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# Comparing knowledge, attitudes, and practices in cardiovascular disease prevention and health promotion between community and hospital pharmacists in Saudi Arabia: A cross-sectional study

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ABSTRACT

*Purpose:* Saudi Arabia is one of the leading nations in the world in terms of the high frequency of chronic diseases and their associated risk factors. Knowledge and awareness are crucial for pharmacists to play an active role in the prevention of cardiovascular diseases (CVD). The current study assessed the pharmacists' knowledge, attitude, and practice to determine the potential differences with respect to their respective practice settings toward CVD prevention and related health promotions.

*Methods:* It is a cross-sectional study targeted the registered pharmacists in the Kingdom of Saudi Arabia. An online questionnaire was prepared, and the link was circulated through various social media platforms. Descriptive statistics, multivariate linear regression analysis and chi square test were used to analyze the data accordingly.

*Results:* A total of 324 pharmacists were included in the study. Among these, 157 (48.4 %) were community pharmacists, and the remaining were hospital pharmacists (51.6 %). No significant differences in knowledge scores were observed between community and hospital pharmacists. The mean attitude score among community and hospital pharmacists was found to be 26.40 ± 5.125 and 25.09 ± 5.393 respectively, which was statistically significant ($p = 0.026$). Similarly, the total practice scores across the settings were statistically significant ($p = 0.02$). Gender plays a significant role in terms of knowledge scores among both community and hospital pharmacists ($p = 0.016$ & 0.029). Gender, professional practice experience, and number of prescriptions handled and prescriptions with CVD medications showed significant differences in the distribution of positive attitudes and good practice frequency between community and hospital pharmacists.

*Conclusion:* It is evident that there is a deficiency in knowledge among hospital pharmacists compared to community pharmacists. Which indicates that there is a need for a rigorous continuous pharmacy education covering the fundamental aspects of CVD primary prevention and health promotion among pharmacists, given more focus on hospital pharmacists.

## 1. Background

Saudi Arabia is one of the leading nations in the world in terms of the high frequency of chronic diseases and their associated risk factors, and it is increasing with age (Memish et al., 2014; Saquib et al., 2017). Globally, non-communicable and chronic diseases account for the majority of deaths each year and the chief among these conditions is cardiovascular disease (CVD) (Tash and Al-Bawardy, 2023). CVD remains a global public health problem and significantly burdens the healthcare system clinically and economically (Vaduganathan et al., 2022). In Saudi Arabia, it is estimated that CVD accounts for approximately 45 % of all reported deaths (Tash and Al-Bawardy, 2023).

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The rapid urbanization and socio-economic developments in Saudi Arabia have resulted in a sedentary lifestyle among the Saudi population. Indeed, this lifestyle shift has made a significant contribution to the increased incidences of CVD among this population (Munawir Alhejely et al., 2023). As of 2016, the economic burden of CVD worldwide costs approximately $3.5 billion and is projected to be tripled by 2035 (Tash and Al-Bawardy, 2023). Thus, preventing cardiovascular diseases can significantly reduce the global healthcare burden (Leong et al., 2017). WHO classifies CVD disease prevention into two types: primary and secondary prevention. The primary prevention is to delay the onset of CVD disease, whereas the secondary prevention is to prevent the recurrent episodes of CVD (Peletidi et al., 2019).

As the primary prevention of CVD is of prime concern, it is crucial for the global health professional workforce to have appropriate skills to support patients in providing cardioprotection regimens and preventing CVD (Jennings and Astin, 2017). Moreover, CVD prevention requires a multidisciplinary approach to address all risk factors and lifestyle modifications, including modifiable and nonmodifiable risk factors (Kotseva et al., 2019). Indeed, this interdisciplinary approach requires a contribution from all healthcare team members, including pharmacists (Jennings and Astin, 2017).

Pharmacists are the world's third-largest regulated healthcare professionals (Steed et al., 2019). Pharmacists hold a distinctive position as easily accessible healthcare professionals within many communities (Birarra et al., 2022). Pharmacists shall be actively involved in many programs, including monitoring CVD risk factors, optimizing medications, diseases and health care wellness, public health, educational consultations, and preventive care (Alshahrani et al., 2020; Newman et al., 2020; Vigneshwaran et al., 2013). Much research has established pharmacists' involvement in preventing and controlling CVD (Alavudeen et al., 2023; Almansour et al., 2021; Fahs et al., 2018; Peletidi et al., 2019). A recent report confirmed that practicing community pharmacists in Saudi Arabia have considerable knowledge and understanding of CVD risk factors (Sulaiteen et al., 2023). Further, community pharmacists were found to have a positive attitude towards CVD risk assessment (Al-Ashwal et al., 2022).

