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Knowledge and practice of preparticipation physical evaluation of Saudi primary care physicians in the Eastern Province of Saudi Arabia

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Abstract:

BACKGROUND: The preparticipation physical evaluation (PPE) monograph is a vital resource for medical providers aimed at ensuring the safety and well-being of athletes during sports participation by screening for injuries and disease risk factors. However, the concept of PPE is relatively new in Saudi Arabia, where primary care physicians (PCPs) often lack the proper training for it. This study's aim was to assess PCPs' knowledge and practice of PPE and identify associated factors.

MATERIALS AND METHODS: A self-administrated web-based questionnaire was distributed to PCPs in the Eastern Province of Saudi Arabia. The questionnaire covered the various aspects of PPE knowledge (including general principles, components, contraindications of sports participation, concerning history and physical findings, electrocardiography interpretations, and ethical considerations) as well as PPE practice. Initial treatment of data included descriptive statistics.; Chi-square tes or Fisher's exact test as, as appropriate, were used to determine association of knowledge and practices with various independent variables.

RESULTS: Of the 240 contacted PCPs, 192 responded yielding a response rate of 80%; 50.5% had no prior PPE training. About 43% of the PCPs had not encountered PPE during their examination, but the remainder performed monthly PPE. Notably, 82.8% demonstrated a poor level of knowledge regarding PPE and only 43% had a satisfactory level of practice.

CONCLUSION: This study revealed that a significant proportion of PCPs displayed poor knowledge of PPE and <½ of our sample showed satisfactory practice levels. Recommendations to establish the local guidelines regarding PPE for PCPs to follow should be emphasized and PPE training integrated into both undergraduate and postgraduate family medicine curricula. These measures are crucial for the enhancement of the safety of athletes in Saudi Arabia.

Keywords:

Adolescent health, health-care policy, national guidelines, preparticipation physical evaluation, sport medicine

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Introduction

The preparticipation physical evaluation (PPE) has become the standard of care for athletes of all ages.[1] It is recommended as a prerequisite preceding athletic participation, and most professional sport clubs, universities, and schools mandate a medical clearance for athletes before sport participation.[1,2] The main purpose of the PPE is to detect any injury or medical conditions that predispose athletes to risk during participation, assess the general condition and level of fitness of the athlete, and give counsel about any health-related issues.[3-5]

About 40 years ago, PPE was limited to medical history, cardiac auscultation, and

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examination of inguinal region for hernia. The American Heart Association (AHA) then recommended additional questions to the PPE to evaluate for conditions that predispose athletes to injuries or sudden cardiac death.[6]

Studies have indicated that 0.3%–1.9% of athletes are not granted medical clearance for participation in their respective sport, while 3.2%–13.5% required further assessment during PPE.[7,8] More recent studies have reported that PPE detected 1.5%–3.9% participants with cardiovascular abnormalities, 12% had respiratory problems, and the risk of sudden cardiac death was found in 0.8%.[9,10]

According to the 5th PPE monograph published by the American Academy of Pediatrics, physicians should conduct focused history for chronic diseases, type of sports, time of participation, and family history of sudden cardiac death.[11] In addition, physical examination for body mass index, heart sound, and musculoskeletal examination should be performed.

Physicians should be knowledgeable about the purpose of the PPE in assessing the athlete's health.[11] The awareness level of primary care physicians (PCPs) regarding PPE guidelines was found to be low.[12,13]

In Saudi Arabia, there is no standardized PPE form that PCPs are required to follow, and PCPs are often not adequately trained to conduct thorough PPEs. Students or athletes must obtain a signed clearance from a PCP before participating in some national or international sports competitions.[14] Consequently, some students and athletes visit PCPs solely to obtain this clearance, without fully understanding the implications of a failed PPE. Our research is aimed at assessing the knowledge and practice of PCPs regarding PPE.

Materials and Methods

A descriptive cross-sectional study was conducted in three cities of the Eastern Province of Saudi Arabia (Qatif, Dammam, Khobar) from November 2022 to January 2023. Ethical approval was obtained from the Institutional Review Board vide Letter No. IRB-2022-01-413 dated 01/11/2022 and informed written consent was taken from all the participants in the study.

