnancies or sexually transmitted infections (STIs) threaten the reproductive health. Therefore, it is reasonable to promote the health education of young people, the intellectuals of the future, who will affect public opinion, especially among university students, in order to preserve their reproductive health.

The selection of the appropriate contraceptive method is not always successful and sometimes, despite good intentions, people make mistakes in contraception. Emergency contraception may play a significant role in such cases, especially in the case of young people, mostly the OC version.

Emergency contraception (OC and IUD) has been known for more than half a century. Clinical studies have shown that its use can reduce the number of abortions. Adolescents are more likely to become pregnant after unprotected sexual intercourse. The probability of becoming pregnant is approximately 8%, nearly 75% of which can be prevented with emergency contraception.

It is essential for young people at the beginning of their reproductive years to select the appropriate contraceptive method, to use it adequately, and to know how to use an emergency contraceptive pill (ECP) in a case of emergency to protect their reproductive health and to avoid early and late complications of abortion, including psychological consequences, difficulty in conceiving or miscarriage.

Educating the healthy adult society of the future, the healthy young generation is in the common interest of the individual, the family, and the entire community. Unfortunately, it can be stated that in many cases the knowledge of young people about reproductive health is superficial, inaccurate; its quality is lower than expected at their age, and their knowledge and behavior are not in line with each other. Therefore, we aimed to assess the knowledge of factors affecting reproductive health among young people and healthcare workers, and their knowledge of intimate products that influence the incidence of STIs.

We evaluated availability and adequate application of ECP in Békés County, the underexamined knowledge of the pharmaceutical society that plays a key role in the contraceptive service, and the European practice. To do so, we surveyed the knowledge of pharmacists in South-Eastern Hungary, including Békés County, about emergency contraceptive pills and the opinion of pharmacists on the over-the-counter distribution of ECPs. In the study period in 2009, there was only one prescription-only emergency contraceptive pill available that contained 1.5 mg of levonorgestrel (LNG). The effectiveness of this method depends on the length of time between the unprotected sexual intercourse and taking the tablet. Consequently, prolonged access time to the emergency contraceptive pill after an unprotected sexual intercourse leads to a decrease in its effectiveness. The structure of the pharmacy staff varied in the surveyed area. In smaller villages, one pharmacist works in a pharmacy or more pharmacies, while in cities, pharmacists perform their duty as members of a pharmacy network. The study was conducted among members of the Hungarian Chamber of Pharmacists.

The chance of preventing unwanted pregnancies depends largely on the knowledge of the affected individuals, women of reproductive age and especially young people, about fertility and the selection of the appropriate method of contraception. Therefore, we surveyed the knowledge and the attitudes of female students in Hungary and Serbia about the menstrual cycle and contraception. Serbia was selected because of the close professional relationship with Serbian colleagues, which was built at the events of the Pro Familia Hungarian Scientific Society and the Hungarian committee of the European Society of Contraception (ESC). Considering the different cultural and economic conditions, we decided to examine whether there is a difference between the opinions of the university students of the two countries, intellectuals of the future, who will affect public opinion, regarding the preservation of reproductive health. Thorough knowledge of the fertile period is important both for optimal planning of pregnancy and for avoiding unwanted pregnancies. Research objectives included the assessment of the extent of knowledge in university / college students about their awareness of the fertile period within a menstrual cycle, and how they perceive the importance of menstruation.

In addition to the prevention of unwanted pregnancies, protection against STIs in young people is also of paramount importance in the promotion of reproductive health. The dangers of an unprotected sexual intercourse can be enhanced by the use of vaginal lubricating gels, which is part of the sexual behavior of young people. Many people use vaginal lubricants without being well informed about the possible side effects, and they might be unaware of the chemical effects of lubricants, which can even negatively affect the vaginal ecosystem. We evaluated the impact of lubrication gels used during sexual intercourse on the replication of one of the most common sexually transmitted viral infections, herpes simplex virus-2 (HSV-2). The chemical components of vaginal gels applied during sexual intercourse, such as lubricating gels, are exactly in same space and time where infections are transmitted, consequently, they might have a fundamental effect on the rate of the transmission. Because of this potentially important attribute, we aimed to test the effect of commercially available vaginal gels on HSV-2 replication.

