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Knowledge, Attitude and Practice (KAP) towards control and preventive measures of hypertension among primary healthcare physicians in Jeddah City, Saudi Arabia, 2022

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ABSTRACT

Background: Hypertension remains a huge challenge globally and in Saudi Arabia in particular. Almost all patients with hypertension in Saudi Arabia are followed up at primary health care (PHC) centers. Therefore, we assessed the knowledge, attitude, and practice (KAP) towards control and preventive measures of hypertension among PHC physicians. *Methods:* This was a cross-sectional study carried out using an online questionnaire on PHC physicians from April 2022 to December 2022. We performed descriptive statistics and the Student t-test, ANOVA and Chi-Square test were used to compare and determine associations among variables, with $p<0.05$ for significance. *Results:* Our study received responses from 214 physicians, mostly female (55.1%), and aged 25 – 35 years (74.8%). The mean KAP scores were 15.74±2.39, ranging from 6.0-19.0, 47.14±5.12, ranging from 33-57 and 32.39±5.93, ranging from 8-40, respectively. Knowledge positively correlated with attitude ($R=0.551$) ($p<0.001$) and practice ($R=0.369$) ($p<0.001$), and attitude correlated with practice ($R=0.241$) ($p<0.001$). Female gender, family medicine degree and older age were positively correlated with all KAP scores ($p<0.05$). Family medicine studies ($p<0.001$), > 2 years of experience ($p=0.004$) and managing > 30 patients (and $p=0.022$), and attending hypertension courses ($p=0.004$) positively correlated with attitude, practice, and knowledge, respectively. *Conclusion:* This study showed that PHC physicians had good knowledge, attitude and practice towards control and preventive measures of hypertension. However, updating and adjusting courses on hypertension and post-course follow-up to ensure the practice of acquired knowledge are recommended.

Keywords: Physicians Knowledge, Attitude and Practice, Hypertension, Control, Prevention, Primary Health Centers.

1. INTRODUCTION

Hypertension is a chronic disease defined as systolic blood pressure greater than or equal to 140 mmHg or diastolic blood pressure greater than or equal to 90 mmHg due to blood's long-term significant pressure against the arterial walls, causing chronic diseases such as cardiovascular damage (Shnaimer & Gosadi, 2020). Elevated systolic blood pressure is among the primary causes of death and disability worldwide, and the World Health Organization (WHO) designated hypertension the subject of World Health Day in 2013 (WHO, 2013). The prevalence of hypertension has been found to range from 10% to 20% in several European, Asian, and African countries. General practitioners, primary healthcare physicians, and other healthcare specialists should be involved in diagnosing and managing the disease. For proper health care system administration, physicians' knowledge, attitude, and practice (KAP) are associated with implementing recommendations in diagnosing, treating, and preventive measures for non-communicable illnesses. Because increases risks for heart disease, identifying the appropriate indices for therapy appears to be essential. Some of the previous studies showed that most physicians had good attitude, good knowledge, and attitude but poor practices of hypertension management (Almutairi et al., 2018; Mukhopadhyay et al., 2020).

The majority of patients in Saudi Arabia are managed at primary healthcare centers (PHC), and physicians managing hypertensive patients can play a major role in the prevention of hypertension and its complications. However, there is a lack of local data exploring the KAP towards control and preventive measures of hypertension among PHC physicians. Knowing the level of physicians' KAP towards control and preventive measures of hypertension would serve to improve the KAP of the physicians and the patient's well-being by filling the identified gaps and updating current guidelines to ensure quality healthcare and reduce hypertension-related mortality and morbidity. Therefore, we explored the KAP towards control and preventive measures of hypertension and the associated factors among PHC physicians in Jeddah, Saudi Arabia.

2. METHODS

Study design

This was an analytical cross-sectional study carried out from April 2022 to June 2022 on physicians (general practitioners, consultants, specialists) and senior residents working in PHC centers of the ministry of health (MOH) in Jeddah city, Saudi Arabia. Volunteering physicians, interns, junior residents, rotating residents, rotating physicians, and physicians who do not speak English were excluded.

Sample size

The sample size was calculated using an online web-based calculator for cross-sectional studies (raosoft.com). Using 5% marginal error, 95% confidence level, study population size in the PHC in Jeddah city during the proposed study period of 400 physicians, and 50% response distribution, the calculated sample size was 197 physicians. Then the researcher added to compensate for non-response items.

