


# A cross-sectional evaluation of knowledge, attitudes, practices, and perceived challenges among Palestinian pharmacists regarding COVID-19

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Amer Koni<sup>1,2</sup> , Sari Taha<sup>3</sup>, Aiman Daifallah<sup>2</sup>,  
Mouath Koni<sup>2</sup>, Shatha Abutaha<sup>3</sup>, Ali Sabateen<sup>4</sup>  
and Sa'ed H Zyoud<sup>2,5,6</sup> 

## Abstract

**Objectives:** This study aims to evaluate knowledge, attitudes, practices, and perceived challenges regarding coronavirus disease 2019 among pharmacists in Palestine.

**Methods:** An online method was used to collect the data. Three hundred sixty-four pharmacists participated in the study from all areas in the Palestinian territories. The questionnaire consisted of three sections: sociodemographics; knowledge, attitudes, practices regarding coronavirus disease 2019; and barriers that prevent the implementation of infection control measures. The Statistical Package for the Social Sciences program Version 21 was used to analyze the data. Variables were expressed as frequencies, percentages, mean, and median. The chi-square test, Kruskal–Wallis test, Mann–Whitney *U* test, and Pearson's test were applied, along with logistic regression analysis.

**Results:** The median age of the participants was 29 years old, and most of them were female (70.9%). The analysis found that 76.4% of pharmacists had good knowledge regarding coronavirus disease 2019, and 52.7% had good practices. The median attitude score recorded by the participants was 32 points [Q1–Q3: 30–34] out of 35. Notably, the level of concern regarding coronavirus disease 2019 was significantly associated with all three tools of measurement; knowledge ( $p=0.001$ ), attitudes ( $p=0.001$ ), and practices ( $p=0.001$ ). It also appears that more years of experience had higher odds (3–5 years of experience: odds ratio, 2.560; 95% confidence interval, 1.413–4.639;  $p=0.002$ , more than 5 years: odds ratio, 2.931; 95% confidence interval, 1.188–7.232;  $p=0.020$ ) of good practice.

**Conclusion:** Although an acceptable level of knowledge was found, it might be considered inadequate. Moreover, there is a lack of appropriate adherence to safety measures from pharmacists. Therefore, we recommend the responsible authorities generate an organized training program to expand pharmacists' knowledge and experience regarding coronavirus disease 2019.

## Keywords

Knowledge, attitudes, practices, perceived challenges, coronavirus disease 2019, pharmacists, Palestine

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<sup>1</sup>Division of Clinical Pharmacy, Hematology and Oncology Department, An-Najah National University Hospital, Nablus, Palestine

<sup>2</sup>Department of Clinical and Community Pharmacy, College of Medicine and Health Sciences, An-Najah National University, Nablus, Palestine

<sup>3</sup>Department of Medicine, Faculty of Medicine and Health Sciences, An-Najah National University, Nablus, Palestine

<sup>4</sup>Infectious Diseases Unit, An-Najah National University Hospital, Nablus, Palestine

<sup>5</sup>Poison Control and Drug Information Center (PCDIC), College of Medicine and Health Sciences, An-Najah National University, Nablus, Palestine

<sup>6</sup>Clinical Research Center, An-Najah National University Hospital, Nablus, Palestine

## Corresponding authors:

Amer Koni, Division of Clinical Pharmacy, Hematology and Oncology Department, An-Najah National University Hospital, Nablus 44839, Palestine.  
Email: koni\_amer@hotmail.com

Sa'ed H Zyoud, Department of Clinical and Community Pharmacy, College of Medicine and Health Sciences, An-Najah National University, Nablus 44839, Palestine.  
Email: saedyoud@yahoo.com



## Introduction

The world has been grappling with the most deleterious public health crisis in modern times, ever since the first case of the novel coronavirus was identified in Wuhan, China, on 31 December 2019.<sup>1</sup> Three months later, on 11 March 2020, the World Health Organization (WHO) labeled the disease as a pandemic.<sup>2</sup> Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and is transmitted through respiratory droplets and infected secretions through direct or indirect contact with infected patients.<sup>3–5</sup> As of 5 May 2021, the COVID-19 pandemic has resulted in over 3,221,052 confirmed deaths worldwide.<sup>6</sup>