The literature search revealed a scarcity of evaluating knowledge, attitudes, and practices toward primary prevention of CVD among hospital pharmacists. However, hospital pharmacies are evolving in various patient care areas, and hospital pharmacists have an excellent opportunity to deal with patients regarding preventive care for outpatients, hospitalized patients, and newly diagnosed patients (Alshaiban et al., 2023; Atkinson et al., 2016). Therefore, it is equally essential for hospital pharmacists to have appropriate knowledge and awareness regarding the primary prevention of CVD, like community pharmacists. Conversely, research comparing community and hospital pharmacists' knowledge, attitudes, and practices (KAP) is scarce, particularly in Saudi Arabia. Therefore, the current study was adopted to evaluate the differences in knowledge, attitudes, and practices between the community and hospital pharmacists and determine the impact of demographic and clinical characteristics on CVD prevention and related health promotion.

## 2. Methodology

### 2.1. Study design and study period

A cross-sectional study assessed the pharmacists' knowledge, attitude, and practice to determine the potential differences based on their respective practice settings. The study was conducted between the period of June 2021 to August 2021.

### 2.2. Study settings

The study was conducted among the hospital and community pharmacists practicing in various regions of Saudi Arabia. The prescriptions reaching the community pharmacists were mostly the floating prescriptions not from the specific physicians or the clinics, whereas the prescriptions reaching the hospital pharmacists were from the specific hospital or physician for both acute and chronic management of diseases.

### 2.3. Sampling

According to the study published in 2023, the total number of registered pharmacists in Saudi Arabia is 30,840. (Almaghaslah, 2023) The sample size was calculated through Raosoft software (Raosoft, Inc., 2007, Seattle, WA, United States). Keeping a predetermined 5 % margin error, 95 % confidence interval, and the response distribution at 50 % for the given number of samples, it was estimated that the required sample size as 380. The current study employed non-probabilistic convenience sampling technique to achieve the required sample size and to collect the data. The researchers managed to collect 387 responses, which justified the required sample size. However, after excluding incomplete responses, the responses from the non-pharmacy professionals and those pharmacists unwilling to provide electronic consent, the final number of valid responses reached 324.

### 2.4. Study tool

The current study was a questionnaire-based survey. The researchers developed the questionnaire with the help of their extensive prior knowledge in the field and by navigating through existing research literature (Amadi et al., 2018; Henneh and Teg-Nefaah Tabong, 2022). We performed a pilot investigation to estimate the level of internal consistency and a field pretest was carried out to anticipate the validity of the questionnaire. Based on the feedback from the pilot study and the field test report, the final revised questionnaire was approved, demonstrating an internal consistency of 0.76. Based on the results, the final version of the questionnaire comprises 28 questions. These questions cover various aspects, including the pharmacists' demographic and clinical background (8 items), familiarity with the diagnostic thresholds for hypertension, diabetes, dyslipidemia, and obesity (6 items), as well as their perspectives on CVD prevention and health promotion (7 items). Table 1. The finalized questionnaire was uploaded onto Google Forms, and the survey link was generated. The link was then shared through social media platforms such as Facebook, Twitter, and WhatsApp® among the participants.

### 2.5. Scoring

**Knowledge scoring:** The knowledge scores were calculated by assigning a value of 1 to each correct response and 0 to each incorrect one. The maximum possible score for the knowledge domain was 6, while the minimum was 0. The total knowledge score was calculated by adding up the scores of all items ranging from 0 to 6.

**Scoring for Attitude:** The attitudes were measured using a 5-point Likert scale with the score ranging from 1 to 5 for each response. The total score for the attitudes was calculated by summing up the responses of each item. Subsequently, it was transformed into a discrete variable represented on a 100-point scale (%). The level of attitudes was calculated based on Bloom's cut-off point, with 60 % to 100 % considered positive and scores ranging from 0 to 59 % as negative. Only the distribution of positive attitudes was analyzed between the community and hospital pharmacists.

**Scoring for Practice:** The practices were assessed using a 4-point Likert scale with response options including "rarely," "sometimes," "often," and "always." The response scores ranged from 1 to 4 for each response. Like the attitude domain, the scores were estimated with Bloom's cut-off point, and only the distribution of good practices was analyzed.

