

Knowledge of risk factors and management of plantar fasciitis among clinical-phase medical students

To Cite:

Almogbil IH, Alshammari AM, Almutairi AS, Alharbi TK, Alshammari SM, Almutairi AT, Almuhamidi RA, Almutairi ZS. Knowledge of risk factors and management of plantar fasciitis among clinical-phase medical students. *Medical Science* 2022; 26: ms508e2596.

doi: <https://doi.org/10.54905/disssi/v26i130/ms508e2596>

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Peer-Review History

Received: 14 November 2022

Reviewed & Revised: 16/November/2022 to 27/November/2022

Accepted: 28 November 2022

Published: 02 December 2022

Peer-review Method

External peer-review was done through double-blind method.

URL: <https://www.discoveryjournals.org/medicalscience>



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ABSTRACT

Objectives: The study aims to assess and evaluate the knowledge and awareness of Plantar Fasciitis (PF), its risk factors and treatment options among clinical phase medical students. **Methods:** A cross sectional study with a validated online questionnaire was conducted electronically by using social network apps among clinical phase medical students in the Qassim Region, Saudi Arabia. **Results:** There were 408 participants in the study, including 182 (44.6%) women and 226 (55.4%) men. The results showed that both sexes (males n=218; 96.5%; and females n=175; 96.2%) had an excellent understanding of the condition. Overall, the majority of students could agree on each of the PF risk factors: Long periods of standing (83.3%), being overweight (87.7%), being pregnant (64.7%), engaging in intense exercise (53.7%), going barefoot (46.8%) and wearing stiletto heels (74.3%) are all risk factors. Finally, the results of this study revealed an overall significant association between the completion of the orthopedic course and the major PF symptoms (n=408; p=0.01). **Conclusion:** The study concluded that knowledge of PF in regards to the symptoms, chronicity and type of shoe wear, the effect of BMI and the diagnostic tool was good among the clinical phase medical students, particularly those who completed the orthopedic course. Although we found that 86.5 % of clinical phase medical students had poor knowledge regarding the management of PF which necessitates more educational activities in the public to raise the awareness level of PF and its management.

Keywords: Plantar Fasciitis, heel pain, medical students, medical shoes, athletes, foot pain

1. INTRODUCTION

Plantar fasciitis (PF) is a frequent and debilitating illness that affects people (Cutts et al., 2012; Trojian and Tucker, 2019). It is the most frequent reason for heel discomfort, according to researchers (Allam and Chang, 2021; Diaz Lopez

and Guzman Carrasco, 2014; Trojiano and Tucker, 2019). Every year, it affects over one million people, with two-thirds of patients seeking treatment from their primary care physician (Goff and Crawford, 2011). PF has been shown to affect athletes, especially runners (Diaz Lopez et al., 2012; Sobhani et al., 2013) and is more common in older adults above the age of 40 (Scher et al., 2009). Most patients are not referred to the orthopedic clinic until their symptoms are recalcitrant (Monteagudo et al., 2018).

The components of the plantar fascia are three bands of dense connective tissue that start at the calcaneus' medial tubercle and fan out to the base of each proximal phalanx (Gill, 1997). The terminal stance to toe off phases of gait cause the plantar fascia to tense (Gill, 1997; Hicks, 1954) this was initially referred to as the windlass mechanism by Hicks in 1954. This strain makes the medial longitudinal arch elevated and reinforced, making it possible for the foot to act as a stiff lever for forward motion (Flanigan et al., 2007). The pathophysiology of PF is poorly understood. However, it's thought to have a mechanical origin (Wearing et al., 2006). Plantar fasciopathy or PF is characterized by discomfort and anatomical abnormalities at the plantar fascia's proximal insertion in the calcis (Monteagudo et al., 2018).

PF contributes to 15% of foot injuries among the general population without gender difference (Rhim et al., 2021). The lifetime prevalence of PF reaches up to 10% (Trojiano and Tucker, 2019). A large study conducted in the U.S in 2018 showed that out of 75,000 participants about 848 (1.1%) of the sample study population had been diagnosed with PF (Nahin, 2018). Like many diseases, quality of life may be affected in patients with PF. Both females and males were affected, but females had worse quality of life when compared to males in regard to footwear, foot pain, foot function and general foot health (Palomo-Lopez et al., 2018).

A variety of risk factors have been connected to PF, including excessive running, reduced ankle dorsiflexion, sedentary lifestyle, high body mass index and prolonged standing (Beeson, 2014; Riddle et al., 2003; Trojiano and Tucker, 2019; Waclawski et al., 2015). Runners are the most susceptible among athletes to plantar fasciopathy (Sobhani et al., 2013). It's not surprising if we consider the biomechanics of running which uses the plantar fascia as well as longitudinal arch as force absorbing structures (Murphy et al., 2013; Ribeiro et al., 2015; Sobhani et al., 2013). In addition to the previously listed variables, one of the main factors contributing to PF in athletes is with training errors, which include an excessively quick rise in the distance, intensity, duration or frequency of activities that require repetitive impact loading of the foot (Young, 2012). Running on poorly cushioned surfaces and prolonged use of poor footwear are other risk factors for athletes (Young, 2012). There is a clear link between aging and PF, since age related degenerative changes can cause a loss of elasticity and shock absorbing capabilities, making the plantar fascia more vulnerable to damage (Monteagudo et al., 2018). Another risk factor is increased incidence of plantar fasciopathy in type 2 Diabetic adults, 1.31% and 0.92% type 1 diabetic adults compared to non diabetic adults 0.80% (Gariani et al., 2020). Even that some health care professionals are also at risk, as one study showed that health practitioners such as nurses, orthopedics physicians, physical medicine and rehabilitation had a higher risk of PF, especially female physicians, according to a nationwide population-based study of PF among physicians and nurses in Taiwan (Sung et al., 2020). Another group at risk of PF is workers who stand many hours in a manufacturing setting (Werner et al., 2010).

