



# Periconceptional folic acid supplementation: knowledge, attitudes and counselling practice of Serbian pharmacists and pharmacy technicians

## Perikonceptijska suplementacija folnom kiselinom: znanja, stavovi i savetodavna praksa farmaceuta i farmaceutskih tehničara u Srbiji

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### Abstract

**Background/Aim.** The protective effect of periconceptional folic acid supplementation in reducing the risk of neural tube defects (NTDs) and other adverse pregnancy outcomes has been scientifically confirmed. The present study aimed to assess knowledge, attitudes, and practice (KAP) of community pharmacists and pharmacy technicians with regards to counselling women of reproductive age on adequate folate intake. **Methods.** The cross-sectional study was conducted among the nationwide stratified sample of pharmacists and pharmacy technicians, practicing in both private and state-owned community pharmacies in Serbia. The detailed literature review, expert consultation and pre-testing were employed in the questionnaire development. The descriptive and inferential statistical analyses were performed using the SPSS software ver. 22. **Results.** Among 730 survey participants, 96.6% correctly identified types of deformities that could be prevented by folic acid and 77.0% recognized recommended dosage for women capable of becoming pregnant. However, fewer were able to recognize the optimal timing for folic acid supplementation (61.1%) and the proper dose for the NTD recurrence prevention (42.9 %). While 43.2% of pharmacy technicians

thought that it was not their responsibility to provide a counselling concerning the measures for the prevention of congenital anomalies, only 4.7% of licensed pharmacists and none of the interns were of that opinion ( $\chi^2 = 198.287$ ;  $df = 4$ ;  $p < 0.001$ ). The majority of respondents (54.7%) reported provision of informative consultation concerning folic acid once a week, or few times a month, while only 10 stated to do so on a daily basis. In addition, based on self-report, only 36.7% of participants communicates information and advice regarding adequate folate status at their own initiative, while the rest addresses this topic only on the patients request, i.e., reactively. **Conclusion.** Although participants acknowledged the importance of their role in preconception health promotion, our findings revealed certain knowledge gaps as well as dominantly reactive counselling practice. Tailored educational interventions and professional support are needed to improve the engagement of community pharmacy personnel in this area of public health.

**Key words:** community pharmacy services; pharmacists; pharmacy technicians; health knowledge, attitudes, practice; folic acid; pregnancy; serbia.

### Apstrakt

**Uvod/Cilj.** Naučno je potvrđen zaštitni efekat primene suplemenata folne kiseline u perikonceptijskom periodu u redukciji rizika od nastanka defekata nervne cevi (DNC) i drugih neželjenih ishoda trudnoće. Cilj ove studije bio je ispitivanje znanja, stavova i prakse farmaceuta i farmaceutskih tehničara zaposlenih u javnim apotekama u vezi sa savetovanjem žena reproduktivne dobi o adekvatnom unosu folata. **Metode.** Sprovedenom studijom preseka obuhvaćen je

nacionalni stratifikovani uzorak farmaceuta i farmaceutskih tehničara zaposlenih u državnim i privatnim javnim apotekama u Srbiji. Detaljan pregled literature, ekspertske konsultacije i pre-testiranje primenjeni su u procesu razvoja upitnika. Deskriptivna i inferencijalna statistička analiza realizovane su primenom SPSS softvera ver. 22. **Rezultati.** Od 730 ispitanika, 96,6% tačno je identifikovalo vrste deformiteta koji se mogu prevenirati primenom folne kiseline, a 77,0% prepoznalo je preporučenu dozu za žene sposobne da ostanu u drugom stanju. Ipak, manji udeo ispitanika prepoznao

je optimalni vremenski okvir za suplementaciju (61,1%), kao i adekvatnu dozu za prevenciju rekurencije DNC (42,9%). Dok je 43,2% farmaceutskih tehničara izrazilo uverenje da nije njihova obaveza da sprovedu savetovanje o merama za prevenciju kongenitalnih anomalija, takvo mišljenje imalo je samo 4,7% licenciranih farmaceuta i nijedan farmaceut-stažer ( $\chi^2 = 198.287$ ;  $df = 4$ ;  $p < 0,001$ ). Većina učesnika studije (54,7%) izjavila je da pruža informativne konsultacije u vezi folne kiseline jednom nedeljno ili nekoliko puta mesečno, a samo 10 ispitanika tvrdilo je da to čini svako-dnevno. Dodatno, na osnovu sopstvenog izveštaja, samo 36,7% ispitanika pruža savete i informacije o adekvatnom statusu folata na sopstvenu inicijativu, dok ostatak ovu temu

pominje samo na zahtev pacijenta tj. reaktivno. **Zaključak.** Iako su ispitanici prepoznali značaj sopstvene uloge u promociji zdravlja u prekonceptijskom periodu, naši rezultati ukazali su na određene propuste u znanju i dominantno re-aktivni pristup savetovanju. Prilagođene edukativne inter-ventivne i profesionalna podrška neophodni su za unapre-đenje javnozdravstvenog angažovanja farmaceutskog tima iz javnih apoteka u ovoj oblasti.