**Table 1**
Description of the questionnaire:

| **Knowledge** | **Maximum score** | **Minimum score** |
|---|---|---|
| What is the cut-off for hypertension? | 6 | 1 |
| What is the cut-off for diabetes mellitus? | | |
| What is the cut-off for obesity? | | |
| What is the cut-off for abdominal obesity for males (waist circumference)? | | |
| What is the cut-off for abdominal obesity for females (waist circumference)? | | |
| What is the cut-off for dyslipidemia? | | |
| **Attitudes** | **Positive attitudes** | **Negative attitudes** |
| Pharmacists play a major role in the primary prevention of cardiovascular diseases | 60 % to 100 % | 0 % to 59 % |
| Providing counseling on how to prevent cardiovascular diseases to the patients at risk is my responsibility | | |
| Screening for the presence of cardiovascular diseases' risk factors is the responsibility of the pharmacist | | |
| I feel confident and prepared to provide cardiovascular disease related health promotion activities to my patients into my daily practice | | |
| Providing cardiovascular diseases counseling to my patients can improve my professional state and increase my professional satisfaction | | |
| I have good expertise in handling the medical devices like sphygmomanometer, glucometer, etc | | |
| I am confident enough to discuss all the CVD related drugs with my patients | | |
| **Practices** | **Good practice** | **Poor practice** |
| Do you respond to patient inquiries related to cardiovascular diseases prevention including hypertension, diabetes, overweight, smoking and dyslipidemia? | 60 % to 100 % | 0 % to 59 % |
| Do you provide patients with educational materials about cardiovascular diseases prevention? | | |
| Do you screen patients for the presence of cardiovascular diseases' risk factors in the pharmacy (BP, Blood glucose & BMI)? | | |
| Do you stress patients on the importance of self-monitoring of blood pressure, blood sugar and timely measurement of blood lipids/cholesterol | | |
| Do you provide patients with advice or counseling regarding the importance of healthy lifestyles to prevent cardiovascular diseases? | | |
| Do you counsel on when to contact the health care provider regarding hypertension/hyperglycemia/dyslipidemia control and complications | | |
| Do you counsel about the cautions of over-the-counter drugs or herbal products as they relate to hypertension/hyperglycemia/dyslipidemia management? | | |

### 2.6. Statistical analysis

The research team employed IBM's SPSS Statistics for the Social Sciences 22 (IBM, Armonk, NY, USA) for the statistical analysis. The categorical variables represented frequencies and percentages were analyzed using descriptive statistics. The student *t* test was used to compare the mean scores of KAP between community and hospital pharmacists. Multivariate linear regression analysis was used to examine the differences in knowledge scores between community pharmacists and hospital pharmacists regarding demographic and clinical factors. The chi-square test was used to determine the differences in attitude and behavior between community and hospital pharmacists based on demographic and clinical characteristics. We considered the results statistically significant if the *p*-value was less than or equal to 0.05.

### 2.7. Ethical considerations

The current study was approved by the research ethics committee of King Khalid University with an approval number of ECM#2020–1103. All the pharmacists included in the current study provided electronic consent to participate in the study.

## 3. Results

There were a total of 324 pharmacists involved in the study. Among these, 157 (48.4 %) were community pharmacists, and the remaining were hospital pharmacists (51.6 %). Most of the community pharmacists (66 %) and the hospital pharmacists (56 %) were under 30 years of age. Regarding gender distribution, there were 140 male and 17 female community pharmacists. Among the hospital pharmacists, the number of males and females was 104 and 63, respectively. The results of the current study indicate that Saudi citizens comprised a considerable percentage of the participants, notably, 48 % of Saudi citizens in community pharmacies and 76 % of Saudi citizens in hospital pharmacies. Overall, 85.8 % of pharmacists included are from the southern region of the Kingdom of Saudi Arabia. Regarding educational qualification, most community pharmacists (73 %) and hospital pharmacists (56 %) held a bachelor's degree in pharmacy. The results show that 54 % and 46 % of community and hospital pharmacists have less than five years of professional experience. Meanwhile, 38 % of pharmacists across both settings had 6 – 10 years of experience. Very few had over 15 years of experience. Regarding workload, most community pharmacists (64 %) handled less than 30 prescriptions daily, whereas 33 % of hospital pharmacists dealt with 31–50 prescriptions. The average number of CVD prescriptions was higher for hospital pharmacists versus community pharmacists. Regarding the workforce, both settings had more than one pharmacist in a single shift (69 %). A good portion of community pharmacists (58 %) had completed their cardiovascular disease management training than hospital pharmacists (44 %). Interestingly, over 70 % of pharmacists across both settings were interested in undertaking cardiovascular disease management training (Table 2**).**

A comparison of KAP scores between community and hospital pharmacists has been depicted in Table 3**.** The mean knowledge score among community and hospital pharmacists was 1.71 ± 1.184 and 1.66 ± 1.284, respectively, with no significant difference. We found a statistically significant difference ($p = 0.026$) in the mean attitude scores between the community and hospital pharmacists, which are 26.40 ± 5.125 and 25.09 ± 5.393, respectively. Similarly, community and hospital pharmacists' total practice scores were statistically significant ($p = 0.02$), with the mean scores of 19.54 ± 3.829 for community pharmacists and 18.50 ± 4.204 for hospital pharmacists.