Diagnosis of PF is based on history, physical examination and imaging. In history, the patient will describe an acute pain along the anteromedial part of the heel that begins in the morning, primarily with the first few steps and subsequently subsides with continued ambulation. On physical examination, there will be tenderness with palpation at the site of plantar fascia insertion (Trojiano and Tucker, 2019). A comprehensive evaluation of the diagnosis of PF in athletes found that there is no special diagnostic method for PF in athletes because no different diagnostic strategies were used for athletes and non-athletes (Petraglia et al., 2017). The American College of Radiology states that, radiography is the initial imaging modality, which can detect bony lesions. Ultrasonography is inexpensive and accurate and is considered an alternative to magnetic resonance imaging. Magnetic resonance imaging can rule out other conditions like plantar fascia tears and calcaneal stress fracture (Trojiano and Tucker, 2019).

Management of PF includes nonoperative and operative management. About 80% of PF cases are self limited and improve with non-operative therapy (Trojiano and Tucker, 2019). Many modalities are used in physiotherapy starting from the application of ice and the use of NSAIDs to stretching exercises (Attar, 2012). A wide variety of orthotic shoes are used either over the counter shoe inserts as silicone heel pads or custom-made orthotics, which aim to elevate the heel to reduce the strain on the plantar fascia (Attar, 2012). When compared to a sham orthosis after three months for people with plantar heel pain, custom made insoles may improve function (but not pain), but they might not be significantly superior to the appropriate prefabricated orthoses (Landorf and Menz, 2008).

A randomized controlled trial study out of 66 patients who did the plantar stretching protocol 90% of them experienced a marked decrease in pain and functional limitation (Digiovanni et al., 2006). Another study conducted in India showed that the group who was treated with exercises for stretching the plantar fascia, the group who was treated with calf stretching exercises and the group who was treated with hot fomentation and silicone heel pad showed more improvement regarding disability and pain than the group who was treated with painkillers (Gupta et al., 2020). Extracorporeal Shock Wave Therapy and corticosteroid

injections are types of the management modalities which thought to improve PF (Trojian and Tucker, 2019). The surgery should be preserved for people who have failed multiple non operative management options. The preferred surgical modality is plantar fasciotomy, either open percutaneous or endoscopic (Trojian and Tucker, 2019).

However, the goal of our study is to assess and evaluate the level of knowledge and awareness of PF, its risk factors and treatment options among clinical phase medical students in various colleges in the Qassim Region as well as to determine the prevalence of the disease among them.

2. RESEARCH METHODS

A cross sectional study carried out from 1st of April 2022 to 1st of October 2022 (6 months duration) with a validated online questionnaire conducted electronically by using social network apps among clinical phase medical students from 3 colleges of medicine (Al-Malida, Unaizah and Sulaiman Al Rajhi) in the Qassim Region, Saudi Arabia. The total population for the 4th and 5th year’s clinical medical students in the three universities was 557. All were given equal chance to participate in the study. However, only 408 consented to participate.

The minimum sample size (n) was calculated using the formula below.

$$n = \frac{z^2 \times p(1-p)}{d^2}$$

The minimum calculated sample size to achieve a precision of ±5% with a 95% confidence interval was 231 participants. Convenience sampling was used to recruit any medical student in the clinical phase who agreed to voluntary participation in the colleges of medicine (Al-Malida, Unaizah and Sulaiman Al Rajhi) in the Qassim region. Interns, first, second and third medical students were excluded from the study. A valid online questionnaire was conducted electronically by using social network apps for clinical phase medical students (male and female) among colleges of medicine (Al-Malida, Unaizah and Sulaiman Al Rajhi) in the Qassim region. Data was collected in a dedicated Google form and spread sheet.

The questionnaire was adapted from research conducted in Saudi Arabia, Riyadh city and some modifications done on it according to recent literature and to make it more targeted to medical students (Awwad et al., 2019). The Questionnaire consisted of 2 sections (A and B); section A consisted of 8 item personal questions and section B consist of 31 item self administered questions regarding knowledge of PF from recent literature and proven hypotheses (Buchbinder, 2004; Irving et al., 2007; Mischke et al., 2017; Petraglia et al., 2017; Piercy et al., 2018; Riddle et al., 2003; Thompson et al., 2014).

