Journal of Health and Rehabilitation Research 2791-156X JHRR

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Original Article

The Prevalence of Pronator Teres Syndrome among Male and Female with Type II Diabetes Mellitus

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Conflict of Interest: None.

Pinky., et al. (2024). 4(1): DOI: https://doi.org/10.61919/jhrr.v4i1.469

ABSTRACT

Background: Pronator Teres Syndrome (PTS) is a condition characterized by the entrapment of the median nerve at the elbow, often resulting in pain, numbness, and weakness in the forearm and hand. While the relationship between diabetes mellitus and peripheral neuropathies is well-established, the prevalence of PTS in individuals with Type II Diabetes Mellitus and its correlation with gender remains underexplored.

Objective: The study aimed to determine the prevalence of PTS among patients with Type II Diabetes Mellitus and to investigate the potential correlation between PTS and gender.

Methods: This cross-sectional study included 100 participants (50 males and 50 females) with Type II Diabetes Mellitus, recruited from a tertiary care facility in Sindh over a six-month period. Participants were subjected to the resisted pronation/supination test to diagnose PTS. Data were analyzed using SPSS version 25, with the Chi-square test applied to examine the correlation between PTS prevalence and gender. A p-value ≤ 0.05 was considered statistically significant.

Results: Of the 100 participants, 45 tested positive for PTS, with a slightly higher prevalence among females (24) compared to males (21). However, the statistical analysis revealed no significant correlation between PTS prevalence and gender (p-value = 0.546). The age distribution of participants showed a broad range, with the highest frequency in the 40 to 45 years and more than 60 years age groups, each constituting 22% of the sample.

Conclusion: The study concludes that there is no significant correlation between the prevalence of PTS and gender among patients with Type II Diabetes Mellitus. These findings suggest that PTS affects males and females with Type II Diabetes Mellitus equally, indicating that gender does not play a discernible role in the prevalence of PTS within this population.

Keywords: Pronator Teres Syndrome, Type II Diabetes Mellitus, Peripheral Neuropathy, Resisted Pronation/Supination Test, Gender Differences.

INTRODUCTION

The phenomenon of Pronator Teres Syndrome (PTS) epitomizes a clinical condition characterized by the entrapment of the median nerve at the elbow, primarily facilitated by the Pronator Teres muscle. This condition is distinguished by the anatomical configuration of the pronator muscle, which consists of a larger humeral head originating from the superior part of the medial epicondyle and a smaller ulnar head emanating from the coronoid process of the ulna. Such anatomical predispositions contribute to the majority (66%) of PTS occurrences, with the muscle descending towards the forearm to join the radial shaft in forming a common flexor tendon. Notably, in a significant proportion of cases (74% to 82%), the median nerve is entrapped between these two heads before their convergence (3). When juxtaposed with Carpal Tunnel Syndrome (CTS)—the compression of the median nerve at the wrist—and Anterior Interosseous Syndrome, which involves the injury to the anterior interosseous branch of the median nerve, PTS emerges as a less common but distinct entity. Despite its lower prevalence, PTS accounts for 9.2% of median nerve entrapment cases, making it the second leading cause of median nerve compression (5). The demographic profile of PTS patients reveals a higher incidence in women over the age of 40 and a propensity for the condition to manifest in the dominant arm. The syndrome is notably

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prevalent among individuals engaged in activities that necessitate prolonged or repetitive forearm pronation, such as tennis players, mechanics, carpenters, weightlifters, assembly line workers, and rowers (7).

The etiology of PTS primarily revolves around extended or repetitive forearm pronation, leading to swollen and inflamed structures around the elbow, with the deep fascia of the superficial head of the Pronator Teres Muscle (PTM) also potentially contributing to nerve compression. Additionally, trauma to the forearm, alongside bony abnormalities, tumors, or fibrous and scar tissue bands, can precipitate this condition (9). Importantly, Diabetes Mellitus and Hypothyroidism are identified as significant risk factors, with up to a third of diabetic patients experiencing an entrapment syndrome. Elevated blood glucose levels can induce glycosylation of tendons, diminishing muscle strength and exacerbating pain and sensory impairment. Concurrently, severe and untreated hypothyroidism can lead to peripheral neuropathy and tissue swelling, further increasing the risk of nerve compression (10).