**Ključne reči:**  
**farmaceutske službe, javne; farmaceuti; farmaceutski pomoćnici; zdravlje, znanje, stavovi, praksa; folna kiselina; trudnoća; srbija.**

## Introduction

Nutritive deficiencies are well-recognized preventable risk factors for the development of congenital anomalies and other adverse pregnancy outcomes. A protective effect of the periconceptual folic acid supplementation in reducing the risk for both occurrence and recurrence of neural tube defects (NTDs) is scientifically confirmed through many observational and interventional studies<sup>1</sup>. Folate derivatives are involved as coenzymes in the single-carbon transfer of units in the metabolism of amino acids and synthesis and reparation of nucleic acids. Accordingly, the role of this water-soluble B<sub>9</sub> vitamin is of a special importance for the intense cell maturation, division and proliferation during embryogenesis<sup>2</sup>.

Teratogenic effect of folate deficiency is particularly intensive during the process of neurulation occurring in early gestation phases, namely, in the first 28 days after conception<sup>3</sup>. Consequently, the timing for folic acid supplementation is critical. The fact that over 40% of pregnancies worldwide are unplanned indicates that this process, essential for proper development of the foetal nervous system, occurs before most women even become aware of the pregnancy<sup>4</sup>. That is the reason why great efforts have been made globally to create efficient public health strategies and interventions focused on folate intake and status optimization in all women of reproductive age<sup>5-7</sup>.

Due to the problematic stability and limited bioavailability of folate native forms from natural sources, it is recommended that all women capable of becoming pregnant should take 400 µg of the synthetic form of the vitamin, i.e., folic acid daily via oral supplements and/or fortified foods as an addition to varied and nutritionally balanced diet. Especially high risk level is recognized in women with the NTD-affected pregnancies in their reproductive history, women using anticonvulsive therapy and those with diagnosed diabetes. Thus, they are recommended to take substantially higher (medicinal) doses of folic acid, i.e. 4–5 mg and to be under medical supervision<sup>8-10</sup>.

However, regardless the unequivocal epidemiological evidence, achieved scientific consensus on the folic acid benefits in ensuring healthy offspring, and the fact that many health authorities officially recommended the use of folic acid prior to conception and during early phases of pregnancy,

numerous studies revealed suboptimal intake of this essential nutrient among the women of reproductive age<sup>5, 11, 12</sup>.

The variability of the situation in different countries is affected by a number of factors such as the awareness of women of prevention measures for NTDs, the existence, application and coverage of strategies for improving folate intake and status in the targeted population group, the availability and affordability of folic acid supplements, and finally, the population exposure to folic acid – fortified foods<sup>13-15</sup>. In the absence of fortification, educational campaigns and programs directed towards the promotion of adequate periconceptual care are crucial, while the responsibility and role of healthcare professionals are especially emphasized.

Serbia, like the majority of European countries, has refrained from establishing the mandatory folic acid fortification policy, and the availability of voluntarily fortified products is quite modest. Recently conducted study among the Serbian women of childbearing potential pointed to the alarmingly low level of folate intake. Based on an analysis of dietary questionnaires (24h dietary recalls and food frequency questionnaire – FFQ), the folate intake was below recommended levels in more than 90% of studied women. Furthermore, folate concentration in erythrocytes associated with the optimal protection against neural tube defects (i.e., 906 nmol/L) was not recorded in any of the examinees. Previous findings that less than 5% of women in reproductive age takes the folic acid supplements on regular basis was additionally confirmed<sup>16, 17</sup>. In such a context, the necessity of public health initiatives and efficient interventions directed to the optimization of nutritive status of women prior to their pregnancy and during it is clearly evident.

Healthcare professionals, being reliable members of the community, may significantly contribute to the improvement of maternal and newborns' health by the delivery of timely, accurate and evidence-based information and advice. Pharmacists and pharmacy technicians are ideally positioned within the health care system to promote the periconceptual folic acid supplementation and to participate in the health education of women of reproductive age. Unique accessibility of community pharmacies provides a strategically significant platform for achieving the greater coverage of targeted population group. Dissemination of health-promotional messages regarding folic acid and stimulation of women to apply preventive measures is supported by the International

Pharmaceutical Federation (FIP). This organization, through policies and recommendations complying with the World Health Organization (WHO) Maternal, Newborn and Child Health Interventions, emphasizes the role and responsibility that pharmacists bear in the context of reaching child mortality and maternal health targets set forth by the United Nations Millennium Development Goals four and five<sup>18,19</sup>. In order to efficiently address public health needs, it is essential for the community of pharmacy professionals to have positive perception of the importance of preconception care-related activities as well as the adequate knowledge, skills and motivation to integrate them into everyday work practice.

The aim of the present study was to assess the knowledge, attitudes, and practice (KAP) of Serbian community pharmacists and pharmacy technicians with regard to counselling the women of reproductive age on adequate folate intake.

## Methods

### *Study design, setting and study participants*

A questionnaire-based cross-sectional study was conducted from October 2015 to December 2016 among the nationwide stratified sample of licensed pharmacists and pharmacy technicians, working both in private and state-owned community pharmacies in Serbia.

To ensure that a number of survey participants is adequate to represent 5,803 registered pharmacists in Serbia, a sample size calculation procedure proposed by Krejcie and Daryle<sup>20</sup> was used. The required sample size as per formula ( $n = 385$ ) was adjusted to the anticipated drop-out rate ( $d = 20\%$ ) using the equation  $N = n / (1 - d/100)$  resulting in a total of  $N = 481$  subjects<sup>21</sup>.