The COVID-19 pandemic has undermined healthcare systems worldwide and has had profound social, economic, and political implications. In Palestine, the healthcare system is fragile and underresourced, undermining its ability to tackle a pandemic whose repercussions have exhausted developed countries' more robust healthcare systems. Palestine thus represents a unique case where an under-resourced healthcare system operates under occupation.<sup>7</sup> In light of these obstacles, the Humanitarian Country Team (HCT), a multiagency international forum, devised a response plan to contain the pandemic, underlining the need for risk communication and community engagement.<sup>8</sup>

Knowledge, attitudes, practices (KAP) studies are a tool of “education diagnosis” that assesses what is known (knowledge), what is thought and felt (attitudes), and what is translated into actions (practices).<sup>9,10</sup> KAP studies are underpinned by the premise that prior to implementing successful awareness-related interventions, the level of current awareness, knowledge gaps, and behavioral patterns must first be determined. The general population should be subcategorized to draw conclusions in a culture-specific context, thus better reflecting these subcategories' social and cultural backgrounds.<sup>10</sup> This is especially important in pandemics where cultural, behavioral, and social norms have a key role in controlling the disease, as proven in the Ebola epidemic.<sup>11</sup> Recently, several studies have emphasized the necessity of community engagement and empowerment in the fight against COVID-19.<sup>11–13</sup> Meanwhile, others have studied the cultural effects of the implementation of nonpharmaceutical interventions.<sup>14–16</sup> Therefore, success against COVID-19 requires pharmacists to adhere to safety measures and take the lead in educating the public about COVID-19. That is, highly dependent on their KAPs.

Despite the recent emergence of the disease, several studies have investigated the level of knowledge, practices, and awareness concerning COVID-19, targeting physicians, pharmacists, nurses, and the public. Thus far, several studies have targeted three pharmacist populations: hospital pharmacists, community pharmacists, and pharmacy students.<sup>17–22</sup> In a multicenter Pakistani study, the knowledge and attitude scores were significantly higher for physicians compared to pharmacists and nurses, and the practice score was

significantly lower for pharmacists compared to physicians and nurses.<sup>23</sup> Overall, there was an association between greater knowledge on the one hand, and better practices and a positive attitude on the other, reflecting the importance of education and health promotion.<sup>19,24,25</sup> However, other factors, such as age, educational level, years of experience, and job category, were associated with better knowledge, attitude, and practice scores among healthcare workers.<sup>17,19,26–30</sup> In addition, the source of information was linked to the level of KAP in multiple studies, where scientific resources were found to be the most useful.<sup>17</sup> There was also a noticeable dependence on social media to receive information among healthcare workers.<sup>18,19</sup>

In Palestine, a study was conducted among the Palestinian public to assess the KAP regarding COVID-19, which found that 79% had good knowledge about the transmission, 55.6% were aware of the symptoms, and 77% adhered to safety measures.<sup>31</sup> In addition, the level of awareness was found to be associated with education level and young age.<sup>31</sup> To date, no studies have been conducted to investigate the awareness level regarding COVID-19 among healthcare workers in Palestine. This study aims to evaluate KAPs, and perceived challenges regarding COVID-19 among pharmacists in Palestine. Specifically, the study measures the knowledge related to the virus and its clinical presentation, COVID-19 transmission, along with prevention, control, and management of COVID-19. It also evaluates behavior regarding prevention and protection from COVID-19, along with opinions on how to handle COVID-19 information. Furthermore, it assesses the practices regarding adherence to safety measures and counseling patients about COVID-19. This will contribute to filling the knowledge gap among healthcare professionals, which has the potential to improve practice and adherence to guidelines and, thus, limits the scale of the disease. The COVID-19 pandemic has exposed the shortcomings of healthcare systems locally and globally, and therefore, stresses the need to refashion policy-making in a way that is better tailored to public health. This evaluation might be considered in releasing future policies focused on the engagement of healthcare workers in increasing public awareness.

## Methods

### Study design

A cross-sectional study was conducted between 11 December 2020 and 17 January 2021, during the period of lockdown. The researchers used an online method to collect the data as it was difficult to conduct a community-based survey. Online questionnaires and statements of confidentiality were used to minimize social desirability bias.