Descriptive statistics; some of the variables which were used in the study were age, gender, condition, year of study, college of study completion of orthopedics course and daily physical exercise. The study was voluntary and the participants were assured of the privacy of their personal information. The study’s ethical approval was obtained from the Qassim University and involved participants’ written consent was obtained before the start of the study. Each medical student participated voluntarily and there was no cause for any participant to experience stress, discomfort, worry or a loss of self esteem, nor was it invading their privacy.

The collected data were first checked for entry errors or missing data, before getting analysed using IBM SPSS Statistics Version 26. Cross tabulation analysis was conducted to measure associations using Chi square statistics. A baseline threshold of significance (p value) was set at 0.05, with a 95 percent confidence interval (CI). A scoring scale guide used for representation of the knowledge level; 90% good, 80-89% fair and less than 80% poor.

3. RESULTS

Table 1 shows the representation of frequency and percentages. Patient background information was also paramount and the study team assessed patient information concerning who diagnosed them with PF (Table 2). Table 3 shows patient knowledge of PF symptoms indicated in both frequency and percentage.

Table 1 Categorical variables

Variable	Characteristic	Frequency	Percent
Age coded	18-24 years	199	48.8
	25-34 years	209	51.2
Gender	Female	182	44.6
	Male	226	55.4
BMI Condition	Normal	214	52.5
	Obese	60	14.7

	Overweight	105	25.7
	Underweight	29	7.1
Year of study	4th year of medical college	200	49
	5th year of medical college	208	51
College of study	Al-Malida College of Medicine	210	51.5
	Sulaiman Al Rajhi College of Medicine	105	25.7
	Unaizah College of Medicine	93	22.8
Completion Orthopedics Course	No	29	7.1
	Yes	379	92.9
Daily physical exercise	1 Hour but less than 3 hours	73	17.9
	3 Hours or more	14	3.4
	None	158	38.7
	Some but less than 1 hour	163	40

Table 2 Patient's background history of heel pain and diagnosis with PF

Have you ever been diagnosed with PF?	Frequency	Percent
No	383	93.9
Yes	25	6.1
If the answer is yes, by whom were you diagnosed with PF?		
Those not diagnosed	367	90
By a general practitioner	7	1.7
By an orthopaedic doctor	17	4.2
Self-diagnosed	17	4.2
Do you feel any pain in the heel area?		
No	367	90
Yes, especially in the morning when I wake up from my bed	30	7.4
Yes, most of the day	11	2.7
If the answer is yes, does the pain affect your life?		
	361	88.5
Doesn't affect my life	28	6.9
I can't do my activities or exercise	5	1.2
Sometimes it affects my life and my exercise	14	3.4

Table 3 General Knowledge of PF

	Frequency	Percent
Plantar fasciitis is an inflammation, irritation, degenerative or structural changes of the plantar fascia.		
No	15	3.7
Yes	393	96.3
What is the major symptom of PF?		
Foot pain at night.	105	25.7
Foot pain in the afternoon.	17	4.2

Foot pain in the middle of the night.	18	4.4
Foot pain in the morning.	268	65.7
Can PF become a chronic condition?		
No	21	5.1
Yes	387	94.9
Can weight loss help relieve PF symptoms?		
No	56	13.7
Yes	352	86.3
What is the best type of everyday shoe to wear to relieve symptoms of PF?		
A low heel	130	31.9
Flats	184	45.1
Sandals	45	11
Stilettos / high heel	49	12
What is the diagnostic tool for PF?		
Clinical diagnosis	274	67.2
CT-Scan	9	2.2
MRI	55	13.5
Ultrasound	25	6.1
X-ray	45	11
How did you know "PF"?		
From a general practitioner	9	2.2
From an orthopaedic doctor	28	6.9
From my social life (friends, family)	15	3.7
From the college of medicine	314	77
From the internet	13	3.2
I have not heard about it	29	7.1
What would be the initial treatment option for a patient with PF?		
Extracorporeal Shock Wave Therapy	10	2.5
NSAID, physical therapy, and orthotic shoe	393	96.3
Surgery	5	1.2

Multivariate analysis

The current study measured the knowledge of PF among clinical medical students on matters of identifying the major symptom of PF; PF becoming a chronic condition; weight loss, helping to relieve PF symptoms; everyday shoes to wear to relieve symptoms of PF and the diagnostic tool for PF. The above factors were measured based on whether the students had completed their orthopaedic course.

The clinical medical students' knowledge was also measured to know if they could identify the major symptom of PF. There were no significant differences between both genders as shown in Figure 1. The clinical students were supposed to correctly identify that the major symptoms of PF occur in the morning. Significant differences were observed within the two genders as shown in Figure 1.

