Investigating the Impact of Foot Pain on the Lifestyle using Statistical and Machine Learning Approaches

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Abstract

Foot pain and problems have a direct impact the quality of human life. Such issues may affect the foot and other associated functions. The foot problems can be caused due to multiple factors. The use of predictive algorithms utilizing the electronic health records of the patients and data acquired from other sources is helping the healthcare industry to develop tools that are very helpful in diagnosis and prognosis. Professional physiotherapists have been consulted for restructuring of Foot Health Status Questionnaire (FHSQ). Machine learning model and foot disorder predictive algorithm based on the real-world data collected from the foot disorder patients has been developed that is able to accurately diagnose the foot problem of patient. The machine learning methods Gaussian Naive Bayes (GaussianNB), Random Forest, XGBoost, Logistic Regression (LR), K-Nearest Neighbors (KNN), Decision Tree (DT) and AdaBoost have been applied to predict foot disorders. A statistical analysis has been performed for finding the association between foot disorders and other variables. The results of the study have provided useful results about the association of variables and the frequency charts and tables provide useful description of general trends of the society towards the foot functionality and problems as well. Strong association is found among various factors and foot pain.

Keywords: Foot Health; Lifestyle; Foot Pain; Machine learning; Prediction; Statistical Analysis.

Introduction

The human body relies on the foot's functionality for support, balance, and motion, making it a crucial aspect of overall body. Maintaining good foot health is directly linked to a person's quality of life. (López et al., 2018). There is weak diagnostics of feet diseases patients, which sometime leads to disability and incorrect medical treatment. The complex disorders demand for the personalized medications and treatment system that is not possible using traditional diagnostic methods. The

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variables associated with the prevalence of the foot disorders are complex and vary in nature in different geographical distributions. The secondary causes of the foot problems may vary in Southeast Asia and Europe. The variations may occur within different populations situated in the same geographical regions, such as, the reasons for the problems of the foot may vary in the student and nursing population in Rawalpindi. The similarity of the symptoms, inability of the patient to communicate properly with the doctor, complex nature of the symptoms, comorbidities and a lot of other factors make the diagnosis of foot related problems difficult.

In this study by answering this question, what is the impact of statistical and machine learning models for diagnostic of feet diseases? The study is achieving the objectives to identify the population and occupation characteristics that can impact the foot health, to develop predictive models for diagnosis of foot disease using ML, to perform statistical analysis of the data acquired through questioners to find the association between variables related to foot disorders and quality of life. As mentioned previously, the quality of life and foot health is strongly associated. There are multiple factors that are associated with the foot health, these factors are, employment type, number of standing hours, weight, BMI, and type of footwear. The foot problems seem to have a negative impact on quality-of-life related foot health (López et al., 2021). There is an increasing trend for the development of predictive algorithms in the field of healthcare and medicine learning. The complexity of diseases and prevalence patterns in different populations are forcing the healthcare staff to use computer programs and machine learning algorithms. Various diseases should be identified in early stages, to start appropriate treatment otherwise the diseases can adopt a shape that make them in-curable and even deadly (Jayatilake & Ganegoda, 2021). Due to this reason, there exists a strong need for the analysis of complex medical data, health records, and images captured from the medical imaging techniques.

The researchers have further added that there are various scenarios in which there is a requirement for the detailed analysis of the data for the identification of underlying abnormalities and for the study of complex relationships that are not visible or identifiable by the human beings (Jayatilake & Ganegoda, 2021). In such situations, the machine learning algorithms are employed to systematically predict the diagnosis as well as the appropriate treatment based on various socio-physiological factors. When a human beings walk normally for 1 kilometer, there is an increase of about 15 percent pressure on the foot, only 5 percent of entire body surface, the pressure that applies force produces stress or strain in the tissues (Sanz et al., 2018).

An observational cross-sectional quantitative study conducted in 2018 on university students in Spain (Chae et al., 2020). The basic objective of the research is to identify the nature of relationship of foot dysfunction with quality of life. In total 112 students are recruited between the ages of 18-33 years old (median age 22) in which self-reported data is collected and the scores obtained through FHSQ are compared.

A deep learning approach implemented for the classification of the foot by using the heterogeneous pressure data (Tojo et al., 2018). K-Nearest Neighbors (KNN) and fine-tuned VGG16 models are used and combined to generate a more refined and accurate model.

Another research that is based on a questionnaire (cross-sectional) at university hospital of Japan to determine the frequency and related factors of foot and ankle pain among nursing population (Chien et al., 2019). Factors like footwear, age, body mass index and job nature of prolonged standing for many hours are found to be related with foot and ankle pain. Plantar Fasciitis is one of the common foot problems in adults and causes many conditions associated with the foot pain. The current method of detection of the foot dis-orders uses the medical history of the patient and physical examination (Waters & Dick, 2015). The researchers have utilized the approach of deep learning method for the detection of Plantar Fasciitis. A deep learning algorithm architecture is combined with the thermal imaging to develop a smart system of the decision that predicts that the patient has the condition or not.