During the period between 18 November and 2 December 2020, before conducting this study, active cases of COVID-19 tripled in the Gaza Strip and doubled in the West Bank.<sup>32</sup> In the early period of the study (3 December–16 December

2020), the highest daily death toll since the beginning of the pandemic and the number of intensive care unit patients doubled.<sup>33</sup> In the middle period (17 December–30 December 2020), the number of active cases rose in Gaza and decreased in the West Bank.<sup>34</sup> Afterward (31 December 2020–13 January 2021), a 34% drop in active cases was seen across the West Bank, safety measures were eased slightly in the Gaza and West Bank, and the Palestinian Authority secured the provision of vaccines.<sup>35</sup>

### Sample size

According to the last Palestinian Ministry of Health report, the number of registered pharmacists in Palestine is 5655, with an approximate female-to-male ratio of 1.8:1.<sup>36</sup> Sample size was calculated using an online Raosoft sample size calculator ([http://www.raosoft.com/sample\\_size.html](http://www.raosoft.com/sample_size.html)). The minimum effective sample size was found to be 360, assuming a 5% margin of error, a 95% confidence interval (CI), and a response distribution of 50%.

### Inclusion and exclusion criteria

All areas in the Palestinian territories, including the West Bank and the Gaza Strip, were included, and pharmacists of all academic degrees were eligible to complete the study survey.

### Data collection instrument

The questionnaire was developed by going over the relevant literature to evaluate pharmacists' KAP regarding COVID-19 and the perceived barriers to implementing infection control measures.<sup>17–19,37,38</sup> The questionnaire was thoroughly reviewed to ensure correct answers to knowledge questions based on WHO website information regarding COVID-19.<sup>6</sup> Google Forms was used to design the questionnaire, where an Arabic version of the questions was entered. All questions in Google Forms were marked as “required” to avoid missing data. To ensure the significance and simplicity of the study questions, the questionnaire was sent to specialists with extensive research experience, including infectious diseases specialists, academic clinical pharmacists, and academic researchers. They independently revised the questionnaire and made comments and modifications. Their recommendations were considered, and the first version of the questionnaire was modified accordingly. Minor modifications were also done in the subsequent revisions until the final version was obtained. Finally, all specialists read the final edit and approved it. Then, a pilot study with 10 pharmacists was carried out to validate the questionnaire, and those participants were excluded from the final analysis. Afterward, the web-based questionnaire link was shared with the pharmacists' WhatsApp group and private Facebook groups. The inspectors only selected the private groups moderated by authorized pharmacists, and they

ensured that all existing pharmacists were registered in the Palestinian Ministry of Health and adhered to the eligibility criteria. It was also sent individually to pharmacists on the contact list of the inspectors.

The questionnaire consisted of three sections. The first part contained socio-demographics and basic questions regarding COVID-19 (such as wishing to obtain more education and training about COVID-19: yes, no, or, maybe; and the level of concern about COVID-19: low, moderate, or high). The second part included questions to assess knowledge, attitudes, and practices. The knowledge part contained 23 yes/no/I do not know questions, where one point was assigned for a correct answer and no points were offered for incorrect or “I do not know” responses. The resulting score ranged from 0 to 23, with a result of  $\geq 19$  points signifying good knowledge, and a result of less than 19 indicating poor knowledge. This knowledge scoring system has been adopted in numerous publications concerning the same topic, using Bloom's cutoff of 80%.<sup>19,23,24,29,39–42</sup> In the attitude part, the 5-point Likert-type scale was used. The participant had to respond to seven items (strongly disagree=1, disagree=2, uncertain=3, agree=4, and strongly agree=5). The attitude score ranged from 7 to 35, with a higher score demonstrating a good attitude. The last part of KAP comprised nine questions related to practices, where the participant scored 1 point if their answer was “yes” and 0 points if their answer was “no” or “sometimes,” except for the first question where 1 point was given to “no” responses and 0 points were given for “yes” or “sometimes” responses. A score of 8–9 signified good practice, while a score of less than 8 denoted poor practice.

The third part contained 10 statements regarding challenges that prevent the implementation of safety measures. The respondents answered the questions by using the 5-point Likert-type scale.