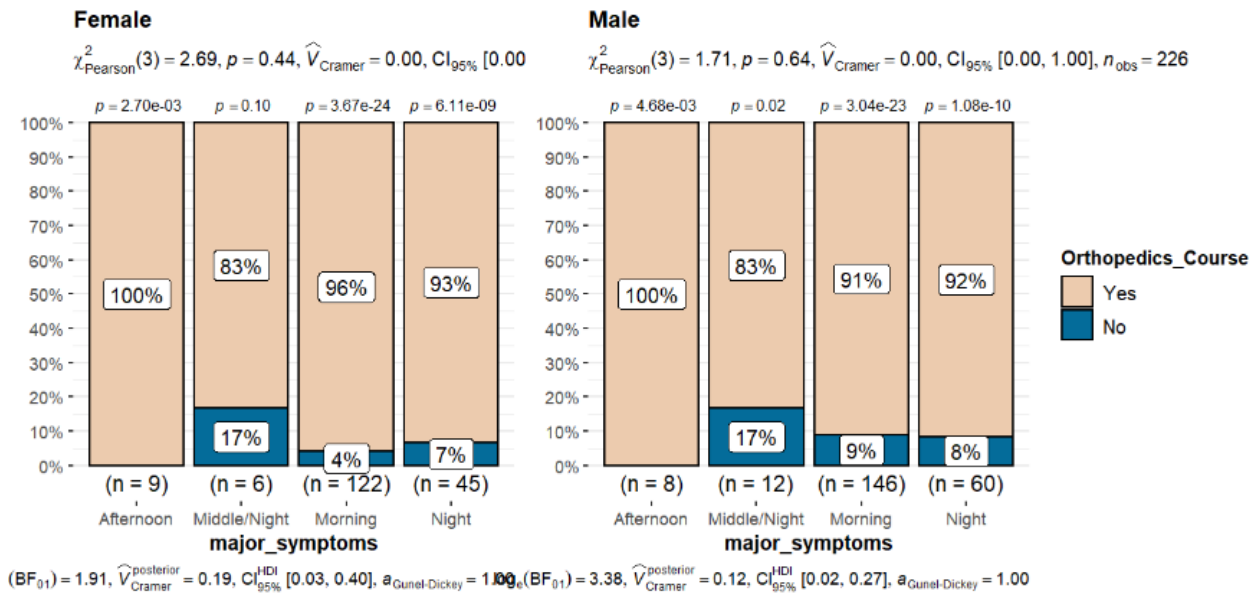


Figure 1 Major symptoms of PF

The students were assessed if they knew that PF could become a chronic condition. The students were supposed to identify the statement as true. There were no significant differences between the two genders: (females' $\chi^2(1) = 0.77, p = 0.38$ and males $\chi^2(1) = 0.27, p = 0.27$) on the association between the completion of the orthopaedic course and if PF could become chronic (Figure 2).

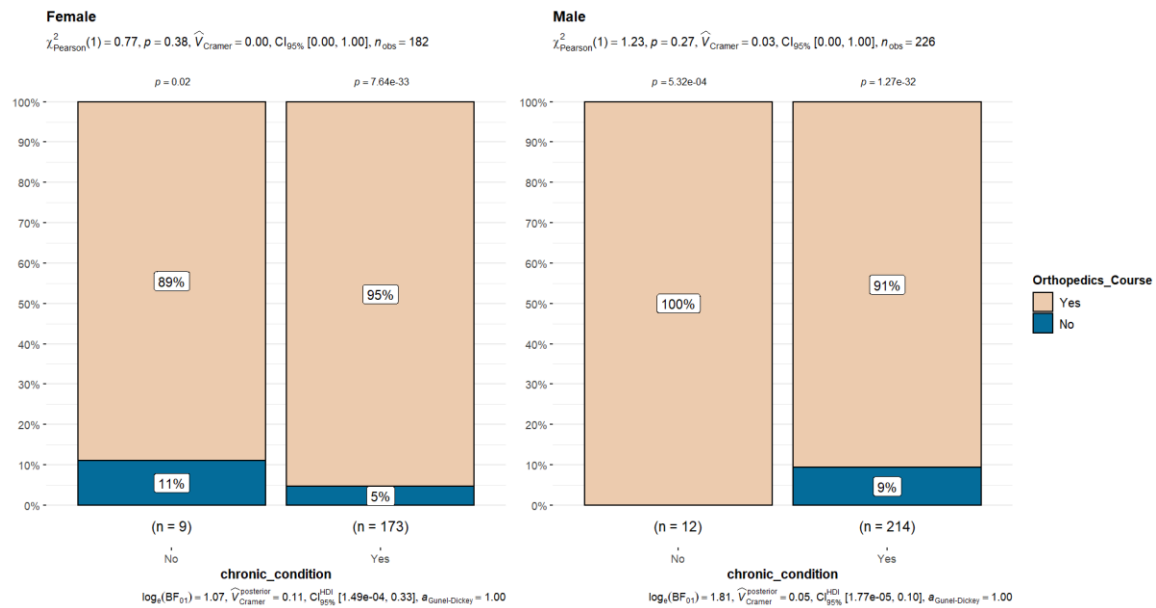


Figure 2 Knowledge of PF becoming a chronic condition

Can weight loss help relieve PF symptoms? There was no significant association between weight losses, helping in the relieving of PF symptoms (Figure 3). However, there were significant within differences among both genders ($p < 0.001$).

