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Occurrence of paralytic scoliosis in patients with poliomyelitis reporting at Fauji Foundation Hospital, Rawalpindi

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Abstract

Pakistan is one of the only three countries in the world with an enduring poliovirus transmission, making poliomyelitis an important health concern for Pakistan. Paralytic scoliosis is a common musculoskeletal dysfunction associated with poliomyelitis. To determine the occurrence of paralytic scoliosis a cross-sectional study was conducted at Fauji Foundation Hospital, Rawalpindi from 2015 to 2018. All patients with poliomyelitis reporting to the hospital were included, whereas patients with scoliosis but no poliomyelitis were excluded. Cobb's angle was used to determine the severity of scoliotic curves. Pearson correlation was used to determine the correlation of Cobb's angle with age and Independent T-test was used to determine the difference in terms of gender. Confidence interval was kept at 95%. A total of 51 patients with poliomyelitis were included in the study with a mean age of 28.58±15.07 years. The overall occurrence of scoliosis was found to be 60.8% with mean Cobb's angle of 23.35°±7.40°, and risk of developing paralytic scoliosis in males was 0.90 times the risk in females. No significant correlation (p=0.833) was observed between

age and Cobb's angle. No significant difference (p=0.72) was observed among males and females in relation to Cobb's angle.

Keywords: Epidemiology, Pakistan, Poliomyelitis, Scoliosis, Spine.

Introduction

Poliomyelitis, also known as polio or infantile paralysis, is an infectious disease caused by poliovirus. Poliomyelitis has been eradicated throughout the world, but unfortunately Pakistan is one of the only three countries in the world with an enduring poliovirus transmission, the other two being Nigeria and Afghanistan.[1, 2] In Pakistan a total of 306 children were reported to have been paralysed by wild poliovirus back in 2014, which dropped to 54 cases in 2015, 20 cases in 2016 and only 8 cases in 2017,[1] because of the efforts made by the government of Pakistan, to achieve the goal of disrupting the transmission of wild poliovirus in Pakistan.[1] Conversely, an increase in cases has been reported following 2017, being 12 in 2018, 147 in 2019 and 53 cases in 2020 so far.[3] Furthermore, throughout the years, most of the cases have been reported in the province of Khyber Pakhtunkhwa.[3]

Post-polio paralysis often involves the trunk muscles which is a serious predicament, and results in severe deformities due to which the individuals suffering from poliomyelitis may be totally incapacitated. This may result in paralytic scoliosis, also known as poliomyelitis scoliosis.[4, 5].Factors which are found to be most important in the progression of scoliotic curves include asymmetrical muscular paralysis, lack of adequate conservative or operative treatment and lack of early absolute recumbence.[5, 6] Evidence shows a consistent pattern of asymmetry of the intercostal and lateral abdominal muscles in patients with paralytic scoliosis, being weak towards the convexity at thoracic and thoraco-lumbar curves respectively.[7] Anterior abdominals on the other hand are found to be symmetrically weak.[7] The frontal plane angle of the spine, known as Cobb's angle is an important measurement tool in the assessment of

scoliosis, which is measured via X-ray images taken in anterior-posterior direction.[8] A person having a Cobb's angle of 10° or greater is said to have scoliosis.[9]

According to a study conducted in 2000 by AL Arjani et al in Saudia Arabia, it was revealed that 59% of all cases of scoliosis were idiopathic, 17% were congenital scoliosis and only 7% were secondary to poliomyelitis.[10] Moreover, according to another study conducted by Colonna Paul C. et al scoliosis developed in 150 out of 500 cases i.e. 30% of chronic poliomyelitis patients consecutively examined at Department of Orthopaedic Surgery, University of Oklahoma,[5] as compared to 0.3% to 15.3% prevalence of scoliosis in the general population.[11-13] It was also revealed that in addition to asymmetrical trunk paralysis, 21 patients had symmetrical trunk paralysis, and had not developed scoliosis.[5] Thus it was suggested that progressive scoliosis will typically not develop in patients with symmetrical trunk paralysis.[5] It was also observed that 3.4% of the patients had total recovery from their identified paralysis.[5]

To the best of our knowledge no study has yet been done in Pakistan regarding the prevalence of paralytic scoliosis in patients with poliomyelitis, nor is there any evidence from Afghanistan or Nigeria. The purpose of the current study is to find out the occurrence of scoliosis in patients with poliomyelitis in Pakistan, as Pakistan is one of the countries in which poliomyelitis is still prevalent.[1]

Methods and Results

Across-sectional study was conducted at Artificial Limb Centre and Physical Medicine and Rehabilitation Department of Fauji Foundation Hospital, Rawalpindi from 2015 to 2018. All the patients with Poliomyelitis reporting to the Fauji Foundation Hospital from 2015 to 2018 were included in the study. Patients with scoliosis but no poliomyelitis were excluded from the study. Cobb's angle was used as an outcome measurement tool, and was calculated

using an x-ray, which was a part of the routine examination and assessment procedure at the hospital. In order to calculate the Cobb's angle, the most tilted vertebra was located at the top of the curve and a line was drawn parallel to the end plate of the superior vertebra. Similarly, the most tilted vertebra was located at the bottom of the curve and a line was drawn parallel to the end plate of the inferior vertebra. Both the lines were extended and the angle was calculated where both the lines intersect each other. A Cobb's angle of 10 degrees is considered the minimum angulation to label scoliosis. SPSS v21.0 was used for statistical analysis. Pearson correlation was used to determine the association between age and value of Cobb's angle, and Independent T-test was used to determine the difference in the values of Cobb's angle in terms of gender with a confidence interval kept at 95%.