### Ethical approval

The study received permission from the Palestinian Ministry of Health and was approved by the Institutional Review Board (IRB) of An-Najah National University on November 22, 2020, with an ethical approval number of “Med. Nov. 2020/23.” The first page of the questionnaire included a complete explanation of all study aspects, including objectives, study instruments, and confidentiality, in addition to consent to participate in the survey. The wording of the invitation was as follows: “As pharmacists have a major role in raising awareness, sharing knowledge, preventing COVID-19 infection, and participating in COVID-19 management, we are conducting a study aiming to measure the knowledge, attitudes, and practices among an important category of the medical field regarding COVID-19. We express our appreciation for filling out the questionnaire (note: all information will be used for research purposes only) and we thank you for your participation.”

## Statistical analysis

Data were entered and analyzed using version 21 of the Statistical Package for the Social Sciences (SPSS) program. Categorical variables were expressed as frequencies and percentages, while continuous variables were described as mean and median. To test the significance of the association between categorical variables, the Chi-square test was used. The Kolmogorov–Smirnov test was performed and indicated that the data were nonparametric. The Kruskal–Wallis test was used to compare continuous and multicategorical variables, whereas the Mann–Whitney *U* test was applied to test the differences between continuous and binary variables. Pearson’s test was used to identify the correlation between KAPs. Binary logistic regression analysis was performed to determine the potential predictors associated with the categorical variables, good knowledge and practice, presenting the output as odds ratios (ORs) and 95% CIs. For all tests, the relationship was deemed significant when  $p < 0.05$ . In this study, Cronbach’s alpha for the knowledge domain was 0.624, 0.697 for attitude, and 0.637 for practice, indicating an acceptable level of internal consistency.<sup>43,44</sup>

## Results

### Sample characteristics

Of all respondents, 364 pharmacists completed the online questionnaire properly. The median age of the participants was 29 years old and most of them were female (70.9%). The most common sources used to obtain information regarding COVID-19 were pharmacists’ groups on Facebook or WhatsApp and WHO websites (Table 1; Supplementary Table 1).

### Pharmacists’ KAPs and perceived challenges about COVID-19

The analysis found that 76.4% of pharmacists had good knowledge regarding COVID-19. Only 64.3% responded “COVID-19 is a zoonotic infection.” The vast majority (97.5%) of pharmacists had good knowledge about the mode of transmission, and 89% were aware of the possibility of transmission of the virus regardless of the presence of fever. However, 21.2% of respondents incorrectly answered the question “Only wear a mask if you are ill with COVID-19 symptoms or looking after someone who may have COVID-19.” Over 95% of participants realized that they have to avoid going to crowded places, wash their hands vigorously, isolate and treat people with COVID-19 infection, and take special precautions in dealing with individuals with suspected COVID-19 (Supplementary Table 2).

In the attitude part, the median score recorded by the participants was 32 [Q1–Q3: 30–34], which indicated a good attitude regarding the disease (Supplementary Table 3). Regarding the practices that pharmacists follow to avoid COVID-19 infection, 192 (52.7%) participants answered at

**Table 1.** Characteristics of the sample ( $n = 364$ ).

Variables	<i>n</i> (%) <i>n</i> = 364
Age (years)	
20–29	198 (54.4%)
30–39	109 (29.9%)
≥40	57 (15.7%)
Gender	
Male	106 (29.1%)
Female	258 (70.9%)
Residency	
City	272 (74.7%)
Village	83 (22.8%)
Camp	9 (2.5%)
Marital status	
Not married	172 (47.3%)
Married	192 (52.7%)
Education site	
West bank	260 (71.4%)
Gaza strip	58 (15.9%)
Outside Palestine	46 (12.6%)
Higher education degree (master’s or PhD degrees)	
No	315 (86.5%)
Yes	49 (13.5%)
Occupation status	
Employed	312 (85.7%)
Non-employed	52 (14.3%)
Experience (years)	
<3	108 (29.7%)
3–5	99 (27.2%)
>5	157 (43.1%)
Need of education and training	
Yes	298 (81.9%)
No	15 (4.1%)
May be	51 (14%)
Level of concern about COVID-19	
Low concern	19 (5.2%)
Moderate concern	104 (28.6%)
High concern	241 (66.2%)
Fear of being infected with COVID-19	
Yes	154 (42.3%)
No	210 (57.7%)

