

Impact of COVID-19 on Health-Related Quality of Life and Vaccine Perceptions: Insights for Community Pharmacists in Romania and Bulgaria

Claudia Iftode¹, Lucian Eva¹, Delia Nica-Badea^{1*}

¹ Department of Pharmacology, Physiology and Pathophysiology, Faculty of Pharmacy, "Iuliu Hațieganu" University of Medicine and Pharmacy, 6A Louis Pasteur Street, 400349 Cluj-Napoca, Romania.

Abstract

Community pharmacists serve as critical frontline healthcare providers during the COVID-19 pandemic, yet their own health-related quality of life (HRQoL) remains underexplored, despite its impact on their professional performance. To assess HRQoL and examine factors influencing COVID-19 vaccination decisions among pharmacists in Romania and Bulgaria, an online survey was conducted from 15th July to 15th August 2020, including 395 participants. Quality of life was measured using the 15D instrument, and pharmacists' guidance on vitamin C and D intake during the pandemic was also analyzed to support future educational programs. Comparative analysis revealed that Bulgarian pharmacists reported lower HRQoL scores than their Romanian counterparts in domains such as sleep, daily activities, cognitive function, discomfort, depression, and distress, with overall scores declining with age (Spearman $r = 0.168$, $p = 0.022$). Vaccine acceptance was similar across both countries, with nearly half of respondents expressing willingness to be vaccinated ($p = 0.7542$), and was significantly linked to vitamin D supplementation ($p = 0.0134$) but not vitamin C ($p = 0.4157$). Other factors, including age, gender, income, and HRQoL markers, showed no significant association with vaccination intentions. These findings highlight the need for evidence-based interventions aimed at improving the wellbeing of community pharmacists actively engaged in pandemic response.

Keywords: Community pharmacists, COVID-19, Quality of life, 15D, Vaccination

Corresponding author: Delia Nica-Badea

E-mail: Delicabadenica@gmail.com

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Introduction

Since the initial reported case of COVID-19 on December 31, 2019, this life-threatening virus has profoundly disrupted virtually all socio-economic dimensions of daily life [1-4]. Frontline healthcare personnel have experienced unprecedented levels of anxiety, largely due to persistent uncertainties surrounding viral transmissibility and effective pharmacological management [1]. Prolonged

stress, panic, and physical fatigue may contribute to post-traumatic disorders or depression, with healthcare workers being particularly vulnerable [1]. Additionally, heightened workload and fears of self-infection, social stigma, or transmitting the virus to family members may compromise professional performance [5,6].

Strong inter-professional collaboration across healthcare settings, including community pharmacies, is strongly advocated to manage the pandemic effectively [2]. For instance, during the Ebola outbreak, coordinated communication between physicians and community

pharmacists was critical in preventing further infection spread [7]. Although pharmacists interact directly with the public daily [3], they are often overlooked as frontline healthcare providers, despite being essential and highly accessible [6-9]. Data on COVID-19 exposure and prevalence among community pharmacists remain scarce and potentially underestimated [7,9,10]. Nevertheless, elevated exposure risk has been linked to significant psychological strain [11]. Constant concern over infection, insufficient social distancing within pharmacies, aggressive patient behavior, and heightened stress may impair pharmacists' cognitive performance and attention [1,12].

Community pharmacists have actively participated in COVID-19 patient screening and triage (**Figure 1**), ensured continuity of care for non-COVID conditions, and promoted adherence to pharmacotherapy, all of which have intensified their occupational strain [2,9]. Despite this, pharmacists have consistently demonstrated responsible adherence to protective measures (**Figure 1**), even amid increased burnout risk [8,10,12]. They have conducted surveillance of suspected cases, offered symptom-based counseling, and guided patients regarding quarantine requirements based on clinical presentation (**Figure 1**) [7]. Moreover, pharmacists enhanced patient education through telehealth services and emerging technologies [2]. By maintaining continuous communication via mobile apps, emails, video calls, and text messaging, they provided ongoing pharmaceutical support to those seeking guidance (**Figure 1**) [2]. This persistent monitoring not only facilitated rational medicine use but also clarified misconceptions about prophylactic and long-term treatments (**Figure 1**) [2], helping reduce unnecessary visits to already overburdened healthcare facilities and promoting cost-effective pandemic management [7]. A systematic review published in July 2019 emphasized the critical role of pharmacists in public health crisis recovery [6], highlighting the importance of safeguarding their mental well-being and overall quality of life.