Sampling technique

We utilized a multistage stratified sampling technique to stratify 46 PHC centers into five clusters according to the five hospitals in Jeddah city (King Abdullah Medical Complex, King Fahad General Hospital, East Jeddah General Hospital, King Abdulaziz Hospital, and Al Thaghr Hospital). The researcher will take the list of PHC physicians affiliated with every hospital. Then the sample was selected randomly and equally from the list of physicians from each cluster (hospital) using a simple random technique.

Data collection tool

The data collection was done using a self-administered questionnaire composed of four main sections. The first section consisted of a welcoming message that explained the purpose and the nature of the study and contained a mandatory item confirming that the participant understood the scope of the research and consented to participate. The second section enquired about the sociodemographic data of the participants (age, gender, nationality, job title, and level of qualification, years of experience, and the average number of patients seen at the daily clinic, and special courses or education attended regarding hypertension management with the mention of time). The third section consisted of 19 questions validated and was adopted from a previously published study (Gyamfi et al., 2017), assessing the physicians' knowledge regarding hypertension and related lifestyle modification. The fourth section was composed of 12 attitude, and 8 practice questions also validated and adopted from a previous study (Mukhopadhyay et al., 2020), measuring the attitude and practice towards hypertension and associated comorbidities.

Data collection technique

The questionnaire was transformed into an electronic form using Google Form and distributed to physicians as an online link via mobile phone's Short Message Service (SMS). Then the responses were collected automatically into an excel sheet.

Statistical analysis

The statistical analysis was done using the statistical package for the social sciences (SPSS, version 21.0). Mean and standard deviation (SD) were used to summarize continuous variables, while percentage and frequency tables were used to summarize the categorical variables. Student t-test and ANOVA were used to find significant differences between the groups. Chi-square was used to find significant associations between categorical variables. The significance level was less than 0.05 and 95% for a confidence interval.

3. RESULTS

This study got 214 participants whose sociodemographic characteristics are summarized in table 1. More than half, 118 (55.1%), were females. Majority of the participants, 160 (74.8%), were aged 25 – 35 years, with a mean age of 32.87±4.59 years for all respondents. Of all respondents, 202 (94.4%) were Saudi nationals. More than two-thirds, 148 (69.2%), had a Bachelors of Medicine, Bachelors of Surgery (MBBS) degree. Almost two-thirds of the participants, 166 (77.6%), had more than two years of experience working in the PHCs. Most of the respondents, 144 (67.3%), had attended hypertension management special courses.

Table 1 Demographic characteristics of the participants (n=214)

Characteristics	Frequency	Percentage
Gender		
Male	96	44.9
Female	118	55.1
Age group		
25 – 35 years	160	74.8
36 – 45 years	52	24.3
>45	2	0.9
Nationality		
Saudi	202	94.4
Non- Saudi	12	5.6
Level of qualification		
MBBS	148	69.2
Residency board of family medicine	66	30.8
Years of working at PHCs		
< 2 years	48	22.4
>2 years	166	77.6
Average number of patients		
<30 years	50	23.4
>30 years	164	76.6
Special course attended regarding hypertension		
Yes	144	67.3
No	70	32.7
Job Title		
General practitioners	100	46.7
Family medicine consultant	24	11.2
Family medicine specialist	42	19.6
Family medicine resident	48	22.4

MBBS: Bachelors of Medicine, Bachelors of Surgery; PHCs: Primary healthcare centers

Table 2 shows the correct responses of the respondents regarding the knowledge of control and preventive measures of hypertension. The total means (±SD) knowledge score was 15.74±2.39, with the minimum and maximum scores of 6.0 and 19.0, respectively. Of all respondents, 95.3% and 97.2% knew the correct normal blood pressure and hypertension levels, respectively. More than two-thirds, 170 (79.4%), of the respondent knew that hypertension is a lifetime condition once it's developed. Most, 200 (93.5%), knew that hypertension medications should be taken daily. The majority knew that losing weight and eating less salt all contribute to lowering blood pressure (91.6%, 93.5%, respectively). Most respondent also knew that high blood pressure cause stroke (97.2%), heart (97.2%), and kidney (97.2%) problems. Moreover, it was believed by most of the respondents that it does not cause cancer (68.2%) or diabetes (64.5%). For the majority (90.7%) of respondents, exercising up to 30 minutes per day can lower blood pressure, 77% knew that people with hypertension should avoid fatty food, and 84.1% knew that fruits and vegetables should be used more. Of all respondents, 76% were confident regarding managing hypertension (figure 1).