The Pharmaceutical Chamber of Serbia membership directory was used as a sampling frame and the geographical quotas were established in order to obtain the sample proportional to the actual distribution of community pharmacists on a national scale. Accordingly, the sample was divided into four strata corresponding to the regional Chamber branches: Belgrade, the capital city (37.92%), Vojvodina, the northern autonomous province (21.83%), Kragujevac, representing Central and Western Serbia (23.19%) and Niš with Kosovo and Metohija, representing the Southern and Eastern Serbia (17.04%). Participation in the study was offered to all pharmacy technicians and interns working in the same pharmacies as recruited pharmacists.

### *Data collection*

After obtaining the consent of the director, or owner of the pharmacy, the self-administered questionnaires in a hard-copy format were hand-delivered to designated respondents in predefined time, so as not to disturb the regular daily operations. Participation in the study was voluntary, and the questionnaires were submitted anonymously. The survey packs included a cover letter, study information sheet, ethical statement and the copy of the survey instrument. During the questionnaires were filled-in, a researcher remained available in case of any further questions, or concerns. The informed

consent was assumed by completion of the questionnaire and no incentives were offered to the respondents.

### *Questionnaire*

The survey instrument, developed for the purpose of this study, was based on the detailed literature review and expert consultation. An expert group discussed the initial set of questions and selected the final assemblage in order to ensure that all relevant domains were covered. An eleven-member panel including five experienced pharmacists, four experts in the field of nutrition, psychologist and a statistician evaluated the face and content validity parameters of the questionnaire, i.e., item relevancy, comprehensibility, clarity and sequence; instrument organization, terminology and completeness<sup>22</sup>. For further refinement, the draft version was pre-tested among 10 pharmacists and 7 pharmacy technicians practicing in community pharmacies. Necessary amendments, dominantly wording and layout were made in accordance with their feed-back to ensure acceptability and proper understanding of the questions and instructions. A pilot study was then conducted with the convenience sample ( $n = 56$ ) of pharmacists and pharmacy technicians to assess the study feasibility and instrument reliability. The Cronbach's alpha values yielded for both knowledge and attitudes sections of the questionnaire were satisfactory, i.e., above the apriory set threshold of 0.7 ( $\alpha_{\text{knowledge}} = 0.823$ ;  $\alpha_{\text{attitudes}} = 0.789$ ) indicating a good internal consistency.

The final version of the questionnaire consisted of 4 sections. Section 1 gathered the respondents' sociodemographic and professional data such as gender, age, highest professional credential, work experience, marital status and details regarding the practicing setting (pharmacy type, ownership and location). Knowledge was assessed by 13 multiple-choice questions with a single correct answer. Attitudes, explored by 14 statements, were captured using 5-point rating of the Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree). The practice section of the questionnaire, containing 15 items with a combination of multiple-choice and the Likert-scale type response format covered the following topics: sources of information on folate, the current practice in advising women about an adequate intake of folate and the barriers to regular provision of information and advice about folate intake in community pharmacies.

### *Data processing and statistical analyses*

The descriptive and inferential statistical analyses were performed using the Statistical Package for Social Science (SPSS) software (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). The numerical data were reported as frequencies for the categorical variables and mean  $\pm$  standard deviation (SD) for the continuous variables. Every correct answer in the knowledge test was credited with one point. The total knowledge score, representing the summarised value for all the listed items, had a theoretical range from 0 to 13 points. The group differences for continuous variables were analysed using the Student's *t*-test and ANOVA

(with the Tukey's post hoc test), while the  $\chi^2$  test was employed for the categorical variables. A level of significance for all statistical tests was previously set at  $p < 0.05$ .

### *Ethical approval*

The study was conducted in accordance with the principles of the Declaration of Helsinki and standards for health-related research involving human participants proposed by the World Health Organization<sup>23</sup> with the institutional review and ethical approval granted by the Ethics Committee for Clinical Trials, Faculty of Pharmacy – University of Belgrade (Dossier no. 261/2).

### **Results**

Among 481 licensed pharmacists, 87 intern pharmacists and 256 pharmacy technicians who were approached during the recruitment stage 461, 77 and 218 respectively, voluntarily agreed to participate in the study, yielding 91.7% of consent rate. All the returned questionnaires were reviewed for completeness and those missing the data on the main outcome variables ( $n = 28$ ) were excluded from further analyses resulting in a total number of 730 valid questionnaires (response rate = 88.6%; completeness rate = 92.9%). The final analytical cohort of pharmacists did not differ significantly with respect to the original Pharmaceutical Chamber directory with a reference to geographical distribution of participants ( $\chi^2 = 4.810$ ;  $df = 3$ ;  $p = 0.186$ ).

Among the respondents, regardless the geographical region, there were more females than males ( $p < 0.001$ ). The mean age of participants was  $37.3 \pm 10.3$  years (range: 21.0–66.0 years) and, on average, they had  $12.4 \pm 9.9$  years (range: 0.5–40.0 years) of working experience in community pharmacies. Within-stratum and overall summaries of the participants' sociodemographic and professional profile is presented in Table 1.