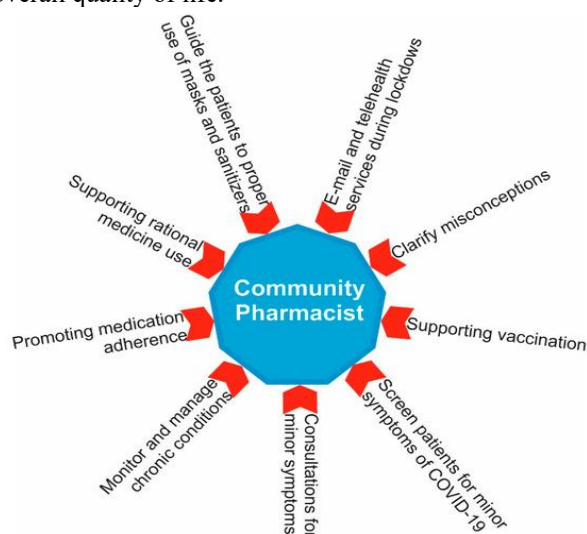


Figure 1. Community Pharmacy Services During the COVID-19 Pandemic

Community pharmacists actively participate in pharmacovigilance and provide education and counseling on both the pharmacological management of COVID-19

and the correct use of personal protective equipment and sanitizers (**Figure 1**) [2,7,12]. They also play a crucial role in addressing misinformation, guiding the public away from unsafe self-medication practices [7,8,11-13]. Furthermore, pharmacists contribute significantly to pandemic prevention and containment by promoting adherence to prophylactic immunomodulatory treatments, such as vitamins C and D, supporting vaccination campaigns, and engaging in vaccinovigilance efforts (**Figure 1**) [2,7,8,13].

The European Medicines Agency (EMA) approved Comirnaty (BioNTech/Pfizer) as the first COVID-19 vaccine for individuals aged 16 and older in Europe on December 21, 2020 [14], followed by conditional approval of the Moderna vaccine on January 6, 2021, for adults 18 years and older [14]. Both vaccines employ mRNA technology to prime the immune system. The AstraZeneca vaccine, based on a modified adenovirus platform, was the latest to receive European authorization on January 29, 2021. Pharmacists actively support and promote all three vaccines, which are closely monitored through pharmacovigilance systems in Romania [15] and Bulgaria [16].

Vitamin C (ascorbic acid) is not synthesized by humans and is primarily obtained from fruits and vegetables [17-19], either alone or in combination with other vitamins and minerals [20]. Vitamin D exists as D2 (plant-derived) and D3 (food-derived or synthesized in the skin under ultraviolet-B light), both available as supplements [21,22]. Modern indoor lifestyles, sun avoidance, and diets rich in processed foods contribute significantly to global vitamin D deficiency [23]. Given prolonged lockdowns and restricted outdoor activities, supplementation of vitamin D is particularly beneficial during the pandemic. Both vitamins C and D have been shown to support immune function and reduce the risk of respiratory infections [24,25].

Pharmacists also serve as initial contact points for individuals needing mental health support [12]. Robinson *et al.* highlight that, to assist patients experiencing behavioral health challenges—such as anxiety, fear, insomnia, fatigue, anger, panic attacks, and depression—community pharmacists should first address their own mental health needs [3,4-6,9,12]. Promotion of self-care strategies, including physical activity, balanced nutrition, sleep hygiene, mindfulness, and resilience building, is essential [11,12]. Additionally, multidisciplinary mental health programs and regular evaluation of pharmacy staff should be implemented promptly to safeguard pharmacists' well-being [9,12].

Romania enforced a COVID-19 lockdown from March 16 to May 15, 2020, while Bulgaria declared a state of emergency from March 13 to May 13, 2020. Both countries subsequently entered alert periods with ongoing restrictions. These two nations were selected for this study due to their similar healthcare systems, legislation, and drug policies within the Central and Eastern European region [26].

This study aimed to assess the health-related quality of life (HRQoL) of community pharmacists in Romania and Bulgaria during the COVID-19 pandemic and to identify factors influencing their perception of vaccination against COVID-19. We examined associations between HRQoL,

demographic characteristics, pharmacists' recommendations for vitamin C and D supplementation, and their attitudes toward COVID-19 vaccination. Additionally, drawing on evidence from multiple clinical trials regarding vitamins C and D in COVID-19 management, we sought to evaluate pharmacists' knowledge and practices in recommending these over-the-counter supplements during the pandemic.

Materials and Methods

Study design

A cross-sectional survey was carried out from 15th July to 15th August 2020. The questionnaire, created via Google Forms, consisted of three parts: socio-demographic data, the 15D health-related quality of life (HRQoL) instrument, and questions assessing perceptions toward COVID-19 vaccination (Supplementary file_Questionnaire). Participation was fully anonymous and confidential. The survey link was distributed through social media pharmacist communities, including Facebook, and via email to previous students.

The first section collected information on age, gender, marital status, professional experience, monthly pharmacist income, and area of pharmacy specialization. Monthly income was classified into three categories: low (<600 Euro), medium (600–1000 Euro), or high (>1000 Euro).