least eight questions correctly (which represented more than 80% of the total mark). Clearly, the majority of pharmacists follow cough etiquette (91.2%), deal with suspected COVID-19 patients cautiously (88.7%), wear a face mask in crowded places (88.7%), rinse their hands with soap/hand sanitizer (88.2%), and put used tissues in a wastebasket (87.9%). However, 43% of pharmacists go/sometimes go to crowded places, and approximately 38% do not keep/sometimes keep a social distance at least 2m away from other people (Supplementary Table 4).

In the last section, respondents considered stigmatization (54.4%), poor safety culture (51.4%), and lack of safety

**Table 2.** Association between sample characteristics and knowledge regarding COVID-19.

Variable	Total frequency (%), N=364	Pharmacists with good knowledge frequency (%), n=278	Pharmacists with poor knowledge frequency (%), n=86	p value (chi-square test)
Age (years)				0.061
20–29	198 (54.4)	144 (51.8)	54 (62.8)	
30–39	109 (29.9)	92 (33.1)	17 (19.8)	
≥40	57 (15.7)	42 (15.1)	15 (17.4)	
Gender				0.408
Male	106 (29.1)	84 (30.2)	22 (25.6)	
Female	258 (70.9)	194 (69.8)	64 (74.4)	
Residency				0.623
City	272 (74.7)	209 (75.2)	63 (73.3)	
Village	83 (22.8)	61 (21.9)	22 (25.6)	
Camp	9 (2.5)	8 (2.9)	1 (1.2)	
Marital status				<b>0.002</b>
Not married	172 (47.3)	119 (42.8)	53 (61.6)	
Married	192 (52.7)	159 (57.2)	33 (38.4)	
Education site				0.349
West bank	260 (71.4)	196 (70.5)	64 (74.4)	
Gaza strip	58 (15.9)	43 (15.5)	15 (17.4)	
Outside Palestine	46 (12.6)	39 (14.0)	7 (8.1)	
Higher education degree (master's or PhD degrees)				0.196
No	315 (86.5)	237 (85.3)	78 (90.7)	
Yes	49 (13.5)	41 (14.7)	8 (9.3)	
Occupation status				0.096
Employed	263 (72.3)	243 (87.4)	69 (80.2)	
Non-employed	52 (14.3)	35 (12.6)	17 (19.8)	
Experience (years)				0.442
<3	108 (29.7)	78 (28.1)	30 (34.9)	
3–5	99 (27.2)	76 (27.3)	23 (26.7)	
>5	157 (43.1)	124 (44.6)	33 (38.4)	
Need of education and training				0.156
Yes	298 (81.9)	233 (83.8)	65 (75.6)	
No	15 (4.1)	9 (3.2)	6 (7.0)	
May be	51 (14)	36 (12.9)	15 (17.4)	
Level of concern about COVID-19				<b>0.001</b>
Low concern	19 (5.2%)	10 (3.6)	9 (10.5)	
Moderate concern	104 (28.6%)	70 (25.2)	34 (39.5)	
High concern	241 (66.2%)	198 (71.2)	43 (50)	
Fear of being infected with COVID-19				<b>0.019</b>
Yes	154 (42.3)	127 (45.7)	27 (31.4)	
No	210 (57.7)	151 (54.3)	59 (68.6)	

Values in bold mean statistical significance.

commitment (53.8%) as the three major barriers to implementing measures aimed at curbing COVID-19. Meanwhile, an inappropriate connection between healthcare advisors and the public and door-to-door services had the lowest mean compared to other barriers (Supplementary Table 5).

### The difference in pharmacists' KAP regarding COVID-19

Notably, the level of concern regarding COVID-19 was significantly associated with knowledge ( $p=0.001$ ), attitudes

( $p=0.001$ ), and practices ( $p=0.001$ ). Pharmacists who feared being infected with COVID-19 had significantly greater knowledge ( $p=0.019$ ) and better practice ( $p=0.038$ ) than pharmacists who were not frightened. It also appears that years of experience are linked to attitude ( $p=0.003$ ) and practice ( $p<0.001$ ). Moreover, the attitude ( $p=0.038$  and  $0.008$ ) and practice scores ( $p=0.009$  and  $0.001$ ) differed significantly among pharmacists' education sites and age groups. Pharmacists with master's or PhD degrees had significantly better practice ( $p=0.028$ ) than those without higher education (Tables 2 and 3; Supplementary Table 6).