The mean score on the knowledge test for the entire study cohort was  $7.27 \pm 1.95$  points with the empirical range of 1–12 points. The majority of participants (24.4%) had 7 correct answers and none achieved a maximum of theoretical score of 13 points. The analyses revealed that women were more knowledgeable than men ( $7.49 \pm 1.91$  vs.  $6.31 \pm 1.86$ ;  $t = 43.614$ ;  $p < 0.0001$ ) just as were the respondents employed in the privately owned community pharmacies than those practising in the state-owned pharmacies ( $7.65 \pm 2.01$  vs.  $6.84 \pm 1.80$ ;  $t = 32.817$ ;  $p < 0.001$ ). The participants who were parents scored higher on the knowledge test than those without children ( $7.66 \pm 1.75$  vs.  $6.82 \pm 2.07$ ;  $t = 35.679$ ;  $p < 0.001$ ), while the respondents older than 50 years of age demonstrated the lower knowledge level ( $6.14 \pm 1.79$ ) than their younger colleagues:  $M_{21-30\text{years}} = 7.36 \pm 2.16$ ;  $M_{31-40\text{years}} = 7.72 \pm 1.97$ ;  $M_{41-50\text{years}} = 6.99 \pm 1.29$  [ $F(3.726) = 18.504$ ;  $p < 0.001$ ]. The analyses of variance showed that the effect of professional status on knowledge was significant [ $F(2.727) = 50.757$ ;  $p < 0.001$ ]: the pharmacy technicians had lower average score ( $6.14 \pm 1.97$ ) than the intern pharmacists ( $8.00 \pm 1.67$ ) and the licensed pharmacists ( $7.60 \pm 1.82$ ). Corre-

spondingly, the lower level of educational attainment was associated with the lower knowledge scores [ $F(2.727) = 59.391$ ;  $p < 0.001$ ]. The participants with secondary education had notably the lower scores ( $6.18 \pm 1.96$ ) than the individuals with university ( $7.42 \pm 1.76$ ) and post-graduate education ( $8.26 \pm 1.80$ ). Furthermore, the marital status had a significant impact on knowledge regarding the folic acid supplementation [ $F(3.715) = 26.280$ ;  $p < 0.001$ ]; the married and the respondents living common law scored higher ( $7.61 \pm 1.66$  and  $8.11 \pm 2.67$  respectively) than the single and divorced/separated participants ( $6.68 \pm 2.03$  and  $6.09 \pm 1.29$  respectively). Distribution of correct response rates regarding folic acid supplementation across the professional groups of pharmacy staff is presented in Table 2.

The majority ( $n = 545$ ; 74.6% of the total sample) of study participants had generally positive attitude towards health benefits of folic acid supplementation. Fewer pharmacy technicians (58.7%) than the licensed pharmacists (79.3%) and intern pharmacists (82.4%) acknowledged congenital anomalies as a major public health problem in view of their mortality and morbidity rates ( $\chi^2 = 46.460$ ;  $df = 4$ ;  $p < 0.001$ ). All three groups of pharmacy staff expressed concern over the low level of informedness about the role of folic acid and proper use among the women of reproductive age in Serbia. Accordingly, a vast majority of respondents (95.7% females and 98.6% males) agreed that it was important to increase women's awareness regarding the folic acid value in preventing the foetal neural tube defects. While 43.2% of pharmacy technicians thought that it was not their responsibility to provide counselling concerning the measures for the prevention of congenital anomalies only 4.7% of licensed pharmacists and none of the interns were of that opinion ( $\chi^2 = 198.287$ ;  $df = 4$ ;  $p < 0.001$ ). Similarly, the substantially higher percentage of pharmacy technicians (37.4%) than the licensed and intern pharmacists (13.1% and 0%, respectively) considered the patients in the community pharmacies uninterested in being educated about the dietary supplements that are used in preconception and prenatal care ( $\chi^2 = 81.342$ ;  $df = 4$ ,  $p < 0.001$ ). More males than females (64.0% vs. 30.8%) reported discomfort with bringing up the issues of family planning and the prevention of neural tube defects in the community pharmacy setting ( $\chi^2 = 60.552$ ;  $df = 2$ ;  $p < 0.001$ ). Furthermore, the male participants were more prone to believe that the use of folic acid-containing dietary supplements contributed to pregnancy medicalisation (53.3% vs. 37.1%;  $\chi^2 = 40.167$ ;  $df = 2$ ;  $p < 0.001$ ).

The frequency distribution of respondents' attitudes across the professional groups of pharmacy staff is presented in Figure 1.

The majority of respondents ( $n = 399$ ; 54.7% of the total sample) reported the provision of informative consultation concerning pre- and post-conception use of folic acid once a week, or few times a month, while only 10 (all licensed pharmacists) stated to do so on a daily basis. By contrast, 69.9% confirmed dispensing contraceptive preparations, vitamin and mineral dietary supplements, ovulation tests/fertility monitors and home pregnancy tests to women of reproductive age once daily or multiple times a day (Table 3).