HRQoL was evaluated in the second section using the 15D instrument [27,28], which measures 15 dimensions: mobility, vision, hearing, breathing, sleeping, eating, speech, excretion, usual activities, mental function, discomfort and symptoms, depression, distress, vitality, and sexual activity. Each dimension is rated on five levels, ranging from no difficulty to severe impairment. The 15D single index score (0–1; 1 = full health, 0 = dead) represents overall HRQoL, while dimension-specific scores reflect relative functioning based on population-derived utility weights.

The third section included five custom items, designed specifically for this study, regarding personal use or

recommendations of vitamin C and D supplementation during the pandemic and attitudes toward COVID-19 vaccination.

Participants

Pharmacists working in community pharmacies in Romania and Bulgaria were invited to participate. Convenience sampling was applied to achieve a representative study population [29]. Using G*Power 3, a power analysis ($\alpha = 0.05$) determined that at least 176 participants were required to detect statistically meaningful effects [30]. The study was approved by the Ethics Committee of the University of Medicine and Pharmacy of Craiova (Registration no. 54/08.07.2020) in accordance with the Declaration of Helsinki. Electronic informed consent was obtained from all participants at the start of the survey.

Data analysis

Continuous variables were described using mean $\pm$ standard deviation (SD) or median with interquartile range (IQR), and comparisons were performed with Student's *t*-test or the Mann–Whitney test. Categorical variables were presented as counts and percentages and analyzed using the chi-squared test. Associations between continuous variables and 15D scores were examined using Spearman's correlation, while ANCOVA assessed relationships between continuous and categorical variables. No missing data were observed. Statistical analyses were conducted using GraphPad Prism 9.0 (GraphPad Software, LLC, San Diego, CA, USA), with significance set at $p < 0.05$.

Results

A total of 395 community pharmacists, all with potential contact with COVID-19 patients, participated in the study, including 241 from Romania and 154 from Bulgaria. The detailed demographic and clinical characteristics are summarized in **Table 1**.

Table 1. Baseline characteristics of pharmacists from Romania and Bulgaria

	Romania (n = 241)	Bulgaria (n = 154)	p-Value
Gender			
Men	18 (7%)	33 (21%)	<0.0001 *
Women	223 (93%)	121 (79%)	
Age ^, years	30 (26–37)	26 (25–32)	<0.0001 *
Marital status			
Married	117 (49%)	49 (32%)	0.0010 *
Not married	113 (47%)	100 (65%)	
Divorced	9 (4%)	4 (3%)	
Widower	2 (1%)	1 (1%)	
Professional experience ^, years	7.36 $\pm$ 8.3	6.2 $\pm$ 7.8	0.0124 *
Income working as pharmacist			
Low (less than 600 Euro)	95 (39%)	29 (19%)	<0.0001 *
High (more than 1000 Euro)	18 (7%)	33 (21%)	
Specialist pharmacists			
Yes	108 (45%)	24 (16%)	<0.0001 *
No	133 (55%)	130 (84%)	

*, significantly different ($p < 0.05$); ^, did not pass normality test.

Comparison of the two pharmacist cohorts indicated that Romanian pharmacists were generally older and included a larger proportion of women, married individuals, and those holding specialist certifications. When evaluating monthly income, Bulgarian pharmacists reported higher earnings despite having less professional experience, a difference that reached statistical significance.

Specialization profiles differed between the countries. Of the 108 Romanian specialists, 47 (44%) focused on Clinical Pharmacy, 51 (47 percent) on General Pharmacy, and 10 (9 percent) on Pharmaceutical Laboratory roles. In contrast, the Bulgarian specialist group was predominantly comprised of Clinical Pharmacy practitioners (46%).

Table 2 highlights disparities in HRQoL dimensions between the groups. Significant differences emerged in sleeping patterns, ability to perform usual activities, cognitive functioning, experience of discomfort and symptoms, levels of depression and distress, and overall 15D scores, with distress levels being particularly low. In Bulgarian pharmacists, lower overall 15D scores were positively associated with advancing age (Spearman $r = 0.168$, $p = 0.022$). Moreover, cognitive functioning demonstrated a strong negative relationship with discomfort and symptom scores (Spearman $r = -0.81$, $p = 0.028$).