A total of 90 patients reported to the rehabilitation department with suspected poliomyelitis, out of which only 51 patients had poliomyelitis and were included in the study. The mean age of the participants was 28.58±15.07 years with 26 (51%) males and 25 (49%) females. Out of the 51 patients with poliomyelitis 31 patients had developed scoliosis, with an overall occurrence of 60.8%. The occurrence of post-poliomyelitis paralytic scoliosis in terms of gender was 57.7% (n=15) for males and 64% (n=16) for females (Fig I), with a relative risk of 0.90 and an odds ratio of 0.77 for males as compared to females. Mean age and Cobb's angle of patients who had developed paralytic scoliosis in addition to poliomyelitis was 28.00±14.36 years and 23.35°±7.40° respectively, with 15 (48.4%) males and 16 (51.6%) females. A non-significant (p=0.833) negative correlation (r=-0.043) was observed between age and Cobb's angle. Moreover, no significant difference was observed among males and females in terms of values of Cobb's angle. (Fig II)

Discussion

Pakistan is one of the only three countries in the world with an enduring poliovirus transmission, thus it is very important to identify the deformities that develop as a result of this condition in order to manage patients affected with poliomyelitis. Paralytic scoliosis is a common musculoskeletal dysfunction associated with poliomyelitis, and based upon the findings of the current study the occurrence of paralytic scoliosis is found to be 60.8% in patients with poliomyelitis. This is twice as large as that identified in a study conducted in Oklahoma by Colonna Paul C. et al, in which scoliosis developed in 150 out of 500 patients with an overall occurrence of 30%.[5] This is perhaps because of lack of attention paid to the maintenance of normal spinal curves in patients with poliomyelitis in Pakistan, who are at a risk of developing impaired biomechanics and abnormalities in spinal curvature due to asymmetrical muscular paralysis.[5-7] This makes it important to screen and manage the patients with poliomyelitis for paralytic scoliosis. Furthermore, the risk of developing paralytic scoliosis in males with poliomyelitis was 0.90 times the risk in females with poliomyelitis, in light of the findings of the current study. However, no significant differences in Cobb's angle based on gender were identified in the current study, nor was there any significant correlation between Cobb's angle and age of the patients ($P<0.05$).

A variety of surgical and conservative management options have been found beneficial in the management of paralytic scoliosis.[5] A Cobb's angle of 10°-19°, requires no specific treatment; however, observation and follow-up for six months is advised. On the other hand, an angle of 29°-40° requires conservative management, and 40°or greater may require surgical intervention;[14] however, some studies have also considered an angle of up to 60° for conservative treatment.[15] Conservative treatment options include physical therapy, bracing and exercises. The most common and effective physical therapy treatment for scoliosis is the Schroth method, consisting of breathing pattern and posture

correction, proprioceptive stimulations, mirror control, isometrics, stretching and strengthening exercises.[15] A study was conducted by Bonnett CH et al between 1954 and 1970, in which 351 patients with severe paralytic scoliosis were included, who were treated at Rancho Los Amigos Hospital. The management protocol progressed through five stages: body cast, halo cast, halo cast with buttons and traction wires, Harrington instrumentation, and lastly pre-operative halo-femoral traction in addition to Harrington instrumentation.[16] Simultaneous with this progression, correction of the spinal curve progressed from 20% to 57%, whereas the rate of progression of the scoliotic curve slumped from 38% to 0%. A remarkable reduction in post-operative recumbency was also observed from a period of one year to only three weeks.[16] Moreover, regarding surgical management of poliomyelitis scoliosis in the lumbar region, anterior Dwyer instrumentation with posterior fusion provided remarkable correction of scoliotic curve and pelvic obliquity.[17]

Conclusion

Paralytic scoliosis is a common musculoskeletal dysfunction associated with poliomyelitis, with an occurrence of 60.8%. Males are found to have 0.90 times the risk of developing paralytic scoliosis as compared to females with no significant differences in Cobb's angle based on gender. Moreover, no significant correlation exists between Cobb's angle and age.

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Conflict of Interest: None to declare.