PCPs are physicians working in primary healthcare centers with a board certificate or a general practitioner with a Bachelor's degree in medicine. The sample size was calculated using Epi-Info (version 7.1.5) (CDC,Atlanta, GA, USA), where the total number of PCPs in the Eastern Province was 310 at the time of data collection. This number was obtained from the Ministry of Health administration, the accepted margin of error at 5%, confidence interval 95%, and the minimum accepted sample size was calculated at 172. A list of primary healthcare centers of the Eastern Province was obtained from the Ministry of Health (Dammam 30, Qatif 28 and Khobar 13). The simple random technique was used to select different health-care centers and the sample size was proportionally distributed according to the served region; higher numbers of PCPs were taken from Dammam, then Qatif followed by Khobar. Participants were informed of the aim of the study. Data were kept confidential for research purpose only.

The questionnaire was developed by our research team, on evidence-based practice in PPE,[11] was validated by three consultants and piloted on 28 family medicine practitioners from the university's primary care center. These 28 were not included in the study. The reliability of the questionnaire was tested; Cronbach's alpha was 0.88.

The first section of questionnaire was about the physician's demographic data including age, gender, region, marital status, educational level, specialty, number of patients encountered per day, and PPE provided per month.

The second section was the physician's knowledge of PPE in a total of 37 statements covering the six aspects of PPE as follows: General principles, components/elements, contraindication of sports participation, physical findings needing further testing, electrocardiography (ECG), and ethics. This section derived from the 5th edition of PPE was developed by the American Academy of Family Physicians, American Academy of Pediatrics, American College of Sports Medicine, American Medical Society for Sports Medicine, American Orthopedic Society for Sports Medicine, and the American Osteopathic Academy of Sports Medicine published by the American Academy of Pediatrics in 2019.[11] For knowledge questions, each correct answer was given a score of 1 and 0 for incorrect or I don't know. Scores were calculated ranging from 0 to 37, and the mean score was calculated. The knowledge level was categorized according to the percent score into excellent if ≥70%, fair if it was between 60% and <70%, and poor if it was ≤60%; for the total knowledge score, 26–37 was excellent, fair was 22–25 and poor was 0–21.

The third part related to the participant's practice of PPE, with a total of 15 items including history taking, physical examination, and investigations that may be ordered during PPE consultation with four possible responses "never," "rarely," "sometimes," and "always." Scores ranging from 0 to 60 were calculated, mean score was calculated. Practice level was categorized according to the percent score into satisfactory if ≥70%, fair if between 60% and <70%, and unsatisfactory if it was ≤60%; for

the total practice score, satisfactory was obtained from 42 to 60, fair from 36 to 41 and poor from 0 to 35.

Data were analyzed using the Statistical Package for the Social Sciences software (IBM SPSS statistics for Windows, Version 25, IBM Corporation, Armonk, NY, USA). Descriptive analysis for the continuous variables as mean and median and for the categorical variables as frequency and percentages. The Chi-square test/ Fisher's exact test for testing the association between sociodemographic variables and levels of knowledge and practice was done, *P* value is considered statistically significant at <0.05%.

Results

A total of 192 out of 240 PCPs participated in the study, resulting in an 80% response rate. The distribution of their sociodemographic and job characteristics is shown in Table 1; 47.4% of them were aged 30–34, females constituted 53.6%, the majority were married (77.6%). Most of the PCPs had a Bachelor's degree (67.2%), but only 16.7% had the Board license and 62% were family physicians. Nearly half of them were in a training program (49%), and nearly one-third (32.8%) had work experience of 5–9 years. PCPs who saw 16–30 patients constituted 35.4% and those who usually saw 15 and less patients were 30.2%. Regarding information about PPE; 50.5% of PCPs had not previously had any training course on PPE, and 19.2% were not sure about it. 43.2% of PCPs had not encountered PPE in their examination and the same percentage, 43.2% performed monthly PPE of 1–5 times. PCPs who had previously personally witnessed sudden death accounted for 12.5%.

Regarding the knowledge of PCPs of different areas of PPE: the total mean score for all six areas of PPE knowledge was 17.88 ± 5.78 (median = 19). Table 2 shows different responses of PCPs on knowledge of PPE. Higher percentages of PCPs either responded incorrectly to the general principles of performing PPE or lacked knowledge of them. The majority correctly answered that healthcare team professionals should be involved in the decision on clearance (87.5%) and the clearance depends on the type of sport participated in (72.9%). The mean score of knowledge in this area of general principles was 1.76 ± 0.71 ranging from 0 to 4.