Clinically, PTS manifests through symptoms such as tingling and numbness in the radial third and half finger, arm or hand weakness, and a throbbing forearm pain that intensifies with activity but subsides with rest. These symptoms may also be accompanied by a sense of clumsiness or a weakened pincer grasp. Diagnostic indicators of PTS include forearm pain, a positive Tinel sign over the proximal border of the PTM, and tenderness over the PTM itself (11). Diagnostic procedures encompass X-rays, magnetic resonance imaging, nerve conduction studies, and electromyography, complemented by physiotherapeutic assessments including the Resisted Pronation test, Supination test, Pronator compression test, and Pronator teres syndrome test (12). Treatment modalities vary, with conservative approaches such as splinting and exercises, including Pronator stretching, proving effective for 50-70% of patients, and up to 90% responding favorably to a combination of conservative treatments (8). Surgical interventions may involve the examination and release of the median nerve in the forearm and the alleviation of compressive structures (13).

The literature review underscores a paucity of data regarding the prevalence of PTS among male and female patients with Type II Diabetes Mellitus, thus highlighting a significant gap in understanding the correlation between gender and the incidence of PTS in this demographic. This research endeavor aims to elucidate the frequency of PTS and its gender correlations among individuals with Type II diabetes, addressing the current knowledge deficit. By shedding light on the gender-specific prevalence of PTS in diabetic patients, this study endeavors to pave the way for enhanced preventive and therapeutic interventions, ultimately contributing to improved patient outcomes in the future.

MATERIAL AND METHODS

This research was meticulously executed over a span of six months at a tertiary care facility located in Sindh, focusing on the evaluation of Pronator Teres Syndrome (PTS) among patients suffering from Type II Diabetes Mellitus. The study incorporated a total of 100 individuals, evenly divided by gender with 50 males and 50 females, all of whom were above the age of 40. Selection of participants was carried out using convenience sampling, a non-probability sampling technique, ensuring the inclusion of a representative demographic cross-section pertinent to the study objectives. Prior to their enrollment, all participants were provided with a comprehensive overview of the study's aims and methodologies, ensuring informed consent was duly obtained in alignment with ethical research practices. The exclusion criteria were meticulously defined to omit individuals with psychological disorders, those with a history of previous fractures, and pregnant females, thereby minimizing confounding variables that could potentially skew the study's findings (14).

The methodological approach for data collection entailed the application of Resistive Pronation/Supination Tests, designed to identify the presence of PTS among participants. During the assessment, patients were instructed to position their elbow at a 90-degree flexion, maintaining this posture while a therapist, adopting a stabilizing role, engaged with the patient in a handshake position. The therapist then endeavored to supinate the patient's forearm while concurrently extending the elbow. The outcome of this test was dichotomously classified, with patients experiencing pain during the procedure identified as positive for PTS, while the absence of pain denoted a negative result (15).

In adherence to the ethical considerations paramount in medical research, the study was conducted in strict compliance with the Declaration of Helsinki, ensuring the protection of participant rights, safety, and well-being throughout the research process. This commitment to ethical standards was further evidenced by the rigorous process of obtaining informed consent from all participants, thereby upholding the principles of autonomy and respect.

The statistical analysis of the gathered data was conducted utilizing the Statistical Package for the Social Sciences (SPSS) version 25. This advanced analytical tool facilitated a comprehensive examination of the data, employing the Chi-square test to ascertain the presence of statistically significant differences between genders in the prevalence of PTS among the studied cohort. A threshold of P-value ≤ 0.05 was established as the criterion for statistical significance, ensuring that the findings were both robust and reliable.

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RESULTS

In the conducted study encompassing 100 participants, the age distribution of patients with Type II Diabetes Mellitus revealed a diverse range across several age brackets. An examination of the age groups (Table 1) showcased that individuals aged between 40 to 45 years constituted the largest segment of the study population, with 22 participants accounting for 22% of the total. This was closely followed by those in the 46 to 50 years age group, representing 21% with 21 individuals. Notably, both the youngest age group (35 to 40 years) and the oldest (more than 60 years) held significant portions of the demographic as well, each contributing to 14% and 22% of the population, respectively. The remaining age groups, 51 to 55 years and 56 to 60 years, were comparatively smaller in size, comprising 9% and 12% of the participants, respectively.

