AMERICAN JOURNAL OF BIOMEDICINE AND PHARMACY
https://biojournals.us/index.php/AJBP
ISSN: 2997-7177

Article

Epidemiology and Clinical Characteristics of Congenital Clubfoot in Dhi Qar Governorate, Iraq: A One-Year Descriptive Study

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Citation: Alshamy, I. O, Alaskary, M. M, Hasan, M. F & Kadhium, N. J. Epidemiology and Clinical Characteristics of Congenital Clubfoot in Dhi Qar Governorate, Iraq: A One-Year Descriptive Study. American Journal of Biomedicine and Pharmacy 2026, 3(4), 38-46

Received: 10th Jan 2026
Revised: 07th Feb 2026
Accepted: 24th Mar 2026
Published: 10th Apr 2026

Abstract: Background: Congenital clubfoot (talipes equinovarus) is one of the most common congenital musculoskeletal deformities worldwide, with a reported incidence of approximately 1–2 cases per 1,000 live births. Early diagnosis and treatment are essential to prevent long-term disability. However, epidemiological data on congenital clubfoot in Iraq remain limited. The aim of this study was to evaluate the incidence, demographic characteristics, and clinical features of congenital clubfoot in Dhi Qar Governorate, southern Iraq. Method: A retrospective descriptive study was conducted including all patients diagnosed with congenital clubfoot who presented to the Nasiriya Clubfoot Center between January and December 2025. Demographic and clinical variables were collected from medical records, including sex, laterality of deformity, type of clubfoot (idiopathic or syndromic), age at first cast, number of casts required for correction, and tenotomy status. The incidence of congenital clubfoot was estimated using the reported number of live births in Dhi Qar Governorate health registry. Results: A total of 62 patients with congenital clubfoot involving 100 affected feet were included in the study. The estimated incidence was approximately 1.05 cases per 1,000 live births. Male patients represented 72.6% of cases, resulting in a male-to-female ratio of 2.6:1. Bilateral deformity was observed in 61% of patients, while unilateral involvement accounted for 39% of cases. The majority of patients were diagnosed with idiopathic clubfoot (95.2%). The mean number of casts required for correction was approximately six casts, and percutaneous Achilles tenotomy was performed in 89% of patients. Conclusion: The incidence and clinical characteristics of congenital clubfoot in Dhi Qar Governorate are comparable to those reported in international literature. These findings provide valuable baseline epidemiological data and highlight the importance of early detection and treatment programs for congenital clubfoot in southern Iraq.

Keywords: Congenital clubfoot; Talipes equinovarus; Epidemiology; Ponseti method; Incidence; Iraq

Introduction

Congenital clubfoot, also known as talipes equinovarus, is a complex congenital deformity characterized by equinus of the ankle, hindfoot varus, midfoot cavus, and forefoot adduction. If left untreated, deformity can lead to severe functional impairment, abnormal gait, and long-term disability. Congenital clubfoot is considered one of the most common congenital musculoskeletal deformities encountered in pediatric orthopedic practice [1].

The global incidence of congenital clubfoot has been estimated to range between 1 and 2 cases per 1,000 live births, although considerable geographic and ethnic variations have been reported. Population-based epidemiological studies have demonstrated that males are affected more frequently than females, with reported male-to-female ratios typically ranging between 2:1 and 3:1 [2].

The etiology of congenital clubfoot remains incompletely understood and is believed to be multifactorial, involving both genetic and environmental factors. Several potential risk factors have been proposed, including family history, maternal smoking during pregnancy, and intrauterine constraints. Nevertheless, the majority of cases are classified as idiopathic clubfoot, while a smaller proportion may be associated with syndromic conditions or neuromuscular disorders such as arthrogryposis or spina bifida [3].

Over the past several decades, the Ponseti method has become the gold standard treatment for idiopathic clubfoot. This technique involves serial manipulation and casting, followed in most cases by percutaneous Achilles tenotomy and subsequent bracing to maintain correction. Numerous clinical studies have demonstrated excellent outcomes with this method, with high rates of deformity correction and a significant reduction in the need for extensive surgical procedures [4].