**Table 3.** Association between sample characteristics and attitudes regarding COVID-19.

Variable	Total Frequency (%), N=364	Mean $\pm$ SD	Median (Q1–Q3)	<i>p</i> value (Kruskal–Wallis test, and Mann–Whitney <i>U</i> test)
Age (years)				<b>0.008</b>
20–29	198 (54.4%)	30.939 $\pm$ 3.756	32 (29–34)	
30–39	109 (29.9%)	32.202 $\pm$ 2.512	33 (31–34)	
$\geq$ 40	57 (15.7%)	31.193 $\pm$ 2.893	31 (29.5–33)	
Gender				0.623
Male	106 (29.1%)	31.481 $\pm$ 3.240	32 (30–34)	
Female	258 (70.9%)	31.306 $\pm$ 3.382	32 (30–34)	
Residency				0.709
City	272 (74.7%)	31.221 $\pm$ 3.53	32 (30–34)	
Village	83 (22.8%)	31.747 $\pm$ 2.673	32 (30–34)	
Camp	9 (2.5%)	31.889 $\pm$ 2.759	33 (30–33.5)	
Marital status				<b>0.014</b>
Not married	172 (47.3%)	30.802 $\pm$ 3.879	32 (29–33)	
Married	192 (52.7%)	31.854 $\pm$ 2.678	32 (30–34)	
Education site				<b>0.038</b>
West bank	260 (71.4%)	31 $\pm$ 3.473	32 (30–33.75)	
Gaza strip	58 (15.9%)	31.776 $\pm$ 3.084	32.5 (31–33.25)	
Outside Palestine	46 (12.6%)	32.283 $\pm$ 2.630	33 (30–35)	
Higher education degree (master's or PhD degrees)				0.448
No	315 (86.5%)	31.298 $\pm$ 3.394	32 (30–34)	
Yes	49 (13.5%)	31.734 $\pm$ 2.949	32 (30–34)	
Occupation status				0.692
Employed	312 (85.7%)	31.365 $\pm$ 3.385	32 (30–34)	
Non-employed	52 (14.3%)	31.308 $\pm$ 3.065	32 (30–33)	
Experience (years)				<b>0.001</b>
<3	108 (29.7%)	31.111 $\pm$ 3.397	32 (29–34)	
3–5	99 (27.2%)	30.414 $\pm$ 4.101	31 (29–33)	
>5	157 (43.1%)	32.121 $\pm$ 2.500	33 (31–34)	
Need of education and training				0.218
Yes	298 (81.9%)	31.507 $\pm$ 3.264	32 (30–34)	
No	15 (4.1%)	29.867 $\pm$ 4.764	31 (28–33)	
May be	51 (14%)	30.922 $\pm$ 3.199	32 (29–33)	
Level of concern about COVID-19				<b>0.001</b>
Low concern	19 (5.2%)	28.474 $\pm$ 5.037	30 (26–33)	
Moderate concern	104 (28.6%)	30.808 $\pm$ 3.639	31 (29–33)	
High concern	241 (66.2%)	31.821 $\pm$ 2.873	32 (30–34)	
Fear of being infected with COVID-19				0.050
Yes	154 (42.3%)	31.682 $\pm$ 3.379	32 (30–34)	
No	210 (57.7%)	31.119 $\pm$ 3.294	32 (29–33)	

Values in bold mean statistical significance.

### Results of regression analysis of the association between variables and KAPs

All variables with significant *p* values according to univariate analysis were included in the logistic regression analysis. The results revealed that pharmacists highly concerned about COVID-19 were more likely to have good knowledge (OR, 3.525; 95% CI, 1.315–9.448; *p*=0.012) compared to less concerned pharmacists. High level of concern (OR, 4.258; 95% CI, 1.425–12.720; *p*=0.009), receiving an education in Gaza Strip (OR, 2.376; 95% CI, 1.215–4.646; *p*=0.011), and having 3–5 years of experience (OR, 2.560; 95% CI, 1.413–4.639; *p*=0.002) or more than 5 years (OR, 2.931; 95% CI,

1.188–7.232; *p*=0.020) were potential predictors of good practice (Supplementary Tables 7 and 8).

