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Plantar fasciitis in middle aged population and its impact on quality of life in association with lifestyle disorders. A survey study.

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Abstract
Objective: *the objectives of this study were to findout the association between lifestyle disorders and quality of life in plantar fasciitis in middle aged group population and to examine the association of plantar fasciitis with lifestyle disorders and to find out whether their quality of life is altered or not.*
Methods *: A survey was made with questionnaires included with demographic data and outcomes such as BMI, NPRS, MFPDI,QOLS scales and the recommended sample size was 136 and the form was circulated as a google form in various social media platforms like facebook and whatsapp. Received 530 forms were screened for inclusion and exclusion criteria and the final 136 samples were measured with descriptive statistics.*
Results *: In our results occurrence was slightly more in females compared to males across the middle aged group. The results indicates that there is a significant relationship between BMI and QOLS as well as BMI and NPRS as well as NPRS and QOLS. There is positive correlation between BMI and QOLS, weak positive correlation but statistically significant. between BMI and NPRS, strong positive correlation between QOLS and NPRS. The correlation between NPRS scores and QOLS score the Pearson show r value as 0.760 and p value as < .001 respectively. Similarly spearman shows rho value as 0.818 and p value as < .001 and the last Kendall shows tau B value as 0.690 and p value as <.001 interpret that there is a strong positive correlation between the two variables.*
The average functional limitation for females is slightly higher than for males, but the difference is not statistically significant. There is a skew in the data for females in terms of functional limitation, pain intensity, and personal appearance. For males, there is a skew in the data for functional limitation, but it is not as pronounced as it is for females. Which means majority of females have lower pain intensity scores than the majority of males, females with lower personal appearance score and more males with higher personal appearance score, females are working and less males are working and that there is more variability in the functional limitations of females than males.
Conclusion; *plantar fasciitis is a typical incapacitating condition in middle-aged adults. Plantar fasciitis is associated with lifestyle conditions, according to observed patterns of relationship has a high prevalence. Significant impact on a middle aged individual's quality of life and this impact is even stronger for those who are overweight or obese, and that there is a significant correlation between plantar fasciitis and lifestyle disorders. For treatment interventions primary care therapies should focus on more general physical and psychological aspects that may potentially operate as barriers to treatment adherence and recovery in addition to targeted management of food-specific issues.*
Keywords: *plantar fasciitis , prevalence, epidemiology, lifestyle disorders, quality of life*

I. Introduction

Plantar fasciitis was first described by Woos in 1812, it is known by many pseudonyms like joggers heel, heel spur syndrome, plantar fascial insertitis, calcaneal enthesopathy,[1] subcalcaneal bursitis. It is mostly seen in weight bearing occupations. The plantar fascia acts as a mechanical platform that passively stabilizes the foot to maintain the medial longitudinal arch. The dynamic role of plantar fascia is to assist in the propulsive phase of the gait.[1]

Plantar fasciitis is a widespread issue that is occuringin 1 million patient visits annually.It is causing heel pain and is most common in adults with incidence of about 10% mostly in women who are around 40-60 years. [2]

Two most common causes of heel pain are degenerative and mechanical resulting from years of trauma and overuse. Higher prevalence in women and in the obese when compared with others with bmi less than 25. [3]Patients could suffer from persistent discomfort and knife like pain in heel during walking especially in the morning. [4]

The condition has been known as Plantar fasciitis but according to a study, it was not an inflammatory illness, especially in its chronic form. Following the investigation, it was hypothesised that plantar fasciocis degeneration of the plantar fascia; since then, some authors have also referred to it as plantar fasciopathy. The