A cross-sectional online survey is conducted to study the risk factors such as per-sonal health characteristics and lifestyle which could be associated with foot dysfunctions that may affect the health and condition of foot and associated quality of life in an educated population of Glasgow Caledonian University in UK (Hendry et al., 2018). The prediction ability of the machine learning and artificial intelligence is being utilized for the analysis to predict the requirement and need of foot orthotics in the patients with the early stages of the stroke (Choo et al., 2021). A total number of 474 patients are recruited for this purpose.

The selection of footwear has got a long-term impact on the posture, as well as the health of the lower limb. In case the footwear is not proper, the overall balancing functionality of the lower limb is affected. Foot screening done by automated pervasive methods have a huge potential for the detection of the abnormalities of the foot and other problems (Mei et al., 2020). The normal, caves, and planar foot type are distinguished using the sensors, and the data collected through the sensors is processed through one dimensional convolutional neural network. A cross-sectional study is conducted on 333 females aged between 18- 25 years DPT final year students at Dow university of Karachi to study the

association between shoe wear and foot pain and the frequency of foot pain (Khan et al., 2019). The data is collected through self-administered questionnaire containing questions regarding footwear and foot pain.

Methodology

Population Sample Size and Nature

The first and foremost thing is the calculation of the sample size. Various detailed methods are available for the calculation of the sample size. In this study the Epitool calculator is used to determine the sample size. Epitools contains the epidemiological calculators, diagnostic tests, and the tools available for the epidemiologists and other professionals working on the prevalence of the diseases. The desired estimated precision and the confidence level is specified. The proposed sample size came to be 324.

Questionnaire

The questionnaire contains the demographics related questions that are based on age gender, and education. BMI of the participants is calculated using the height and weight. The questionnaire contains the simplified foot behavior questions that include foot problem, foot problem region and number of standing hours. The questions related to the difficulty in the walking, performing tasks, and more importantly the type of footwear that the participants normally wear is also asked. Numeric Pain Rating Scale (NPRS 11) is generally used to study the intensity of pain (Jones et al., 2007). And the numeric pain scale rating is categorized as No Pain, Mild, Moderate, and Severe Pain as shown in the Figure 1.

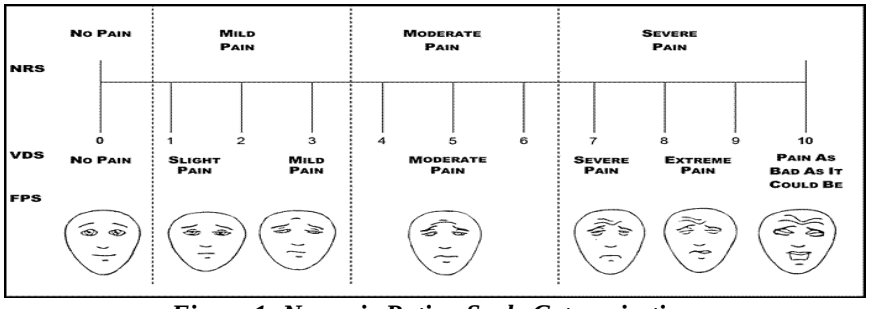

Figure 1: Numeric Rating Scale Categorization.

Statistical Analysis

The statistical analysis of the data is done using IBM SPSS. The main types of the statistical analysis done is the frequency distribution

study and chi-square test for finding the association between the variables. Among the population studied, the highest number and the percentage belonged to the young people having the age of 25-30 years. 113 individuals (34%) percent of the population belonged to the age group of 25-30 years. Figure 2 shows the distribution of population according to the age group.

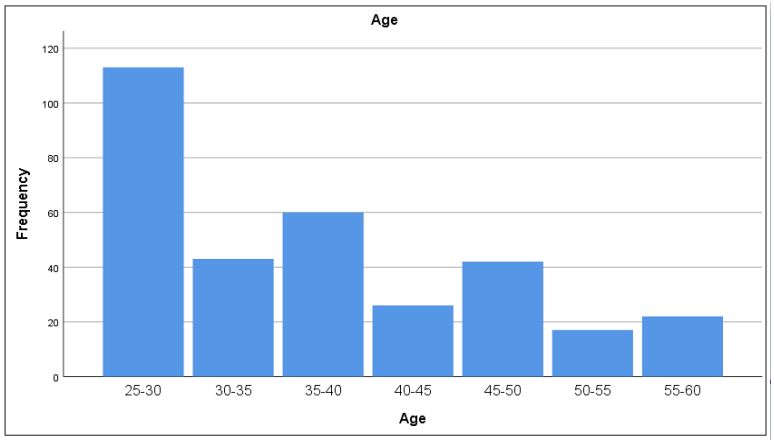

Figure 2. Age wise distribution of the population.