The mean of the knowledge of PPE components was 6.63 ± 2.67 ranging from 0 to 12. More than half of the PCPs correctly answered questions on palate inspection (55.7%), palpating femoral pulse (53.1%), and performing a brief standardized orthopedic screening (58.3%). More than three quarters of them gave the correct answers to the unknown cause of death before the age of 50 years (91.7%), dyspnea

Table 1: Distribution of primary care physicians according to their sociodemographic and job characteristics (*n*=192)

Variable	*N* (%)
Age	
<30	54 (28.1)
30–34	91 (47.4)
35–39	27 (14.1)
≥40	20 (10.4)
Gender	
Male	89 (46.4)
Female	103 (53.6)
Region	
Dammam	96 (50)
Khobar	39 (20.3)
Qatif	57 (29.7)
Marital status	
Single	38 (19.8)
Married	149 (77.6)
Widowed/divorced	5 (2.6)
Degree level	
Bachelor's	129 (67.2)
Diploma/master's	31 (16.1)
Board	32 (16.7)
Specialty	
General practitioner	71 (37.0)
Family medicine	119 (62.0)
Other primary healthcare specialty	2 (1.0)
Currently a trainee	
Trainee	94 (49.0)
Not a trainee	98 (51.0)
Experience (years)	
<1	26 (13.5)
1–4	70 (36.5)
5–9	63 (32.8)
≥10	33 (17.2)
Patients seen per day	
≤15	58 (30.2)
16–30	68 (35.4)
31–45	42 (21.9)
≥46	24 (12.5)
PPE trained[$] (*n*=196)	
No training	99 (50.5)
Not sure	38 (19.4)
At medical school	26 (13.3)
Postgraduate	24 (12.2)
CME course	9 (4.6)
Number of PPE done per month	
0	83 (43.2)
1–5	83 (43.2)
6–10	16 (8.3)
>10	10 (5.2)
Sudden death witnessed	
Yes	24 (12.5)
No	168 (87.5)

[$]>1 answer was allowed. PPE=Preparticipation physical evaluation, CME=Continuing medical education

Table 2: Distribution of primary care physicians according to their knowledge of general principles and components/elements of preparticipation physical evaluation (*n*=192)

Knowledge of preparticipation evaluation	Correct *N* (%)	Incorrect *N* (%)	Don't know *N* (%)
General principles			
The PPE done by the physician is required to determine the cardio-respiratory fitness level (false)	4 (2.2)	168 (87.5)	20 (10.3)
Team health-care professional should be involved in the athlete's sports participation clearance decision (true)	168 (87.5)	7 (3.6)	17 (8.9)
The preparticipation evaluation should occur within 4 weeks prior to preseason practice (false)	11 (5.7)	99 (51.6)	82 (42.7)
The recommended screening interval is every 3 years for high school students (false)	14 (7.3)	59 (30.7)	11 (62)
In addition to athlete's health status, clearance for sports participation depends on type of sport in which athlete wishes to participate (true)	140 (72.9)	13 (6.8)	39 (20.3)
Mean score±SD (minimum–maximum)		1.76±0.72 (0–5)	
Components/elements			
Performing ECG is essential before clearance in asymptomatic individuals (false)	60 (31.3)	103 (53.6)	29 (15.1)
Athletes who seek clearance for boxing should be screened for eating disorders (true)	74 (38.5)	27 (14.1)	91 (47.4)
It is important to ask about sudden unknown cause of death before the age of 50 in the family (true)	176 (91.7)	5 (2.6)	11 (5.7)
Persons undergoing PPE should be asked about dyspnea associated with exercise (true)	172 (89.6)	3 (1.6)	17 (8.8)
Performing chest X-ray is essential for clearance in asymptomatic athlete (false)	59 (30.7)	81 (42.2)	52 (27.1)
Inspecting the athlete's palate is required during PPE (true)	107 (55.7)	19 (9.9)	66 (34.4)
It is necessary to check femoral pulses during PPE (true)	102 (53.1)	27 (14.1)	63 (32.8)
Female athletes should be asked about irregular menstrual period during PPE (true)	148 (77.1)	10 (5.2)	34 (17.7)
It is essential to check athlete's vision during PPE visit (true)	146 (76)	16 (8.4)	30 (15.6)
Hearing is tested by whispering test in the clinic for all athletes (true)	84 (43.7)	33 (17.2)	75 (39.1)
It is enough to do a brief standardized orthopedic screening during PPE in athletes with no history of injuries (true)	112 (58.3)	22 (11.5)	58 (30.2)
It is essential to request a blood hemoglobin level test for all athletes (false)	32 (16.7)	113 (58.9)	47 (24.4)
Mean score±SD (minimum–maximum)		6.63±2.67 (0–12)	

ECG=Electrocardiography, PPE=Preparticipation physical evaluation, SD=Standard deviation

associated with exercise (89.6%), questions on irregular menstruation (77.1), and checking the vision of the athlete (76%). Regarding this area of the PPE guidelines, percentages of "I don't know" answers were considerable [Table 2].

