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Original Article

# Exposure of community pharmacists to COVID-19: A multinational cross-sectional study

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**الملخص**

**أهداف البحث:** إن صيادلة المجتمع من ضمن مقدمي الرعاية الصحية العاملين في الخطوط الأمامية والمعرضين لخطر كبير للإصابة بفيروس كورونا المستجد أثناء الجائحة. ومن الملاحظ أن دراسات تحليل المخاطر المهنية الخاصة بصيادلة المجتمع في الشرق الأوسط محدودة. لذلك فقد هدفت هذه الدراسة إلى تقييم مخاطر تعرض هؤلاء الصيادلة لفيروس كورونا المستجد وعوامل التنبؤ بالإصابة بالعدوى.

**طرق البحث:** تم إجراء مسح مقطعي باستخدام استبانة عبر الإنترنت يتم تعبئتها ذاتيا وتم توزيعها على صيادلة المجتمع في المملكة العربية السعودية ولبنان والأردن خلال شهري نوفمبر وديسمبر 2020. وتم استخدام اختبار الانحدار اللوجستي ثنائي المتغير لتحليل المتنبئات المرتبطة بفيروس كورونا المستجد.

**النتائج:** كان صيادلة المجتمع أكثر عرضة للإصابة بعدوى فيروس كورونا المستجد من عامة المجتمع (١٢.٩٪ مقابل ١.٥٪). وكانت المؤشرات المهمة للعدوى هي وجود أحد أفراد العائلة مصابا بالعدوى، وكون السن أقل من ٤٠ عاما، ومقابلة المصابين في الصيدلية دون حاجز زجاجي واق، والاحتكاك بمصابين بالعدوى أثناء ممارسة المهنة، ووجود زميل مصاب. بالإضافة إلى ذلك، كان معدل توقع الإصابة بالعدوى لدى الصيادلة ٣.٢٧ ±١.٠٤(من ٥). وكان المستوى أعلى بشكل ملحوظ بين الصيادلة الإناث والصيادلة اللبنانيين.

**الاستنتاجات:** أظهرت هذه الدراسة أن صيادلة المجتمع أكثر عرضة للإصابة بعدوى فيروس كورونا المستجد مقارنة بعامة المجتمع. ويعزى ذلك إلى عدة عوامل مهنية تزيد من خطر تعرضهم للفيروس. لذلك فإنه ينبغي للجهات الصحية المسؤولة أن تضع ضوابط توجيهية مهنية صارمة لصيادلة المجتمع مع مراقبة تطبيقها عن كثب.

**الكلمات المفتاحية:** التعرض لفيروس كورونا المستجد؛ صيدلة المجتمع؛ المملكة العربية السعودية؛ لبنان؛ الأردن

**Abstract**

**Objectives:** Community pharmacists (CPs) are among the frontline healthcare providers who have been exposed to a high risk of being infected with SARS-CoV-2 during the pandemic. Unfortunately, there have been limited studies in the Middle East that provide an occupational risk analysis among CPs. Therefore, this study aims to evaluate the risk of COVID-19 exposure among Middle Eastern CPs and to identify the infection predictors.

**Methods:** A cross-sectional survey was conducted using an online, self-administered questionnaire that was distributed to CPs across KSA, Lebanon, and Jordan between November and December 2020. The bivariate logistic regression test was used to analyse the predictors associated with COVID-19.

**Results:** CPs were more susceptible to acquiring SARS-CoV-2 than the general public (12.9% vs. 1.5%). The significant predictors of infection included a family member with confirmed COVID-19 infection, age <40 years, encountering patients in pharmacy without a protective glass-barrier, and contact with confirmed COVID-

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19 patients or colleagues with confirmed COVID-19 during practice. Additionally, the mean level of the respondents' expected rate of infection was 3.27 ± 1.04 (out of 5). This level was significantly higher among female pharmacists and Lebanese pharmacists.

**Conclusions:** This study demonstrates that CPs are at a higher risk of acquiring COVID-19 compared with the general public. This is attributed to several occupational factors that increase the risk of exposure to COVID-19. Therefore, healthcare authorities are advised to enforce strict occupational guidelines for CPs.