Table 1: Age Distribution of Patients

S.No.	Age Group (Years)	Frequency	Percentage (%)
1	35 to 40	14	14%
2	40 to 45	22	22%
3	46 to 50	21	21%
4	51 to 55	9	9%
5	56 to 60	12	12%
6	More than 60 years	22	22%

Table 2: Correlation between Resisted Pronation/Supination Test and Gender

S.No.	Gender	Resisted Pronation/Supination Test Positive	Resisted Pronation/Supination Test Negative	p-value
1	Male	21	29	0.546
2	Female	24	26	
3	Total	45	55	

Further analysis delved into the correlation between gender and the outcomes of the resisted pronation/supination test, a pivotal aspect of the study aimed at identifying the prevalence of Pronator Teres Syndrome among the participants (Table 2). The results indicated a relatively balanced distribution of positive test outcomes across genders, with females marginally higher at 24 positive cases compared to 21 in males. However, when considering the negative outcomes of the test, males exhibited a slightly higher frequency, with 29 instances compared to 26 in females. Despite these differences, the statistical analysis, denoted by a p-value of 0.546, suggested that there was no significant correlation between the test outcomes and gender among the study's participants. This p-value underscores the absence of a statistically significant difference, thereby indicating that within the context of this study, gender did not markedly influence the likelihood of a positive or negative resisted pronation/supination test result.

DISCUSSION

In this cross-sectional study, we aimed to elucidate the prevalence of Pronator Teres Syndrome (PTS) among patients with Type II Diabetes Mellitus and to explore any potential gender-based disparities in its occurrence. The study comprised an equal distribution of 100 participants, split evenly between males and females, with the resisted pronation/supination test serving as the diagnostic tool. The findings revealed that 21 males and 24 females tested positive for PTS, while a larger proportion, 45 males and 55 females, were negative, yielding a p-value of 0.546, which indicates no statistically significant difference between genders.

The literature suggests that PTS can affect individuals over the age of 40, with a noted higher prevalence among females—58% compared to 41% in males—which hints at a potential gender predisposition (16). This disparity was not reflected in our findings, which may be attributable to the specificities of our sample population or the diagnostic criteria employed. The relationship between diabetes mellitus and peripheral neuropathies, including median nerve neuropathies, is well-documented, though data specifically correlating PTS with this patient demographic remains scant (17). Diabetes mellitus is known to heighten the risk of various neuropathies, such as Carpal Tunnel Syndrome (CTS), which shares symptomatic similarities with PTS, including pain, numbness, and weakness in the hand and forearm (7, 18, 19). Given the anatomical proximity of the pronator teres muscle to the median nerve and the increased susceptibility of diabetic patients to nerve compression syndromes, it could be posited that PTS might also be

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more prevalent in this population (21). However, our study's findings suggest an equitable distribution of PTS across genders among diabetic patients, challenging the notion of a significant gender influence (22).

The strengths of this study lie in its clear focus and the utilization of a standardized diagnostic test, contributing valuable data to the relatively underexplored domain of PTS within diabetic populations. Nevertheless, the study is not without its limitations. The use of convenience sampling may limit the generalizability of the findings, and the absence of a significant gender difference could be influenced by the sample size or demographic characteristics. Furthermore, the reliance on a single diagnostic test without corroborative neurophysiological assessments may have affected the detection sensitivity for PTS.

In light of these findings and limitations, it is recommended that future research on PTS in diabetic patients incorporate larger, more diverse samples and employ a multi-modal diagnostic approach to enhance the accuracy of PTS diagnosis. Additionally, longitudinal studies could offer deeper insights into the progression of PTS and its management outcomes in the diabetic population.

CONCLUSION

In conclusion, this study found no significant correlation between gender and the prevalence of PTS among patients with Type II Diabetes Mellitus. These results suggest that PTS can affect individuals of any gender equally within this demographic. Further research is warranted to substantiate these findings and to explore the broader implications of PTS within diabetic and general populations alike, with an emphasis on refining diagnostic criteria and treatment strategies.