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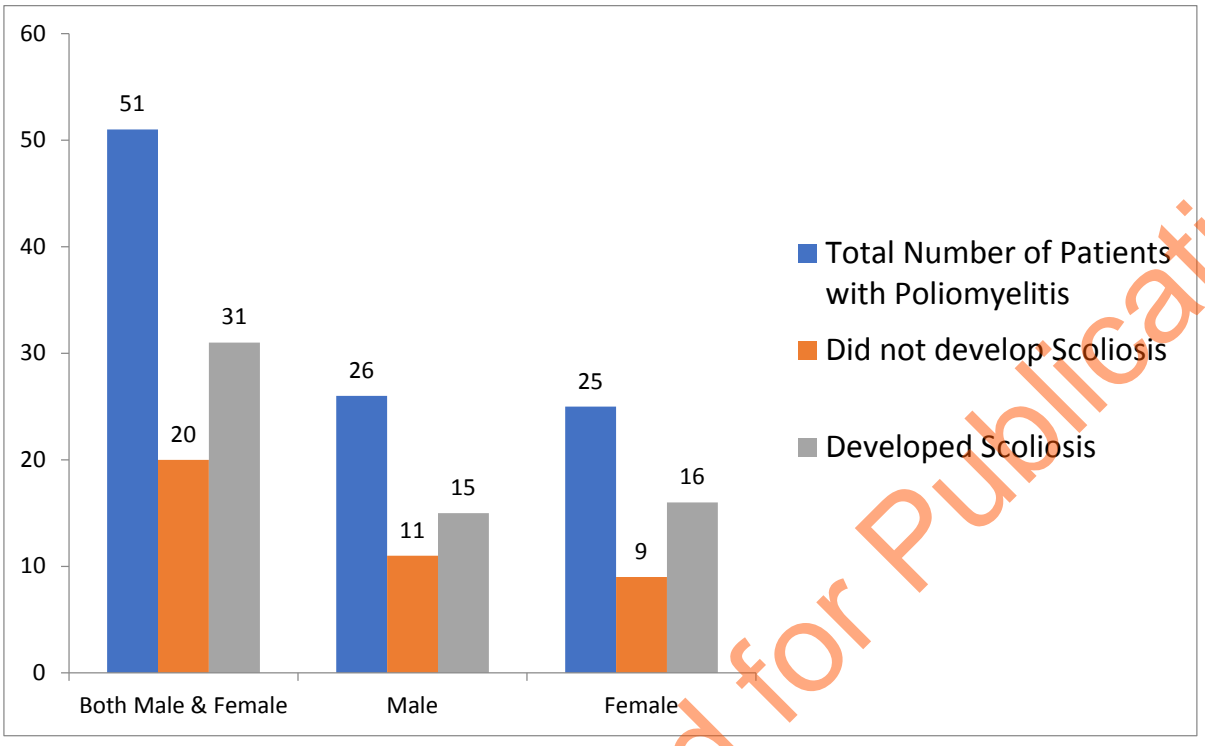
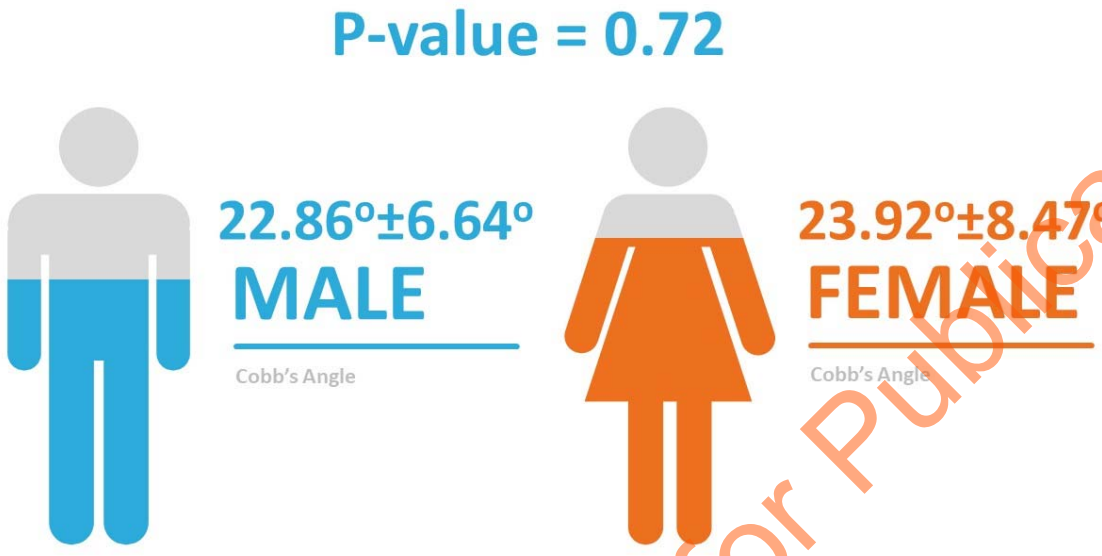


Fig I: Frequency distribution of patients in terms of gender and development of post-poliomyelitis paralytic scoliosis. 1.3636 1.7777 0.767



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236 **Figure II: Gender based difference in terms of Cobb's Angle in patients**

237 **with Post-polio paralytic scoliosis**

238