About contraindication of sport participation, higher percentages of PCPs gave correct responses to questions on the safety clearance of athletes with well-controlled asthma (68.2%) and of athletes with bleeding disorders such as hemophilia (60.9%). The mean knowledge score for contraindication was 2.48 ± 1.30 ranging from 0 to 6 [Table 3].

Table 3 also shows high mean knowledge score (3.49 ± 1.23) ranging from 0 to 5 regarding the area of concerning history or physical examination findings. Regarding the knowledge of the interpretations of ECG findings in athletes; Table 3 shows a mean score of 1.89 ± 1.28 ranging from 0 to 5.

PCPs had a mean knowledge score of 1.63 ± 0.96 ranging from 0 to 3 in the area of knowledge about ethical considerations. The percentages of correctly answered questions regarding the acceptability of conducting PPE in the presence of teammates were high (58.9%) and permission from the guardians of athletes aged 14 years (74.5%). There was a high percentage of incorrect answers from PCPs on informing the team coach on the need for the clearance (55.7%).

The majority of PCPs (82.8%) demonstrated poor knowledge regarding PPE, 8.9% demonstrated fair level of knowledge, and 8.3% had excellent knowledge.

With regard to the practice of PPE, 114 (59.4%) PCPs had encountered PPE in their practice. The practice score ranged from 23 to 53. Less than half of PCP (43%) had a satisfactory level of practicing PPE, 23.7% had an unsatisfactory level of practice, and one-third (33.3%) had fair practice level.

Table 4 shows that high percentages of PCPs always asked about sudden unknown cause of death of persons before the age of 50 years in the family or asked about the type of exercise for each participant during PPE (70.3% and 73.7%, respectively). Always taking an individual's ECG with mild-systolic murmur during

Table 3: Distribution of primary care physicians according to their knowledge of contraindications of sports, concerning history or physical examination findings and electrocardiography finding interpretation (*n*=192)

Knowledge of PPE	Correct *N* (%)	Incorrect *N* (%)	Don't know *N* (%)
Contraindications of sports participation			
Athletes with well-controlled bronchial asthma who are asymptomatic at rest and with exertion can be safely cleared to play football (true)	131 (68.2)	34 (17.7)	27 (14.1)
Persons with well-controlled seizures can be safely cleared to be involved in bicycling sport (false)	59 (30.7)	82 (42.7)	51 (26.6)
Athletes with ACL tear who pass functional tests can be cleared to participate in football (true)	51 (26.6)	77 (40.1)	64 (33.3)
22-year-old athletes with blood pressure of 150/90 should not be cleared to participate in sporting activities until treated (false)	64 (33.3)	89 (46.4)	39 (20.3)
Athletes with bleeding disorders such as hemophilia can be safely cleared to play football (false)	117 (60.9)	27 (14.1)	48 (25.0)
Persons with known hypertrophic cardiomyopathy can be cleared to participate in low-intensity activities (true)	55 (28.6)	82 (42.8)	55 (28.6)
Mean score±SD (minimum–maximum)		2.49±1.31 (0–6)	
The following history/physical examination findings are concerning in athlete and requires further testing			
Syncope on exertion (true)	182 (94.8)	1 (0.5)	9 (4.7)
A heart rate of 50 beats/min in an endurance athlete (false)	57 (29.7)	108 (56.2)	27 (14.1)
An athlete with disproportionately long arms and legs with high-arched palate (true)	154 (80.2)	9 (4.7)	29 (15.1)
Diastolic murmurs grade 2/6 in severity (true)	136 (70.8)	18 (9.4)	38 (19.8)
High-pitched mid-systolic murmur heard best at the left lower sternal border that gets louder with Valsalva maneuver (true)	142 (74.0)	12 (6.3)	38 (19.7)
Mean score±SD (minimum–maximum)		3.49±1.23 (0–5)	
ECG finding interpretation in athletes			
First degree AV block (normal in athlete)	51 (26.6)	104 (54.2)	37 (19.2)
Left axis deviation−30°−−90° (abnormal in athlete)	57 (29.6)	51 (26.6)	84 (43.8)
Isolated QRS voltage criteria for left ventricular hypertrophy (abnormal in athlete)	104 (54.2)	26 (13.5)	62 (32.3)
Incomplete right bundle branch blocker (normal in athlete)	31 (16.1)	107 (55.7)	54 (28.2)
A QT interval (QTc) of 0.50 s (abnormal in athlete)	85 (44.3)	28 (14.6)	79 (41.1)
Early re-polarization (normal in athlete)	36 (18.8)	65 (33.9)	91 (47.3)
Mean score±SD (minimum–maximum)		1.89±1.28 (0–5)	
Ethics			
It is acceptable to conduct the PPE of an athlete in the presence of his teammates (false)	113 (58.9)	50 (26)	29 (15.1)
A guardian is required when evaluating a 14-year-old male athlete (true)	143 (74.5)	16 (8.3)	33 (17.2)
The team coach could be informed about the reason for not clearing the player to participate in sport (false)	56 (29.2)	107 (55.7)	29 (15.1)
Mean score±SD (minimum–maximum)		1.63±0.96 (0–3)	