The occupation wise distribution of the population has been presented in Figure 3. The highest number of individuals belonged to the category of housewives. Out of the total population of 324 individuals, 119 are housewives.

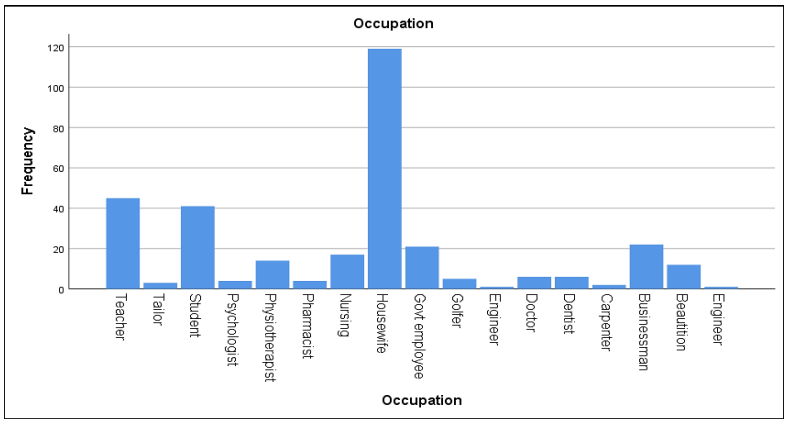

Figure 3. Occupation wise distribution of the population.

Similarly, the education wise distribution of the population has been presented in Figure 4, from educational perspective, most of the population is graduate.

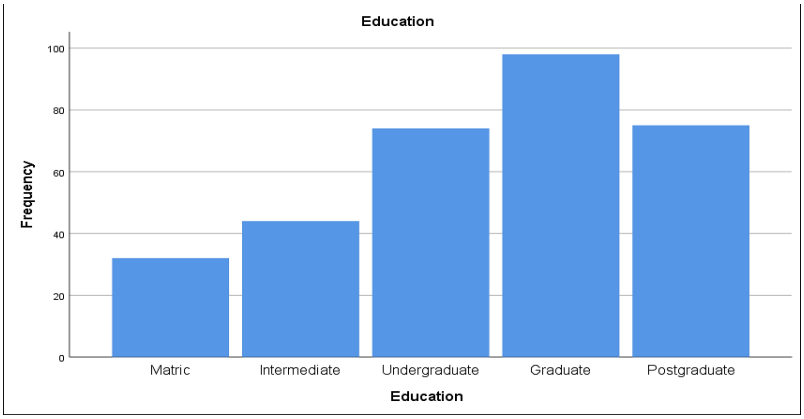

Figure 4. Education wise distribution of the population.

The trend of the foot problems prevalence has been shown in the form of percentages in Table 1.

Table 1. Foot problem prevalence in the population represented in the form of percentages.

Foot Problem	Frequency	Percentage
Heel Pain	193	59.2%
Ankle pain	79	24.2%
Ankle sprain	23	7.1%
Nail Problem	28	8.6%
Metatarsalgia	68	20.9%
Flat feet	28	8.6%
Pes Cavus	6	1.8%
Edema	55	16.9%
Others	9	2.8%

The survey showed that 59.2% of the participants had heel pain, making this the most reported foot complaint. This finding implies that heel pain is a frequent health issue and might need treatment.

Ankle pain is also considered an essential area, with 24.2% of the overall participants complaining of this pain. This percentage, while lower than heel pain, shows that ankle pain is another kind of foot pain problem. Consequently, the survey's findings can be of practical use to healthcare (HC) professionals and researchers who observe foot issues and try to assist in successfully treating patients. It also stresses the need to help

people learn how to avoid and prevent foot issues to minimize risks and inflammation.

Associating Foot Disorders with Pain Intensity

In this section the association of foot problems with foot pain intensity and frequency has been explained. Table 2 relates the percentage of the foot problem with the percentage of foot pain. In simple words, the response of the participants who have reported a foot problem and the level of pain they felt have been reported.

Table 2. Foot pain and the foot problems association.

NPRS Scale	Foot Problems								
	Heel pain	Ankle pain	Ankle sprain	Nail problem	Metatarsal Pain	Flat feet	Pes Cavus	Edema	Others
None	43.5%	17.4%	0.0%	21.7%	13%	4.3%	0.0%	13.0%	4.3%
Mild	60.2%	24.1%	6.0%	8.4%	8.4%	4.8%	4.8%	16.9%	0.0%
Moderate	59.9%	23.7%	7.2%	6.6%	24.3%	10.5%	0.7%	17.1%	3.3%
Severe	64.6%	29.2%	10.8%	9.2%	32.3%	10.8%	1.5%	18.5%	4.6%
Total	193	79	23	28	68	28	6	55	9
p value	0.224	0.336	0.101	0.370	0.000	0.091	0.303	0.640	0.205

The p values for the individual case have been reported. The highest cases of foot problems reported in this study belongs to the category of Heel pain, and the percentage recorded is 43.5%. And 64.6% of the respondents stated that they have felt severe pain, but the p-value calculated for this case is 0.224 which shows that there are 20 percent chances of the correctness of the null hypothesis. And the null hypothesis in this case is there is no association between foot pain and foot problems. The p-values in case of Metatarsalgia and flat feet are less than 0.005 which shows the significant association.