**Table 1**  
**Sociodemographic characteristics and the professional profile of study participants**

Parameters	Geographical region					Total sample (n = 730) n (%)
	Vojvodina (n = 166) n (%)	Belgrade (n = 240) n (%)	Central and Western Serbia (n = 174) n (%)	Southern and Eastern Serbia (n = 150) n (%)		
Gender						
male	30 (18.1)	38 (15.8)	44 (25.3)	27 (18)	139 (19)	
female	136 (81.9)	202 (84.2)	130 (74.7)	123 (82)	591 (81)	
Age (years)						
21–30	71 (42.8)	85 (35.4)	41 (23.6)	49 (32.7)	246 (33.7)	
31–40	51 (30.7)	72 (30)	73 (42)	44 (29.3)	240 (32.9)	
41–50	34 (20.5)	45 (18.8)	34 (19.5)	20 (13.3)	133 (18.2)	
51+	10 (6)	38 (15.8)	26 (14.9)	37 (24.7)	111 (15.2)	
Professional status						
licensed pharmacist	94 (56.7)	160 (66.7)	102 (58.6)	94 (62.7)	450 (61.6)	
intern pharmacist	16 (9.6)	28 (11.7)	16 (9.2)	14 (9.3)	74 (10.1)	
pharmacy technician	56 (33.7)	52 (21.7)	56 (32.2)	42 (28)	206 (28.2)	
Marital status						
single	51 (30.7)	80 (33.3)	32 (18.4)	43 (28.7)	206 (28.2)	
married	78 (47)	103 (42.9)	99 (56.9)	77 (51.3)	357 (48.9)	
widowed	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
separated/divorced	13 (7.8)	24 (10)	26 (14.9)	16 (10.7)	79 (10.8)	
living common law	24 (14.5)	33 (13.8)	17 (9.8)	14 (9.3)	88 (12.1)	
Work experience						
less than 3 years	57 (34.3)	73 (30.4)	34 (19.5)	38 (25.3)	202 (27.7)	
3–10 years	28 (16.9)	56 (23.3)	45 (25.9)	32 (21.3)	161 (22.1)	
11–15 years	27 (16.3)	26 (10.8)	39 (22.4)	26 (17.3)	118 (16.2)	
more than 15 years	54 (32.5)	85 (35.4)	56 (32.2)	54 (36)	249 (34.1)	
Pharmacy ownership						
state-owned	62 (37.3)	110 (45.8)	99 (56.9)	78 (52)	349 (47.8)	
privately-owned	104 (62.7)	130 (54.2)	75 (43.1)	72 (48)	381 (52.2)	

**Table 2** **Distribution of correct response rates regarding folic acid supplementation across the professional groups of pharmacy staff**

Knowledge domain	Licensed pharmacists (n = 450)	Intern pharmacists (n = 74)	Pharmacy technicians (n = 206)	Total sample (n = 730)
	n (%)	n (%)	n (%)	n (%)
Folic acid origin: natural vs. synthetic vitamin form	113 (25.1)	33 (44.6)	31 (15)	177 (24.2)
Folate natural food sources	285 (63.3)	41 (55.4)	86 (41.7)	412 (56.4)
Importance of folic acid supplementation as an addition to balanced diet in an optimal NTD risk reduction	327 (72.7)	60 (81.1)	130 (63.1)	517 (70.8)
Folic acid food fortification policy status in Serbia	95 (21.1)	28 (37.8)	79 (38.3)	202 (27.7)
Types of deformities prevented by folic acid	438 (97.3)	68 (91.9)	199 (96.6)	705 (96.6)
Folate recommended dietary allowances for adults (WHO)	351 (78)	50 (67.6)	88 (42.7)	489 (67)
Folate tolerable upper intake level (WHO)	178 (39.6)	35 (47.3)	37 (18)	250 (34.2)
Which women should take folic acid dietary supplements	367 (81.6)	62 (83.8)	133 (64.6)	562 (77)
Proper timing for folic acid supplementation	278 (61.8)	48 (64.9)	120 (58.3)	466 (63.8)
NTD timeline	276 (61.3)	39 (52.7)	96 (46.6)	411 (56.3)
Recommended dosage of folic acid for women capable of becoming pregnant	414 (92)	50 (67.6)	98 (47.6)	562 (77)
Recommended dosage of folic acid for women with history of NTD-affected pregnancy	187 (41.6)	46 (62.2)	80 (38.8)	313 (42.9)
Bioavailability: folate from natural food sources vs. folic acid	112 (24.9)	32 (43.2)	89 (43.3)	233 (31.9)

NTD – neural tube development; WHO – World Health Organization.