Study objectives

- To assess the biology and pharmacology related general knowledge of pharmacists in Békés County in South-Eastern Hungary and their attitudes regarding the over-the-counter distribution of ECPs.
- To compare the knowledge of female university students receiving different education in Hungary and Serbia regarding the menstrual cycle, including the fertile period.
- To compare the attitude of students towards menstruation and the selection of long-term hormonal contraceptive pills to suppress menstrual bleeding.
- To measure the effect of commercially available vaginal gels on the replication of HSV-2 in laboratory conditions.
- To evaluate the impact of commercially available vaginal gels in terms of their ability to inhibit the characteristic cytolytic effect of HSV-2 in laboratory conditions.
- To compare the anti-HSV-2 and detergent attributes of commercially available vaginal gels.

Materials and methods

A questionnaire survey was conducted among pharmacists in a three-county area of South-Eastern Hungary in 2009. These three counties were generally considered to be representative of the country, Hungary with the exception of Budapest. Self-administered questionnaires with 22 simple and multiple-choice questions were sent out to 215 members of the Hungarian Chamber of Pharmacists via mail. Of the pharmacists surveyed, 108 completed the questionnaire. These questions were approved by a staff member of the Central Pharmacy of the University of Szeged. The studies were performed with the permission of the ethics committee. The questionnaires were administered in Excel, and cross-tabulations for variables of interest were calculated by SPSS 15.0. A questionnaire-based survey was conducted among female university students of health sciences and other faculties in Hungary, Serbia, and Romania between November 2009 and January 2011. The study locations were Szeged and Gyula in Hungary, Belgrade and Novi Sad in Serbia, and Arad and Iasi in Romania. The analysis of the Romanian data is not part of this dissertation.

The selection of sampling condition and the number of participants to be included in the survey were determined by the Department of the Hungarian Central Statistical Office, Szeged, Hungary. The total number of female students of each faculty and class were taken into account.

10% of the female students in Belgrade and Novi Sad, 16% in Arad and Szeged, 9% in Iasi, and 50% in Gyula were invited to participate. Prior to the questionnaire-based survey, the deans and lecturers of the participating faculties consented to the interview of students before the lecture. The studies were performed with the permission of the ethics committee. The questionnaire was completed by the students in their native language. The person responsible for completing the questionnaires explained the nature of the questionnaire, the background of the study, and asked the participating students to voluntarily complete the questionnaire, which took approximately 15 minutes. The anonymous questionnaires and signed consent forms were collected in separate boxes. All data were processed by the co-workers of the Department of the Hungarian Central Statistical Office, Szeged, Hungary. The questionnaire was validated in all three study centers. In Serbia, intelligibility of the questionnaire was pilot tested with the involvement of 20–20 female students of health sciences and other faculties, respectively. The questionnaire comprised a total of 33 questions concerning reproductive health. The study protocol was approved by the local ethics committee of each participating study center. The sample consisted of 1466 students: 568 (38.8%) and 898 (61.2%) students from Hungary and Serbia, respectively. Participants were analyzed in two groups: students of health sciences and students from other faculties. Regarding the Hungarian sample, the number of students of health sciences was 277 (18.9%), and the number of students from other faculties was 291 (19.9%). The Serbian study population consisted of 408 (27.8%) students of health sciences and 490 (33.4%) students from other faculties.

The following groups of variables were included in the analyses:

- Demographic and background variables: age, country, nature of university studies, type of residence, marital status, and data related to menstrual cycle (period, length, complaints, and the use of contraceptives)
- Knowledge-related variables: necessity of menstruation and the most fertile period of the menstrual cycle.
- Variables related to the attitudes on the administration of oral contraceptives with the intention to suppress menstrual bleeding for a long time
- Variables related to attitudes on the preferred frequency of menstruation.

Statistical analyses were performed by using contingency coefficients, correlations (Spearman's correlations), statistical comparisons (two-way ANOVA), and calculations were made by SPSS software (© IBM Corporation, Szeged, Hungary). The threshold for statistical significance was set at 5%.

Evaluation of anti-HSV-2 attributes of commercially available vaginal gel

Characterization of the maximum non-toxic concentrations of applied vaginal gels

3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay was applied to assess the maximum non-toxic concentrations of the applied vaginal gels. The initial concentrations of the vaginal gels were 20 weight per volume percentages (w/v%). Further dilutions were performed in cell culture media. MTT assays were completed after a 24-hour incubation period.