Associating Foot Disorders with Pain Frequency

Table 3 aimed to investigate the relationship between foot pain frequency and foot problems. The table presents the percentage of respondents who reported experiencing heel pain and always feeling pain, as well as the p-value calculated for this case. According to Table 3, 69.8% of respondents who reported heel pain also stated that they always feel pain. This finding suggests that there may be a significant association between heel pain frequency and the experience of always feeling pain. However, the p-value of 0.075 is higher than the standard threshold of 0.05, indicating that this association may not be statistically significant.

Table 3 also reports the p-values for other foot problems, which show mixed strength of association between the variables. Overall, these findings suggest that there may be a complex relationship between foot

pain frequency and foot problems. Further research is needed to explore these associations in more detail and to identify potential risk factors and interventions that may help to alleviate foot pain and improve foot health.

Table 3. Association between foot problems and frequency of pain.

Frequency of pain	Foot Problems								
	Heel pain	Ankle pain	Ankle sprain	Nail problem	Metatarsal pain	Flat feet	Pes Cavus	Edema	Others
Never	27.3%	18.2%	0.0%	27.3%	18.2%	0.0%	9.1%	9.1%	9.1%
Occasionally	58.9%	16.8%	6.3%	9.5%	6.3%	3.2%	3.2%	13.7%	1.1%
Fairly many times	53.1%	20.4%	10.2%	6.1%	18.4%	10.2%	2.0%	18.4%	2.0%
Very often	61.0%	36.2%	9.5%	5.7%	27.6%	10.5%	1.0%	20.0%	1.9%
Always	69.8%	20.6%	3.2%	11.1%	34.9%	14.3%	0.0%	17.5%	6.3%
Total	193	79	23	28	68	28	6	55	9
P value	0.075	0.018	0.400	0.140	0.00	0.100	0.222	0.741	0.197

Associating Foot Disorders with Maximum Standing Hours

Association between the hours of standing and the foot problems is also studied. It is highly possible that the people who stand a lot during whole day may have suffered from any of the foot problem that has been studied in this study. The continuous even or uneven load on the foot may result in the development of any foot problem. The problem may get severe for the people who have high weight and are obese. 63.2% of the participants who have reported heel pain are standing more than 8 hours per day, and the level of association is significant ($p = 0.003$). 31.6% of the population who has reported Metatarsalgia is standing for more than 8 hours.

There are high chances of the occurrence of foot pain among the people who stand for long hours. Adverse foot health effects have been associated with the prolonged standing. Figure 5 shows the association between foot pain frequency and number of standing hours. In Figure 5 people standing for 7-8 hours have stated that they have “Often” felt pain in the feet.

Associating Foot Health with Occupation

The occupation directly and indirectly affects the quality of life as well as the health of people. People working in the radiation environments are likely to develop certain health related conditions, and people who have got work intensive jobs get affected from the stress. The occupation plays a critical role in defining the health status of a person. The job descriptions of the people belonging to different professions vary a lot, such as the restaurant staff and managers, and gas station staff or beauticians have their role which requires continuous standing. The study focuses on finding the association between foot health and occupation. The

focus of the research is to determine that foot health of the individuals get affected by the occupation or not. Figure 6 shows the level of foot pain that the participants have experience during the last week, and the response of the participants has been grouped according to the occupation of the participants.

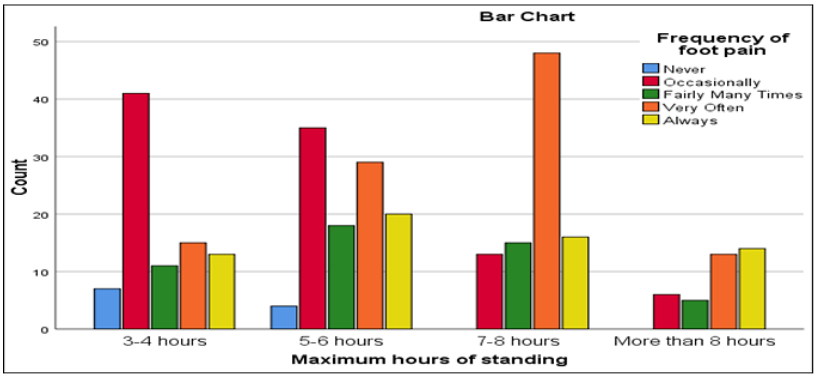

Figure 5. Frequency of foot pain association with the Maximum standing hours.