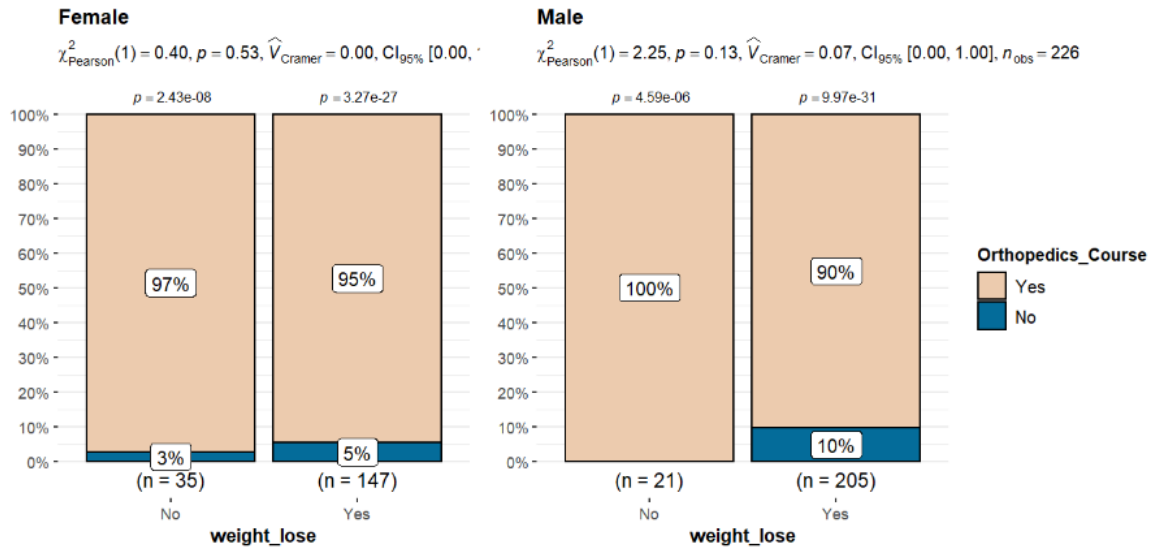


Figure 3 Weight losses helping in the relieving of PF symptoms

What is the best type of everyday shoe to wear to relieve symptoms of PF? Shoes worn regularly had no significant effect between everyday shoes to wear on relieving PF symptoms and completion of the orthopaedic course. The clinical medical students were supposed to identify that wearing low heeled shoes relieves symptoms of PF. The findings indicate that more females (98%; $p < 0.001$) than males (93%; $p < 0.001$) had completed the orthopaedic course and had the knowledge that wearing low heeled shoes relieves PF symptoms (Figure 4).

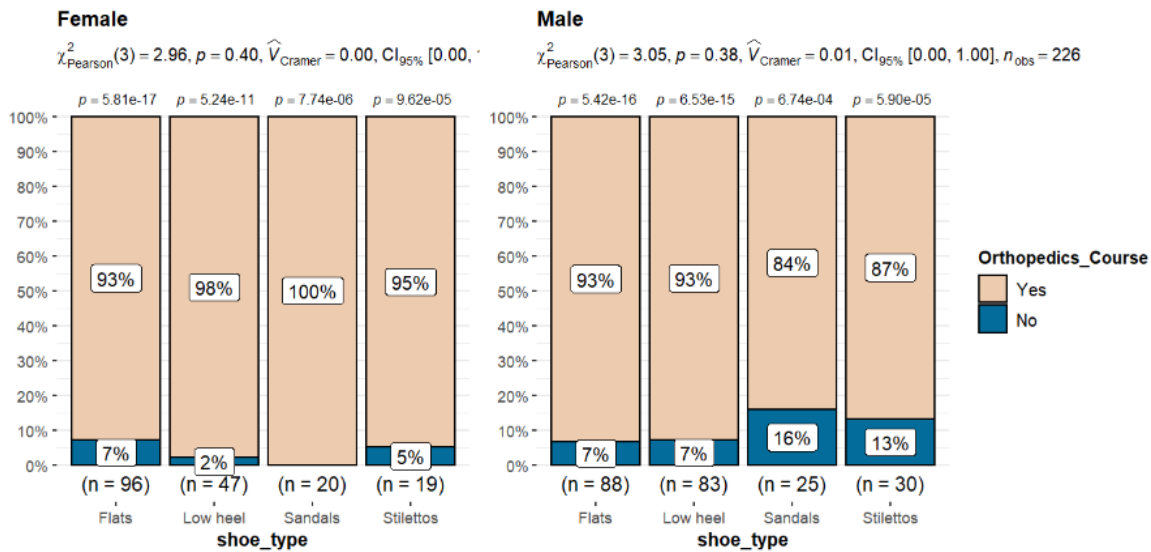


Figure 4 Everyday shoes worn daily and relieving PF symptoms

What is the diagnostic tool for PF? The overall result of the awareness of the diagnostic tool for PF was significant only among female students ($p = 0.02$). For a student to be rated they were knowledgeable on the correct diagnostic tool for PF, they were supposed to mention clinical diagnosis. The female students who responded correctly to this question represented 96% of those who had attended the orthopaedic course (Figure 5).