Assessment of the impact of vaginal gels on HSV-2 replication by direct qPCR

HeLa cervical epithelial cells were seeded into 96-well plates in 100 μ L medium (MEM). The next day, virions were preincubated with vaginal gel for 1 hour at 37 °C, and then the HeLa cells were infected (multiplicity of infection (MOI) 0.1). Each gel concentration was tested in three parallel wells. 24 hours after the infection, cells were washed and exposed to two freeze–thaw cycles in 100 μ L Milli-Q water to extract viral DNA. 1 μ L of the cell lysates were used as templates in a direct qPCR with HSV-2 specific primers for quantitative measurement of viral DNA concentration. Statistical comparisons of treated samples vs untreated controls (qPCR Ct values) were performed by Student's t-test.

Measurement of the impact of vaginal gels on surface tension

Surface tension measurements of diluted gel solutions were carried out with a K100 MK2 Tensiometer (Krüss Co., Hamburg, Germany) using the Wilhelmy plate method. Surface tension was measured at different concentrations by placing 40 mL volume of sample solution in a sample receptacle and diluting it with deionized water from a connected Dosimat 765 (Metrohm, Herisau, Switzerland) titration stand. During the automatized surface tension measurements, the tensiometer and the dosing unit were controlled by using the modularly constructed LabDesk TM software.

Results

Attitudes of pharmacists regarding over-the-counter emergency contraception in South-Eastern Hungary

Of the 215 questionnaires sent out, 108 were returned, representing a completion rate of 50.2%. 47 (44.4%) of the 108 responding pharmacists supported the over-the-counter use of ECP because they think that it would improve accessibility. 3 other respondents (2.8%) also supported over-the-counter access because they believe that there is no significant medical risk from its use. 9 respondents (8.5%) agreed with both of these statements in favor of the over-the-counter

use of ECP. 13 of the study participants (12.3%) did not support it since they thought there would be abuses related to its use. 18 (17%) of the respondents did not support it because they consider that ECP carries a serious medical risk. Of all the pharmacists surveyed, 16 (15%) agreed with both of these statements and would not support the over-the-counter use of ECP. 2 participants did not answer any of these questions.

88 of the 108 respondents agreed with one of the statements about the over-the-counter ECP use in relation to the protection of reproductive health, while 20 participants did not respond. Two respondents (2.3%) claimed that using over-the-counter ECP would affect moral standards. According to 5 pharmacists (5.7%), OTC use would weaken sexual morality. 31 people (35.2%) believe that over-the-counter access would lead to more frequent use of ECPs. 6 respondents (6.8%) claimed that over-the-counter access would increase the risk of sexually transmitted infections. Half of the study participants, 44 respondents agreed with the statement that using ECP could reduce the number of induced abortions.

Knowledge and attitudes of Hungarian and Serbian female university students on the menstrual cycle and contraception

Out of the 1466 volunteer participants in the research, 568 (38.8%) studies in Hungary and 898 (61.2%) in Serbia. The ratio of students of health sciences and other faculties was 48.8% vs 51.2% and 45.4% vs 54.5% in Hungary and Serbia, respectively. The response rate was ample sufficient to analyze the data. The mean age of the voluntarily participating students in the study was 22.2 years (18–28 years).

Knowledge on the menstrual cycle

71.5% of the Hungarian students of health sciences gave correct answer to the question of the fertile period in the menstrual cycle, whereas among Serbian students, this proportion was 86%. Among students of other faculties, 59.8% of the Hungarian respondents and 71.8% of Serbian university students selected the correct answer. 8.3% of the Hungarian students of health sciences, 2.7% of the Serbian students of health sciences, 9.6% of the Hungarian students of other faculties, and 4.8% of the Serbian students of other faculties presumed that the fertile period of the cycle was the beginning of the menstrual period. 7.2% of the students of health sciences in Hungary and 3.7% of those in Serbia believed that the fertile period of the cycle was the end of the menstrual period. This proportion was 11.3% and 12% among the students of other faculties in Hungary and Serbia, respectively. 6.9% and 5.9% of the respondents studying health sciences thought that they could become pregnant at any time within a menstrual cycle in Hungary and Serbia, respectively. This ratio was 13.1% among Hungarian students of health sciences and 9.8% among those in Serbia.