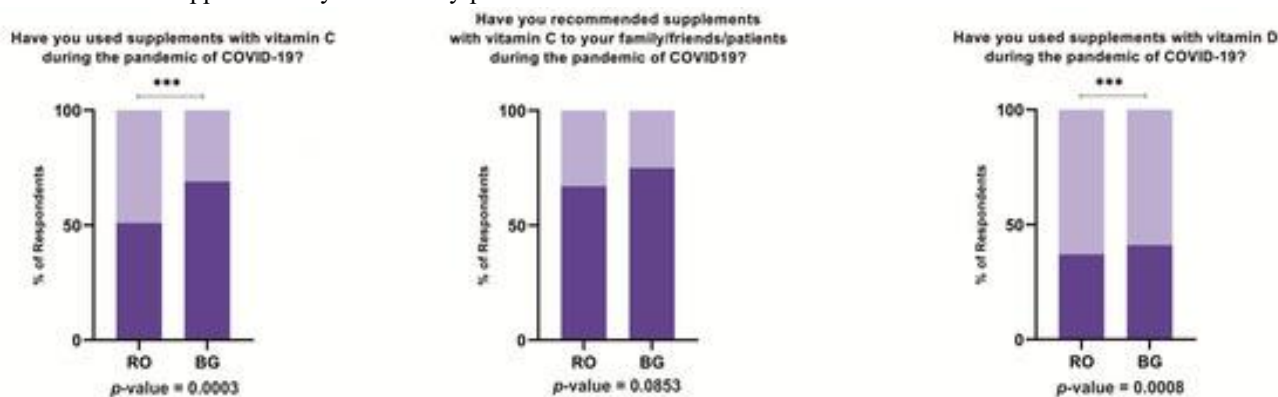
Table 2. Health-related quality of life (HRQoL) results

Mean $\pm$ SD	Romania (n = 241)	Bulgaria (n = 154)	p-value
Mobility	1	1	>0.999
Vision	1	1	>0.999
Hearing	1	1	>0.999
Breathing	0.903 $\pm$ 0.143	0.928 $\pm$ 0.132	0.0702
Sleeping	0.896 $\pm$ 0.161	0.848 $\pm$ 0.207	0.0494 *
Eating	1	1	>0.999
Speech	0.982 $\pm$ 0.084	0.975 $\pm$ 0.083	0.1778
Excretion	0.976 $\pm$ 0.094	0.961 $\pm$ 0.104	0.0786
Usual activities	0.975 $\pm$ 0.113	0.961 $\pm$ 0.114	0.041 *
Mental function	0.979 $\pm$ 0.087	0.943 $\pm$ 0.136	0.0007 *
Discomfort and symptoms	0.921 $\pm$ 0.141	0.979 $\pm$ 0.094	<0.0001 *
Depression	0.933 $\pm$ 0.130	0.853 $\pm$ 0.197	<0.0001 *
Distress	0.844 $\pm$ 0.187	0.765 $\pm$ 0.217	0.0002 *
Vitality	0.881 $\pm$ 0.139	0.844 $\pm$ 0.185	0.1305
Sexual activities	0.925 $\pm$ 0.155	0.930 $\pm$ 0.141	0.14
Total 15D score	0.956 $\pm$ 0.051	0.936 $\pm$ 0.063	0.0024 *

*, significantly different ($p < 0.05$); SD, Standard Deviation.

We examined whether gender influenced HRQoL outcomes, and no significant associations were observed across all dimensions: breathing ($p = 0.060$), sleeping ($p = 0.302$), speech ($p = 0.191$), excretion ($p = 0.582$), usual activities ($p = 0.887$), mental function ($p = 0.065$), discomfort and symptoms ($p = 0.322$), depression ($p = 0.677$), distress ($p = 0.622$), vitality ($p = 0.809$), sexual activity ($p = 0.077$), and overall HRQoL score ($p = 0.661$). Responses regarding the use and recommendation of vitamin C and D supplements by community pharmacists

were analyzed and are shown in **Figure 2**. Significant differences emerged in supplement usage, with Bulgarian pharmacists reporting higher personal use of vitamins C and D. However, this pattern did not extend to recommendations: a larger proportion of pharmacists recommended these supplements to family, friends, or patients than reported using them personally, and no significant differences were found between Romanian and Bulgarian pharmacists in this regard.



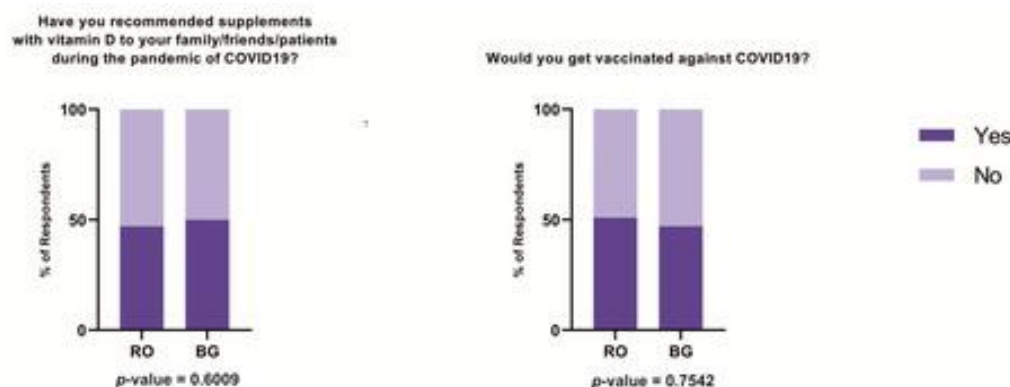


Figure 2. Attitudes regarding COVID-19 vaccination and the recommendation of vitamins. *** p-value < 0.001

Community pharmacists from both countries reported a nearly identical willingness to receive COVID-19 vaccination, with 50% expressing readiness ($p = 0.7542$). A significant statistical relationship was observed between willingness to vaccinate and the use of vitamin D during the pandemic ($p = 0.0134$), whereas no such relationship was found with vitamin C use ($p = 0.4157$). No other significant associations emerged between vaccination willingness and factors such as age, gender, income, or quality-of-life indicators.