Table 2 knowledge regarding hypertension (n=214)

No.	Knowledge Question	Correct response
1	If patient blood pressure is 115/75, it is Normal.	204 (95.3%)
2	If patient blood pressure is 160/100, it is Hypertension	208 (97.2%)
3	Once patient has high blood pressure, it usually last for (Lifetime)	170 (79.4%)
4	Patient with high blood pressure should take their medicine (regularly)	200 (93.5%)
5	Losing weight usually makes blood pressure (go down)	196 (91.6%)
6	Eating less salt usually makes blood pressure (go down)	200 (93.5%)
7	High blood pressure can cause heart attack (Yes)	208 (97.2%)
8	High blood pressure can cause cancer (no)	146 (68.2%)
9	High blood pressure can cause kidney problem (Yes)	208 (97.2%)
10	High blood pressure can cause diabetes (No)	138 (64.5%)
11	High blood pressure can cause a patient to have a stroke (Yes)	208 (97.2%)
12	Moderate to vigorous exercise 30 mins/day 3-5 times a week lowers blood pressure (yes)	194 (90.7%)
13	Smoking a pack of cigarettes per day will not affect a patient risk for hypertension (No)	192 (89.7%)
14	Motivational interviewing techniques are not useful when guiding a patient to make lifestyle changes (No)	164 (76.6%)
15	High blood pressure cannot be cured (No)	120 (56.1%)
16	A hypertensive patient should strive for a normal blood pressure of 120/80 (yes)	104 (48.6%)
17	A patient who has high blood pressure should eat less fat (Yes)	166 (77.61%)
18	A patient who had high blood pressure should eat more fruits and vegetable (Yes)	180 (84.1%)
19	Rate your confidence in detecting and treating hypertension (confident)	164 (76.6%)

The total mean attitude score was 47.14±5.12, with a minimum of 33 and a maximum of 57. Table 3 shows responses to attitude questions. Agreeing responses combine bother strongly agree and agree responses, and disagreeing responses combine bother strongly disagree and disagree responses. Of all participants, 59.8% disagreed that 100g of rice and vegetables provide the same energy, and 76.6% disagreed that daily intake is unnecessary for hypertensive patients. To control blood pressure, most agreed with restricting salt (88.8%), and modifying diet (97.2%). The majority (83.2%) disagreed with the unnecessary regular exercise for hypertensive people engaged in daily physical activities, and similarly, 87.9% disagreed with avoidance of exercise after starting medication for hypertension. Of all respondents, 75.7% disagreed with the cessation of medication when hypertension is under control, and 86% of the respondent disagreed that prevention and control are responsibilities of the doctor only. For most respondents, PHCs should be able to identify hypertension (94.4%), and regular counseling should be done (94.4%). In this study, most respondents (29%) were neutral regarding how well equipped their respective centers are for hypertension care.