phrase "plantar heel pain" is more suitable because new imaging studies are progressively showing that this ailment affects more structures than simply the fascia, such as the heel bone and surrounding tissues. [5]From the calcaneus tuberosity to the heads of the metatarsals, the plantar fascia is a thick aponeurosis. Plantar fascia traction frequently causes microrupture or inflammation, and the deterioration of the whole fascia is another common occurrence[6]The plantar fascia supports for the longitudinal arch and serves as dynamic shock absorber. The risk factors thought to be high body mass index [BMI] or weight gain, excessive running, prolonged standing/ walking occupations, work-related weight bearing activities, limited ankle dorsiflexion, pes cavus and pes planus.[7] Characterized by gradual onset of sharp pain along the medial aspect of the heel which is worse within the first step taken in the morning and lessens as the person warms up. It is more prevalent in sedentary individuals.[7]The pain is usually caused by collagen degeneration is repetitive microtears of the plantar fascia at the calcaneal enthesis and is thought to be caused by prolonged standing or running. Soft tissue ossification can be present as a heel spur at the origin of plantar fascia.

Patients in their fourth and fifth decades are most commonly affected. Due to the presence of common hazards and co-morbidities like obesity or a sedentary lifestyle, diabetic patients are at risk.[7]

Patients classically describe medial plantar heel pain on weightbearing, which exacerbates with first steps in the morning. Abnormalities include tightness of Achilles tendon and plantar fascia, less strength in foot and ankle musculature and abnormal foot alignment.[8]

Plantar fasciopathy occurs in a range of patients such as athletes and those working for a long time and sedentary individuals. It has an adverse affects on activities of daily living causing pain particularly in middle aged and elderly patients. [9]Obesity is a global health issue and its prevalence is increasing at a faster rate around the world which is about 1.2billion people are pre-obese (over weight) and atleast 300 million are severe obese. As per WHO obesity is considered as an important risk factor for various diseases such as diabetes and cardiovascular diseases. Studies have stated that factors such as body weight, gender and range of motion could affect plantar pressure distribution of foot. Therefore causing foot pain due to prolonged plantar fascia stretch due to weight distribution in obese. [10]

Two most common causes of heel pain are degenerative and mechanical resulting from years of trauma and overuse. Higher prevalence in women and in the obese when compared with others with bmi less than 25. [3]

Epidemiology:

Plantar fasciitis is the most prevalent and frustrating disorder presents to orthopedics outpatient department. More prevalent between 40-60 years of both genders affecting athletes and middle aged individuals. Age elevated BMI , excessive weight bearing and Achilles tendon tightness are common predisposing factors. [11]

In general plantar pain is the most common type of plantar fasciitis injury estimated to affect 10% of the general population during middle age and 80% of foot injuries in runners related to plantar fasciitis. [12]Approximately 1millon patients are diagnosed with PF, mostly in age group of 45-64 years more common in women. Risk populations include persons with pesplanus and pes cavus, marathon runners, police and military personnel, occupations with prolonged standing occupations and obese or sedentary persons. [13]The incidence of PF was 0.85 percent and 0.80 percent in non-diabetic people, 1.31 percent in type 2 diabetics, and 0.92 percent in type 1 diabetics, according to a recent cohort research that examined the prevalence of PF in 720,000 diabetic patients. [7]

One of the most frequent foot ailments among sportsmen is PHP, which is thought to affect 5 to 18 percent of them.

3.6% of the 3206 respondents over the age of 18 in the North West Adelaide health study in Australia were found to have PHP. 6.9 percent of the 784 participants in the feet first study in the USA who were 65 years of age and older reported plantar fascia and 4.2 percent experienced plantar heel pad soreness. PHP was reported to be 7.3% in a Framingham study of 3378 people who were above the age of 18. [14]

Pathology:

Plantar fasciitis is largely defined by deterioration of the plantar fascia brought on by recurrent micro rips that result in a localised inflammatory reaction without systemic consequences. Shortening of the gastrocnemius soleus complex may be a major contributing factor to PF. Advanced glycation end-products have been associated to the PF in diabetic patients (AGEs). Collagen crosslinking brought on by AGEs eventually results in altered collagen structures and consequent mechanical dysfunction. Collagen's structure is upset by glycation, which results in uneven fibril density and form. Electron microscopy has shown a decreased density of tenocytes and fibroblasts and an increased density of collagen. Elevated plantar fascial or Achilles tendon thickness in DM participants has been directly linked to increased AGE levels.Redox homeostasis is altered by hyperglycemia, particularly the polyol pathway, which results in cellular edoema. Reduced tendon neovascularization is related to DM. Reduced capillary density per unit of surface area results in less blood flow,

which promotes the growth of vessels and nerves and, ultimately, causes the overuse and injury of tendons. The increased weight on the tendons, which is one of the two processes by which obesity contributes, encourages inflammation and structural changes. The cellular function of chondrocytes and tenocytes is disrupted by a number of adipose tissue hormones, including adipokines, lipocalin-1, serum amyloid A-3, and adiponectin, which may result in tendon disruption. [7]

The primary purpose of this study is

- To find out how the impact of plantar fasciitis on Quality of Life of an individual.
- To find out the association between plantar fasciitis and lifestyle disorders in middle aged population.

II. Methods:

Systemic search of studies for this study were sourced from the databases(Google scholar and pubmed) published between years 2015-2022. In two databases the terms used to search were “plantar fasciitis” or “plantar heel pain”, “plantar fasciosis” were inserted as free text into the keywords in pairs [e.g., plantar fasciitis physiotherapy, plantar fasciitis obesity, plantar fasciitis diabetes , plantar fasciitis lifestyle disorders] in an attempt to best capture the wide range of studies addressing the search terms. Titles abstracts and contents were screened based on their relevance to the purpose and full texts of relevant articles are assessed for eligibility. Search results are further narrowed down to 1] study containing patients diagnosed with plantar fasciitis 2] studies that showing quality of life 3] studies using valid outcome measures 4]studies discussing lifestyle disorder involvement in plantar fasciitis 5]studies discussing various interventions for plantar fasciitis 6]text in English language . the reference list of articles meeting these criteria were then reviewed to identify additional articles for possible inclusion. In addition possible relevant articles discussing plantar fasciitis etiology, prevalence, symptoms, screening, differential diagnosis and types of interventions were included in this correlational study.

- Correlational study was conducted, for which the related questionnaires made relevant to the topic which will include, demographic data ,NPRS, THE MACHESTER FOOT PAIN AND DISABILITY INDEX, The quality of life scale [QOLS] AND BMI

The recommended sample size was 136.

Ethical approval was granted by IEC of Garden city university Bangalore India.

Design: A cross sectional survey was undertaken

Survey tool: Google forms were used to share the survey forms. All questions including the demographic data and outcome measures such as NRS, the Manchester foot disability index ,body mass index and quality of life scales are given in English . The questions were designed specifically for this study.

Procedure:

The survey was live in January 2022 and was available for 6weeks. The survey form was promoted widely on social media platforms like facebook and whatsapp and many groups.

Analysis

All returned forms as per the criteria were included in the analysis.

Findings

Participant characteristics

There were exactly 530 samples collected from various people out of which we filtered the responses as per the inclusion and exclusion criteria and the final responses taken for the analysis was 136 out of which majority were middle aged women , all the respondents were from various parts of India

III. Results:

Correlation

Pearson's Correlations					
			Pearson's r		P
NPRS	-	QOLS	0.014		0.868
NPRS	-	BMI	0.191	*	0.026
QOLS	-	BMI	-0.062		0.472

Pearson's Correlations				
			Pearson's r	**P**
* p < .05, ** p < .01, *** p < .001				

- In the correlation between NPRS scores and QOLS score the Pearson show r value as 0.014 and p value as 0.868 respectively.

The correlation between NPRS scores and QOLS score the Pearson show r value as 0.014 and p value as 0.868 means that there is no relationship between the two variables. This means that as NPRS scores increase, there is no change in QOLS scores. The p value indicates that this relationship is not statistically significant, which means that other factors may be influencing the QOLS scores.