**Keywords:** Community pharmacists; COVID-19 exposure; Jordan; Lebanon; KSA



## Introduction

The rapid spread of COVID-19 around the world resulted in it being declared a pandemic by the World Health Organization (WHO) on March 11, 2020.[1] This announcement was based on the exponential increase in the rate of COVID-19 cases and the subsequent deaths. By January 9, 2021, there were more than 80 million confirmed cases worldwide with almost 2 million reported deaths. The prevalence rate was 1.11%, whereas the estimated mortality rate was 2.17%.[2] As healthcare workers (HCWs) were at the frontlines of the fight against this virus, they were constantly exposed to infected patients, colleagues, and possible contaminated environments. This risk was further exacerbated by the initial shortage in personal protective equipment (PPE) and ongoing community transmission from asymptomatic individuals, which resulted in increased mortality rates of HCWs.[3–5] On April 8, 2020, the WHO reported that almost 22,073 HCWs from 52 countries had tested positive for COVID-19.[6] More recent data about HCWs from the US Center for Disease Control and Prevention (CDC), which was published on November 15, reported 216,000 cases and 799 documented deaths since the start of the pandemic.[7]

Community pharmacists, who are an integral part of the healthcare system, have been contributing to the efficient management of COVID-19 by raising community awareness through customer education about preventive measures, counselling patients on their medications and diseases, as well as providing optimal patient care. In addition to ensuring adequate storage and supply of relevant medications and equipment, community pharmacists are involved in the early detection and referral of suspected individuals, while simultaneously continuing to treat minor ailments using over-the-counter (OTC) products, providing points of care for screening services, and promoting therapy adherence. As such, the pandemic has increased the burden of, and pressure on, community pharmacists, since their responsibilities were extended; for example, one additional challenge they have faced is searching for alternative medications due to patients stockpiling drugs out of fear of shortages.[8–10] In addition to this growing responsibility, community pharmacists are at higher risk of contracting COVID-19 because they are more accessible to patients (through the provision of free consultations and other services), and they have continued to work during the lockdown period.[11–15] Members of staff with pre-existing medical conditions are at an even higher risk of contracting severe COVID-19.[16,17]

To the best of our knowledge, the impact of the COVID-19 pandemic on Middle Eastern community pharmacists has not yet been investigated. Therefore, in this study, we aim to obtain insight and gain a deeper understanding of the exposure of community pharmacists to COVID-19 in the Middle East. The primary objectives were to investigate the occupational risk of exposure and the predictors of infection with SARS-CoV-2, as well as to estimate the prevalence of COVID-19 among community pharmacists during the SARS-CoV-2 outbreak. The secondary objectives were to determine how worried community pharmacists are, and to identify their behaviour once they start experiencing COVID-19 symptoms.

## Materials and Methods

### *Study design*

This observational cross-sectional study, which used a self-administered questionnaire, was conducted among community pharmacists in KSA, Lebanon, and Jordan. To this end, a Google survey form was distributed to participants through social networking platforms in November and December 2020.

### *Questionnaire development and structure*

The questionnaire was developed based on a deep literature review and consisted of 29 items including both close-ended questions with pre-defined answers and open-ended questions.[18,19] It was made up of the following four sections: The first section was dedicated to the socio-demographic data and medical history of the participants. The second section retrieved information about the exposure of pharmacists to COVID-19. The third section was about the perceived action to be taken by pharmacists experiencing COVID-19 symptoms. Finally, the last section assessed how worried community pharmacists were during this pandemic, which was measured on a five point Likert scale (1: totally unworried, 2: unworried, 3: neutral, 4: worried, 5: totally worried).

Three experts in the pharmacy practice field reviewed the questionnaire for structure, content validity, and applicability in the countries selected for this study. Moreover, a pilot test was conducted on 15 community pharmacists (that were not included in our sample) to assess the clarity, understandability, and structure of the questionnaire. The questionnaire was amended according to their feedback.