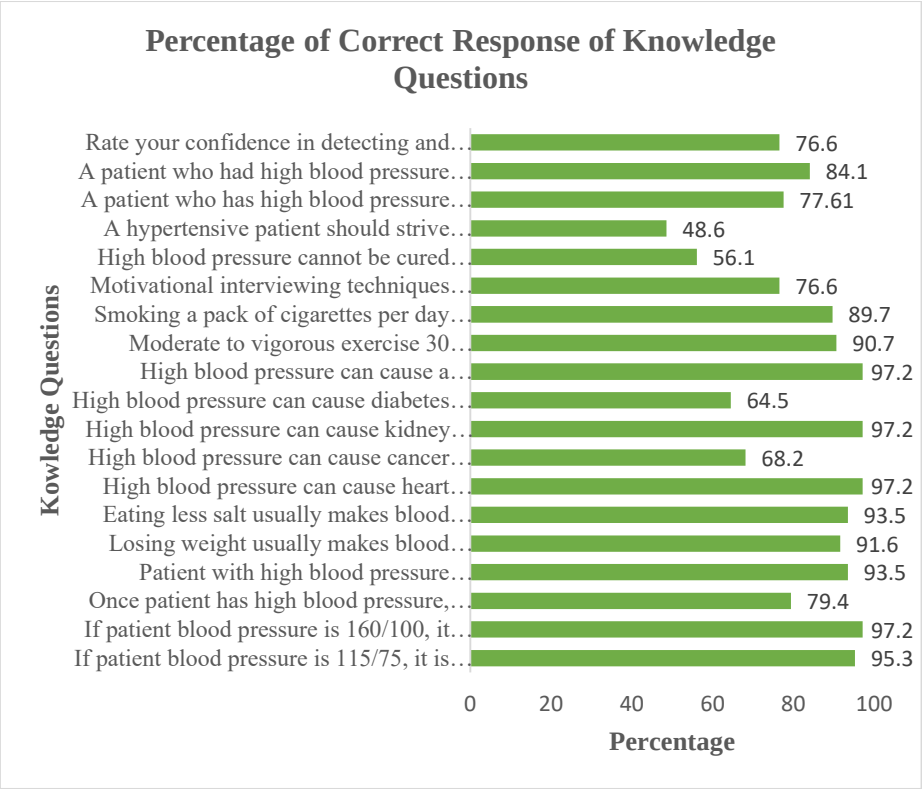

Figure 1 percentage of correct response of knowledge questions

Table 3 Attitude regarding hypertension (n=214)

No.	Attitude question	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	100g of rice and 100g of vegetables provide the same energy	10 (4.7)	20 (9.3)	56 (26.2)	78 (36.4)	50 (23.4)
2	Daily intake of fruits and vegetables is not necessary for patients with hypertension	12 (5.6)	8 (3.7)	30 (14)	88 (41.1)	76 (35.5)
3	Salt intake should be reduced to prevent hypertension	126 (58.9)	64 (29.9)	6 (2.8)	14 (6.5)	4 (1.9)
4	Diet should be modified for patients with diabetes and hypertension	178 (83.2)	30 (14)	4 (1.9)	00	2 (0.9)
5	Regular physical activities is not needed for hypertensive patients engaged in routine daily activities	12 (5.6)	6 (2.8)	18 (8.4)	68 (31.8)	110 (51.4)
6	Once medication for hypertension and diabetes is started physical activities is no longer needed	6 (2.8)	6 (2.8)	14 (6.5)	52 (24.3)	136 (63.6)
7	Routine screening of blood pressure and blood sugar is needed >30 years of age	64 (29.9)	62 (29.0)	26 (12.1)	38 (17.8)	24 (11.2)
8	Medication can be stopped once high blood pressure is under control	6 (2.8)	22 (10.3)	24 (11.2)	72 (33.6)	90 (42.1)
9	Prevention and control of hypertension and diabetes is the job of physician alone	10 (4.7)	10 (4.7)	10 (4.7)	86 (40.2%)	98 (45.8)
10	PHC physician should be able to	166 (77.6)	36 (16.8)	2 (0.9)	4 (1.9)	6 (2.8)

	identify common life-threatening complications of patients with hypertension					
11	Regular counseling and follow up by PHC physician improve patient satisfaction and disease outcome	156 (72.9)	46 (21.5)	6 (2.8)	2(0.9)	4 (1.9)
12	My healthcare center is not well equipped to improve primary care for hypertensive	22 (10.3)	44 (20.6)	62 (29.0)	44 (20.6)	42 (19.6)

The total mean practice score was 32.39±5.93, with a minimum of 8 and a maximum of 40. Counseling patients about weight control was always practiced by 50.5% of the respondent. In the last month, only 39.3% of the respondents had asked patients about smoking or drinking, and 33.6% always counseled the patients to quit smoking. Most of the respondents always (43.9%) and often (29.9%) taught patients to do daily physical activity. Half of the respondents (50%) always counseled their patients to modify their diet. Most respondents (64.5%) always monitored patients' blood pressure in the past month (Table 4).