The highest population in the current sample is of housewives. And most of the housewives experienced moderate, and a considerable number of housewives experience severe pains. The reason that the occupation has got a relevancy in determining the foot health is because of the reason that if the job requires long standing hours, then foot health can be affected. People usually stand in different postures while working, and continuously the load is transmitted to the feet, and some of the loads produce deformations that can cause various problems of foot. In Figure 7, the occupation and standing hours are plotted together.

The study indicates that a significant number of housewives must stand for long hours, with most of them standing up to 5-6 hours, while a considerable number stands for 7-8 hours. This result suggests that housewives are prone to developing some ailments associated withstanding for prolonged periods. Inspection of the p-values indicates that the duration of standing is significantly related to the participant's level of pain experience. This association simply means that standing for several hours could cause discomfort in the legs, back, and neck regions, as mentioned above, to moderate to severe levels.

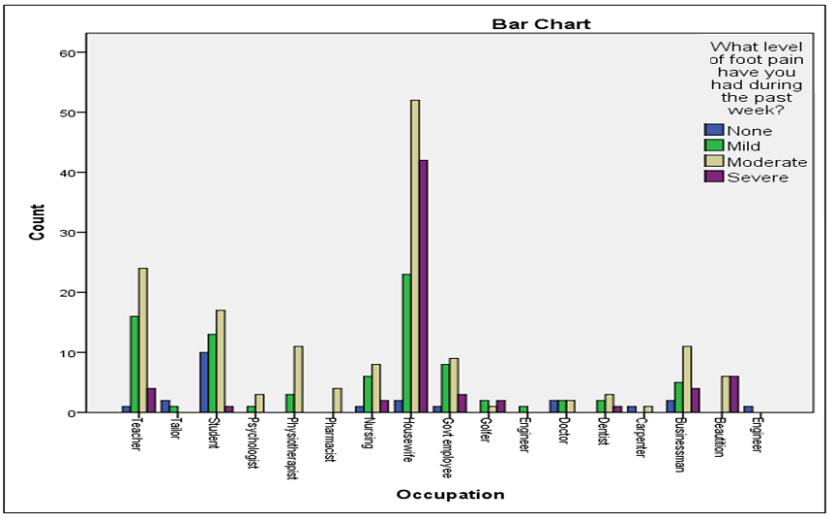

Figure 6. Association between occupation and foot pain experienced.

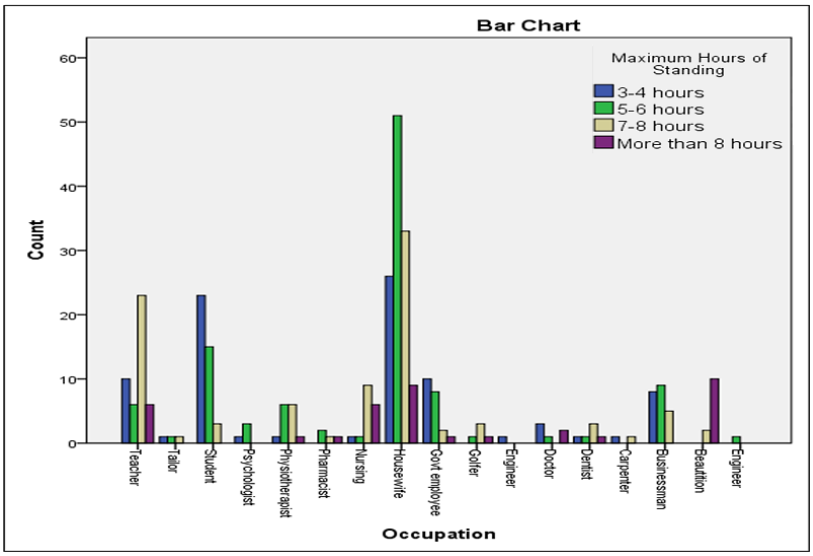

Figure 7. Maximum standing hours and occupation.

What is more impressive is that 14 out of 17 participants with standing occupations described moderate to severe pain. This clearly implies the need to institute measures that will decrease the time one spends standing and give support to those who have no option but to spend their time on their feet.

In general, the study demonstrates that policymakers need to consider the risk factors associated with prolonged standing to health when espousing policies that will enhance the welfare of those who spend long hours on their feet at their places of work. Measures should be taken to decrease the standing time of these persons further and offer them support to help significantly improve their health.

Associating Foot Health with Footwear

The type of footwear generally defines the overall posture, walking style, therefore the loading patterns as well. There are certain occupations and office requirement that define the type of footwear for the persons that work in that vicinity. In the office people usually wear formal shoes, that are flatter in shape and the housewives wear different types of shoes that are not comfortable and suitable from bio-mechanics point of view. Figure 8 shows the different types of footwear that participants usually wear, and the intensity of pain experienced by the participants.