This study demonstrated a highly significant correlation between the three tools of education diagnosis; knowledge-attitude (*r*=0.333, *p*<0.001), knowledge-practice (*r*=0.209, *p*<0.001), and attitude-practice (*r*=0.247, *p*<0.001), and showed a positive linear relationship (Supplementary Table 9).

### Discussion

Pharmacists, as healthcare workers, have a dual responsibility during health emergencies. In a professional capacity, they play a key role in optimizing the quality of healthcare

provided to patients. In a communal capacity, they undertake the ethical responsibility of raising health awareness and combating the propagation of misinformation in their respective societies.<sup>45,46</sup> Therefore, a comprehensive analysis of the awareness level regarding COVID-19 among this group is an essential tool for wise healthcare policy-making to enhance health promotion in society at large. Amid the urgency of this pandemic, we conducted a survey investigating Palestinian pharmacists' KAPs to draw basic conclusions for decision-making. In general, Palestinian pharmacists appear to have sound knowledge and a positive attitude, but they are inadequately committed to good practices regarding COVID-19. In this research, the female-to-male ratio was 2.4:1, and 84.3% of pharmacists were <40 years old. That is a little closer to the characteristics of the overall population; the female-to-male ratio among Palestinian pharmacists is 1.8:1,<sup>36</sup> and 75.5% of the pharmacists working in Palestine are <45 years old.<sup>47</sup>

There is a global overabundance of information regarding the coronavirus pandemic, allowing for misinformation to circulate easily. In this study, most respondents relied on online sources to obtain information about COVID-19. With the notable exception of Turkish pharmacists,<sup>17</sup> other studies reported similar results consistent with a marked tendency toward using online sources, regardless of whether the respondents were healthcare workers or not.<sup>18,19</sup> This denotes a global trend toward utilizing online sources, and therefore implies the necessity to introduce expert opinions within the digital world.

Overall, the majority of respondents (76.4%) demonstrated good general knowledge regarding COVID-19. Surprisingly, only 64.3% stated that the infection is zoonotic. This uncertainty has occurred because, at the time of the study, the WHO had not issued an official report on the virus's origins.<sup>48,49</sup> Regarding the question of zoonotic infection, similar findings were reported in related studies from Turkey (70%) and Pakistan (69.2%), which also reported lower scores when compared to other questions in the knowledge section.<sup>17,19</sup>

The knowledge score of this study is comparable to a study conducted in Pakistan among community pharmacists (71.5%) and in Egypt among senior pharmacy students (83%),<sup>18,19</sup> while it lags behind other studies among healthcare workers, such as that of China (89%) and Pakistan (94.8%).<sup>23,27</sup> Notably, a study conducted in Palestine among the public revealed a wide range of knowledge scores ranging from 55.6% to 81%.<sup>31</sup> However, the aforementioned studies used different survey structures and methodologies, which make the comparisons less applicable. While the knowledge score in our study may be generally acceptable, it might be perceived as unsatisfactory, especially considering that pharmacists are vital elements of the healthcare team and are therefore expected to be equipped with ample health knowledge.

As for attitudes and practices, respondents scored a median of 32 in questions related to attitude, while almost half correctly answered more than 80% of the questions related to practice. This could be due to the influence of local

culture and the inadequate commitment of the general public to safety measures. Particularly noteworthy was the variation in response to whether invasive and emergency treatment is limited to patients with severe symptoms. This might be explained by the vague expression used in the question as to what exactly defines "severe" cases. Most importantly, respondents demonstrated acceptable adherence to the main precautionary measures. This is in coherence with a general trend of optimistic attitudes and adequate practices among pharmacists and other healthcare workers found in other studies, except for a study from Pakistan, where community pharmacists showed poor attitudes and practices.<sup>18,19,23,27</sup>