Discussion

The intense psychological strain experienced by healthcare professionals over the past year has had repercussions not only for patients but also for broader public healthcare systems [11, 12]. During this demanding period, pharmacists were expected to expand beyond their traditional roles, serving as primary care and triage points for many patients [31-33].

Our study identified strong statistical correlations between reported discomfort, specific symptoms, and mental functioning among participating pharmacists. Unlike other studies [34], our findings did not indicate increased psychological vulnerability among female pharmacists. For instance, Batra *et al.* reported that female healthcare workers with prolonged patient contact experienced higher levels of depression, distress, and behavioral dysfunction [5]. Overall, more than half of pharmacists experienced mental health impacts during the COVID-19 pandemic, with some studies suggesting burnout rates higher than those seen in nurses and physicians [35]. Lange *et al.* [36] found that roughly 35% of community pharmacists reported anxiety, stress, insomnia, feelings of loss of control, fear, or hopelessness, with females being more affected [36, 37]. These early studies from Normandy, France [37] differ from our findings, likely due to the different timing of data collection. Similar results were observed in Romanian young physicians, where no gender-based differences in distress were noted [38].

Our study included a higher proportion of senior and specialist pharmacists from Romania, potentially contributing to better emergency preparedness, coping mechanisms, and overall quality of life [35]. Consequently, Romanian pharmacists reported higher quality of life, while Bulgarian pharmacists experienced more sleep disturbances, distress, and depression. Statistical analysis indicated that Bulgarian pharmacists faced greater challenges in managing routine activities, highlighting the mental health burden imposed by the pandemic.

Dror *et al.* [39] suggested that frontline medical staff exhibit lower vaccine hesitancy, while workers with limited or no patient contact tend to be more skeptical. Vaccine acceptance can be enhanced not only through accurate recommendations and information delivered by pharmacists, who play a critical educational role, but also by pharmacists' own confidence in vaccination [39, 40]. Despite conditional marketing authorization for COVID-19 vaccines being granted when benefits outweigh risks [14], public understanding of vaccine importance remains limited. Pharmacists are crucial in supporting immunization campaigns in both European countries studied, helping to alleviate the COVID-19 burden [9, 41, 42]. Although misconceptions and skepticism persist, vaccination programs prevent over 2.5 million deaths annually worldwide [42]. Community pharmacists can boost vaccination rates both by advising patients and by being authorized to administer vaccines themselves [42]. One of the strongest predictors of vaccine acceptance is individuals' perception of high COVID-19 risk, which can be reinforced through medical education [39,41]. Conversely, females are generally less likely to accept vaccination [39], a trend reflected in our study, possibly due to the higher proportion of female pharmacists in both countries.

This study provides valuable insights into the quality of life of community pharmacists during the COVID-19 pandemic and their attitudes toward vaccination. One limitation is the relatively younger age group of respondents, likely influenced by the channels used for

survey distribution, as more years of professional experience might have affected responses. Additionally, the timing of the survey could have shaped pharmacists' perceptions of COVID-19's impact, meaning responses may vary at different points in time.

Another limitation involves comparing pharmacists' incomes across the two countries, given that the World Bank classifies Bulgaria as an upper-middle-income country and Romania as high-income [42], although community pharmacists in Romania still earn relatively low salaries.

This research represents one of the first studies examining COVID-19's effects on the quality of life of pharmacists in Romania and Bulgaria. Only one prior study addressed the pressures faced by community pharmacists during lockdown [36]. Our study also provides a comparative perspective between neighboring countries regarding psychological distress among frontline healthcare workers and is the first attempt, to our knowledge, to assess the use and recommendation of vitamins C and D by pharmacists during the pandemic.

In European populations, an inverse relationship has been observed between national vitamin D levels and COVID-19 incidence [43,44] and mortality [43-45]. Evidence suggests that vitamin D may reduce the risk and severity of COVID-19 through several mechanisms, including lowering inflammatory cytokine production, limiting viral replication, maintaining endothelial integrity, and increasing angiotensin-converting enzyme 2 levels [46]. Prophylactic use of vitamin D in COVID-19 management has been highlighted [47], with the pandemic consensus recommending 2,000 IU daily for teenagers and adults—far below toxic levels even if taken for extended periods [48].