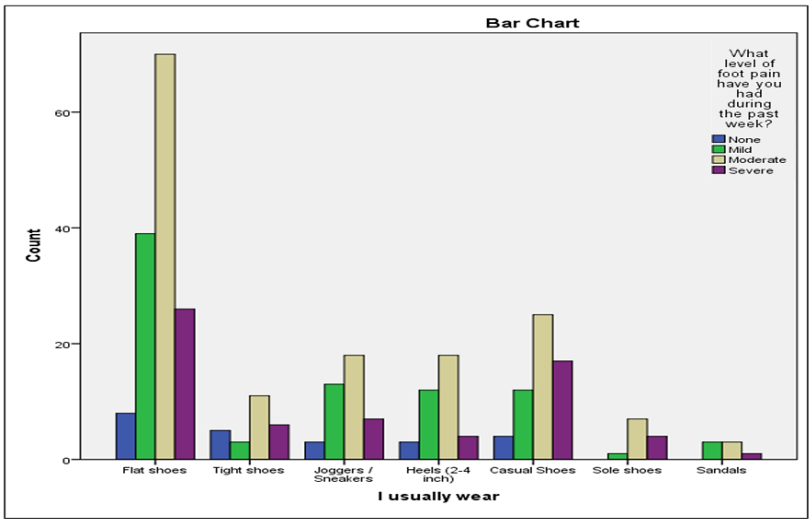

Figure 8. Association between footwear and foot pain.

The count of the people that have experienced moderate to severe pain mostly wore flat shoes. The flat shoes are not recommended for good foot mobility. Figure 9 give insight about the frequency of pain that occurred and the type of footwear that participants usually wear. From the graph it is visible that the highest count of people who stated that they feel pain ‘always’, ‘very often’, and fairly many times used to wear flat shoes.

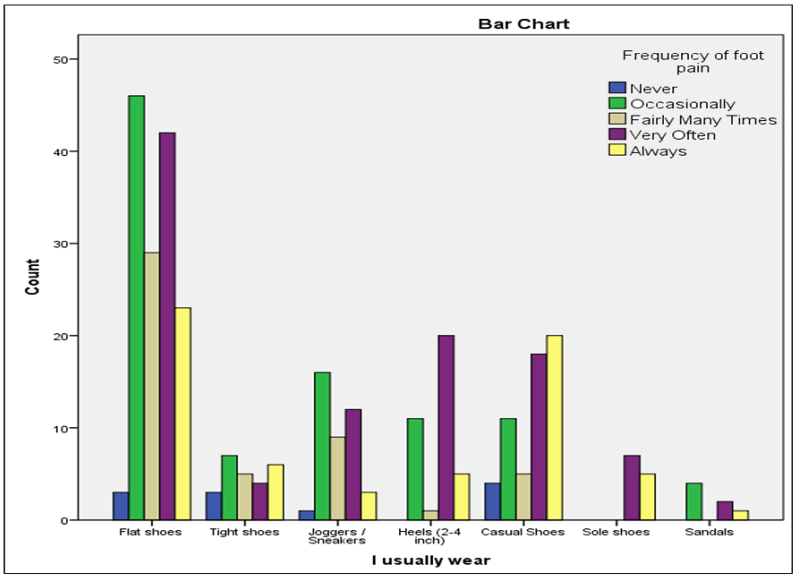

Figure 9. Type of footwear and frequency of the pain

Automatic detection of foot pain using Machine Learning

Machine learning methods have been applied to predict foot disorders. Machine learning is a type of artificial intelligence that allows computer systems to learn and improve from experience without being explicitly programmed.

The Dataset

To train machine learning models to predict foot disorders, the dataset is randomly split into two parts: the training dataset and the testing dataset. The training dataset, which contains 75% of the total data, is used to train the machine learning model. When training is done, the algorithm takes its time and evaluates the information given before identifying the various characteristic patterns of each foot disorder. After that, the model is used to test the testing dataset, which is 25% of the overall data. The model, when implemented, is tested with the testing dataset to compare the results. The model's performance is based on the parameters, where different methods like accuracy, precision, recall, and F1 Score are employed.

Data Pre-processing

Afterwards, the features are obtained while the data is preprocessed using a machine-learning model. For this, data cleaning may involve normalization; to manage the categorical values in the data, the

Label Encoder technique is used. This technique transforms the categorical labels into machine-readable numeric form, enabling the machine-learning algorithms to analyze and make decisions regarding these variables.

Feature selection

Feature selection is simply to determine on which features one must perform the test for foot pain. These are age, gender, BMI, shoe type, occupation, weight, intensity of pain, frequency of pain, standing hours etc.

Machine Learning Models

To predict the disorders of the foot, different parameters of machine learning algorithms are used as follows: Random Forest Classifier with max depth of 4 and using gini criterion, XGBoost with random seed of 25 with number of threads of 10, logistic regression with solver as 'lbfgs' and maximum iteration of 3, K-nearest neighbors with n jobs of 10 and n nearest neighbours of 1, Decision Tree with criterion.