Table 4 provides the distribution of knowledge, attitude, and practice among the participants. A low proportion of pharmacists demonstrated sufficient knowledge (8 %). Meanwhile, 94 % of community pharmacists and 90 % of hospital pharmacists were assessed as having poor knowledge. In relation to the attitudes, overall, a positive attitude was observed among 92 % of the community and 83 % of the hospital pharmacists. In terms of practice, good practice was found to be 75 % & 68 % for community and hospital pharmacists, respectively.

The results from the multivariable linear regression analysis are described in Table 5. Neither demographic nor clinical characteristics of the participants were associated with the overall knowledge score. However, gender is a determinant that significantly influences the knowledge scores among community pharmacists and hospital pharmacists ($p = 0.016$ and $p = 0.029$, respectively). High knowledge scores among community pharmacists were strongly associated with being between 30 and 40 years of age ($p = 0.044$); on the other hand, it is associated with hospital pharmacists over 40 years. Hospital pharmacists who had earned a graduate degree in the field scored considerably higher on the knowledge section ($p = 0.034$). The average daily prescription volume is not associated with the knowledge scores among

**Table 2**
Characteristics of pharmacists.

| Characteristics | Community pharmacists Frequency (%) | Hospital pharmacists Frequency (%) | Total |
|---|---|---|---|
| Age category: | | | |
| • ≤ 30 | 103 (66) | 94 (56) | 197 (61) |
| • 30–40 | 48 (31) | 68 (41) | 116 (36) |
| • >40 | 6 (4) | 5 (3) | 11 (3) |
| Gender | | | |
| • Male | 140 (89) | 104 (62) | 244 (74) |
| • Female | 17 (11) | 63 (38) | 80 (25) |
| Educational qualification | | | |
| • Diploma | 6 (4) | 13 (8) | 19 (6) |
| • B Pharm | 115 (73) | 94 (56) | 209 (65) |
| • M Pharm | 5 (3) | 5 (3) | 10 (3) |
| • Pharm D | 31 (20) | 55 (33) | 86 (27) |
| Region | | | |
| • South | 141 (90) | 137 (82) | 278 (86) |
| • Eastern | 9 (6) | 12 (7) | 21 (6) |
| • Middle | 3 (2) | 10(6) | 13 (4) |
| • Western | 1 (1) | 5 (3) | 6 (2) |
| • Northern | 3 (2 | 3(2) | 6 (2) |
| Professional practice experience | | | |
| • Less than or Equal to 5 | 84 (54) | 76 (46) | 160 (49) |
| • 6–10 Years | 60 (38) | 64 (38) | 124 (38) |
| • 11–15 Years | 11 (7) | 25 (15) | 36 (11) |
| • 16–20 Years | 2 (1) | 2 (1) | 4 (1) |
| Number of prescriptions per day | | | |
| • Less than 30 | 100 (64) | 34 (20) | 134 (41) |
| • 31–50 | 41 (26) | 55 (33) | 96 (30) |
| • 51–100 | 8 (5) | 29 (17) | 37 (11) |
| • 101–200 | 6 (4) | 28 (17) | 34 (10) |
| • More than 200 | 2 (1) | 21 (13) | 23 (7) |
| Number of pharmacists in a single shift | | | |
| • One | 72 (46) | 29 (17) | 101 (31) |
| • More than one | 85 (54) | 138 (83) | 223 (69) |
| Average number of prescriptions for CVD diseases | | | |
| • Less than 10 | 97 (62) | 33 (20) | 130 (40) |
| • 11—20 | 43 (27) | 55 (33) | 98 (31) |
| • 21–30 | 6 (4) | 34 (20) | 40 (12) |
| • More than 30 | 11 (7) | 45 (27) | 56 (17) |

**Table 3**
Comparison of KAP scores between community and hospital pharmacists.

| Domains | Type of pharmacy | Mean | Std. Deviation | Std. Error Mean | *p* Value |
|---|---|---|---|---|---|
| **Knowledge** | Community Pharmacists | 1.71 | 1.184 | 0.094 | 0.725 |
| | Hospital pharmacists | 1.66 | 1.284 | 0.099 | |
| **Attitude** | Community Pharmacists | 26.40 | 5.125 | 0.409 | 0.026* |
| | Hospital pharmacists | 25.09 | 5.393 | 0.417 | |
| **Practice** | Community Pharmacists | 19.54 | 3.829 | 0.306 | 0.02* |
| | Hospital pharmacists | 18.50 | 4.204 | 0.325 | |

Student *t* test; * ***p*** value $< 0.05$ considered significant.

community and hospital pharmacists. However, significantly higher knowledge scores ($p = 0.035$) were observed among community pharmacists who filled over 30 prescriptions for CVD illnesses.