Vitamins C and D are widely available, low-cost, and generally safe, and they are recommended at specific doses for COVID-19 prevention and treatment [49]. Ongoing clinical trials are expected to clarify the relationship between these vitamins and COVID-19 (52 [50] and 71 [51] trials listed on ClinicalTrials.gov). Results from these studies could inform future training for community pharmacists, helping them provide evidence-based recommendations for vitamin supplementation during the pandemic.

Both Bulgaria and Romania face the risk of healthcare system overload during COVID-19 surges, emphasizing the importance of reliable information and management of fear and misinformation. Community pharmacies remain among the few public services open even under strict restrictions, providing an accessible and trustworthy point of contact for the public [2].

In Romania, several interventions were implemented to reduce the pandemic's impact on both pharmacists and patients, including limiting service hours, restricting

patient access, installing protective panels or air purifiers, and performing surface and personal item disinfection at intervals shorter than an hour [52]. A survey conducted by Padureanu *et al.* between April and May 2020 revealed that just over half of pharmacists (52%) were satisfied with these protective measures [53]; however, 57% still expressed fear of contracting COVID-19, which aligns with our findings. During periods when dental services were unavailable, Romanian community pharmacists were permitted to provide over-the-counter antibiotics to ensure appropriate treatment of dental abscesses [52]. Elbeddini *et al.* also reported that pharmacists' stress increased due to verbal harassment from patients requesting COVID-19 protocol medications without prescriptions or diagnoses [9].

In Bulgaria, pharmacists took on additional administrative responsibilities, such as reporting new paperless prescription forms known as "S blanks" for patients receiving medications under special NHIF protocols [54]. This system aimed to spare chronically ill patients from repeated visits to their physicians to renew protocols, though it added significant workload to pharmacies [54].

Pharmacy owners in both countries were required to supply personal protective equipment, including gloves, masks, and safety goggles, for their staff [52, 54]. In Bulgaria, the Bulgarian Pharmaceutical Union (BPU) and non-profit organizations, like the Bulgarian Medicines Verification Organization, supplied some protective gear to their members [54]; however, no government assistance was provided, as most pharmacies operate privately.

Longitudinal follow-up studies in Romania and Bulgaria could provide valuable insights, enabling comparisons with the current findings, while expanding the research to neighboring countries could offer a more comprehensive view of how COVID-19 affected community pharmacists' well-being.

Conclusions

Examining pharmacists' health-related quality of life and the pandemic's psychological impact highlights the importance of recognizing their work and improving community healthcare management. This study sheds light on Romanian and Bulgarian pharmacists' perspectives on COVID-19 vaccination and their recommendation of vitamins C and D, providing a foundation for future strategies aimed at boosting resilience among frontline healthcare professionals, whose critical roles are often undervalued.