The present findings showed that pharmacists highly concerned about COVID-19 were more likely to have good knowledge and practices, as shown by regression analysis. Emotions of concern are likely to prompt a greater inclination to know more and behave properly regarding a particular disease. In this study, age was not a predictor of good knowledge and practice, differing from other studies. Age was associated with good knowledge and practices among Turkish hospital pharmacists,<sup>17</sup> but it had higher odds of better attitudes among Pakistani healthcare workers who were 40 years or older,<sup>24</sup> and better knowledge among Pakistani community pharmacists who were years 26 or older.<sup>19</sup> Marital status was found to be a determinant of good knowledge. This may be because married people are more likely to try to protect their children by adopting behaviors that halt the spread of COVID-19. Therefore, they are more likely to educate themselves properly, improve their attitude, and try to follow the instructions provided by the ministry of health about the disease. It was also found that more years of experience had higher odds for better practices. Results were somewhat close to those of the Pakistani study, which revealed that experience of more than 5 years was linked to adequate practices among healthcare workers.<sup>24</sup> However, a study conducted in China among nursing staff showed that those with working experience of more than 20 years scored significantly better on the knowledge score when compared to those with less than 10 years of experience.<sup>30</sup> Another point, receiving education in Gaza Strip, was significantly associated with good practice. This could be due to differences in social cultures and education programs within Gazan universities compared to West Bank universities, in addition to differences between the local health authorities in the Gaza Strip and the West Bank in their methods of implementation and enforcement of strict safety measures.

Statistically significant correlations were found between all three measures; KAP, similar to two studies conducted in Pakistan among healthcare workers and pharmacists,<sup>19,24</sup> and another study conducted in Vietnam among pharmacy students.<sup>25</sup>

In this study, respondents considered stigmatization (54.4%), poor safety culture (51.4%), and lack of safety commitment (53.8%) as the three major challenges to implementing measures aimed at curbing COVID-19. These

challenges seem region-specific and culturally constructed. To further highlight the cultural aspect of behavior in a pandemic, one study from Pakistan concluded that healthcare workers perceived a shortage of personal protective equipment (gloves, protective clothing, goggles, and facemasks) and poor knowledge regarding transmission as the two main barriers to implementation.<sup>24</sup>

This study was conducted in a time of health emergency to help draw conclusions aimed at managing the current pandemic. However, the study has its limitations. Due to the pandemic's constraints on in-person communication, it was conducted online. This might have led to more subjective answers and engendered recall bias. In addition, the convenience sampling method was used, which might limit the generalizability during the study. Furthermore, there is potential for selection bias due to the exclusion of those without Internet access.

## Conclusion

Although this study showed an acceptable level of knowledge among Palestinian pharmacists regarding COVID-19, it might be considered inadequate, as the pharmacists have a major role in filling the knowledge gap of the public about health issues. The most important observation is the lack of appropriate commitment from pharmacists to social and infection control measures. Therefore, we recommend the responsible authorities generate an organized training program, focusing on pharmacists and other health care providers, to expand their knowledge and experience regarding COVID-19.

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## Authors' contributions

A.K. designed the study, performed data collection and analysis, reviewed the literature, and wrote the draft manuscript. S.T. and S.A. participated in data collection and analysis and wrote the draft manuscript. A.D. participated in the study design, performed data collection and analysis, and reviewed the literature. M.K. and A.S. performed data collection and analysis and reviewed the literature. S.Z. formed the idea of the study, supervised, analyzed the data, reviewed the results' explanation, critically, revised the manuscript critically for enhancement of intellectual contents, and assisted in the final write-up of the manuscript. Then, all authors reviewed and accepted the final manuscript.

## Availability of data

The data sets supporting the results of the current research are available from the corresponding authors upon request.

## Declaration of conflicting interests

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## Ethics approval

Ethical approval for this study was obtained from the Palestinian Ministry of Health and the *Institutional Review Board (IRB) of An-Najah National University* (the ethics approval number: Med. Nov. 2020/23).

## Informed consent

Written informed consent was obtained from all subjects before the study.

## ORCID iDs

Amer Koni  <https://orcid.org/0000-0002-0514-9352>

Sa'ed H Zyoud  <https://orcid.org/0000-0002-7369-2058>

## Supplemental material

Supplemental material for this article is available online.

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