Table 6. Among all the pharmacists in both settings, 282 (87 %) had positive attitudes, and 40 (13 %) had a negative attitude toward cardiovascular disease prevention and health promotion. The frequency distribution of positive attitudes between the community and hospital pharmacists was analyzed. Gender significantly impacted positive attitude distribution between community and hospital pharmacists ($X^2 = 28.807$, $p \leq 0.001$). The professional practice experience and number of prescriptions handled per day were significantly associated with positive attitude distribution, with the $X^2$ and $p$ values 8.92, 0.030, and 69.756,

**Table 4**
Overall distribution of KAP between community and hospital pharmacists.

| Category | Community pharmacistsN (%) | Hospital PharmacistsN (%) | Total |
|---|---|---|---|
| Good knowledge | 9 (6) | 17 (10) | 26 (8) |
| Poor knowledge | 148 (94) | 150 (90) | 298 (92) |
| Positive attitude | 144 (92) | 138 (83) | 282 (87) |
| Negative attitude | 13 (8) | 29 (17) | 42 (13) |
| Good practice | 118 (75) | 113 (68) | 231 (71) |
| Poor practice | 39 (25) | 54 (32) | 93 (29) |
| Total | 157 (100) | 167 (100) | 324 (100) |

**Table 5**
Differences in knowledge scores between community and hospital pharmacists.

| Variables | | Total | | Community Pharmacists | | Hospital Pharmacists | |
|---|---|---|---|---|---|---|---|
| | | Coefficients (95.0 % Confidence Interval for B) | *p* value | Coefficients (95.0 % Confidence Interval for B) | *p* value | Coefficients (95.0 % Confidence Interval for B) | *p* value |
| Age | ≤ 30 | Reference | | | | | |
| | 30—40 | 0.050 (−0.154 to 0.413) | 0.369 | 0.163 (0.012 to 0.823) | 0.044* | −0.039 (−0.503 to 0.300) | 0.618 |
| | >40 | −0.083 (−1.315 to 0.187) | 0.140 | −0.013 (−1.057 to 0.892) | 0.867 | −0.151 (−2.291 to 0.023) | 0.055* |
| Gender | Male | Reference | | | | | |
| | Female | 0.032 (−0.223 to 0.403) | 0.572 | −0.191 (−1.318 to −0.136) | 0.016* | 0.169 (0.046 to 0.846) | 0.029* |
| Educational qualification | Diploma | Reference | | | | | |
| | B Pharm | −0.102 (−1.144 to 0.074) | 0.085 | −0.051 (−1.360 to 0.736) | 0.557 | −0.131 (−1.385 to 0.132) | 0.105 |
| | M Pharm | 0.108 (−0.029 to 0.586) | 0.076 | 0.029 (−0.399 to 0.552) | 0.751 | 0.175 (0.035 to 0.870) | 0.034* |
| | Pharm D | −0.005 (−0.838 to 0.768) | 0.932 | 0.083 (−0.577 to 1.687) | 0.334 | −0.090 (−1.821 to 0.476) | 0.249 |
| Professional practice experience | ≤ 5 years | Reference | | | | | |
| | 6–10 Years | 0.033 (−0.206 to 0.376) | 0.566 | 0.060 (−0.253 to 0.543) | 0.472 | 0.009 (−0.406 to 0.454) | 0.913 |
| | 11–15 Years | −0.060 (−0.685 to 0.212) | 0.300 | −0.024 (−0.864 to 0.646) | 0.775 | −0.087 (−0.895 to 0.274) | 0.296 |
| | 16–20 Years | −0.039 (−1.662 to 0.799) | 0.491 | 0.033 (−1.339 to 2.030) | 0.686 | −0.103 (−3.026 to 0.605) | 0.190 |
| Number of prescriptions per day | Less than 30 | Reference | | | | | |
| | 31–50 | −0.011 (−0.353 to 0.296) | 0.862 | 0.015 (−0.389 to 0.470) | 0.853 | 0.032 (−0.458 to 0.630) | 0.755 |
| | 51–100 | 0.101 (−0.061 to 0.841) | 0.090 | −0.115 (−1.466 to 0.236) | 0.156 | 0.257 (0.239 to 1.499) | 0.007* |
| | 101–200 | −0.041 (−0.630 to 0.302) | 0.489 | −0.120 (−1.714 to 0.234) | 0.135 | 0.048 (−0.470 to.802) | 0.607 |
| | More than 200 | −0.003 (−0.560 to 0.536) | 0.966 | 0.120 (−0.395 to 2.915) | 0.135 | 0.021 (−0.609 to 0.775) | 0.814 |
| Number of pharmacists in a single shift | One | Reference | | | | | |
| | More than one | 0.043 (−0.178 to 0.405) | 0.444 | −0.023 (−0.429 to 0.322) | 0.778 | 0.137 (−0.051 to 0.978) | 0.077 |
| Average number of prescriptions for CVD diseases | Less than 10 | Reference | | | | | |
| | 11—20 | 0.091 (−0.079 to 0.567) | 0.138 | 0.095 (−0.170 to 0.675) | 0.240 | 0.125 (−0.218 to 0.897) | 0.231 |
| | 21 – 30 | 0.019 (−0.365 to 0.507) | 0.748 | −0.033 (−1.172 to 0.770) | 0.683 | 0.079 (−0.370 to 0.869) | 0.427 |
| | More than 30 | −0.096 (−0.700 to 0.071) | 0.109 | −0.171 (−1.526 to −0.058) | 0.035* | −0.025 (−0.651 to 0.510) | 0.810 |