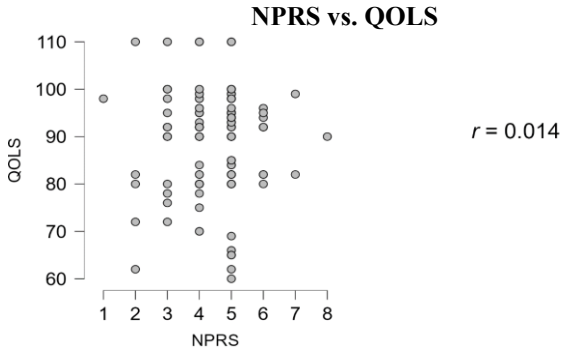
- In the correlation between BMI scores and NPRS the Pearson show r value as 0.191 and p value as 0.026 respectively.

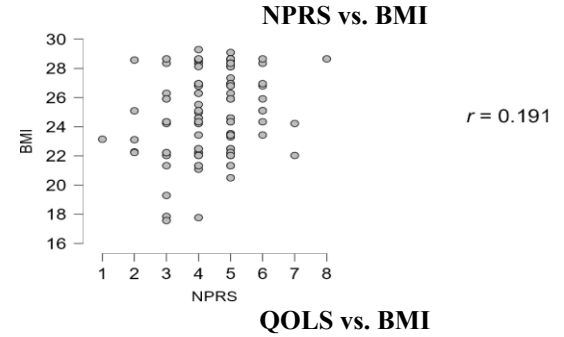
The correlation between BMI scores and NPRS the Pearson show r value as 0.191 and p value as 0.026 respectively means that there is a weak positive relationship between the two variables. This means that as BMI scores increase, NPRS the Pearson show r values also tend to increase. However, the p value indicates that this relationship is not statistically significant, which means that other factors may be influencing the NPRS the Pearson show r values.

- In the correlation between BMI scores and QOLS the Pearson show r value as -0.062 and p value as 0.472

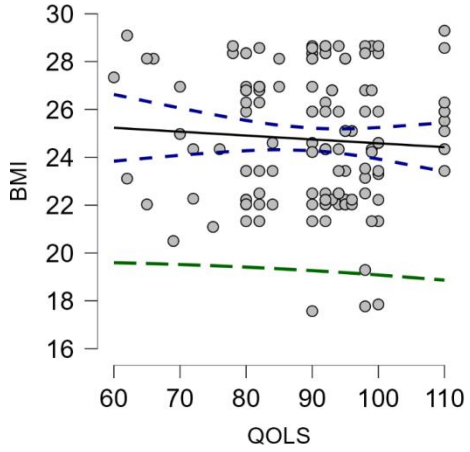
The correlation between BMI scores and QOLS the Pearson show r value as -0.062 and p value as 0.472 means that there is a weak negative relationship between the two variables. This means that as BMI scores increase, QOLS the Pearson show r values tend to decrease. However, the p value indicates that this relationship is not statistically significant, which means that other factors may be influencing the QOLS the Pearson show r values.

Scatter plots





QOLS vs. BMI



r = -0.062

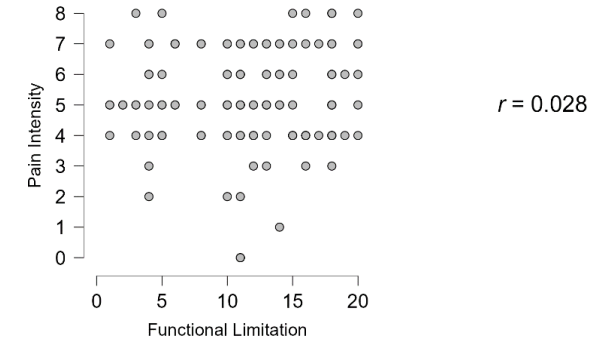
Pearson's Correlations				
			Pearson's r	**P**
Functional Limitation	-	Pain Intensity	0.028	0.745
Functional Limitation	-	Personal Appearance	-0.002	0.980
Functional Limitation	-	Work/ Leisure	-0.049	0.575
Pain Intensity	-	Personal Appearance	-0.069	0.424
Pain Intensity	-	Work/ Leisure	0.104	0.229
Personal Appearance	-	Work/ Leisure	-0.072	0.403
* p < .05, ** p < .01, *** p < .001				