Frequency distribution of respondents' attitudes (%)					
	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
<b>Periconceptional use of folic acid-containing dietary supplements is of great importance in ensuring healthy offspring</b>					
Licensed pharmacists	0	2.7	10.9	51.7	34.7
Intern pharmacists	0	1.4	4.1	32.4	62.1
Pharmacy technicians	1.9	14.1	42.2	30.6	11.2
<b>Among women of reproductive age only those who are planning pregnancy should take folic acid dietary supplements</b>					
Licensed pharmacists	19.1	24.9	22.4	25.1	8.5
Intern pharmacists	8.1	39.2	1.4	47.2	4.1
Pharmacy technicians	0	14.1	23.3	33	29.6
<b>Pharmacists and pharmacy technicians are knowledgeable enough to provide appropriate counseling regarding adequate folate intake for reproductive-aged women</b>					
Licensed pharmacists	0	7.1	36	52.4	4.5
Intern pharmacists	0	0	28.4	70.2	1.4
Pharmacy technicians	0	1.9	34	55.3	8.8
<b>Congenital anomalies represent a major public health problem in view of their mortality and morbidity rates</b>					
Licensed pharmacists	0	5.3	15.3	39.1	40.3
Intern pharmacists	0	10.8	6.8	50	32.4
Pharmacy technicians	0	6.3	35	41.7	17
<b>Folic acid supplementation preconception and during pregnancy represents medicalization of pregnancy</b>					
Licensed pharmacists	25.8	12.7	19.6	36.6	5.3
Intern pharmacists	51.4	24.3	5.4	17.5	1.4
Pharmacy technicians	21.8	21.4	13.1	28.5	15
<b>Primary health care professionals play an important role in reproductive health promotion and the prevention of congenital anomalies</b>					
Licensed pharmacists	0	1.8	5.8	30.4	62
Intern pharmacists	0	0	6.8	29.7	63.5
Pharmacy technicians	1.9	0	30.6	51.5	16
<b>Women of reproductive age living in Serbia are well-informed about folic acid benefits and recommended level of intake</b>					
Licensed pharmacists	22	54.7	20.6	1.8	0.9
Intern pharmacists	12.2	56.7	2.3	0	8.1
Pharmacy technicians	13.6	73.3	12.1	1	0
<b>Strongly disagree (1)</b>					
<b>Disagree (2)</b>					
<b>Neutral (3)</b>					
<b>Agree (4)</b>					
<b>Strongly agree (5)</b>					
<b>It is important to increase women's awareness regarding the importance of folic acid in preventing foetal neural tube defects</b>					
Licensed pharmacists	0	1.8	25.1	0	73.1
Intern pharmacists	0	0	5.4	37.8	56.8
Pharmacy technicians	1.9	0	13.2	49	35.9
<b>Congenital anomalies do not pose a major public health problem in the context of social costs and human suffering</b>					
Licensed pharmacists	54.7	32.8	9.8	1.8	0.9
Intern pharmacists	27	62.2	9.4	1.4	0
Pharmacy technicians	14.5	64.1	16.5	4.9	0
<b>Patients in community pharmacies are not interested to be educated about dietary supplements that are used in preconception and prenatal care</b>					
Licensed pharmacists	17.8	40	29.1	13.1	0
Intern pharmacists	6.7	54.1	39.2	0	0
Pharmacy technicians	0.5	48.5	13.6	23.8	13.6
<b>It is not my responsibility to educate women about measures for the prevention of congenital anomalies</b>					
Licensed pharmacists	46	20.9	28.4	2.9	1.8
Intern pharmacists	36.5	52.7	10.8	0	0
Pharmacy technicians	8.7	24.8	23.3	40.8	2.4
<b>Pharmacists and pharmacy technicians should provide information about adequate folate intake only on patient's request, not on their own initiative</b>					
Licensed pharmacists	29.1	25.8	23.8	18.9	2.4
Intern pharmacists	43.2	35.1	9.5	12.2	0
Pharmacy technicians	8.3	20.8	19.9	37.4	13.6
<b>When interacting with women of reproductive age I feel uncomfortable to bring up the topic of family planning and the prevention of neural tube defects</b>					
Licensed pharmacists	26.4	23.8	16	30	3.8
Intern pharmacists	6.7	29.7	20.3	41.9	1.4
Pharmacy technicians	7.3	35	15.4	24.3	18
<b>Community pharmacists and pharmacy technicians, being health professionals most accessible to general public, play an important role in health promotion and disease prevention</b>					
Licensed pharmacists	0.9	1.8	2.7	24.2	70.4
Intern pharmacists	0	0	5.4	25.7	68.9
Pharmacy technicians	0	1.9	1.5	34.6	48.5

Fig. 1 – Frequency distribution of respondents' attitudes across the professional groups of pharmacy staff.

**Table 3** Frequency distribution of participants' answers to practice-related questions

Practice domain	Options	Number of participants	Total (n = 756)
Frequency of providing information and advice concerning pre- and post-conception use of folic acid for the prevention of neural tube defects and other congenital anomalies	Every day	10	1.4
	Few times a week	124	17
	Once a week	226	31
	Few times a month	173	23.7
	Once a month	87	11.9
Dispensing frequency of the following products to women of reproductive age: contraceptive preparations, vitamin and mineral dietary supplements, ovulation tests/ fertility monitors, and home pregnancy tests	Rarely	110	15.1
	Never	0	0
	Multiple times a day	191	26.2
	Every day	319	43.7
	Few times a week	197	27
Last access to information on recommended level of intake, role and importance of folic acid	Once a week	20	2.7
	Few times a month	3	0.4
	Once a month or rarer	0	0
	More than 5 years ago	115	15.8
	4–5 years ago	129	17.7
Main sources of information on recommended level of intake and health benefits of folic acid*	2–3 years ago	278	38.1
	6 months–1 year ago	136	18.7
	3–6 months ago	59	8.1
	In the past 3 months	11	1.5
	Medical representatives	317	43.4
Barriers to regular provision of information and advice about folate intake in community pharmacies*	Continuing medical education courses	345	47.3
	Websites of relevant institutions and health authorities	377	51.6
	Scientific journals and textbooks	298	40.8
	Media (TV, radio, public press, internet etc.)	285	39
	Professional meetings and conferences	261	35.8
*Note: Percentage may sum over 100 since multiple answers were permitted; 461 licensed pharmacists, 77 intern pharmacists, 218 pharmacy technicians (total n = 756).	Lack of time and/or adequate space	432	59.2
	Lack of patients' interest	259	35.5
	Lack of remuneration for these activities/services	253	34.7
	Feeling uncomfortable to bring up the issue of birth defects	319	43.7
	Insufficient folic acid-relevant knowledge among pharmacy staff	243	33.3
	Low motivation level among pharmacy staff	384	52.6

\*Note: Percentage may sum over 100 since multiple answers were permitted; 461 licensed pharmacists, 77 intern pharmacists, 218 pharmacy technicians (total n = 756).