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References

1. Temsah MH, Al-Sohime F, Alamro N, Al-Eyadhy A, Al-Hasan K, Jamal A, et al. The psychological impact of COVID-19 pandemic on health care workers in a MERS-CoV endemic country. *J Infect Public Health*. 2020;13(6):877–82.
2. Bragazzi NL, Mansour M, Bonsignore A, Ciliberti R. The role of hospital and community pharmacists in the management of COVID-19: towards an expanded definition of the roles, responsibilities, and duties of the pharmacist. *Pharmacy*. 2020;8(3):140.
3. Robinson JD, Johnson N, Brand-Eubanks DC, Kim AP. A call to action: community pharmacists to address COVID-19 related behavioral health concerns. *J Am Pharm Assoc*. 2020;60(6):e1–3.
4. World Health Organization. Rolling updates on coronavirus disease (COVID-19). Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen>. Accessed 2021 Feb 4.
5. Batra K, Singh TP, Sharma M, Batra R, Schvaneveldt N. Investigating the psychological impact of COVID-19 among healthcare workers: a meta-analysis. *Int J Environ Res Public Health*. 2020;17(23):9096.
6. Aburas W, Alshammari TM. Pharmacists' roles in emergency and disasters: COVID-19 as an example. *Saudi Pharm J*. 2020;28(12):1797–816.
7. Mallhi TH, Liaqat A, Abid A, Khan YH, Alotaibi NH, Alzarea AI, et al. Multilevel engagements of pharmacists during the COVID-19 pandemic: the way forward. *Front Public Health*. 2020;8:561924.
8. Hedima EW, Adeyemi MS, Ikunaiye NY. Community pharmacists: on the frontline of health service against COVID-19 in LMICs. *Res Social Adm Pharm*. 2021;17(1):1964–6.
9. Elbeddini A, Wen CX, Tayefehchamani Y, To A. Mental health issues impacting pharmacists during COVID-19. *J Pharm Policy Pract*. 2020;13:46.
10. Cabas P, Di Bella S, Giuffrè M, Rizzo M, Trombetta C, Luzzati R, et al. Community pharmacists' exposure to COVID-19. *Res Social Adm Pharm*. 2021;17(1):1882–7.
11. Blake H, Bermingham F, Johnson G, Tabner A. Mitigating the psychological impact of COVID-19 on healthcare workers: a digital learning package. *Int J Environ Res Public Health*. 2020;17(9):2997.
12. Hayden JC, Parkin R. The challenges of COVID-19 for community pharmacists and opportunities for the future. *Ir J Psychol Med*. 2020;37(3):198–203.
13. Carico R Jr, Sheppard J, Thomas CB. Community pharmacists and communication in the time of COVID-19: applying the health belief model. *Res Social Adm Pharm*. 2021;17(1):1984–7.
14. European Medicines Agency. Treatments and vaccines for COVID-19: authorised medicines. Available from: <https://www.ema.europa.eu/en/human-regulatory/overview/public-health-threats/coronavirus-disease-covid-19/treatments-vaccines/treatments-vaccines-covid-19-authorised-medicines>. Accessed 2021 Feb 3.
15. National Agency for Medicines and Medical Devices of Romania. Report a COVID-19 vaccine's adverse reaction. Available from: <https://www.anm.ro/medicamente-de-uz-uman/farmacovigilenta/raportarea-reactiilor-adverse-suspectate-vaccin-covid-19/>. Accessed 2021 Feb 3. Romanian.
16. Bulgarian Drug Agency. Available from: <https://www.bda.bg/bg/>. Accessed 2021 Feb 3. Bulgarian.
17. Carr AC, Rosengrave PC, Bayer S, Chambers S, Mehrtens J, Shaw GM. Hypovitaminosis C and vitamin C deficiency in critically ill patients despite recommended enteral and parenteral intakes. *Crit Care*. 2017;21(1):300.
18. Carr AC, Maggini S. Vitamin C and immune function. *Nutrients*. 2017;9(11):1211.
19. Mousavi S, Bereswill S, Heimesaat MM. Immunomodulatory and antimicrobial effects of vitamin C. *Eur J Microbiol Immunol*. 2019;9(3):73–9.
20. Bogdan M, Meca AD, Boldeanu MV, Gheorghe DN, Turcu-Stiolica A, Subtirelu MS, et al. Possible involvement of vitamin C in periodontal disease-diabetes mellitus association. *Nutrients*. 2020;12(2):553.
21. Courbebaisse M, Cavalier E. Vitamin D in 2020: an old pro-hormone with potential effects beyond mineral metabolism. *Nutrients*. 2020;12(11):3378.
22. Saponaro F, Saba A, Zucchi R. An update on vitamin D metabolism. *Int J Mol Sci*. 2020;21(17):6573.
23. Zittermann A, Pilz S, Hoffmann H, Marz W. Vitamin D and airway infections: a European perspective. *Eur J Med Res*. 2016;21(1):14.
24. Zmijewski MA. Vitamin D and human health. *Int J Mol Sci*. 2019;20(1):145.
25. Infusino F, Marazzato M, Mancone M, Fedele F, Mastroianni CM, Severino P, et al. Diet supplementation, probiotics, and nutraceuticals in SARS-CoV-2 infection: a scoping review. *Nutrients*. 2020;12(6):1718.
26. Kawalec P, Tesar T, Vostalova L, Draganic P, Manova M, Savova A, et al. Pharmaceutical regulation in Central and Eastern European