Multivariable linear regression analysis; * $p$ value < 0.05 considered significant.

**Table 6**
Frequency distribution of positive attitudes between community and hospital pharmacists (N1 = 282, N2 = 42).

| Variables | | Community Pharmacists | Hospital pharmacists | Total | Chi-square | *p* value |
|---|---|---|---|---|---|---|
| Age in years | ≤ 30 | 94 | 77 | 171 | 2.762 | 0.251 |
| | 30–40 | 45 | 56 | 101 | | |
| | >40 | 5 | 5 | 10 | | |
| Gender | Male | 131 | 89 | 220 | 28.807 | ≤0.001* |
| | Female | 13 | 49 | 62 | | |
| Education | Diploma | 6 | 12 | 18 | 7.006 | 0.072 |
| | B Pharm | 107 | 84 | 191 | | |
| | M Pharm | 5 | 4 | 9 | | |
| | Pharm D | 26 | 38 | 64 | | |
| Professional practice experience | ≤ 5 | 76 | 64 | 140 | 8.92 | 0.030* |
| | 6–10 Years | 58 | 49 | 107 | | |
| | 11–15 Years | 8 | 23 | 31 | | |
| | 16–20 Years | 2 | 2 | 4 | | |
| Number of prescriptions per day | < 30 | 91 | 29 | 120 | 69.756 | ≤0.001* |
| | 31–50 | 38 | 37 | 75 | | |
| | 51–100 | 7 | 28 | 35 | | |
| | 101–200 | 6 | 27 | 33 | | |
| | > 200 | 2 | 17 | 19 | | |
| Number of pharmacists in each shift | One | 64 | 25 | 89 | 22.615 | ≤0.001* |
| | > one | 80 | 113 | 193 | | |
| Average number of prescriptions for CVD | Less than 10 | 86 | 31 | 117 | 56.528 | ≤0.001* |
| | 11—20 | 41 | 39 | 80 | | |
| | 21–30 | 6 | 28 | 34 | | |
| | More than 30 | 11 | 40 | 51 | | |
| Total | | 144 | 138 | 282 | | |

Chi-square test; *$p$ value < 0.05 considered significant.
N1 = number of pharmacists with a positive attitude, N2 = number of pharmacists with a negative attitude.

≤0.001, respectively, for community and hospital pharmacy settings. The availability of more than one pharmacist increased the positive attitude and significantly differed between community and hospital pharmacists ($X^2 = 22.615$, $p \leq 0.001$). There was a significant difference in the positive attitude distribution between community and hospital pharmacists in relation to the number of CVD prescriptions handled ($X^2 = 56.528$, $p \leq 0.001$).