ECG=Electrocardiography, PPE=Preparticipation physical evaluation, SD=Standard deviation, ACL=Anterior cruciate ligament, QTc=QT corrected, AV=Atrioventricular

auscultation for further evaluation before clearance and always waiting till the participant is treated for acute muscular injury before participating in play were satisfied by 46.4% and 51.8%, respectively. The number of reports of "never" answers (67.5%) by PCPs when doing genital examination of all individuals during PPE was high.

Table 5 shows the association between the knowledge level and different sociodemographic and job characteristics: In board certified physicians, a high percentage of excellent knowledge (28.1%) was indicated, $P < 0.05$, and also the number of PPE per month as 30% of those who had excellent knowledge were physicians who reported performing ≥11 PPE/month; $P < 0.05$.

Table 6 shows that board certified physicians had higher percentage of satisfactory level of practice (72.2%); having PPE training at CME, and a postgraduate degree promoted a significant higher satisfactory practice level (81%), $P < 0.05$.

Discussion

The current study revealed that most PCPs (82.8%) exhibited poor knowledge, which is consistent with studies conducted in the USA.[12,13] This highlights a global challenge in PPE knowledge. Charboneau *et al*., reported that most of his sample (92%) did not use PPE forms that meet the AHA recommendation for student athletes; therefore, physicians might not be effectively screening them for cardiovascular abnormalities that could lead to sudden cardiac death.[15] The absence of PPE as a basic requirement for sports participation places athletes at risk of sports injuries and even sudden death.[16]

Table 4: Distribution of primary care physicians according to their practice regarding preparticipation physical evaluation (*n*=192)

Practice	Always *N* (%)	Sometimes *N* (%)	Rarely *N* (%)	Never *N* (%)
I ask about sudden unknown cause of death before the age of 50 years in the family (always is the best practice)	80 (70.3)	18 (15.7)	10 (8.7)	6 (5.3)
I ask about the type of exercise for each participant during PPE (always is the best practice)	84 (73.7)	24 (21.1)	5 (4.3)	1 (0.9)
I ask specific questions on the eating habits of a female athlete (always is the best practice)	20 (17.5)	28 (24.6)	38 (33.3)	28 (24.6)
I ask about the menstrual history of female athletes (always is the best practice)	49 (42.9)	28 (24.6)	13 (11.4)	24 (21.1)
I ask about performance enhancing substances used by each athlete (always is the best practice)	41 (35.9)	38 (33.3)	19 (16.7)	16 (14.1)
I look for Marfan syndrome features (disproportionate long arms, legs and fingers, high-arched palate, pectus carinatum…) (always is the best practice)	43 (37.7)	29 (25.4)	16 (14.1)	26 (22.8)
I check femoral pulses during examination for all PPE consultation (always is the best practice)	31 (27.1)	19 (16.7)	28 (24.6)	36 (31.6)
I check for vision equity by Snell chart for all participants during PPE (always is the best practice)	27 (23.8)	29 (25.4)	25 (21.9)	33 (28.9)
I check the hearing by the whispered test for all athlete during PPE (always is the best practice)	20 (17.5)	21 (18.4)	22 (19.4)	51 (44.7)
I do brief standardized orthopedic screening for each athlete during PPE (always is the best practice)	25 (21.9)	28 (24.6)	29 (25.4)	32 (28.1)
I do genital examination in all individuals during PPE (always is the best practice)	5 (4.3)	14 (12.4)	18 (15.8)	77 (67.5)
I do CBC for all individuals during PPE (never is the best practice)	33 (28.9)	24 (21.1)	29 (25.4)	28 (24.6)
I order chest X-ray during PPE for each individuals (never is the best practice)	13 (11.4)	29 (25.4)	33 (28.9)	39 (34.3)
I do ECG for individual with mild-systolic murmur during auscultation for further evaluation before clearance (always is the best practice)	53 (46.4)	28 (24.6)	16 (14.1)	17 (14.9)
If the player has acute muscular injury you wait till he is treated before participate in playing (always is the best practice)	59 (51.8)	35 (30.7)	11 (9.7)	9 (7.8)