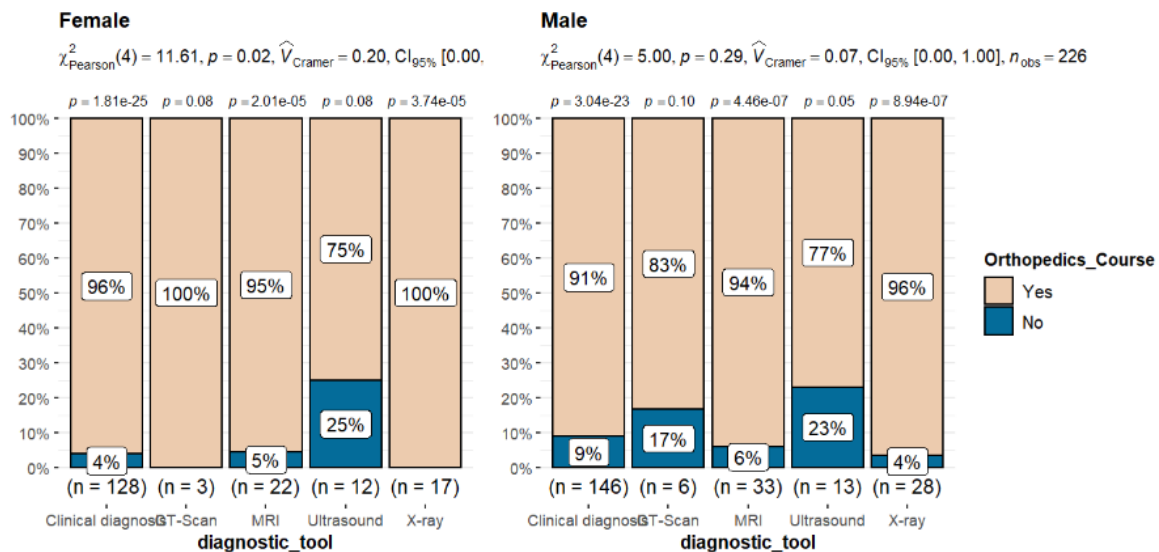


Figure 5 Identification of the correct diagnostic tool for PF

Table 4 shows participants perception on different risk factors. The results are presented in percentages. Some of the risk factors assessed included, standing for a long time, being overweight, pregnancy, sudden exercise, walking barefoot, lack of exercise, increase flattening of the foot, advancing age and arthritic disorders such as rheumatism. Concerning standing for a long time as a risk factor, most of the participants agreed which accounted for 83.3% of the participants. However, most of the participants attributed all these risk factors to the development of PF.

Table 4 Do you think the following is one of the risk factors for PF

Risk factors	Agree	Don't agree	Don't know	Overall Knowledge
1. Standing for a long time	340(83.3%)	29(7.1%)	39(9.6%)	fair
2. Being overweight	358(87.7%)	19(4.7%)	31(7.6%)	fair
3. Pregnancy	264(64.7%)	44(10.8%)	100(24.5%)	poor
4. Doing sudden exercise	219(53.7%)	72(17.6%)	117(28.7%)	poor
5. Walking barefoot	191(46.8%)	92(22.5%)	125(30.6%)	poor
6. Wearing high-heeled/stiletto shoes (in the case of females)	303(74.3%)	36(8.8%)	69(16.9%)	poor
7. Lack of Exercise	181(44.4%)	103(25.2%)	124(30.4%)	poor
8. Increase the flattening of the foot (flat foot)	266(65.2%)	44(10.8%)	98(24%)	poor
9. Shortness/lack of elasticity of the posterior hind leg muscle	214(52.5%)	43(10.5%)	151(37%)	poor
10. Advancing age	243(59.6%)	59(14.5%)	106(26%)	poor
11. Bearing a heavy load	255(62.5%)	48(11.8%)	105(25.7%)	poor
12. Exposure to fractures in the joints of the foot	207(50.7%)	56(13.7%)	145(35.5%)	poor
13. Arthritic disorders such as rheumatism	233(57.1%)	50(12.3%)	125(30.6%)	poor

Table 5 represents assessment results on participants' knowledge of the different treatment modalities of PF. Some of the treatments assessed included elongation of exercise time, rinsing the foot in iced water, oral cortisone replacement, wearing night-time leg casts, IV/IM cortisone treatment, specialized medical shoes, surgery and another treatment method was to leave PF without any form of treatment. Most of the participants agreed with all treatment options and did not agree to leave PF without treatments.

Table 5 Do you think the following is one of the treatments for PF

Methods of treatment	Agree	Don't agree	Don't know	Knowledge
1. No need to treat the PF	55(13.5%)	287(70.3%)	66(16.2%)	poor
2. Elongation exercises (physical therapy)	346(84.8%)	32(7.8%)	30(7.4%)	fair
3. Rinsing the foot in iced water	223(54.7%)	62(15.2%)	123(30.1%)	poor
4. Oral Cortisone replacement	176(43.1%)	128(31.4%)	104(25.5%)	poor
5. IV/IM Cortisone treatment	159(39%)	138(33.8%)	111(27.2%)	poor
6. Wearable night-time leg cast	193(47.3%)	95(23.3%)	120(29.4%)	poor
7. Specialized medical shoes	363(89%)	16(3.9%)	29(7.1%)	fair
8. Surgery	274(67.2%)	70(17.2%)	64(15.7%)	poor

Table 6 presents the findings of a multivariate logistic regression which was used to predict the relationship between the dependent variable and the independent variable. In this case, the dependent variable was knowledge of PF and the independent variables were the major symptoms of PF, weight loss, type of everyday shoe worn, completion of orthopaedics course and BMI condition (Obese, Overweight and Underweight) were the independent variables. A significant finding was only observed among the wearers of flat shoes.