**Table 1: Socio-demographic data of the participants and their distribution among[a–c] countries (N = 800).**

| | Total N (%)[a] | Lebanon 424 (53)[b] | Jordan 261 (32.6)[b] | KSA 115 (14.4)[b] |
|---|---|---|---|---|
| **Sex** | | | | |
| Male | 357 (44.6) | 126 (35.3) | 136 (38.1) | 95 (26.6) |
| Female | 443 (55.4) | 298 (67.3) | 125 (28.2) | 20 (4.5) |
| **Age (mean = 32 ± 9.8 years)** | | | | |
| 22–30 | 481 (60.1) | 303 (63) | 132 (27.4) | 46 (9.6) |
| 31–40 | 172 (21.5) | 57 (33.1) | 81 (47.1) | 34 (19.8) |
| 41–50 | 90 (11.3) | 34 (37.8) | 36 (40) | 20 (22.2) |
| >50 | 57 (7.1) | 30 (52.6) | 12 (21.1) | 15 (26.3) |
| **Pharmacy ownership** | | | | |
| Owner | 191 (23.9) | 129 (67.5) | 51 (26.7) | 11 (5.8) |
| Employee | 609 (76.1) | 295 (48.4) | 210 (34.5) | 104 (17.1) |
| **Academic degree** | | | | |
| Bachelor | 558 (69.8) | 303 (54.3) | 172 (30.8) | 83 (14.9) |
| PharmD | 148 (18.5) | 82 (55.4) | 45 (30.4) | 21 (14.2) |
| Masters | 84 (10.5) | 36 (42.9) | 40 (47.6) | 8 (9.5) |
| PhD | 10 (1.3) | 3 (30) | 4 (4) | 3 (3) |
| **Pharmacy location** | | | | |
| Urban | 599 (74.9) | 272 (45.4) | 224 (37.4) | 103 (17.2) |
| Rural | 201 (25.1) | 152 (75.6) | 37 (18.4) | 12 (6) |
| **Average number of clients encountered per day** | | | | |
| 0–10 | 32 (4) | 15 (46.9) | 7 (21.9) | 10 (31.3) |
| 11–20 | 97 (12.1) | 47 (48.5) | 38 (39.2) | 12 (12.4) |
| 21–30 | 142 (17.8) | 63 (44.4) | 73 (51.4) | 6 (4.2) |
| 31–40 | 127 (15.9) | 65 (51.2) | 53 (41.7) | 9 (7.1) |
| 41–50 | 137 (17.1) | 78 (56.9) | 35 (25.5) | 24 (17.5) |
| 51–100 | 265 (33.1) | 156 (58.9) | 55 (20.8) | 54 (20.4) |
| **Average time spent in the pharmacy per day** | | | | |
| <5 hours | 76 (9.5) | 49 (64.5) | 17 (22.4) | 10 (13.2) |
| 5–8 hours | 476 (59.5) | 269 (56.5) | 188 (39.5) | 19 (4) |
| > 8 hours | 248 (31) | 106 (42.7) | 56 (22.6) | 86 (34.7) |
| **Years of experience (mean = 8.3 ± 8.6)** | | | | |
| <5 | 397 (49.5) | 257 (64.7) | 101 (25.4) | 39 (9.8) |
| 5–10 | 187 (23.4) | 85 (45.5) | 83 (44.4) | 19 (10.2) |
| 11–15 | 72 (9) | 23 (31.9) | 27 (37.5) | 22 (30.6) |
| 16–20 | 49 (6.1) | 13 (26.5) | 22 (44.9) | 14 (28.6) |
| >20 | 95 (11.9) | 46 (48.4) | 28 (29.5) | 21 (22.1) |
| **Smoking status** | | | | |
| Non-smoker | 539 (67.4) | 314 (58.3) | 169 (31.4) | 56 (10.4) |
| Current smoker | 186 (23.3) | 93 (50) | 58 (31.2) | 35 (18.8) |
| Ex-smoker | 75 (9.4) | 17 (22.7) | 34 (45.3) | 24 (32) |
| **Having chronic medical conditions** | | | | |
| No | 676 (84.5) | 381 (56.4) | 215 (31.8) | 80 (11.8) |
| Yes | 124 (15.5) | 43 (34.7) | 46 (37.1) | 35 (28.2) |
| **Declared chronic medical conditions[c]** | | | | |
| Hypertension | 52 (6.5) | 16 (30.8) | 23 (44.2) | 13 (25) |
| Diabetes mellitus (type II) | 35 (4.4) | 13 (37.1) | 10 (28.6) | 12 (34.3) |
| Bronchial asthma | 25 (3.1) | 13 (52) | 7 (28) | 5 (20) |
| Other cardiovascular diseases | 18 (2.3) | 5 (27.8) | 9 (50) | 4 (22.2) |
| Rheumatoid arthritis | 12 (1.5) | 5 (41.7) | 4 (33.3) | 3 (25) |
| Obesity | 17 (2.1) | 2 (11.8) | 11 (64.7) | 4 (23.5) |
| Renal impairment | 11 (1.4) | 1 (9.1) | 9 (81.8) | 1 (9.1) |

[a] Percentages for the column.
[b] Percentages for the rows.
[c] Some participants gave more than one response.