ECG=Electrocardiography, PPE=Preparticipation physical evaluation, CBC=Complete blood count

A concerning finding was that medical students lacked the proper education in PPE as 69.9% reported either being unsure (19.4%) or having had no training at all (50.5%), suggesting a broader need for curriculum improvements and standardization. Notably, postgraduate training and CME attendance appeared crucial to enhancing both knowledge and practice. Interestingly, neither knowledge nor practice was influenced by the years of experience or gender. However, participants who reported "none" to PPEs per month displayed the lowest knowledge score, highlighting the role of practical experience. Out of the six parts of the knowledge questions, physicians scored the highest on questions related to history/physical examination findings in athletes possibly because PCPs are familiar with these. Exercise participation is known to decrease morbidity and mortality rates, but the clearance to participate or abstain from exercise, depends on the participant's health status as well as the type and intensity of the exercise, given that certain conditions can contraindicate exercise.[11,17,18] Our result revealed a concerning low score in the section related to contraindications of sports participation. This emphasizes the immediate need for comprehensive educational courses to address this lack of knowledge. Ensuring accurate identification of contraindications is crucial for the individual's safety during physical activities. Similarly, the low knowledge score of ECG interpretation reveals the importance of focused training in cardiac evaluation.

During PPE consultation, participants' rights should be observed like other consultations. Ethical considerations received attention by PCPs, with relatively high knowledge score. While awareness was relatively high, concerns about privacy and confidentiality persist. Breaking confidentiality without informed consent from the participants has legal implications which may render the physician liable to legal action.[19-21]

Notably, a considerable portion of PCPs (59.4%) had encountered PPE in their practice, indicating that it is relevant. However, a fair practice level was observed in one-third of the sample. The reported findings regarding practice score are probably attributed to some abnormal findings being overlooked in PCPs examination since there are no local mandatory guidelines for their performance.

Conclusion

In summary, our study highlights substantial knowledge and practice gaps of PPE in PCPs, echoing concerns from international research. To address these issues, medical education must be strengthened, awareness of guidelines

Table 5: Relation between knowledge level of primary care physicians and sociodemographic and job characteristics

Characteristics	Knowledge level			*P*-value
	Poor (*n*=159) *N* (%)	Fair (*n*=17) *N* (%)	Excellent (*n*=16) *N* (%)	
Age (years)				
<40	144 (83.7)	14 (8.1)	14 (8.1)	0.518
≥40	15 (75.0)	3 (15.0)	2 (10.0)	
Gender				
Female	90 (87.4)	6 (5.8)	7 (6.8)	0.193
Male	69 (77.5)	11 (12.4)	9 (10.1)	
Education				
Bachelor	114 (88.4)	10 (7.8)	5 (3.9)	0.001*
Diploma/master	24 (77.4)	5 (16.1)	2 (6.5)	
Board	21 (65.6)	2 (6.3)	9 (28.1)	
Specialty				
General practitioner	61 (85.9)	7 (9.9)	3 (4.2)	0.142
Other primary healthcare specialty	1 (50)	1 (50)	0	
Family medicine	97 (81.5)	9 (7.6)	13 (10.9)	
Years of experience				
<10	132 (83.0)	13 (8.2)	14 (8.8)	0.743
≥10	27 (81.8)	4 (12.1)	2 (6.1)	
Patients seen per day				
≤15	52 (89.7)	3 (5.2)	3 (5.2)	0.120
16–30	51 (75.0)	7 (10.3)	10 (14.7)	
≥31	56 (84.4)	7 (10.6)	3 (45)	
Number of PPE per month				
None	76 (91.6)	4 (4.8)	3 (3.6)	0.019*
1–5	66 (79.5)	9 (10.8)	8 (9.6)	
6–10	11 (68.8)	3 (18.8)	2 (12.5)	
≥11	6 (60)	1 (1)	3 (30)	
PPE trained				
No training/not sure	117 (83.6)	13 (9.3)	10 (7.1)	0.092
Yes, at medical school	21 (95.5)	1 (4.5)	0	
Yes, at CME and postgraduate	21 (70)	3 (10)	6 (20)	
Witnessed sudden death				
No	141 (83.9)	15 (8.9)	12 (7.1)	0.292
Yes	18 (75.0)	2 (8.3)	4 (16.7)	