IV. Correlation

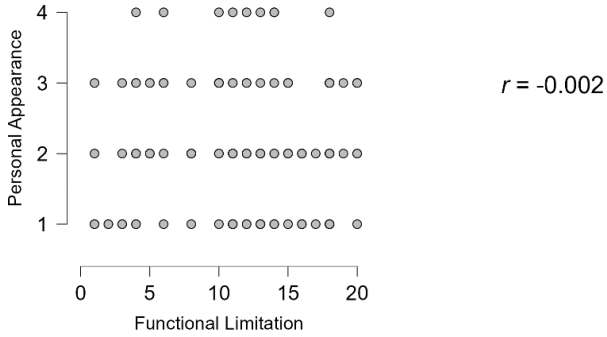
- In the correlation between Functional limitation scores and pain intensity the Pearson show r value as 0.028 and p value as 0.745 respectively, which means it means that the two variables are not correlated.
- In the correlation between Functional limitation scores and personal appearance the Pearson show r value as -0.002 and p value as 0.980 respectively, which means that there is a very weak negative correlation between the two variables, and that this relationship is not statistically significant.
- In the correlation between Functional limitation scores and work/leisure score the Pearson show r value as -0.049 and p value as 0.575 respectively suggests that there is no real relationship between the two variables. The p-value (0.575) also indicates that there is no statistically significant relationship between the two variables.
- In the correlation between Functional limitation scores and personal appearance the Pearson show r value as 0.158 and p value as 0.002 respectively means that there is a slight relationship between the two variables, but that this relationship is not likely to occur by chance.
- In the correlation between pain intensity scores and personal appearance the Pearson show r value as -0.069 and p value as 0.424 respectively means is not statistically significant, as shown by the p value. The r value of -0.069 indicates a very weak negative correlation between the two variables.
- In the correlation between pain intensity work leisure scores and QOLS score the Pearson show r value as 0.104 and p value as 0.229 respectively shows the r value of 0.104 indicates a very weak positive correlation between pain intensity and quality of life scores, while the p value of 0.229 indicates that this correlation is not statistically significant.
- In the correlation between personal appearance and work leisure scores and QOLS score the Pearson show r value as -0.072 and p value as 0.403respectively shows the r value of -0.072 indicates a very weak negative correlation between the two variables, and the p value of 0.403 indicates that this relationship is not statistically significant.

Scatter plots

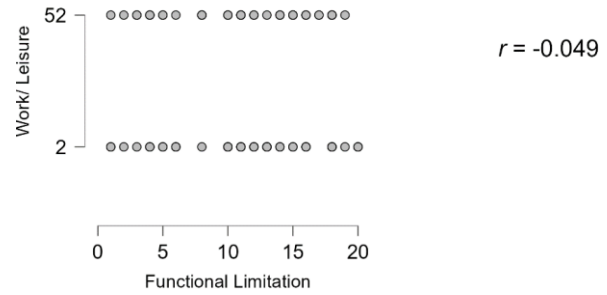
Functional Limitation vs. Pain Intensity



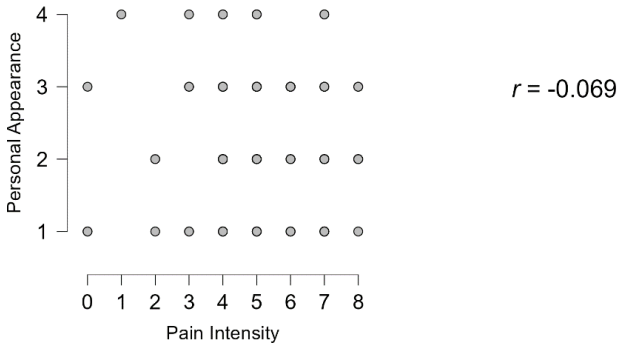
Functional Limitation vs. Personal Appearance