Table 4 Practice regarding hypertension (n=214)

No.	Practice Questions	Always	Often	Sometime	Rarely	Never
1	How often did you counsel overweight patients about weight reduction and maintenance of correct body weight in the past 1 month?	108 (50.5)	50 (23.4)	40 (18.7)	10 (4.7)	6 (2.8)
2	How often did you ask patients about their addiction to tobacco and/or alcohol in the past 1 month?	84 (39.3)	58 (27.1)	58 (27.1)	10 (4.7)	4 (1.9)
3	How often did you counsel patients about quitting tobacco and/or avoiding alcohol consumption in the past 1 month?	72 (33.6)	62 (29.0)	60 (28.0)	16 (7.5)	4 (1.9)
4	How often did you teach patients about undertaking moderate intensity daily physical activity in the past 1 month	94 (43.9)	60 (28.0)	46 (21.5)	6 (2.8)	8 (3.7)
5	How often did you teach patients about incorporating changes in their diet (low salt intake and higher intake of fruits and vegetables) in the past 1 month?	108 (50.5)	64 (29.9)	28 (13.1)	12 (5.6)	2 (0.9)
6	How often did you monitor the patient' weight in the past 1 month?	46 (21.5)	58 (27.1)	60 (28.0)	42 (19.6)	8 (3.7)
7	How often did you monitor the patient' blood pressure in the past 1 month?	138 (64.5)	52 (24.3)	18 (8.4)	00	6 (2.8)
8	How often did you monitor the patient' blood sugar in the past 1 month?	100 (46.7)	78 (36.4)	28 (13.1)	2 (0.9)	6 (2.8)

We found that knowledge had significant positive correlation with attitude (r=0.551, p <0.001), and practice (r=0.369, p<0.001). Similarly, there was a fair positive correlation between attitude and practice (r=0.241, p<0.001) (Table 5). Table 6 shows the correlation between the demographics of studied physicians and KAP scores regarding hypertension. The female gender significantly positively correlated with higher knowledge (p=0.004), attitude (p=0.021), and practice (p=0.034) scores compared to the male gender. Older age (>45 years) significantly positively correlated with the highest knowledge (p=0.010) and practice (p<0.001) scores but the correlation with attitude was statistically insignificant. Only higher practice scores significantly correlated with being a non-Saudi physician. Family medicine subspecialty significantly correlated with higher knowledge (p<0.001), attitude (p=0.002), and practice (p<0.001) scores. Family medicine consultants scored significantly highest in knowledge (p<0.001) and practice (p<0.001), while family medicine residents had the highest attitude scores (p<0.001). As expected, physicians with more

experience (> 2 years) and caring for more patients (> 30 patients) scored significantly higher in practice (p=0.004 and p=0.022, respectively). Attending hypertension courses significantly correlated with only higher knowledge scores (p=0.004).

Table 5 Correlation between knowledge, attitude and practice regarding hypertension

Variable	R	P value*
Knowledge and attitude	0.551	<0.001
Knowledge and practice	0.369	<0.001
Attitude and practice	0.241	<0.001

**Statistically significant*

Table 6 Correlation of total score of KAP regarding hypertension between sociodemographic data

Variables	Knowledge score	P value	Attitude score	P value	Practice score	P value
Gender						
Male	15.22±2.75	0.004	46.25±5.86	0.021	31.43±5.50	0.034
Female	16.16±1.97		47.86±4.31		33.16±6.18	
Age group						
25 – 35 years	15.50±2.44	0.010	47.01±4.67	0.646*	31.45±6.02	<0.001
36 – 45 years	16.38±2.09		47.42±6.39		35.00±4.71	
>45	19.0±0.00		50.0±0.00		40.0±0.00	
Nationality						
Saudi	15.68±2.44	0.107*	47.03±5.19	0.239*	32.12±5.97	0.007
Non- Saudi	16.83±0.17		48.83±3.27		36.83±2.65	
Level of qualification						
MBBS	15.24±2.60	<0.001	46.40±5.06	0.002	31.21±6.33	<0.001
Residency board of family medicine	16.87±1.25		48.78±4.88		35.03±3.81	
Years of working in PHCs						
< 2 years	15.66±1.94	0.791*	47.58±4.95	0.497*	30.66±7.55	0.022
>2 years	15.77±2.51		47.01±5.17		32.89±5.30	
Average number of patients						
<30 years	15.92±2.21	0.563*	47.56±4.88	0.509*	30.28±6.65	0.004
>30 years	15.69±2.45		47.01±5.19		33.03±5.56	
Special course attended regarding hypertension						
Yes	16.05±3.34	0.007	47.20±4.88	0.781*	32.58±5.14	0.502*
No	15.11±3.34		47.0±5.61		32.00±7.33	
Job Title						
General physician	14.88±2.89	<0.001	45.72±5.18	<0.001	30.46±6.74	<0.001
Family medicine consultant	17.41±0.88		47.50±6.87		36.58±4.13	
Family medicine specialist	16.00±1.65		47.83±4.54		32.79±5.09	
Family medicine resident	16.57±1.34		49.52±3.13		34.14±3.35	