*Data analysis*

Incomplete questionnaires were excluded from analysis. The dataset of valid questionnaires was coded, labelled, and analysed using the 24th version of the Statistical Package for the Social Sciences (SPSS, International Business Machines Corp., Armonk, New York, USA). Descriptive data were represented by frequencies and percentages for categorical variables, and a mean with standard deviation was used for continuous variables. All

**Table 2: Exposure of community pharmacists to COVID-19 per country (N = 800).**

| | Total N (%)[a] | Lebanon 424 (53)[b] | Jordan 261 (32.6)[b] | KSA 115 (14.4)[b] |
|---|---|---|---|---|
| **Average size of the community pharmacy** | | | | |
| Small (32−70 $m^2$) | 249 (31.1) | 128 (51.4) | 93 (37.3) | 28 (11.2) |
| Medium (70−100 $m^2$) | 378 (47.3) | 198 (52.4) | 127 (33.6) | 53 (14) |
| Large (>100 $m^2$) | 173 (21.6) | 98 (56.6) | 41 (23.7) | 34 (19.7) |
| **Number of staff present at the same time per shift (mean = 2.4 ± 1.2)** | | | | |
| 1 | 186 (23.3) | 124 (66.7) | 49 (26.3) | 13 (7) |
| 2 | 315 (39.4) | 148 (47) | 128 (40.6) | 39 (12.4) |
| 3 | 163 (20.4) | 73 (44.8) | 61 (37.4) | 29 (17.8) |
| 4 | 50 (6.3) | 17 (34) | 14 (28) | 19 (38) |
| ≥5 | 86 (10.8) | 62 (72.1) | 9 (10.5) | 15 (17.4) |
| **Pharmacies limiting the number of clients in the pharmacy** | | | | |
| No | 347 (43.4) | 166 (47.8) | 148 (42.7) | 33 (9.5) |
| Yes | 453 (56.6) | 258 (57) | 113 (24.9) | 82 (18.1) |
| **Method of encountering patients** | | | | |
| Direct Contact (person to person) | 277 (34.6) | 32 (11.6) | 171 (61.7) | 74 (26.7) |
| From behind the plexiglass barrier | 419 (52.4) | 305 (72.8) | 74 (17.7) | 40 (9.5) |
| Through the dispensing window | 104 (13) | 87 (83.7) | 16 (15.4) | 1 (1) |
| **Method of handling prescriptions**[c] | | | | |
| Directly from the patient | 597 (74.6) | 338 (56.6) | 156 (26.1) | 103 (17.3) |
| Using disposable gloves | 318 (39.8) | 99 (31.1) | 148 (46.5) | 71 (22.3) |
| Electronically | 101 (12.6) | 13 (12.9) | 56 (55.4) | 32 (31.7) |
| **Patient encountering/counselling session duration** | | | | |
| <5 minutes | 348 (43.5) | 212 (60.9) | 97 (27.9) | 39 (11.2) |
| 5−10 minutes | 409 (51.1) | 201 (49.1) | 139 (34) | 69 (16.9) |
| 11−20 minutes | 39 (4.9) | 7 (17.9) | 25 (64.1) | 7 (17.9) |
| > 20 minutes | 4 (0.5) | 4 (100) | 0 (0) | 0 (0) |
| **Services currently being provided**[c] | | | | |
| Blood tests (e.g., fasting blood glucose, cholesterol) | 359 (44.9) | 249 (69.4) | 72 (20.1) | 38 (10.6) |
| Blood pressure check-up | 492 (61.5) | 286 (58.1) | 161 (32.7) | 45 (9.1) |
| Injections | 390 (48.8) | 266 (68.2) | 101 (25.9) | 23 (5.9) |
| Physical examination (e.g., skin examination, tonsils) | 226 (28.3) | 165 (73) | 53 (23.5) | 8 (3.5) |
| None of the above | 199 (24.9) | 74 (37.2) | 71 (35.7) | 54 (27.1) |
| **Pharmacist previous infection with SARS-CoV-2** | | | | |
| No | 697 (87.1) | 381 (54.7) | 217 (31.1) | 99 (14.2) |
| Yes | 103 (12.9) | 43 (41.7) | 44 (42.7) | 16 (15.5) |
| **Severity of infection with SARS-CoV-2 (n = 103)** | | | | |
| Asymptomatic | 21 (20.4) | 5 (23.8) | 12 (57.1) | 4 (19) |
| Mild-to-moderate (treated as outpatient) | 78 (75.7) | 38 (48.7) | 29 (37.2) | 11 (14.1) |
| Severe (required hospitalization) | 4 (3.9) | 0 (0) | 3 (75) | 1 (25) |
| **PCR test performed among those who were not previously infected (n = 697)** | | | | |
| No | 423 (60.7) | 245 (57.9) | 131 (31) | 47 (11.1) |
| Yes | 274 (39.3) | 136 (49.6) | 86 (31.4) | 52 (19) |
| **Family members with confirmed SARS-CoV-2 infection** | | | | |
| No | 563 (70.4) | 300 (53.3) | 183 (32.5) | 80 (14.2) |
| Yes | 237 (29.6) | 124 (52.3) | 78 (32.9) | 35 (14.8) |
| **Staff members with confirmed SARS-CoV-2 infection** | | | | |
| No | 578 (72.3) | 310 (53.6) | 182 (31.5) | 86 (14.9) |
| Yes | 222 (27.8) | 114 (51.4) | 79 (35.6) | 29 (13.1) |
| **COVID-19 patients encountered during practice** | | | | |
| No | 153 (19.1) | 70 (45.8) | 27 (17.6) | 56 (36.6) |
| Yes | 647 (80.9) | 354 (54.7) | 234 (36.2) | 59 (9.1) |