Table 7 shows the results pertaining to the practice of the

**Table 7**
Frequency distribution of good practices between community and hospital pharmacists (N1 = 231, N2 = 93).

| Variables | | Community Pharmacists | Hospital Pharmacists | Total | Chi-square | *p* Value |
|---|---|---|---|---|---|---|
| Age in years | ≤ 30 | 81 | 58 | 139 | 7.34 | 0.03* |
| | 30–40 | 35 | 51 | 86 | | |
| | >40 | 2 | 4 | 6 | | |
| Gender | Male | 109 | 79 | 188 | 19.22 | ≤0.001* |
| | Female | 9 | 34 | 43 | | |
| Education | Diploma | 5 | 5 | 10 | 6.92 | 0.08 |
| | B Pharm | 85 | 66 | 151 | | |
| | M Pharm | 5 | 3 | 8 | | |
| | Pharm D | 23 | 39 | 62 | | |
| Professional practice experience | ≤ 5 | 58 | 45 | 103 | 9.80 | 0.02* |
| | 6–10 Years | 52 | 45 | 97 | | |
| | 11–15 Years | 7 | 22 | 29 | | |
| | 16–20 Years | 1 | 1 | 2 | | |
| Number of prescriptions per day | < 30 | 77 | 23 | 100 | 56.33 | ≤0.001* |
| | 31–50 | 30 | 40 | 70 | | |
| | 51–100 | 4 | 20 | 24 | | |
| | 101–200 | 5 | 14 | 19 | | |
| | > 200 | 2 | 16 | 18 | | |
| Number of pharmacists | One | 56 | 20 | 76 | 23.16 | ≤0.001* |
| | > one | 62 | 93 | 155 | | |
| Average number of prescriptions for CVD | Less than 10 | 66 | 26 | 92 | 39.09 | ≤0.001* |
| | 11—20 | 36 | 32 | 68 | | |
| | 21–30 | 6 | 24 | 30 | | |
| | More than 30 | 10 | 31 | 41 | | |
| Total | | 118 | 113 | 231 | | |

Chi-square test; *$p$ value < 0.05 considered significant.
N1 = number of pharmacists with good practices, N2 = number of pharmacists with poor practice.

pharmacists across both settings. It was evident that 231 pharmacists (71.3 %) had good practices, and 93 (28.7 %) pharmacists had poor practices toward preventing CVD and related health promotion. A significant difference in the frequency distribution of positive practice between the two groups in relation to the pharmacists' age was observed ($X^2 = 7.34$, $p = 0.03$). Gender of the pharmacists is another determinant that significantly affected the practice scores between community and hospital pharmacists ($X^2 = 19.22$, $p \leq 0.001$). The professional practice experience and the number of CVD prescriptions are significantly associated with a distribution of good practice between the community and hospital pharmacists ($X^2 = 9.80$, $p = 0.02$ and $X^2 = 56.33$, $p \leq 0.001$ respectively); The number of pharmacists and the average number of prescriptions with CVD medications significantly differed between community and hospital pharmacists in terms of distribution of good practices ($X^2 = 23.16$ & $39.09$, $p \leq 0.001$).

## 4. Discussion

This study demonstrated the differences in the knowledge, attitudes, and practices between community and hospital pharmacists toward CVD prevention and associated risk factors. To our knowledge, this study is the first of its kind comparing the differences between community and hospital pharmacists in terms of CVD prevention. Moreover, the current study results provide a strong foundation for the development of cohort and interventional studies in the near future. The current study's findings reveal a prevalence of poor knowledge of CVD among pharmacists despite their active involvement in the primary prevention of CVD. This finding is supported by their positive attitude and good practices towards CVD prevention. The study also showed that only a few pharmacists had sufficient knowledge; additionally, both community and hospital pharmacists achieved poor knowledge scores. These results are consistent with the study conducted among community pharmacists in northwest Ethiopia (Sendekie et al., 2023). However, some studies conducted in the same context demonstrated adequate knowledge, which diverged from the current study results (Amadi et al., 2018). This inadequate knowledge among the pharmacists indicates the requirement for rigorous, continuous pharmacy education for all pharmacists, irrespective of their area of practice.

Gender was significantly associated with the knowledge scores of community and hospital pharmacists. In contrast, a Ugandan study conducted among adults reported that gender is not associated with knowledge related to the prevention of CVD (Ndejjo et al., 2020). These differences in knowledge scores could potentially result from a relatively low number of female pharmacists in the current study. Moreover, prescription volumes and postgraduate qualifications are associated with higher knowledge scores among hospital pharmacists rather than community pharmacists, which indicates the importance of postgraduate studies in pharmacy. The major portion of pharmacists working community pharmacy sectors are holding bachelor's degree, which is a basic requirement for practice. This indicates the importance of continuous and higher level of pharmaceutical education (Shibayama, 2012). These results vary from the study conducted in *Yemen,* where they reported having a Pharm.D degree and dealing with more than 75 prescriptions per day was associated with high knowledge scores among community pharmacists (Al-Ashwal et al., 2022). The huge volume of prescriptions preferably for CVD in the hospital pharmacy is might be due to the requirement of periodic follow up and specialized care for chronic diseases (Zhao et al., 2022).

The current study demonstrates a positive attitude of a significant number of pharmacists towards CVD prevention, in line with findings from *Jordanian and Yemeni* community pharmacists (Al-Ashwal et al., 2022; Rababa'h et al., 2023). In addition, the positive attitude observed in our study is higher than the study conducted in Nigeria (Adje et al., 2017) and relatively lower than the study conducted among community pharmacies from China (Chen et al., 2022). Additionally, gender was also one of the variables influencing the attitudes and practices towards CVD prevention among the pharmacists across both settings, as demonstrated in earlier studies that gender was closely associated with the attitudes of community pharmacists toward medication management and primary care for chronic diseases such as CVD (Muijrers et al., 2004; Rendrayani et al., 2023).