The pharmacists (49.2%) were more likely than the pharmacy technicians (32.5%) to report a prior training on folic acid health protective benefits ( $\chi^2 = 9.496$ ;  $df = 2$ ;  $p < 0.01$ ), and the vast majority of subjects ( $n = 630$ ; 91.9%) expressed an interest in receiving the additional education on this issue. The main sources of information, used by the respondents to expand and update their folic acid-related knowledge are listed in Table 3. Among the survey participants 254 (34.8%) confirmed availability of informative materials (e.g., brochures, posters, flyers, etc.) about folic acid and/or recommended vitamin/mineral intake preconception and during pregnancy in the pharmacy. Based on the self-report, 36.7% of respondents, on most occasions, communicated information and advice concerning folic acid at their own initiative, while 63.3% dominantly did it reactively, i.e., in response to the patients' questions. The communication strategy was significantly associated with gender ( $\chi^2 = 12.43$ ;  $df = 2$ ;  $p < 0.001$ ) and the current professional status ( $\chi^2 = 10.289$ ;  $df = 4$ ;  $p < 0.01$ ). The females were more likely to act proactively than the males (39.8% vs. 23.7%), so as were the licensed and intern pharmacists (40.2% and 42.5% respectively) compared to the pharmacy technicians (27.7%). The participants' perceptions of the most common barriers to regular provision of advice and information regarding the folate intake are presented in Table 3.

## Discussion

Being highly accessible and trusted health professionals, community pharmacists have both professional responsibility and opportunity to participate actively in disease prevention and health promotion<sup>24</sup>. Additionally, the evolving role of pharmacy technicians may support community pharmacists in providing advanced services, including those related to the public health promotion<sup>25,26</sup>. During the routine interactions with women of reproductive age members of pharmacy staff can recognize and address biomedical and behavioural risk factors that may jeopardize women's health and cause adverse pregnancy outcomes<sup>8</sup>. Despite conclusive scientific evidence regarding the importance of adequate folate status prior to conception and in the early phases of pregnancy, the folate insufficiency among women remains a significant public-health concern worldwide. In countries lacking the mandatory folic acid food fortification policies, like Serbia, the strategies to optimize the folate status at the population level are focused on the folic acid supplementation<sup>27</sup>. The main challenge of this approach comes from the fact that folic acid is effective in the NTD prevention only during the neurulation, i.e., by 28th day post-conception. Due to a high rate of unplanned pregnancies, the interventions aiming to increase awareness of the folic acid benefits and compliance with the recommendations should be directed towards all women of childbearing age. By provision of health-education materials, informative consultation and advice pharmacists and pharmacy technicians may give their contribution in public-health efforts to combat neural tube defects and other preventable congenital anomalies<sup>8</sup>. To the best of our knowledge, this study was the first one that ex-

plore knowledge, attitudes and practice (KAP) of the Serbian pharmacists and pharmacy technicians with regards to counseling women of reproductive age on adequate folate intake.

The finding that the vast majority of survey participants (96.6%) correctly identified the types of deformities which could be prevented by folic acid indicates a high level of general awareness of this important issue. These observations were in accordance with previous studies conducted among the pharmacists, pharmacy students and obstetrician-gynecologists<sup>28-30</sup>. Nevertheless, the study revealed certain gaps in the knowledge regarding some particular aspects of folate nutrition and the folic acid supplementation. Even though more than two-thirds of surveyed pharmacy staff members knew the recommended dietary allowances for adults (67%) and a dosage of folic acid for women capable of becoming pregnant (77%), less than one-half properly identified a recurrence dose and a dose for women with an increased risk of having infants with NTDs. The folic acid origin, bioavailability issues and current food fortification policy in Serbia were targeted as knowledge domains that elicited the lowest correct response rates. It is worrisome that almost 40% of surveyed health professionals did not recognize that folic acid should be administered prior to pregnancy to ensure the optimal NTD prevention. This finding was directly coupled with a poor knowledge regarding the neural tube closure timeline. Even more significant deficiency in knowledge on these issues was observed among the obstetricians and specialists in women's health in the Northern China, physicians in the Southern Israel, health professionals in the Northwestern Ethiopia and Chilean primary health workers<sup>31-34</sup>. The participants in the present study had the comparable knowledge level to the Ohio community pharmacists and similar gaps were identified<sup>28,35</sup>. Furthermore, consistent with other studies conducted among different groups of healthcare personnel, the professional category and educational attainment level significantly affected folic acid-related knowledge<sup>31,33,36</sup>. Based on the test results, the pharmacy technicians were less knowledgeable than both intern and licensed pharmacists concerning the majority of analyzed domains. The reasons for the identified knowledge deficiencies should be explored and the curriculum modifications, refreshment trainings and specific guidance should be created accordingly.

The majority of respondents acknowledged the importance of folic acid favourable effects on pregnancy outcomes and almost all expressed support to raising awareness of this issue among women of childbearing age. Although more than 40% of participants thought that folic acid contributed to pregnancy medicalization, in line with findings from study conducted in the Netherlands, that did not seem to affect their support to this NTD preventive measure<sup>37</sup>. Only 2.7% of respondents believed that the women in Serbia are sufficiently informed about the role of folate status in achieving a healthy offspring. Such observations of pharmaceutical staff members are supported with findings of previously conducted studies indicating a very small proportion of Serbian women regularly taking the folic acid dietary supplements<sup>16,17</sup>. Similarly, alarmingly poor knowledge regarding benefits of