Random Forest

Random Forest is a machine learning algorithm used in classification and regression problems. It grows more than one DT and uses it as a basis for a more comprehensive model. Since the data in hand has many features, and the priority is to get high accuracy along with high robustness, the Random Forest model is used with max_depth=4 and criterion set to 'gini'.

XGBoost

In general, XGBoost has high scalability, high speed, and good accuracy. This it does using factors such as regularization learning, parallelism, and user control of trees. In XGBoost, the 'seed' parameter is used to define the same random number seed, which is particularly used to get the same results each time. The 'thread' parameter determines the number of threads that are to be used in the process of training XGBoost.

Logistic Regression (LR)

LR is a method designed for applications in binary classification problems, which involve predicting the likelihood of a binary event depending on one or multiple predictors. In this study, LR solver = 'blogs' chosen value is appropriate for high-dimensionality data. The parameter

max_iter is set to be 3 since it allows the model to have sufficient iterations on average to attain a local optimum.

K-Nearest Neighbors

KNN is known to be an instance of instance-based learning, a classification and regression technique. In KNN, the class of the new instance is identified based on the class of nearest neighbours of that instance within the training data sample. n_jobs of KNN are used to set the number of cores used during the model's training and prediction phases. The parameter n_jobs, when set to 10, will make KNN employ 10 cores on the CPU, which is highly useful when dealing with large datasets because it speeds up the training and prediction exercises. The n_neighbors parameter in KNN is the number of nearest neighbours to be considered when making the prediction. When we assign a value of 1 to n_neighbors, KNN will use the class of a single nearest neighbour to compute a prediction. This can be a good choice for problems with straight lines of decision.

Decision Tree (DT)

DTs are a kind of machine learning algorithm used to implement the purpose of classification and regression. In a DT, a given set of input features is successively split according to the value possessed by the features, till a decision is made on the class or value of the output variable. Criterion = entropy' for DTs is applied used as dealing with the classification problem, and the target is to split the classes according to categorical variables.

Gaussian NB

Gaussian NB is actually a very simple and computationally efficient approach and therefore is suitable for use on large datasets that contain many features and only a small number of training examples. It is very suitable for those problems which has continuous input variables which are normally distributed.

Ada Boost

AdaBoost is ensemble model that is used for performing classification and regression. It is another level up in the classification algorithms where weak classifiers or regressors are grouped into one powerful classifier or regressor.

Results and Discussions

It is important to note that the choice of algorithm and hyper parameters can greatly impact the accuracy and effectiveness of the prediction model. Therefore, it is essential to carefully select and fine-tune the algorithms and parameters to achieve the best possible results. The quality of life related to foot health is influenced by several factors [2] including footwear, general health, and physical activities. In a recent study, the impact of footwear, occupation, and standing hours on foot health is investigated. The results of this study showed that weight is the most important factor affecting foot health, followed by occupation.

The decision classifier presented in Table 4, showing the most important features that participated or contributed to learning. The Random Forest algorithm with a maximum depth of 4 and criterion of 'gini' is found to be the most effective in predicting foot disorders.

Table 4. Decision classifier-feature importance.

Features	Importance Order
Weight	1
Occupation	2
Age (year)	3
Height (ft.)	4
Is your foot problem diagnosed by a medical health professional?	5
It is hard to find shoes that do not hurt my feet.	6
Have your feet caused you to have difficulties in your work or activities?	7
I usually wear	8
How many hours of maximum standing you have per day?	9
How much does your foot health limit you climbing stairs?	10
Did you feel full of life?	11
Are you limited in the kind of work you could do because of your feet?	12
What level of foot pain have you had during the past week?	13
Getting up from a chair	14
Have you had any treatment for your foot problem? If yes, then what treatment.	15
How often have you had foot pain?	16
Does your health limited your ability to perform moderate activities, such as cleaning the house, lifting shopping bags, playing golf or swimming?	17
Did you feel tired?	18
In general, how would you rate your overall health?	19
Are you limited in walking long distances?	20
In general, what condition would you say your feet are in?	21
Your foot problem is improving/worsening?	22
Does your health limited your ability to perform vigorous activities, such as running, or lifting heavy objects or participate in strenuous sports?	23
How much does your foot health limit you are walking?	24
Are you limited in walking short distances?	25
Are you limited in dressing yourself?	26
Gender	27
Are you Diabetic	28

Table 4, presented in the study highlights the importance of weight in relation to foot health. This finding suggests that maintaining a healthy weight is crucial for preventing foot disorders and maintaining good foot health. Occupation is also found to have a significant impact on foot health. People who stand for long periods of time as part of their job are at an increased risk of developing foot problems. This finding emphasizes the importance of wearing appropriate footwear and taking breaks to rest the feet while on the job. In addition, the study applied machine learning to predict factors predisposing to foot disorders. The study is significant enough since the two functional parameters of weight and occupation emerged as the primary indicators under which foot disorders are likely to strike.