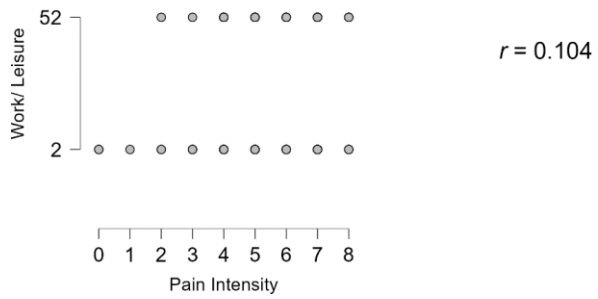
Functional Limitation vs. Work/ Leisure



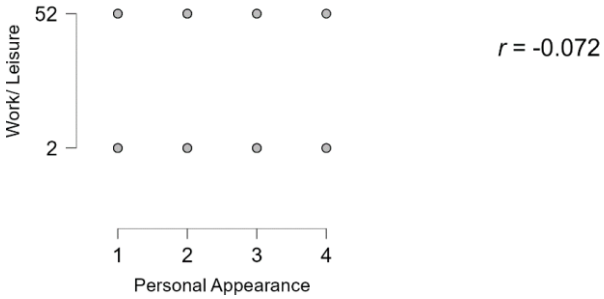
Pain Intensity vs. Personal Appearance



Pain Intensity vs. Work/ Leisure



Personal Appearance vs. Work/ Leisure



Discussion: We got 530 samples recorded for this study and 394samples have been excluded as per the exclusion criteria and 136 samples fulfilled inclusion criteria has been analysed.There has been an increase in the number of people suffering from plantar fasciitis in recent years. This condition is more common in middle-aged adults, and can have a significant impact on their quality of life. The pain associated with the condition can make it difficult to walk, stand, or even sleep. This can lead to difficulty performing everyday activities, and can also cause problems at work.The risk factors that have been seen are high body mass index [BMI] or weight gain, excessive running, prolonged standing/ walking occupations, work-related weight bearing activities, limited ankle dorsiflexion, pes cavus and pes planus. Along with these we also considered life style disorders such as diabetes, obesity, cancer and cardiovascular diseases. In the survey 70% female and80% of male were diabetic population.

The reason for the higher prevalence of plantar fasciitis and their impact on quality of life in our study may be due to the following reasons:

1. **Age**: The mean age of the patients with symptoms of plantar fasciitis in our study was 46.04. This may be due to the fact that as the age increases, the wear and tear Repetitive micro tears that cause a localised inflammatory reaction without having an impact on the body's tissues systemically lead to plantar fascia degenerationwhich results in the symptoms of plantar fasciitis.
2. **Sex**: In our study, the maximum numbers of patients with symptoms of plantar fasciitis were females (67) and the minimum numbers of patients with plantar fasciitis were males (53).This suggests that symptoms of plantar fasciitis were more in females compared to males. This may be due to the fact that in females, the weight of the abdomen increases which leads to the symptoms of plantar fasciitis.
3. **Obesity**: In our study, the maximum numbers of patients with symptoms of plantar fasciitis were obese. This suggests that symptoms of plantar fasciitis were more in obese patients compared to non-obese patients. This may be due to two mechanisms, first the added strain on the tendons encourages structural changes and inflammation. Secondly the cellular function of chondrocytes and tenocytes is disrupted by a number of adipose tissue hormones, including adipokines, lipocalin-1, serum amyloid A-3, and adiponectin, which may result in tendon disruption.
4. **Hypertension/ Cardiovascular issues**: In our study, some patients presented with symptoms of plantar fasciitis were hypertensiveThis might be because people with hypertension have fewer capillaries per unit of surface area, which results in less blood flow causing the pressure in the vessels increases ultimately leading to tendon overuse and damage. Which in turn results in the symptoms of plantar fasciitis.