**P*-value significant <0.05. CME=Continuing medical education, PPE=Preparticipation physical evaluation, FET=Fisher's exact test

Table 6: Relation between practice level of primary care physicians and sociodemographic and job characteristics

Characteristics	Practice level (*n*=114)			*P*-value
	Nonsatisfactory (*n*=27) *N* (%)	Fair (*n*=38) *N* (%)	Satisfactory (*n*=49) *N* (%)	
Knowledge level				
Poor	23 (25.8)	33 (37.1)	33 (37.1)	0.164
Fair	2 (18.2)	1 (9.1)	8 (72.7)	
Excellent	2 (14.3)	4 (28.6)	8 (57.1)	
Age				
<40	23 (23.2)	35 (35.4)	41 (41.4)	0.493
40 and more	4 (26.7)	3 (20)	8 (53.3)	
Gender				
Female	9 (16.1)	19 (33.9)	28 (50)	0.133
Male	18 (31.0)	19 (32.8)	21 (36.2)	
Marital				
Single	6 (25)	4 (16.7)	14 (58.3)	0.112
Married	20 (23)	32 (36.8)	35 (40.2)	

Contd...

Table 6: Contd...

Characteristics	Practice level (*n*=114)			*P*-value
	Nonsatisfactory (*n*=27) *N* (%)	Fair (*n*=38) *N* (%)	Satisfactory (*n*=49) *N* (%)	
Divorced	1 (33.3)	2 (66.7)	0	
Education				
Bachelor's	24 (31.2)	26 (33.8)	27 (35.1)	0.019*
Diploma/master's	2 (10.5)	8 (42.1)	9 (47.4)	
Board	1 (5.6)	4 (22.2)	13 (72.2)	
Specialty				
General practitioner	14 (35)	14 (35)	12 (30)	0.060
Other primary healthcare specialty	1 (50)	0	1 (50)	
Family medicine	12 (16.7)	24 (33.3)	36 (50)	
Years of experience				
<10	20 (22.2)	30 (33.3)	41 (45.1)	0.606
10 and more	7 (30.4)	8 (34.8)	8 (34.4)	
Patients seen per day				
15 or less	6 (17.1)	13 (37.1)	16 (45.7)	0.507
16–30	9 (20.9)	16 (37.2)	18 (41.9)	
31 and more	12 (33.3)	9 (25)	15 (41.9)	
Number of PPE per month				
None	8 (24.2)	13 (39.4)	12 (36.4)	0.080
1–5	13 (22.4)	13 (22.4)	32 (55.2)	
6–10	3 (20)	8 (53.3)	4 (26.7)	
≥11	3 (37.5)	4 (50)	1 (12.5)	
PPE trained				
Not at all/not sure	20 (25.3)	31 (39.2)	28 (35.4)	0.003*
Yes, at medical school	5 (35.7)	5 (35.7)	4 (28.6)	
Yes, at CME and postgraduate	2 (9.5)	2 (9.5)	17 (81)	
Witness sudden death				
No	24 (25.3)	36 (37.9)	35 (36.8)	0.011
Yes	3 (15.8)	2 (10.5)	14 (73.7)	

**P*-value significant <0.05. CME=Continuing medical education, PPE=Preparticipation physical evaluation, FET=Fisher's exact test

improved, and policies enforced. The development of specific licenses for PPE practitioners could further ensure competence in this critical area.

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Conflicts of interest

There are no conflicts of interest.

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