- countries: a current review. *Front Pharmacol*. 2017;8:892.
27. Sintonen H. The 15D instrument of health-related quality of life: properties and applications. *Ann Med*. 2001;33(5):328–36.
 28. Subtirelu MS, Turcu-Stiolica A, Sintonen H. Translation and cultural adaptation of 15D quality of life questionnaire from English to Romanian language. *Value Health*. 2019;22(Suppl 3):S731.
 29. Cochran WG. Sampling techniques. 3rd ed. New York: Wiley; 1977.
 30. Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods*. 2007;39(2):175–91.
 31. Austin Z, Gregory P. Resilience in the time of pandemic: the experience of community pharmacists during COVID-19. *Res Social Adm Pharm*. 2021;17(1):1867–75.
 32. Merks P, Jakubowska M, Drelich E, Swieczkowski D, Bogusz J, Bilmin K, et al. The legal extension of the role of pharmacists in light of the COVID-19 global pandemic. *Res Social Adm Pharm*. 2021;17(1):1807–12.
 33. Goff DA, Ashiru-Oredope D, Cairns KA, Eljaaly K, Gauthier TP, Langford BJ, et al. Global contributions of pharmacists during the COVID-19 pandemic. *J Am Coll Clin Pharm*. 2020;3(4):124–35.
 34. Moccia L, Janiri D, Pepe M, Dattoli L, Molinaro M, De Martin V, et al. Affective temperament, attachment style, and the psychological impact of the COVID-19 outbreak: an early report on the Italian general population. *Brain Behav Immun*. 2020;87:75–9.
 35. Johnston K, O'Reilly CL, Cooper G, Mitchell I. The burden of COVID-19 on pharmacists. *J Am Pharm Assoc*. 2020;60(5):e77–81.
 36. Lange M, Joo S, Couette PA, de Jaegher S, Joly F, Humbert X. Impact on mental health of the COVID-19 outbreak among community pharmacists during the sanitary lockdown period. *Ann Pharm Fr*. 2020;78(6):459–63.
 37. Ardebili ME, Naserbakht M, Bernstein C, Alazmani-Noodeh F, Hakimi H, Ranjbar H. Healthcare providers' experience of working during the COVID-19 pandemic: a qualitative study. *Am J Infect Control*. 2020;48(12):1472–8.
 38. Ungureanu BS, Vladut C, Bende F, Sandru V, Tocia V, Turcu-Stiolica RV, et al. Impact of the COVID-19 pandemic on health-related quality of life, anxiety, and training among young gastroenterologists in Romania. *Front Psychol*. 2020;11:579177.
 39. Dror AA, Eisenbach N, Taiber S, Morozov NG, Mizrahi M, Zigron A, et al. Vaccine hesitancy: the next challenge in the fight against COVID-19. *Eur J Epidemiol*. 2020;35(8):775–9.
 40. Lee L, Peterson GM, Naunton M, Jackson S, Bushell M. Protecting the herd: why pharmacists matter in mass vaccination. *Pharmacy*. 2020;8(4):199.
 41. Poudel A, Lau ETL, Deldot M, Campbell C, Waite NM, Nissen LM. Pharmacist role in vaccination: evidence and challenges. *Vaccine*. 2019;37(40):5939–45.
 42. World Bank. Country and lending groups. Available from: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519>. Accessed 2021 Feb 4.
 43. Ilie PC, Stefanescu S, Smith L. The role of vitamin D in the prevention of coronavirus disease 2019 infection and mortality. *Aging Clin Exp Res*. 2020;32(7):1195–8.
 44. Singh S, Kaur R, Singh RK. Revisiting the role of vitamin D levels in the prevention of COVID-19 infection and mortality in European countries post infections peak. *Aging Clin Exp Res*. 2020;32(8):1609–12.
 45. Jain A, Chaurasia R, Sengar NS, Singh M, Mahor S, Narain S. Analysis of vitamin D level among asymptomatic and critically ill COVID-19 patients and its correlation with inflammatory markers. *Sci Rep*. 2020;10(1):20191.
 46. Mercola J, Grant WB, Wagner CL. Evidence regarding vitamin D and risk of COVID-19 and its severity. *Nutrients*. 2020;12(11):3361.
 47. Kumar R, Rathi H, Haq A, Wimalawansa SJ, Sharma A. Putative roles of vitamin D in modulating immune response and immunopathology associated with COVID-19. *Virus Res*. 2021;292:198235.
 48. Benskin LL. A basic review of the preliminary evidence that COVID-19 risk and severity is increased in vitamin D deficiency. *Front Public Health*. 2020;8:513.
 49. Marik P. EVMS COVID-19 management protocol: an overview of the MATH+ and I-MASK+ protocols. Available from: https://www.evms.edu/media/evms_public/departments/internal_medicine/EVMS_Critical_Care_COVID-19_Protocol.pdf. Accessed 2021 Jan 12.
 50. ClinicalTrials.gov. Results for: COVID-19 and vitamin C. Available from: <https://clinicaltrials.gov/ct2/results?cond=COVID-19&term=vitamin+c>. Accessed 2021 Jan 13.
 51. ClinicalTrials.gov. Results for: COVID-19 and vitamin D. Available from: <https://clinicaltrials.gov/ct2/results?cond=COVID&term=vitamin+d>. Accessed 2021 Jan 13.

52. National College of Pharmacists Romania. National guide for adaptation of pharmaceutical practice during pandemic COVID-19. Available from: <https://www.colegfarm.ro/userfiles/file/GHID%20orientativ%20de%20adaptare%20a%20practicii%20farmaceutice%20in%20cursul%20pandemiei%20COVID-19.pdf>. Accessed 2021 Jan 12. Romanian.
53. Padureanu V, Bogdan M, Subtirelu MS, Padureanu R, Turcu-Stiolica A, Petrescu F, et al. Perceptions of COVID-19 vaccination among healthcare professionals in Romania. *Med Surg J.* 2020;124(3):454–60.
54. National Health Insurance Fund (Bulgaria). Terms and conditions for dispensing of medicines, medical devices and dietary foods for special medical purposes. Available from: https://www.nhif.bg/news_page?id=420414&page_id=422584. Accessed 2021 Jan 15. Bulgarian.