**Statistically insignificant; MBBS: Bachelors of Medicine, Bachelors of Surgery; PHCs: Primary healthcare centers.*

4. DISCUSSION

Saudi Arabia is one of the countries with an increasing burden of non-communicable diseases, including hypertension, necessitating evolving and constantly updating care strategies that are decentralized close to all Saudi citizens. PHC physicians play a vital role in controlling, preventing, and treating hypertension at the community level through education, influencing lifestyles, and examining and treating the patients. For this reason, physicians' KAP towards control and preventive measures of hypertension impact the outcomes of prevention strategies and patient care. Therefore, we assessed the physicians' KAP and towards hypertension control and preventive measure their associated factors at the Jeddah PHCs in Saudi Arabia.

We found that the total mean (±SD) score of knowledge was 15.74±2.39 (around 82% correct responses), ranging from 6.0 to 19.0, which is similar to the hypertension knowledge score of 80% for nurses in Ghana (Gyamfi et al., 2017), but slightly than the mean score of 74.33% among residents in Malaysia (Buang et al., 2019) and primary health physicians and nurses in Mongolia whom only 13.5% correctly answered hypertension epidemiology questions, 31% correctly answered practice questions and 63.2% correctly answered hypertension control questions (Myanganbayar et al., 2018). This may be caused by our sample consisting of practicing physicians who are responsible for managing and take final decisions on hypertensive patients' care. In contrast, some Malay residents from different specialties are not directly involved in managing hypertension cases and nurses who usually assist physicians in patient care but do not solely manage patients and whose studies don't go in deep about diseases.

In contrast, generally, more than 90% of our study respondents correctly answered questions regarding hypertension and its complications, its management and treatment, control and prevention (Table 2). While 63.2 physicians in Mongolia were confident in performing hypertension control tasks, 76% of our study respondents were confident in managing hypertension. As expected, our study participants had higher knowledge compared to hypertensive patients studied at King Abdullah Medical City, Saudi Arabia, who scored 78%, probably because that hypertension is a chronic disease. Most patients admitted to the hospital have been with it so long ago that they became good at understanding it, preventing them from scoring poorly.

The total mean (± SD) attitude score for our study respondents was 47.14±5.12 (around 82%), ranging from 33 to 57. This attitude is good and is consistent with good knowledge, as supported by another study conducted on Saudi medical interns about malignant hypertension (Almutairi et al., 2018). Our study result on attitude is slightly lower than 44.22±5.05 reported in Malaysia (Buang et al., 2019), and the reason might be because the study from Malaysia targeted the general public, who are expected to have lower knowledge compared to physicians and knowledge level reflects attitude. Our findings also showed that respondents had a good attitude towards prevention, control, and treatment of hypertension, which is expected. Similarly, previous studies have also reported that a better overall attitude was associated with a better attitude towards prevention measures among nurses (Gyamfi et al., 2017) and the general public (Buang et al., 2019; Sabouhi et al., 2011; Vaidya et al., 2013). However, our respondents were generally not unsure if their respective PHCs were well equipped enough to manage hypertension. The reason may be that hypertension management usually requires various modalities and multi-disciplinary approaches, making respondents doubt if PHCs are equipped enough to deal with all hypertension cases, including complications. These findings highlight the need to increase the capacity of PHCs in Saudi Arabia and educate PHC physicians about the different stages and referral levels for managing hypertension and its complications.

Previous studies have also found that good knowledge was correlated with a good attitude and practice of hypertension treatment and prevention (Almutairi et al., 2018; Buang et al., 2019). A study evaluating the impact of education about hypertension involving nurses found that post-education increased knowledge levels were associated with the better practice of hypertension prevention (Gyamfi et al., 2017). Another study that found Saudi interns to have better knowledge reported that the knowledge was also associated with the better practice for most studied interns (Almutairi et al., 2018). In addition to the total mean (SD) practice score of 32.39±5.93, which is higher than the 27.55±2.86 reported in the Malay study (Buang et al., 2019), our findings were also consistent with other previous studies (Buang et al., 2019; Sabouhi et al., 2011), and showed a positive correlation between knowledge and practice, knowledge and attitude, as well as attitude and practice. This confirms that physicians with higher knowledge have better attitude and practice and also those with better attitude have better practice.