***PCR***, Polymerase chain reaction.
[a] Percentages for the column.
[b] Percentages for the rows.
[c] Some participants gave more than one response.

continuous variables were tested for normality (using the Shapiro−Wilk test) prior to statistical comparisons. Bivariate logistic regression, using backward stepwise analysis, was utilized to test the association between different independent variables with COVID-19, and the adjusted odds ratio (AOR) was calculated. Kruskal−Wallis and Mann−Whitney U tests were used to test the association between the level of worry and pharmacists' socio-demographic data. Results with a P-value $\leq 0.05$ and a 95% CI were considered significant.

**Table 3: Logistic regression analysis of significant predictors associated with COVID-19[a].**

| Predictors | UOR | B | SE | Wald | AOR | 95% CI | *P*[b] |
|---|---|---|---|---|---|---|---|
| Constant | | −4.63 | 0.53 | 74.98 | 0.10 | | <0.001 |
| **Age group** (reference: older than 40 years) | | | | | | | |
| <40 years | 2.28 | 0.86 | 0.36 | 5.58 | 2.37 | 1.15−4.85 | 0.018 |
| **Encountering confirmed COVID-19 patients during practice** (reference: No) | | | | | | | |
| Yes | 2.15 | 0.76 | 0.37 | 4.10 | 2.15 | 1.02−4.52 | 0.043 |
| **Family member with confirmed COVID-19** (reference: No) | | | | | | | |
| Yes | 6.39 | 1.69 | 0.23 | 50.71 | 5.46 | 3.42−8.70 | <0.001 |
| **Staff member with confirmed COVID-19** (reference: No) | | | | | | | |
| Yes | 3.16 | 0.74 | 0.23 | 9.89 | 2.10 | 1.32−3.33 | 0.002 |
| **Method of encountering patients** (reference: behind the Plexiglass barrier) | | | | | | | |
| Direct contact | 1.88 | 0.79 | 0.24 | 10.74 | 2.20 | 2.20−1.37 | 0.001 |
| Through the dispensing window | 0.60 | −0.36 | 0.44 | 0.66 | 0.69 | 0.29−1.66 | 0.41 |

***AOR***, adjusted odds ratio; ***B***, coefficient for the constant in the null model; ***CI***, confidence interval; ***SE***, standard error; ***UOR***, unadjusted odds ratio; ***Wald***, Wald chi-square test that tests the null hypothesis that the constant equals 0.