The distribution of positive attitudes and practices significantly differed between community pharmacists and hospital pharmacists. The current study discovered that the availability of more than one

pharmacist per shift increased the positive practices, a phenomenon more prevalent amongst hospital pharmacists than community pharmacists. The availability of pharmacists may vary depending on the number of beds available in hospitals, and it is required to have a minimum of three pharmacists for small hospitals (Wei et al., 2020). The results of the current study showing overwhelmingly positive perspectives and behaviors among hospital pharmacists may be at least partially attributable to this suggested figure.

A remarkable positive attitude was observed among those with less than or equal to five years of professional practice experience. This positive attitude could be attributed to their enthusiasm, fresh knowledge, and motivation, often seen in the early career stages. On the other hand, highly experienced community and hospital pharmacists showed a diminished positive attitude, as it was reported that healthcare professionals' experiences are very well associated with performance and patient outcomes (Connection, 2021). The diminished positive attitude among highly experienced pharmacists may be due to factors such as routine work pattern, increased workload, burnout, or decreased job satisfaction over time.

The workload and workforce can also influence their attitude and practice. Dealing with a higher number of prescriptions and increased workload may contribute to stress and affect the quality of care (Kovacs and Lagarde, 2022). We observed that the community pharmacists, dealing with fewer prescriptions, exhibited a higher attitude toward CVD prevention and health promotion than the hospital pharmacists.

It is generally accepted by the policymakers in Saudi Arabia that there is a paucity of CVD preventive health services and primary care. One possible solution to address this is to upgrade the capability of pharmacists to provide CVD preventive care. Above all, policymakers are in favor of empowering pharmacists to provide CVD preventive services and health promotion (Almansour et al., 2021). This study provides a valuable insight into community and hospital pharmacists' knowledge, attitude and practice regarding CVD prevention. The findings offer a guidance to formulate policies or guidelines for the better prevention of CVDs with a potential involvement of pharmacists, as the pharmacists play a major role in CVD prevention by monitoring the risk factors and providing appropriate patient education and counselling (Santschi et al., 2012). A study conducted among community pharmacists from the United Arab Emirates revealed that they exhibit positive perceptions and practices toward CVD prevention and management, indicating a considerable scope for development (Jairoun et al., 2023). Similarly, in this current study, despite the pharmacists' positive practices toward CVD prevention, there is still plenty of room for improvement. Reducing their workload and increasing the workforce would not only improve their positive practices in preventive care but also contribute to ensuring patient safety (Alavudeen et al., 2013; Athiyah et al., 2019; Easwaran et al., 2023). The attitude in reporting medication errors differs between hospital and community pharmacists (Zolezzi et al., 2019), which agrees with the current study's findings. However, given the focus on providing preventive care for CVD, it is crucial to evaluate the responsibilities of pharmacists across the settings.

A recent study conducted among simulated patients in *Qatar* revealed that pharmacists are not ready to be involved in CVD-related health promotion activities or risk factor assessments (Zolezzi et al., 2019). Interestingly, our study results stand in contrast to these results, where the pharmacists from both settings demonstrated significant positive attitudes and practices towards the desired goal. However, the frequency distribution of these positive responses was relatively higher among community pharmacists as compared to their counterparts in hospital pharmacy settings.

**Limitations:** Our findings are limited to a particular population being studied as the data were gathered using convenience sampling. Additionally, it is essential to note that most of the pharmacists in our study were employed in the southern region of Saudi Arabia. Since participation in the study was voluntary, and the opinions were self-reported, it is possible that the response may be inflated and influenced by the desire to adapt to societal norms. Therefore, it is necessary to be cautious when generalizing the results to the broader context.

## 5. Conclusion

Pharmacists' attitudes and practices toward CVD prevention varied depending on their practice setting. Regardless of the practice setting, the current study emphasizes a need for rigorous and continuous pharmacy education (CPE) related to the recent updates in guidelines and policies and the latest development in the field. Additionally, refreshment training and workshops related to CVD risk factors can also be implied to enhance the knowledge and skills. Our study findings revealed a lack of knowledge among the hospital pharmacists despite their positive attitude and practice than community pharmacists. Hence, hospital pharmacists shall be given a focus in enhancing these aspects by framing an interventional program related to preventive care for CVD. Our research findings also highlighted the importance of adequate training in CVD prevention, ensuring an appropriate workload for pharmacists to deal with the prescription volume, and maintaining an appropriate number of pharmacists per shift, which can improve the quality of CVD prevention practices and health promotion.

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## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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