Our findings align with another study carried out on Iranian hypotensive patients (Rashidi et al., 2018). Unlike our study finding, Buang et al., (2019) didn't find any statistically significant association between attitude and practice, i.e., better attitude didn't increase practice. Physicians have better practical knowledge compared to the general public, and their willingness for prevention is more likely to be put into practice. On the other hand, the general public studied by Buang et al., (2019) with a good attitude might have difficulties in practicing prevention strategies due to poor practical skills, leading to the unchanged practice of hypertension prevention. However, some previous studies supported our findings and reported a relationship between knowledge and attitude, attitude, and practice towards hypertension prevention (Myanganbayar et al., 2018; Rashidi et al., 2018).

We found that female physicians, family medicine specialists, and older physicians scored tended to score higher in KAP. While Buang et al., (2019) didn't find a significant correlation between gender, education levels, and employment with KAP towards hypertension, a study on Iranian hypertensive patients was consistent with our findings (Rashidi et al., 2018). Women are usually more concerned about body weight, a factor for hypertension, and tend to inquire more about related comorbidities and practice healthy lifestyles to control weight and other comorbidities, including hypertension. This might explain higher KAP scores among female physicians compared to their male counterparts. Family medicine specialists have higher practical knowledge and more experience enabling them to score higher too. Family medicine studies, which deal with comprehensive health care, including disease prevention and health promotion (Waked et al., 2019), might have contributed to higher KAP scores among family medicine specialists and family medicine residents.

The impact of experience in practice is also shown by higher practice scores among our study respondents with more than 2 years of experience and more than 30 patients managed. This also might be why older age positively correlated with higher scores because older physicians tend to have more experience, to be specialists and consultants, all of which were positively correlated with higher knowledge, a better attitude, and better practices towards control and preventive measures of hypertension in our study. These align with other previous studies on physicians and hypertensive patients (Myanganbayar et al., 2018; Rashidi et al., 2018; Redon et al., 2011), indicating that being hypertensive tends to lead to more knowledge, better attitude, and practice, probably from education by physicians during care service delivery. Unlike a study conducted on Ghanaian nurses that showed improved practice after education on hypertension (Gyamfi et al., 2017), our study showed that attending hypertension courses significantly correlated with only higher knowledge scores. This indicates that follow-up measures and refresher courses are needed to ensure that knowledge acquired from courses about hypertension is put into practice. Redesigning courses focusing on practical content could also improve practice among trained physicians, especially general practitioners who make up the majority of our study participants.

The present study has some limitations to be addressed. First, the cross-sectional design may not reflect the true effect between the variables due to a lack of temporality. While a good sampling technique was used, the study can be generalized only to the PHC physicians of Jeddah city. This was an online study with responses dependent upon the willingness of participants to fill out the forms that might affect the results. Future longitudinal physical interview-based studies involving all healthcare providers at different healthcare facility levels are recommended to get more generalizable results.

5. CONCLUSION

This study found that physicians at PHCs in Jeddah, Saudi Arabia had good KAP towards control and preventive measures of hypertension. We found that higher knowledge was significantly correlated with better attitude and practice, and better attitude was correlated with better practice too. Female gender, family medicine degree, and older age were positively correlated wither higher KAP scores, while family medicine residency, more experience, caring for more patients, and attending hypertension courses positively correlated with attitude, practice, and knowledge, respectively. These findings highlight the necessity for updating courses on hypertension to ensure that knowledge acquired is practiced, focusing on practical hands-on skills useful during patient care.

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Authors' contributions

Ayat I. Althobaiti designed the study's conceptual framework and wrote the research proposal also did data collection and analysis. Then she wrote the manuscript draft.

Hani A. Alghamdi contributed to designing the study's conceptual framework and supervised the research conduction.

Ethical approval

The study was approved by the Medical Ethics Committee of the Saudi Ministry of Health (Ethical approval code: A01391) Jeddah, Saudi Arabia.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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