Despite the clinical importance of congenital clubfoot, epidemiological data from Iraq and the Middle East remain limited. Most available studies have been conducted in North America, Europe, and parts of Asia, while data from Middle Eastern populations are relatively scarce. Understanding the incidence and clinical characteristics of clubfoot in different populations is essential for healthcare planning, resource allocation, and the development of early detection and treatment programs [2].

Therefore, the aim of the present study was to evaluate the incidence and epidemiological characteristics of congenital clubfoot in Dhi Qar Governorate, southern Iraq, during the year 2025, and to describe the demographic and clinical features of patients presenting to a specialized clubfoot center in the region [5][6].

Materials and Methods

Study Design

This study was designed as a retrospective descriptive epidemiological study. The study aimed to evaluate the incidence and clinical characteristics of congenital clubfoot among patients presenting to specialized treatment center in Dhi Qar Governorate, southern Iraq.

Study Setting

The study was conducted at the Nasiriya Clubfoot Center, located within Nasiriya Teaching Hospital. This center serves as a regional referral facility for children with congenital clubfoot from multiple districts within Dhi Qar Governorate and neighboring regions.

Study Population

All patients diagnosed with congenital clubfoot who attended the Nasiriya Clubfoot Center between January 1 and December 31, 2025, were included in the study.

Inclusion Criteria

1. Patients diagnosed with congenital clubfoot
2. Patients whose medical records contained complete clinical information

Exclusion Criteria

1. Patients with positional foot deformities
2. Patients with incomplete clinical data

Data Collection

Clinical and demographic data were extracted from patient medical records using a structured data collection form. The following variables were recorded:

1. Sex
2. Laterality of deformity (right, left, bilateral)
3. Type of clubfoot (idiopathic or syndromic)
4. Age at first cast
5. Number of casts required for correction
6. Tenotomy status
7. District of residence

The diagnosis of congenital clubfoot was based on clinical examination and the characteristic deformity features described in orthopedic literature [1].

Incidence Calculation

The incidence of congenital clubfoot was estimated using the total number of live births reported in Dhi Qar Governorate during 2025, which was approximately 59,000 births, according to regional health registry data.

The incidence was calculated using the following formula

Incidence = number of clubfoot cases / total live births multiply by 1000

Statistical Analysis

Data was analyzed using descriptive statistical methods. Continuous variables were summarized using means, while categorical variables were presented as frequencies and percentages. The distribution of demographic and clinical variables was presented using tables and graphical illustrations.

Ethical Approval

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval for this study was obtained from the administration of Nasiriya Teaching Hospital, Dhi Qar Governorate, Iraq. Patient data were collected and analyzed anonymously, and no identifiable personal information was included in the study.

Informed Consent

As this study was conducted using retrospective analysis of anonymized medical records, individual informed consent was waived according to institutional guidelines.

Author Contributions

1. Ihsan Oudah Alshamy contributed to the study conception and design, clinical supervision, interpretation of data, and preparation of the manuscript.
2. Murtadha Mutasher Alaskary participated in patient evaluation, clinical supervision, data collection, and manuscript review.
3. Muhanad Flayeh Hasan contributed to data collection, questionnaire preparation, and database organization.
4. Noor Jawad Kadum assisted in data entry, data organization, and clinical data collection.

All authors read and approved of the final manuscript.

Funding

The authors declare that no external funding was received for this study.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this study.

Results and Discussion

Results

Patient Population and Incidence: During the study period between January and December 2025, a total of 62 patients diagnosed with congenital clubfoot were identified and included in the study. These patients accounted for 100 affected feet.

Based on the estimated number of live births in Dhi Qar Governorate during 2025 (approximately 59,000 live births), the calculated incidence of congenital clubfoot was approximately 1.05 cases per 1,000 live births.

Incidence= number of clubfoot cases / total live births multiply by 1000
62 / 59000 * 1000 = 1.05

Sex Distribution: Among the 62 patients included in the study, 45 patients (72.6%) were male, while 17 patients (27.4%) were female, resulting in a male-to-female ratio of approximately 2.6:1. The demographic characteristics of the study population are summarized in figure 1.