Obesity generates extra pressure on the feet and makes it easy to develop conditions like plantar fasciitis. Furthermore, foot disorders arising from conditions involving positional or positional strain injury can also originate from jobs involving a lot of standing, walking, or lifting due to the amount of stress placed on feet. Healthcare providers can advise the affected individuals of the appropriate shoes and foot safety measures at work, especially those who spend most of their time preparing while standing or lifting heavy items. Further, to avoid pressures that give feet a tough time, more often make sure that one takes a break and rests or performs some mild foot exercises. Healthcare workers must understand which factors are likely most strongly related to foot disorders to create effective prevention and intervention practices. When these factors have been identified, healthcare providers can intervene to increase the health of people's feet, decrease the incidence of foot diseases, and help improve patients' overall well-being.

The study's results are summarized in Figure 10 regarding weight and occupation profiles predictive of foot disorders. This visualization is useful for establishing the relevance of these factors to foot health and assisting in creating interventions and treatment plans. As a result, the aspects concerning a healthy weight, the proper type and size of shoes, and periods of rest for the feet when the person is on his/ her feet most of the time should be highlighted. By knowing the relationship between these factors and foot health, more efforts can be put into determining the extent of foot health impact on patients.

Plantar fasciitis is an extremely painful ailment of the plantar fascia region, a dense connective tissue located in the arch of the foot. The plantar fascia acts as the shock absorber of the foot arch during walking and running activity. However, when stressed and strained, micro tears begin to form within the fascia, causing inflammation and pain to develop.

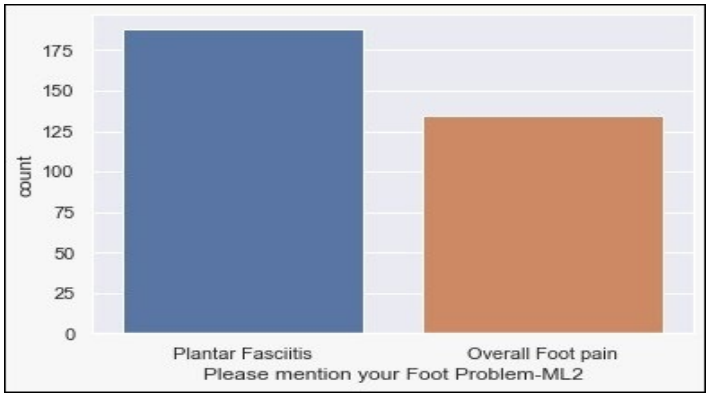

Figure 10. Foot Problem Prediction.

The main sign of plantar fasciitis is the sharp, stabbing pain in the heel that eases during the day when one is on his or her feet but worsens in the morning upon arising or after periods of immobility. The pain can also be associated with some forms of rigidity and soreness in the medial foot arch. Complicated cases cause severe pain, which may limit the affected person's ability to walk or perform daily activities. As the research conducted in the current world will show, the increase in the number of Plantar Fasciitis cases is alarming, with the current count being 175+. This means they are becoming common, and hence, there should be continued research to find a treatment that minimizes the effects of this condition.

Table 5 presents the precision and accuracy of these models, which provides valuable information regarding their efficiency and validity. These models will assist doctors and other healthcare professionals in diagnosing the cause of Plantar Fasciitis and administering a treatment plan for any patients they may be treating. Trauma to the foot can cause pain, limited movement, and even more injuries; hence, dressing it will likely give it a favorable report.

Table 5. Accuracy of machine learning methods applied.

S.No.	Algorithm	Accuracy	Precision	Recall	F1 Score
1.	GaussianNB	66.666667	67.123288	94.230769	78.400000
2.	Random Forest	65.432099	70.689655	78.846154	74.545455
3.	XGBoost	65.432099	76.086957	67.307692	71.428571
4.	LR	64.197531	65.753425	92.307692	76.800000
5.	KNN	59.259259	72.093023	59.615385	65.263158
6.	DT	58.024691	68.750000	63.461538	66.000000
7.	Ada Boost	51.851852	64.444444	55.769231	59.793814

Overall, the upswing in the causes of Plantar Fasciitis is a worrying factor, but the evolution of new models and approaches suggests better patient treatment in the future. So, we must concentrate on accurately describing this condition to enhance the quality of the existing treatments for these people.

Conclusion

The statistical tests reveal the correlation of foot health with the type of occupation, type of shoe worn and several standing hours. The numbers of reported congenital conditions and circulatory system diseases correspond with the p-values and the hypothesis. In general, this variable is a significant asset for proof of the presence of the foot problem. Weight and BMI are very important factors that determine the foot health and status of the feet. Foot disorders are correlated with pain intensity, frequency, and maximum standing hours. There also existed a relationship between foot health and shoes. The relationships depicted when the data disclosed the statistical analysis of the variables are compared to the feature highlighting or decision classifier of the machine learning. Occupation and weight have been considered the most significant factors in evaluating foot disorders.

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