Significant differences ($p < 0.01$) were also observed between Hungary and Serbia in terms of study types. After dichotomization of the answers (1 point for the correct answer and 0 for the wrong ones), two-way ANOVA was applied to reveal both country- and study-type effects. We found that the country of origin had a significant, medium-level role in the response pattern ($\eta^2=6.3\%$). However, the type of the study had a significant but small effect ($\eta^2=2.5\%$). These two factors proved to be independent of each other ($p=0.41$ for the interaction). Other background variables were likely to have only a limited effect on answers to the question of the nature and length of the fertile period. Some of these factors were the type of the permanent residence and marital status, with values of 0.4% and 0.3% in Serbia, and 1.9% and 1.6% in Hungary, respectively (η^2 , $n=1466$). The length of the menstrual periods and spotting between two cycles showed even less influence on the answers (Hungary: 0.1% and 0.0%, Serbia: 0.0% and 0.3% and Romania: 0.9% and 0.4%; η^2 , $n=1466$).

The importance of menstruation

In both Hungary and Serbia, the majority of the university students considered monthly menstruation necessary for being healthy. Among the students of health sciences, 73.3% of the Hungarian respondents and 69.6% of the Serbian respondents believed that it is necessary to have a monthly menstruation. This proportion was 58.5% and 72.5% among students of other faculties in Hungary and Serbia, respectively. 8.3% of the Hungarian students of health sciences, 4.4% of the Serbian students of health sciences, 19.2% of the Hungarian students of other faculties, and 2.2% of the Serbian students of other faculties did not consider regular, monthly menstruation necessary. In Hungary, 16.6% of the students of health sciences and 22.3% of the students of other faculties did not have an opinion on whether monthly menstruation is necessary. In Serbia, 25% of the students of health sciences and 24.7% of the students in other faculties had no opinion on this issue as well.

1.8% of the Hungarian respondents and 1% of the Serbian students among the students of health sciences did not answer the question at all. Among the students of other faculties, in the case of Hungarian students, there was no missing answer, and 0.6% of the Serbian participants did not provide the answer. Regarding the frequency of menstruation, 28.5% of the Hungarian students of health sciences and 27.7% of the Serbian students of health sciences would prefer having it once a month. This proportion was 31% vs 10.8% for once in 3 months, 5.8% vs 6.8% for once in 6 months, 10.5% vs 13% for once a year, and 23.5% vs 41.2% for never. The proportion of the preferred frequency of menstruation was considered to be 25.1% vs 24.1% for once a month, 36.1 vs 12.2% for once in 3 months, 8.1% vs 8.2% for once in 6 months, 5.2 vs 13.1% for once

a year, and 24.1% vs 42.2% for never having menstruation among the Hungarian and Serbian respondents, respectively. This question was not answered by 0.7% and 0.5% of students of health sciences and 1.4% and 0.2% of students of other faculties in Hungary and Serbia, respectively. There was a question about the interest in a daily, low-dose, hormonal, combined, oral contraceptive that does not have a hormone-free interval and that suppresses menstruation for as long as desired without any harmful effect. 37.6% of the Hungarian students of health sciences, 55.6% of the Serbian students of health sciences, 44.4% of the Hungarian students of other faculties, and 60.3% of the Serbian students of other faculties would use this method. In case of special occasions (usually vacation or summer period), 5.4% and 18.9% of the students of health sciences, whereas 2.4% and 11.6% of the students in other faculties would choose this method in Hungary and Serbia, respectively. Among students of health sciences, 51.6% of the participant from Hungary and 20.1% of the participants from Serbia would not use contraception that suppresses menstruation. This proportion was 50.5% and 20.8% of the students of other faculties in Hungary and Serbia, respectively. 5.4% of the students of health sciences did not answer this question in either country.

Among students of other faculties, 2.7% of the Hungarian participants and 7.3% of the Serbian participants did not respond to this question.

Assessment of anti-HSV-2 activity of commercially available vaginal gels

The impact of vaginal gels on the viability of HeLa cells

To exclude the indirect HSV-2 replication inhibitory effects of the vaginal gels due to the inhibition of the host cell metabolism, viability of HeLa cells was measured after 24 hours of incubation by using the MTT method in the presence of gels. Concentrations of 20 w/v% (Gel-1, Gel-2, Gel-4) and 10 w/v% (Gel-3) were identified as the maximum non-toxic concentration and were used as the first concentrations in the subsequent experiments.