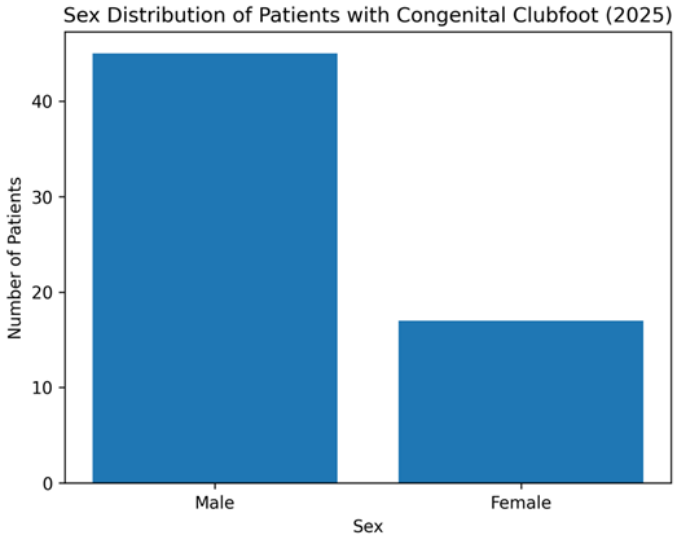

Figure 1. Sex distribution of patients with congenital clubfoot in Dhi Qar Governorate (2025)

Laterality of Deformity: With regard to the laterality of the deformity, bilateral involvement was observed in 38 patients (61%), while 24 patients (39%) presented with unilateral clubfoot deformity. Among unilateral cases, 12 patients (19%) had right-sided involvement, while 12 patients (19%) had left-sided involvement. In total, the cohort included 100 affected feet. As shown in figure 2.

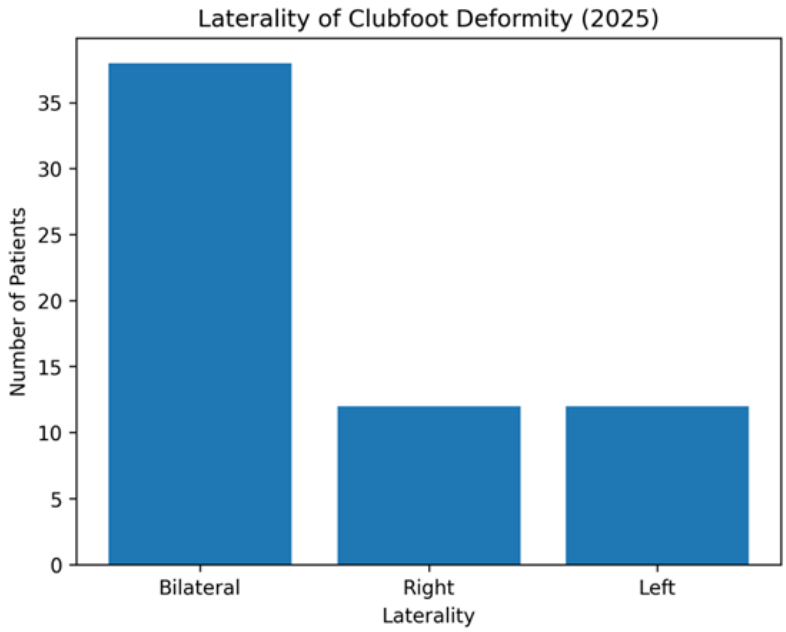

Figure 2. Laterality of congenital clubfoot deformity among the study population.

Type of Clubfoot: The distribution of clubfoot types is presented in figure 3. Most patients were diagnosed with idiopathic clubfoot, accounting for 59 patients.(%95.2)

Only three patients (4.8%) were diagnosed with syndromic clubfoot, which was associated with underlying conditions such as arthrogryposis and skeletal dysplasia.