[a] Binary logistic regression analysis was conducted on significant variables using a backward stepwise analysis. Hosmer and Lemeshow test: 3.52, P-value = 0.833.

[b] Statistically significant ($P \leq 0.05$).

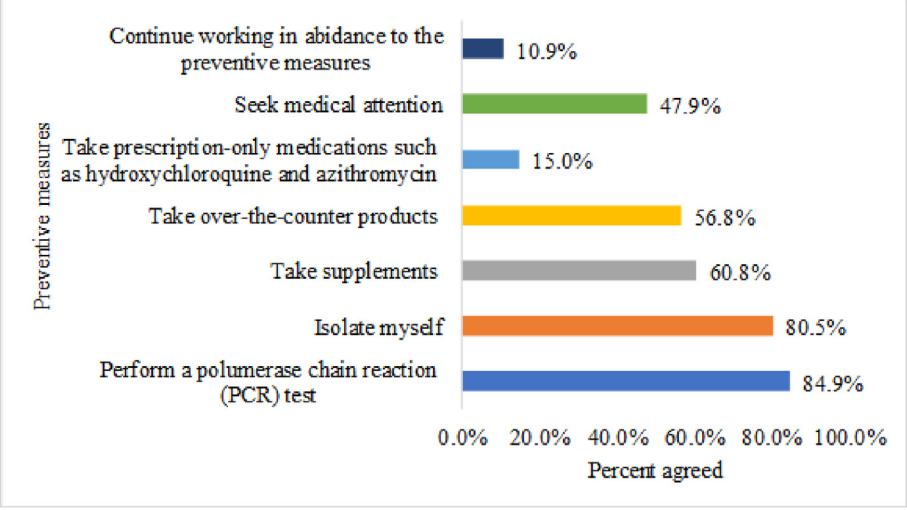


**Figure 1:** Measures to be considered when a pharmacist experiences COVID-19 symptoms (N = 800).

## Results

### *Participants' socio-demographic data*

A total of 800 responses from Lebanon, Jordan, and KSA were included in the analysis of the survey. Table 1 presents the characteristics of the participating pharmacists.

### *Exposure to and prevalence of COVID-19*

Data on the responding community pharmacists' exposure to COVID-19 are summarized in Table 2. By December 13, 2020, there were 145,245 confirmed COVID-19 cases in Lebanon out of the general population of 6,855,713, therefore yielding a prevalence rate of 2.12%.[20,21] Similarly, in Jordan, there were a total of 257,275 confirmed cases out of the general population of 10,101,694 (prevalence = 2.54%).[20,22] KSA, however, reported the lowest prevalence rate of 1.05%, as there were 359,749 confirmed cases out of the general population of 34,268,528.[20,23] In total, confirmed cases in the three countries reached 762,269 out of the total population of 51,225,935, giving rise to a cumulative prevalence rate of 1.5%. However, the prevalence of COVID-19 among the study participants varied in the three countries, with a prevalence rate of 16.8%, 13.9%, and 10.1% in Jordan, KSA, and Lebanon, respectively.

A binary logistic regression was performed using a backward stepwise analysis for the significant variables in Tables 1 and 2, and results have shown significant findings that are illustrated in Table 3. According to this analysis, the predictors that were significantly associated with COVID-19 included having a family member with confirmed SARS-CoV-2 infection, being under 40 years old, directly encountering patients in the pharmacy without a protective glass barrier, encountering COVID-19 positive patients during practice, and having a pharmacy staff member with confirmed SARS-CoV-2 infection.

*Perceived measures to be taken after experiencing COVID-19 symptoms*

Pharmacists were asked about the measures they took when they started experiencing COVID-19 symptoms (Figure 1). These perceived measures are illustrated in Figure 1.