Direct qPCR measurement of the inhibition of HSV-2 replication by antiviral compounds

The direct qPCR method was applied to assess the impact of vaginal gels on HSV-2 replication. HeLa cells were infected with HSV-2 in the presence of serial dilutions of the vaginal gels, starting with the maximum non-toxic concentrations. The four tested gels could be divided into two groups based on their impact on HSV-2 replication. Gel-1 and Gel-2 were not able to inhibit HSV-2 replication even in the highest applied concentration, while Gel-3 and Gel-4 strongly inhibited HSV-2 replication in the maximum applied concentrations. The extent of the HSV-2 replication inhibition was 98.2% and 98.1% in the case of Gel-3 and Gel-4, respectively. Further dilutions of all the four gels behaved similarly; they reduced to a lesser amount or even increased the replication of HSV-2. In order to elucidate whether the antiviral activity of Gel-3

and Gel-4 could be detected against different viral, additional experiments with MOIs ranging from 0.4 to 6.4 were conducted. Similar to the previous experiments, Gel-3 and Gel-4 had a ~99% inhibitory effect in the 0.4–6.4 MOI range. In correlation with their significant antiviral activity, Gel-3 and Gel-4 prevented the cytopathic effect of HSV-2 at MOI 6.4 and MOI 1.6.

The impact of the vaginal gels on surface tension

To measure the detergent activity of the vaginal gels, we measured their surface tension decreasing effect. Surface tension values in the presence of vaginal gel dilutions were measured, and the difference between surface tensions at minimum and maximum gel concentrations were calculated. The highest surface tension decreasing effect was observed in case of Gel-3 and Gel-4 (18 mN/m and 33 mN/m, respectively), whereas Gel-1 and Gel-2 only minimally decreased surface tension (5.9 mN/m and 0.8 mN/m, respectively). The surface tension decreasing effects of the gels, their detergent activity, strongly correlated with the HSV-2 replication inhibitory activity (R^2 : 0.88).

Discussion

The health-conscious attitude and behavior of young people are important to maintain their reproductive health. With primary intervention, it is easier to protect, maintain, or improve health at a young age than to manage a disease as it occurs. Shaping health behavior of young people is a priority to prompt health-conscious attitude and behavior in adulthood, since raising a healthy young generation is a collective interest of the future families and the society. In case of young people, the priority areas of health education in reproductive health promotion are the following: prevention of unwanted pregnancies, reduction in the number of abortions among young people, and prevention of sexually transmitted infections.

Attitudes of pharmacists regarding over-the-counter emergency contraception in South-Eastern Hungary

This study covering three counties can be extrapolated to the whole country except for the capital, Budapest. Most respondents were well-informed about the topic. Our findings have identified shortcomings and concerns regarding ECPs that even nowadays must be taken into account for an effective reproductive health protection.

Our results support the need for regular updates of information for pharmacists regarding the use of emergency contraceptive pills. Not only the prevention of unwanted pregnancies, but also the prevention of STIs is essential in reproductive health promotion, which should be part of the daily activities of pharmacists. In Hungary, despite the unfavorable reproduction rate, the abortion rates among young people are not sufficiently diminishing. Knowing the significance of early and late complications, an effort should be made to undertake wanted and planned pregnancies. Providing

appropriate information can encourage young people to consider having a family with more children and to choose consciously the date of the first birth. Well-organized training courses are needed to provide up-to-date information to pharmacists with which they can give reasonable advice in the course of their works. The information should cover the benefits, risks, and side effects of ECPs, failure rates, and the importance of follow-up. With the adequate knowledge, women can make informed choices about their reproductive health.

Post-graduate education of pharmacist is very important to address their concerns. However, even regardless of the OTC distribution, appropriate professional expertise is necessary to give proper advice to patients who buy medicine. Therefore, courses that describe all available contraceptive methods and STI prevention options should be organized.

Knowledge and attitude of Hungarian and Serbian female university students on menstrual cycle and contraception

The nature of university studies influenced the knowledge on the fertile period within a menstrual cycle: the proportion of students with appropriate knowledge was higher by 11.7% in Hungary and by 14.1% in Serbia among students of health sciences compared to students of other faculties. Most of the students in the two countries believed that a monthly menstrual bleeding is necessary to be healthy. Nearly a quarter of the Hungarian students do not wish to menstruate, while this proportion was more than 40% in Serbia. The social and cultural differences between Hungary and Serbia play an important role in forming the above opinion. The Serbian results can also be explained by the fact that respondents came from large cities.