5. **Diabetes**: The majority of the participants in our study who had plantar fasciitis symptoms were diabetics. This may be because the PF is associated with Advanced glycation end-products in diabetic people (AGEs). Collagen crosslinking brought on by AGEs eventually results in altered collagen structures and consequent mechanical dysfunction.Reduced tendon neovascularization is related to DM. Reduced capillary density per unit of surface area results in decreased blood flow, which promotes the formation of vessels and nerves ultimately leading to tendon overuse and damage.

6. **Sedentary lifestyle**: Patients with sedentary lifestyle had more at risk factor to developing PF than compared to patients with activelifestyle. This may be due to the fact that when an individual has sedentary lifestyle, there is increase in cholesterol and adic uric deposition, low grade inflammation, and chances of plantar fascia stiffening leading to plantar fasciitis.

In our study the results indicates that there is a weak positive relationship betweenBMI scores and NPRS, weak negative relationship betweenBMI scores and QOLS, no relationship betweenNPRS scores and QOLS.

The average functional limitation for females is slightly higher than for males, but the difference is not statistically significant. There is a skew in the data for females in terms of functional limitation, pain intensity, and personal appearance. For males, there is a skew in the data for functional limitation, but it is not as pronounced as it is for females. Which means majority of females have lower pain intensity scores than the majority of males, females with lower personal appearance score and more males with higher personal appearance score, females are working and less males are working and that there is more variability in the functional limitations of females than males.And on an average both middle aged females and males were affected.

This study indicates that there is a weak relationship between plantar fasciitis and lifestyle disorders but NPRS of people with high blood pressure is 4.125, and the standard deviation is 0.991. This means that the average NPRS of people with high blood pressure is slightly higher than the general population, The mean NPRS of people with arthritis is 6.000, and the standard deviation is 2.828. This means that the average NPRS of people with arthritis is lower than the general population, but the range is relatively large.The NPRS of people with diabetes is 4.667, and the standard deviation is 1.528. This means that the average NPRS of people with diabetes is slightly higher than the general population, but the range is relatively small.The mean QOLS of people with high blood pressure is 88.375, and the standard deviation is 12.177. This means that the average QOLS of people with high blood pressure is slightly higher than the general population, but the range is relatively small.The mean QOLS of people with diabetes is 87.333, and the standard deviation is 13.279. This means that the average QOLS of people with diabetes is slightly lower than the general population, but the range is relatively small.The mean QOLS of people with arthritis is 90.000, and the standard deviation is 0.000. This means that the average QOLS of people with arthritis is the same as the general population, but the range is very small which does show that plantar fasciitis even though not significant but impacts quality of life.

If we were to talk about the limitations of the study sample size it was difficult to segregate plantar fasciitis from heel pain in a self reported data, a greater sample size would give us a better outlook of the correlation. The questionnaire being a self-reported data is one other limitation. Further studies need to be made based on more objective outcome measures.

V. **Conclusion**:

According to this study, middle-aged adults commonly have plantar fasciitis, plantar fasciosis, or plantar heel pain. Lifestyle disorders are associated with a high prevalence of plantar fasciitis, plantar fasciosis, or plantar heel pain, according to observed patterns of relationship.The conclusion derived from the above study is that BMI is not a significant predictor of QOLS. However, other factors such as NPRS may be influencing QOLS scores, BMI is weakly positively correlated with NPRS but this relationship is not statistically significant. There is also no relationship between NPRS scores and QOLS.

Significant impact on a middle aged individual's quality of life and this impact is even stronger for those who are overweight or obese, and that there is a significant correlation between plantar fasciitis and lifestyle disorders. Primary care therapies should target more broad physical and psychological problems that may potentially operate as barriers to treatment adherence and recovery in addition to targeted management of food-specific issues.

Abbrevations: PF- Plantar fasciitis,BMI- Body Mass Index,NPRS- Numerical Pain Rating scale,MFPDI- Manchester foot pain disability index,QOLS- Quality of life scale,WHO- World health organization,PHP- Plantar heel pain,AGEs- Advanced glycation end products,DM- Diabetes mellitus.

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