Table 6 Binary logistic regression on knowledge of PF

Variable(s)	Beta coefficient	p-value
Foot pain in the afternoon	0.045	0.971
Foot pain in the middle of the night	16.677	0.995
Foot pain in the morning	0.492	0.401
Weight loss (Yes)	0.558	0.421
Wearing flat shoes	1.248	0.047**
Wearing sandals	1.269	0.247
Wearing stilettos / high heels	1.453	0.183
Completion of orthopaedics course (Yes)	0.433	0.693
Obese	0.998	0.358
Overweight	0.193	0.754
Underweight	16.592	0.994
	1.086	0.422
Observations	408	
Log Likelihood	-58.52	
Akaike Inf. Crit.	141.039	

4. DISCUSSION

The current study measured the knowledge of PF among clinical medical students on matters of identifying the major symptom of PF; PF becoming a chronic condition; weight loss, helping to relieve PF symptoms; everyday shoes to wear to relieve symptoms of PF and the diagnostic tool for PF. The above factors were measured based on whether the students had completed their orthopaedic course. The knowledge question on PF as an inflammation, irritation, degenerative or structural changes of the plantar fascia posed to the medical clinic student had very encouraging results. The finding confirmed that both genders (females $n=175$; 96.2% and males $n=218$; 96.5%) had good knowledge of the disease. This was a good indication that most students had the good know how about the disease. However, there were no significant differences among both genders in terms of their comprehension of the disease (females $\chi^2(1) = 1.35, p = 0.245$ and males $\chi^2(1) = 0.805, p = 0.370$).

It is important to note that from the descriptive statistics, 41% of the participants were either obese or overweight. Obesity was reported by Awwad et al., (2019) it was one of the risk factors for developing PF. Loss of weight was associated with relieving PF symptoms. These findings were only significant among persons who acknowledged weight relieves PF symptoms. A closer review within this group was significant ($p = 0.0037$), where the finding indicated more men were aware of the association between weight loss and improvement of PF symptoms. This finding is similar with (Beeson, 2014; Riddle et al., 2003; Trojian and Tucker, 2019; Waclawski et al., 2015) studies that reported a high body mass index was associated with the risk of developing PF. Equally, the findings from the current study depicts the relationship between being overweight and the average number of cases of PF. As an individual's weight increases, there is an increased chance of getting PF. However, it should be noted that BMI is a direct indication of overweight in an individual. There is a significant strong association between completion of the orthopaedic course and weight loss improving symptoms of PF. Overall, both females (95%) and males (90%) had good knowledge that weight loss improves symptoms of PF.

More females had significantly completed the orthopaedic course (females $n=122$; 96%; $p < 0.001$) and males $n=146$; 91%; $p < 0.001$) correctly identified that the major symptoms of PF occur in the morning. Overall, 67% of females identified major symptoms of PF are experienced in the morning compared with 64.6% of men. The completion of the orthopaedic course had a significant association with the clinical medical students on their knowledge of the major symptoms of PF. Those who had completed their orthopaedic course scored high levels compared with those who did not. The current study's findings had an overall significant finding on the association between major symptoms of PF and the completion of the orthopaedic course ($n=408$; $p=0.01$). Equally, overall, the within associations of the symptoms were significant: Foot pain at night ($n=105$; $p < 0.001$, foot pain in the afternoon ($n=17$; $p < 0.001$); foot pain in the middle of the night ($n= 18$; $p = 0.02$); and foot pain in the morning ($n= 268$; $p < 0.001$).

The most surprising finding on the association between major symptoms of PF and the completion of the orthopaedic course was that more the three quarters had completed the orthopaedic course. Most clinical medical students identified that foot pain in the morning, followed by those who acknowledge pain at night. It is worth noting that very few clinical medical students acknowledged foot pain in the afternoon and the middle of the night. These findings show that upon the completion of the orthopaedic course, both females (96%) and males (91%) had good knowledge of the major symptoms of PF.

PF can develop into a chronic disease. The knowledge on aspect indicated there were significant within differences among the respondents who answered correctly among both genders (females 95%; $p < 0.001$) and males 91%; $p < 0.001$) (Figure 2). This is an indication that more females were aware that PF can become a chronic condition if not treated. There was a clear indication that the completion of the orthopaedic course had a significant association with the clinical medical students on their knowledge that PF could become a chronic condition if not controlled. Both females (95%) and males (91%) had good knowledge that PF could develop into a chronic condition if one does not seek medical attention.