During this survey, only the oral combined contraceptive method has been mentioned. From a professional point of view, it is important for both countries to know each other's data and favorable practices. It is very important to improve the general knowledge on the fertile period of the menstrual cycle: on the one hand, to prevent unwanted pregnancies and on the other hand, to provide appropriate information for the planning of wanted pregnancy. Appropriate education of the young people is not only important to prevent unwanted pregnancies, but to prevent STIs as well.

The Youth Department of Pro Familia Hungarian Scientific Society in Békés County is committed to spread family-friendly attitude through contemporary education, especially in the field of reproductive health. Students of health sciences in higher education and young people starting their career can also be involved in the prevention activities. In our city, Gyula, students of the Faculty of Health and Social Sciences of Gál Ferenc College have been preparing young people for optimal family life with a series of lectures in the form of contemporary education for many years.

Assessment of anti-herpes simplex virus-2 activity of commercially available vaginal gels

In our study, four commercially available vaginal gels were tested to assess their HSV-2

replication modulating activity *in vitro*. Our data showed that the tested gels either had a neutral effect (Gel-1, Gel-2) or strong inhibitory effect (Gel-3, Gel-4) in the highest tested concentration (10–20 w/v%). Since for Gel-3 and Gel-4, the tested 10–20 w/v% concentrations are practically five to tenfold dilutions, and considering that the volume of vaginal fluid and sperm lies in the 1–3 mL range, one may expect that these gels can achieve 10–20 w/v% or higher concentrations *in vivo* and have significant antiviral activity. The daily testing of HSV-2 seropositive individuals revealed that asymptomatic HSV-2 shedding occurred in 2–3.8% of the days. Consequently, asymptomatic HSV-2 shedding is a relatively frequent event.

Schiffer et al. have shown that out of 14,685 swab samples, 18% were HSV-2 positive (>150 DNA copies/mL), and close to 90% of the samples contained more than 104 DNA copies/mL. Since the median HSV-2 load was 104.8 DNA copies/mL and the threshold of HSV-2 transmission was calculated previously as >104 infectious unit (IFU) [22], even a low level of HSV-2 load decrease could be significant in preventing the transmission. Gel-3 and Gel-4 were able to cause ~2 logs decrease in HSV-2 IFU and were effective at least at 6.4 MOIs (~400,000 IFUs); therefore, these gels might lower the risk of transmission, despite the fact that they were not designed for prevention. In summary, our experiments revealed that there are substantial differences among commercially available vaginal gels regarding their anti-HSV-2 activity. From the tested four gels, we found two with a significant antiviral activity, suggesting that these gels might be able to decrease the frequency of HSV-2 transmission. The anti-HSV-2 activity of the gels strongly correlated with their detergent activity, indicating that their antiviral activity against lipid-enveloped HSV-2 can be achieved by destabilizing its lipid envelope. We should also emphasize that different sexual attitudes, such as the use of vaginal gels, can influence the probability of STI transmission. Thus, the use of a commercially available vaginal gel and the type of the selected gel (Gel-1 and Gel-2 vs Gel-3 and Gel-4) may affect the epidemiology of the sexually transmitted pathogen, HSV-2.

New findings

- Our study was the first to examine the availability of ECPs in Hungary and their appropriate use in Békés County representing the national scenario, as well as the attitude of pharmacists playing a key role in dispensing emergency contraceptives.
- There are professional shortcomings in the use of emergency contraceptives, and thus, postgraduate education is required also for pharmacists.
- Our study was among the first ones to examine the knowledge of university students on the fertile period of the menstrual cycle being important both concerning contraception and the planned conception.
- Adequate knowledge of the menstrual cycle and the fertile period is an important element of sex education. This could enhance the protection for sexual encounters more effectively and make young people more prepared for a wanted pregnancy.
- For the long-term preservation of reproductive health in young people, contemporary education can be effectively used as a novel method of health education. This educational method was first used in Békés County, and the experience gained is favorable.
- Based on our experience, this model was implemented in Serbia as well with the help of the Serbian colleagues. It resulted in a professional cooperation at regional level.
- There are large differences between commercially available gels in terms of anti-HSV-2 effect.
- Two of the four gels tested had significant anti-HSV-2 activity, whereas the other two gels did not affect viral replication in high concentrations.
- Gels with antiviral activity were also able to inhibit the replication of large amounts of HSV-2 and the cytopathic effect of the virus.
- The anti HSV-2 effect of the gels correlated with their detergent activity.