*Level of worry about COVID-19*

With regard to the level of worry, the mean obtained was 3.27 ± 1.04 (out of 5). A sum of 349 (43.6%) pharmacists were worried/extremely worried about getting infected with COVID-19. When asked about the reasons why, 325 participants (93.1%) stated that they had a fear of transmitting the infection to their loved ones, 63 participants (18.1%) had a fear of losing clients, 61 participants (17.5%) had a chronic condition and were worried about complications, and 39 participants (11.2%) feared social shame. However, 451 participants (56.4%) felt neutral/unworried/totally unworried about being infected. Among the 451 participants, 280 participants (62.1%) claimed that they strictly followed the preventive measures, 168 participants (37.3%) considered COVID-19 to be a self-limiting viral infection, 144 participants (31.9%) reported having strong immunity, 56 participants (12.4%) stated that they were previously infected with the virus, and 51 participants (11.3%) assumed that they worked in a region with limited COVID-19 cases.

Kruskal–Wallis and Mann–Whitney U tests were conducted to compare the mean worry scores between Lebanon (3.45 ± 0.95), Jordan (3.15 ± 1.117), and KSA (2.90 ± 1.04), and a significant difference was found among them ($P < 0.001$). Females were shown to have a higher mean fear score (3.37 ± 1.03) than males (3.15 ± 1.04, $P = 0.002$), and pharmacists who encountered 51–100 patients/day had a greater level of worry (3.38 ± 0.978, $P = 0.027$). In addition, participants who communicated with patients through a dispensing glass window were more worried (3.58 ± 1.07) than those who were in direct contact with patients (3.03 ± 1.7, $P < 0.001$). Moreover, participants who had not yet been infected had a superior level of fear (3.31 ± 1.03) than those who were previously infected (2.98 ± 1.08, $P = 0.001$).

## Discussion

Globally, community pharmacists are integral members of the healthcare system. Throughout the COVID-19 pandemic, community pharmacists have been facing a wide range of challenges to ensure that patient care continues to be available to the general population. This pandemic has accentuated the critical contribution of community pharmacists as frontline healthcare providers, while also highlighting their key public health-related functions.[24] Moreover, community pharmacists continue to cater to the population's health care needs, even during the lockdown.[25] However, in addition to their increased efforts, their professional duty has also increased their risk of contracting SARS-CoV-2 infection.[25,26]

To the best of our knowledge, this is the first study to report on the exposure of community pharmacists to COVID-19 in the Middle East. The current study revealed a high COVID-19 prevalence among the Middle Eastern community pharmacists (12.9%), which was almost 8.6 times higher than the calculated prevalence in the general population (1.5%). This alarming result can be attributed to the increased exposure of community pharmacists to COVID-19 due to various factors including direct contact with patients, provision of free of charge consultations, and subjection to stockpiling actions by patients.[8,9] Moreover, due to the low socioeconomic status, as well as the high occupancy rate in hospitals and healthcare centres, a substantial number of individuals with respiratory symptoms seek medical advice from community pharmacists, who are the most accessible healthcare professionals.[25,27]

A recent study from Italy, which had one of the highest rates of COVID-19 infections, revealed that the prevalence of COVID-19 among the community pharmacists was 0.92%, with up to 98% of pharmacists adhering to PPE use.[18] Unfortunately, there are limited studies investigating the preventive measures being adopted by community pharmacists. However, a multi-national cross-sectional study revealed inadequate preparedness of Middle Eastern community pharmacists in their response to the pandemic.[28] Moreover, a study from KSA has shown that the regulation of wearing facial masks inside community pharmacies during COVID-19 outbreak was violated by pharmacists and customers in 34% and 87% of pharmacies, respectively.[29] The higher exposure risk detected among the Middle Eastern community pharmacists in the current study (12.9%) may be due to different factors including socioeconomic status, the absence of national guidance and support, and low levels of implementation in regard to protective measures. The national support provided to community pharmacies in each country varies greatly, with pharmacists receiving different levels of guidance and preparation to adequately respond to the pandemic, despite the fact that they are forced to act as a 'gatekeeper with no safety'.[26,30]