timely use of folic acid and a high rate of suboptimal periconceptional practises were found in a large multinational survey of more than 22,000 European women of reproductive age, clearly reflecting unmet needs in preconception care<sup>38</sup>. In the mentioned study, based on the participants' self-report, the lack of awareness and absence of appropriate counselling were identified as the main reasons for not taking folic acid preconceptionally and/or during pregnancy. It is noteworthy that more than 90% of surveyed licensed and intern pharmacists agreed that the primary health care professionals were of particular importance for preconception health promotion. Furthermore, comparable with the studies conducted among their Dutch and Australian colleagues, almost all responding pharmacists regarded it as their professional duty to inform women about folic acid and advocate for preconception care<sup>37</sup>. The analyses of reported attitudes, however, revealed that 37.1% of surveyed community pharmacy personnel expressed discomfort with discussing the issues of family planning and prevention of congenital anomalies, with this problem being especially accentuated among the male providers. In addition, 21.3%, 12.2% and 51.0% of licensed pharmacists, interns, and pharmacy technicians, respectively, were of the opinion that these topics should be addressed only on patients request, i.e., reactively. Consistently with other studies, the pharmacists' concern about being too intrusive by imposing information and advice discourage them from acting proactively, which causes underutilisation of full potential of community pharmacy setting in the prevention of folic acid-sensitive congenital malformations<sup>37-41</sup>.

In compliance with the United Nation Global Strategy for Women's and Children's Health, International Pharmaceutical Federation (FIP) encourages active involvement of pharmacists in the preservation and improvement of maternal, newborn and children health through a variety of evidence-informed interventions, screening, health-education, facilitation of health-care services and provision of appropriate products<sup>18</sup>. Nevertheless, the current study demonstrated a large discrepancy between the opportunities for preconception counselling and implemented activities, highlighting the gap between the ideal and actual level of pharmacy staff contribution. Based on the self-report, more than one-half of respondents provided information and advice regarding the folic acid value in the prevention of congenital abnormalities once a week, or few times a month, while only 10 pharmacists stated to perform these activities on daily basis. Conversely, approximately 70% of respondents reported dispensing products associated with the general and reproductive female health to women of childbearing age once daily, or even multiple times a day, which revealed a myriad of missed occasions for the informative consultation<sup>40</sup>. The fact that a healthcare provider recommendation was recognized as the single most important reason women would commence folic acid supplementation underscores the significance of responsible and consistent provision of counseling<sup>38</sup>. Understanding the key obstacles to the adequate delivery of such activities is a prerequisite for addressing suboptimal involvement of the community pharmacy health professionals.

The main barriers perceived by the surveyed pharmacists and pharmacy technicians were consistent with the findings from the studies done elsewhere and included the time and space constraints, low motivation level among personnel, discomfort with raising the issue of birth defects, lack of financial compensation, uncooperative patients and knowledge deficiencies<sup>39,42-44</sup>. In order to overcome the low level of self-assessed competency and motivation, initiate behavioral change and improve current and future performance of pharmacy staff, implementation of targeted training programmes is required.

The theory of Planned Behaviour, as an extension of the Theory of Reasoned Action, has been widely applied in the analyses and prediction of health professionals' behaviour<sup>45-48</sup>. This theoretical framework postulates that intention, capturing the motivational factors which influence behaviour, is the crucial antecedent and reasonably accurate predictor of an individual's actions<sup>49</sup>. Based on this model, behavioural intention is influenced by attitudes, subjective norms (i.e., social pressure), and perceived control over the behaviour with each of these variables being driven with a corresponding type of salient beliefs (behavioural, normative and control). If these social-cognitive constructs were transferred to pharmacy practice, we might assume that the favourable attitudes toward preconception counselling, subjective norms supporting these activities and strong perceived behavioural control are positive and significant predictors of community pharmacists' and pharmacy technicians' intentions to involve proactively in dissemination of evidence-informed, health-promotional messages about folic acid. Advancement of self-perceived knowledge, skills and efficacy would empower pharmacists and pharmacy technicians to embrace more active roles in providing the patient-centered preconception care in accordance with their professional responsibilities and scope of practice<sup>18</sup>.

Certain limitations of the present study should be taken into consideration when interpreting the results. The recruitment strategy applied to pharmacy technicians might have caused participation bias and influenced generalizability of the obtained results. However, the rationale behind the selected sampling protocol was based on the fact that the pharmacy technicians perform pharmaceutical health care activities in the community pharmacies only in the presence of licensed pharmacists and under their supervision. Furthermore, considering geographical distribution, no statistically significant difference was found between the structure of the analyzed cohort of pharmacy technicians and the Serbian Chamber of Nurses and Medical Technicians membership directory ( $\chi^2 = 4.315$ ;  $df = 3$ ;  $p = 0.229$ ). Another limitation refers to the fact that the evaluation of counseling practice was based on the self-reported behaviour, and therefore, it was a subject of inherent imperfections of that method.

## Conclusion

Given the widespread inadequacy of folate intake, a low level of public awareness concerning the importance of preconception care and high rate of unplanned pregnancies, in-

novative, sustainable and effective public health strategies are needed to reduce the risk of devastating folic acid-preventable congenital malformations. Due to the unique accessibility and expertise community pharmacy health professionals may give indispensable contribution to this agenda.

Nevertheless, the results of the present study provide evidence that tailored educational interventions and professional support are needed to improve their engagement in this area of public health. Although participants demonstrated positive general attitude toward folic acid value for maternal and foetal health, and acknowledged the importance of their role in preconception health promotion, our findings revealed certain knowledge gaps as well as dominantly reactive counselling practice. Being first to explore knowledge, attitudes and practice regarding folic acid supplementation

among the pharmacists and pharmacy technicians in Serbia, this study provides valuable reference data for addressing the barriers to behavioural change, the practice optimisation and establishment of proactive advocacy of folic acid benefits.

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