Acknowledgement

I would like to express my gratefulness to my supervisor Dr. Dezső Virok, associate professor, who provided irreplaceable assistance in the design and conduct of experiments in the study of anti-HSV-2 activity of commercially available vaginal gels. Among the staff of the Institute of Microbiology, I would like to thank Dr. Katalin Burián, head of the institute, Dr. Tímea Rafai, Dr. Anita Bogdanov, and Dr. Valéria Endrész, who gave assistance in conducting our study. I would like to express my gratitude to Dr. László Janovák for his

essential work and help in measuring the detergent activity of vaginal gels.

I would like to thank Prof. emeritus Dr. György Bártfai with great respect and gratitude for his continuous professional guidance and supervision of my thesis.

I would also like to express my gratitude to Prof. Dr. Gábor Németh, head of the Department of Obstetrics and Gynecology, University of Szeged, for his valuable, professional support.

I thank for the continuous professional and emotional support of Dr. Gábor Kozma, rector of Gál Ferenc College, during my work.

I would like to thank the co-authors of my publications for providing opportunity to participate in these studies.

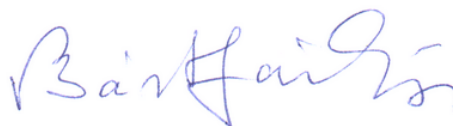
Last but not least, my deepest gratitude goes to my husband László Párducz for his professional and encouraging help and to my sons, László and Levente, for their patience and understanding, which I needed very much during the preparation of my thesis.

Társszerzői lemondó nyilatkozat

Co-author certification

Alulírott Prof. emeritus Dr. Bártfai György (felelős társszerző) kijelentem, hogy Dr Párduczné Szöllösi Andrea (pályázó) PhD értekezésének tézispontjaiban bemutatott - közösen publikált - tudományos eredmények elérésében a pályázónak meghatározó szerepe volt, ezért ezeket a téziseket más a PhD fokozat megszerzését célzó minősítési eljárásban nem használta fel, illetve nem kívánja felhasználni.

Szeged 2020. május 5



Prof. emeritus Dr. Bártfai György
felelős társszerző

A pályázó tézispontjaiban érintett, közösen publikált közlemények:

Knowledge and attitudes of pharmacists regarding over-the-counter emergency contraception in South-Eastern Hungary

Márta Szűcs, Andrea Párduczné Szöllösi and György Bártfai

The European Journal of Contraception & Reproductive Health Care IF 1.616 (2010)

Elsődlegesen az attitude vonatkozó adatok.

Knowledge and attitudes of female university students on menstrual cycle and contraception.

Márta Szűcs, Tamás Bitó, Csaba Csíkos, Andrea Párducz Szöllösi, Cristian Furau, Iolanda Blidaru, Aleksandra Kapamadzija, Katarina Sedlecky and György Bártfai

Journal of Obstetrics and Gynaecology IF 0.629 (2016)

Elsődlegesen a magyar és szerb adatok összehasonlítására vonatkozó eredmények.



Társszerzői lemondó nyilatkozat

Alulírott, Dr. Virok Dezső levelező társszerző kijelentem, hogy Párduczné Szöllősi Andrea PhD. értekezésének tézispontjaiban bemutatott – közösen publikált - eredmények elérésében a pályázónak kiemelt szerepe volt, ezeket a téziseket más társszerző a PhD. fokozat megszerzését célzó minősítési eljárásban nem használta fel, illetve nem kívánja felhasználni.

A pályázó tézispontjaiban érintett, közösen publikált közlemény:

Correlation between detergent activity and anti-herpes simplex virus-2 activity of commercially available vaginal gels

BMC Research Notes. 2020 Jan 31;13(1):52. doi: 10.1186/s13104-020-4918-4.

Szeged, 2020. május 18.

Dr. Virok Dezső
témavezető, egyetemi docens
SZTE, ÁOK, Orvosi Mikrobiológiai
és Immunbiológiai Intézet