The CDC has issued a series of Infection Control Guidance for Healthcare Professionals, including pharmacists, to minimize their risk of exposure to SARS-CoV-2 and to ensure that pharmacies can continue to function during the pandemic.[15] For instance, the use of plexiglass barriers is consistent with the CDC's guidance as a component of exposure control. Essentially, it blocks respiratory droplets and provides a physical separation between a pharmacist and patients, thereby supporting social distancing efforts; as such, it is considered to be a highly effective measure in reducing pharmacists' risk of exposure to COVID-19.[31] This is supported by our findings, which indicated that participants who directly encountered patients had double the risk of being infected than those who used a plexiglass barrier (AOR = 2.20, CI = 1.37–2.20, $P = 0.001$). Additionally, pharmacists who reported having a colleague that had tested positive for COVID-19 were more prone to contracting the infection (AOR = 2.10, CI = 1.32–3.33, $P = 0.002$), which demonstrates that they may be responsible for transmitting the virus amongst themselves, especially since the implementation of social distancing may be difficult. The findings in the Italian study are well aligned with

our own, as they showed that the participants of the study may have been exposed to the infection by co-workers since 7 out of 15 positive community pharmacists reported having a positive case among their team.[18]

The COVID-19 pandemic is having a remarkable effect on the mental wellbeing of the general population, especially HCWs.[32] Lebanese pharmacists had the highest average worry score among the three countries examined herein ($3.45 \pm 0.95$); a multitude of factors could be contributing to this including low salaries, which are generally not proportional to their qualifications, as well as political issues within the country and high inflation.[33,34] On November 19, 2020, Lebanon was classified as the second highest country after Venezuela (2,133%) in terms of global inflation (Lebanon: 365%).[35] This was further aggravated by the pandemic, which has increased the burden on pharmacists' mental health. In the long term, this may continue to hinder pharmacists' performance, productivity, and optimism.

The outcomes of the current study have also demonstrated that pharmacists who encountered more than 50 clients a day had higher levels of fear, indicating that a greater number of patients seeking medical attention from pharmacies increases the staff members' fear of potential COVID-19 carriers. Currently, there are insufficient resources to manage mental health in the Middle East. Therefore, mental health aid should be offered for healthcare providers to effectively confront the pandemic.[36] This can be implemented through different psychological interventions such as online courses to manage common mental disorders and the provision of psychological assistance hotlines to help release stress.[37] In contrast, participants who were previously infected had a lower fear score ($2.98 \pm 1.08$, $P = 0.001$). This could be explained by the common conception that previously SARS-CoV-2-infected patients have life-long immunity, or because they might have experienced mild symptoms as a result of infection.[38,39]

*Limitations of the study*

This study has a few limitations. First, our study is a quantitative cross-sectional study in which data were collected via a self-administered questionnaire, which might have generated a risk of bias since the participants could have reported socially desirable answers that might not reflect their actual behaviour. However, there was no other appropriate method of data collection available during the lockdown period. Second, despite achieving an adequate sample size across the Middle East, representations from Lebanon, Jordan, and KSA were limited when compared to the number of community pharmacists currently working in these countries.

## Conclusions

Community pharmacists are among the primary HCWs who are in direct contact with COVID-19 patients. This is the first study to assess the community pharmacists' risk of exposure to COVID-19 in the Middle Eastern context. Participants were more prone to getting infected due to their occupation, as the prevalence of COVID-19 among pharmacists was shown to be significantly higher than that of the general population.

## Recommendations

Future research should include longitudinal cohort studies to estimate the actual prevalence and predictors associated with COVID-19 among community pharmacists in the Middle East; this would effectively generate more robust evidence. Furthermore, health authorities in these countries should set strict guidelines for community pharmacies and monitor their application to prevent further infections.

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## Conflict of interest

The authors have no conflicts of interest to declare.

## Ethical approval

This study was conducted following the tenants of the Declaration of Helsinki and the protocol was approved by the Institutional Review Board, King Abdullah University Hospital, Jordan University of Science and Technology, Irbid, Jordan (No. 2020–0833, January 17, 2021). Participants were invited to complete the questionnaire after the nature and purpose of the study were explained to them; they were also reassured that the collected data would be kept confidential and anonymous. They had the right to defer from submitting their responses at any time. Participants provided electronic informed consent forms, which contained a statement about the anonymity of the survey and voluntary participation.

## Authors' contributions

Study conception and design: **HMJK**, **RI**, and **TLM**; data collection: **HMJK**, **FJ**, and **RA**; data analysis and interpretation of results: **RI**, **SK**, and **FJ**; manuscript draft: **RI**, **FJ**, and **RA**; and manuscript revision: **HMJK**. All authors critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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