The association between the everyday shoes worn to relieve symptoms of PF was investigated among both genders. The types of shoes reviewed were low heels, flats, sandals and stilettos/high heels. The findings revealed there was no significant association between the wearing of types of shoes and improvement of PF between both genders. Regarding gender, more males (64%) were aware of the role played by low heeled shoes and relieving PF than females (36%). It was worth noting that the findings of this study were contrary to what had been reported in the study in Saudi Arabia. The study participants in both studies believed that wearing proper shoes (low heeled shoes) relieves the symptoms of PF. Although conducted in Saudi Arabia, the only notable differences between the two studies were the study participants the current study investigated clinical phase medical students while the other study in shopping mall clients.

Another major difference between the two studies was on gender and awareness of appropriate shoes to wear as a measure of improving PF symptoms. These findings show that there was a significantly strong association between the choice of the best shoes to wear to relieve PF and the completion of the orthopaedic course. Thus, the knowledge of clinical medical students on the choice of the best shoes to relieve symptoms of PF was high between both genders, but the level of knowledge is significantly higher among females than males. This finding is similar to a study (31) that reported females were significantly more aware of PF than males. Both females (93%) and males (93%) had good knowledge of everyday shoes worn daily to improve symptoms of PF.

The findings of female clinical students were statistically significant on matters of clinical diagnosis as a diagnostic tool for PF. Although the overall gender finding was not significant for male students ($p = 0.29$), the within differences were significantly expressed among those who completed the orthopaedic course and those who did not complete it ($n= 146$; $p < 0.001$). Thus, we can state that the completion of the orthopaedic course plays an important role in helping the students to identify the clinical diagnosis as the correct diagnostic tool for PF. Both females (96%) and males (91%) had good knowledge that clinical diagnosis was the correct diagnostic tool for PF.

The students were also asked to identify the risk factors for PF. The correct response was to agree. Overall, most of the students were able to agree on all the risk factors for PF: Standing for a long time (83.3%); Being overweight (87.7%); Pregnancy (64.7%); Doing sudden exercise (53.7%); Walking barefoot (46.8%); Wearing high heeled/stiletto shoes (74.3%); Lack of Exercise (44.4%); Increase the flattening of the foot (flat foot) (65.2%); Shortness/lack of elasticity of the posterior hind leg muscle (52.5%); and Advancing age (59.6%). However, these findings were not statistically significant even after segregating the data based on gender. The student knowledge was also measured on if the students knew about the treatment for PF. Overall the students had poor knowledge of the risk factors for PF.

The students were supposed to score an agreement with the treatment options posed to them. Most of the students agreed with all the treatment options suggested apart from the question that PF does not need treatment: No need to treat the PF (13.5%); Elongation exercises (physical therapy) (84.8%); Rinsing the foot in iced water (54.7%); Oral Cortisone replacement (43.1%); IV/IM Cortisone treatment (39%); Wearable night time leg cast (47.3%); Specialized medical shoes (89%); and Surgery (67%). In our study, we found 86.5 % of the clinical phase medical student had poor knowledge about PF management. Finally, we found that the knowledge of clinical phase medical students is good due to previous information given through the orthopaedic course. Overall, the students had poor knowledge of the treatment for PF. However, they had some fair knowledge the physical therapy and the use of specialized shoes.

5. CONCLUSION

The study was conducted systematically and the findings subject to analysis were sufficient to give an insight into the level of knowledge of PF among clinical phase medical students in Saudi Arabia. The knowledge and awareness of PF in regards to the symptoms, chronicity and type of shoe wear, the effect of BMI and the diagnostic tool was good among the students who completed the orthopaedic course. Although we found that 86.5 % of the students had poor knowledge regarding the management of PF which necessitates the need for more educational activities through campaigns, social media and printed brochures to raise awareness of the disease and its management.

Acknowledgement

The authors would like to thank the College of Medicine Research Center and the Deanship of Scientific Research at Qassim University for supporting this project.

Authors' contributions

Ismail Hamad Almogbil: From the inception of the research proposal through its conclusion, I organized and supervised the whole project and participated in all aspects of the study.

Ahmed M Alshammari: I was involved in every stage of the study, from proposal preparation to the end.

Abdulraheem S Almutairi: Was responsible for proposal writing and data gathering and participated in the majority of research phases, from proposal writing through conclusion.

Thamer K Alharbi: Responsible for the final introduction and data gathering and participated to the majority of the study phases from proposal preparation to conclusion.

Saif M Alshammari: Responsible for questionnaire design, data collecting and analysis and data gathering and participated in the majority of research phases, from proposal writing through conclusion writing.

Abdullah T Almutairi: Responsible for discussion and conclusion writing and participated largely during research phases, from proposal writing through conclusion writing.

Reem Abdulaziz Almuhamaydi: Helped with the development of the questionnaire, the gathering and analysis of data and many other aspects of the study process from proposal writing through report writing.

Zakiyah S Almutairi: Primary responsibility for the research's discussion and conclusion and participated in its development through its many stages.

Further information

All authors have confirmed that they have no current or historical financial relationships to any organizations that would have an interest in the submitted work and that they have no other affiliations or activities that might be construed to have influenced the work.

Ethical approval

The study was approved by the Medical Ethics Committee of Qassim Regional Research Ethics Committee of Qassim University with registration No. 21-22-06

Informed consent

Written informed consent was obtained from all individual participants included in the study.

Funding

This study has not received any external funding.

Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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