REFERENCES

1. Olewnik Ł, Podgórski M, Polguj M, Wysiadecki G, Topol M. Anatomical variations of the pronator teres muscle in a Central European population and its clinical significance. Anatomical Science International. 2018;93:299-306.
2. Babaei-Ghazani A, Roomizadeh P, Forogh B, Moeini-Taba S-M, Abedini A, Kadkhodaie M, et al. Ultrasound-guided versus landmark-guided local corticosteroid injection for carpal tunnel syndrome: a systematic review and meta-analysis of randomized controlled trials. Archives of physical medicine and rehabilitation. 2018;99(4):766-75.
3. Shojaie P, Botchu R, Iyengar K, Drakonaki E, Sharma GK. Ultrasound-guided median nerve hydrodissection of pronator teres syndrome: a case report and a literature review. Journal of Ultrasonography. 2023;23(94):e165-e9.
4. Balcerzak AA, Ruzik K, Tubbs RS, Konschake M, Podgórski M, Borowski A, et al. How to differentiate pronator syndrome from carpal tunnel syndrome: a comprehensive clinical comparison. Diagnostics. 2022;12(10):2433.
5. Strohl AB, Zelouf DS. Ulnar tunnel syndrome, radial tunnel syndrome, anterior interosseous nerve syndrome, and pronator syndrome. Journal of the American Academy of Orthopaedic Surgeons. 2017;25(1):e1-e10.
6. Mushtaq F, Farooq MM, Gulzar K, Islam F, Asgher S, Kalsoom F. Comparison of Handgrip Strength among Diabetes Mellitus with and without Cervical Radiculopathy. Pakistan Journal of Medical & Health Sciences. 2023;17(06):264-.
7. Özdemir A, Güleç A, Yurteri A, Odabaşı E, Acar MA. Effect of pronator teres muscle botulinum neurotoxin type-A injection on proximal median nerve entrapment. Hand Surgery and Rehabilitation. 2023:101604.
8. Chyrka IL, Lemeshov OS. Clinical features and surgical treatment of combination of pronator teres syndrome and carpal tunnel syndrome. Ukrainian Neurosurgical Journal. 2023;29:N2.
9. Binder H, Zadra A, Popp D, Komjati M, Tiefenboeck TM. Outcome of surgical treated isolated pronator teres syndromes—a retrospective cohort study and complete review of the literature. International Journal of Environmental Research and Public Health. 2021;19(1):80.
10. Creighton A, Cheng J, Press J. Upper body injuries in golfers. Current Reviews in Musculoskeletal Medicine. 2022;15(6):483-99.
11. Adler JA, Wolf JM. Proximal median nerve compression: pronator syndrome. The Journal of Hand Surgery. 2020;45(12):1157-65.
12. Özdemir A, Acar MA, Güleç A, Durgut F, Cebeci H. Clinical, radiological, and electrodiagnostic diagnosis of pronator syndrome concurrent with carpal tunnel syndrome. The Journal of Hand Surgery. 2020;45(12):1141-7.
13. Fernández-de-Las-Peñas C, López-de-Celis C, Rodríguez-Sanz J, Hidalgo-García C, Donelly JM, Cedeño-Bermúdez SA, et al. Safety of Dry Needling of the Pronator Teres Muscle in Cadavers: A Potential Treatment for Pronator Syndrome. Pain Medicine. 2022;23(6):1158-61.
14. Palumbo F, Yamamoto M, Hirata H. Multiple tendon transfer for a case of radial nerve palsy in hereditary neuropathy with liability to pressure palsy. Nagoya Journal of Medical Science. 2023;85(1):204.
15. Chu E, Kim Y-S, Hill G, Kim YH, Kim CK, Shim JK. Wrist resistance training improves motor control and strength. The Journal of Strength & Conditioning Research. 2018;32(4):962-9.

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16. Babaei-Ghazani A, Roomizadeh P, Nouri E, Raeisi G, Yousefi N, Asilian-Mahabadi M, et al. Ultrasonographic reference values for the median nerve at the level of pronator teres muscle. Surgical and Radiologic Anatomy. 2018;40:1019-24.

17. Ng AJT, Chandrasekaran R, Prakash A, Mogali SR. A systematic review: Normative reference values of the median nerve cross-sectional area using ultrasonography in healthy individuals. Scientific Reports. 2022;12(1):9217.

18. Talebi GA, Saadat P, Javadian Y, Taghipour M. Manual therapy in the treatment of carpal tunnel syndrome in diabetic patients: A randomized clinical trial. Caspian Journal of Internal Medicine. 2018;9(3):283.

19. Hong SW, Baek J-H, Kim K, Kang J-H. Complex interplay of oral health, muscle and bone metabolism, and frailty in older individuals. Clinical oral investigations. 2024;28(1):1-10.

20. Tokuçoğlu F, Diniz G. Peripheral Neuropathies. Clues for Differential Diagnosis of Neuromuscular Disorders: Springer; 2023. p. 125-68.

21. Knoedler TG, Gaertner AP, Wilkinson PJ, Neil Salvapongse A. Incidence, Prevalence, and Outcomes of Hand Manifestations in Patients With Diabetes Mellitus: A Comprehensive Literature Review. HAND. 2024:15589447231219522.

22. Elwakil W, Sultan HE, Hassan M, Elshafei M, Hammad E. Ulnar nerve involvement at the wrist in idiopathic mild to moderate carpal tunnel syndrome: electrophysiological and ultrasonographic study. Egyptian Rheumatology and Rehabilitation. 2024;51(1):3.