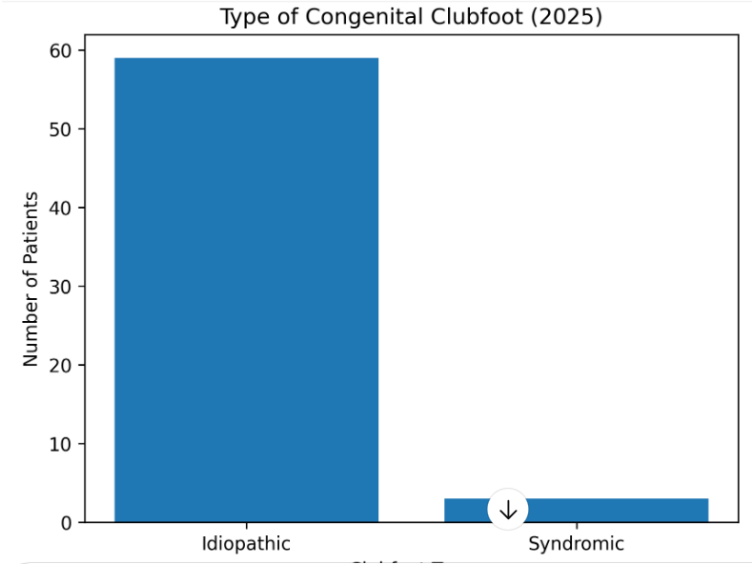

Figure 3. Distribution of idiopathic and Syndromic clubfoot cases

Age at First Cast : The age at which treatment was initiated is summarized in figure 4. Early presentations were common among the study population.

A total of 22 patients (35.5%) initiated treatment within the first week of life, while 30 patients (48.4%) began treatment between 8 and 30 days of age.

Only 10 patients (16.1%) presented after the first month of life, including 4 patients (6.5%) who began treatment between 31 and 90 days of age and 6 patients (9.6%) who initiated treatment after 90 days of age. Overall, 83.9% of patients began treatment within the first month of life.

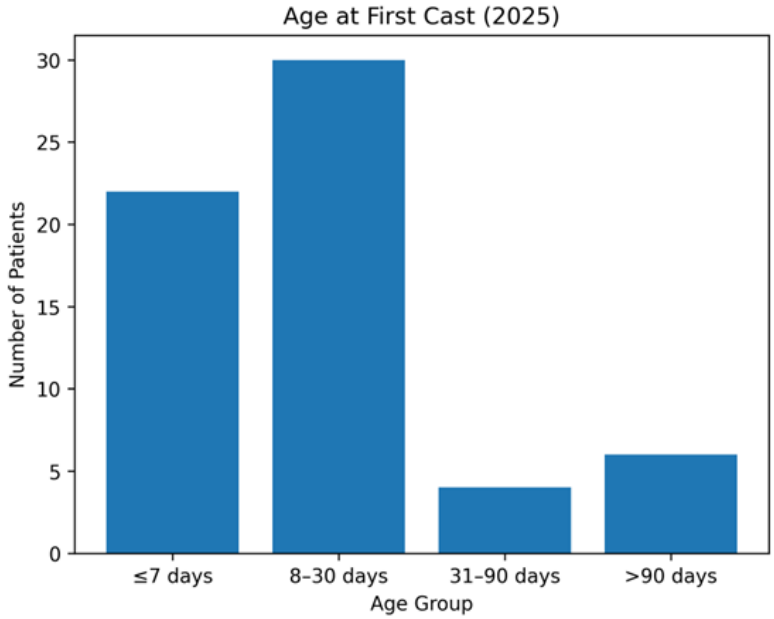

Figure 4. Age at initiation of Ponseti casting among patients with congenital clubfoot.

Geographic Distribution of Patients

The geographic distribution of patients across the districts of Dhi Qar Governorate is presented in Figure 5. Patients were referred to the Nasiriya Clubfoot Center from multiple districts within the governorate.

The majority of patients came from Nasiriya district, accounting for 16 patients (25.8%), followed by Suq Al-Shuyukh district with 14 patients (22.6%). Shatra district represented 8 patients (12.9%) of the study population

Smaller numbers of patients were referred from Galat Sekar (8.1%), Garraf (6.5%), and Rifaee (6.5%) districts. Additional cases were identified from Bathaa, Al-Fajer, Al-Nasar, and Dawayaa, each contributing a small proportion of the total cases.

A single patient (1.6%) was referred from Basra province, indicating that the Nasiriya Clubfoot Center also receives referrals from outside Dhi Qar Governorate.

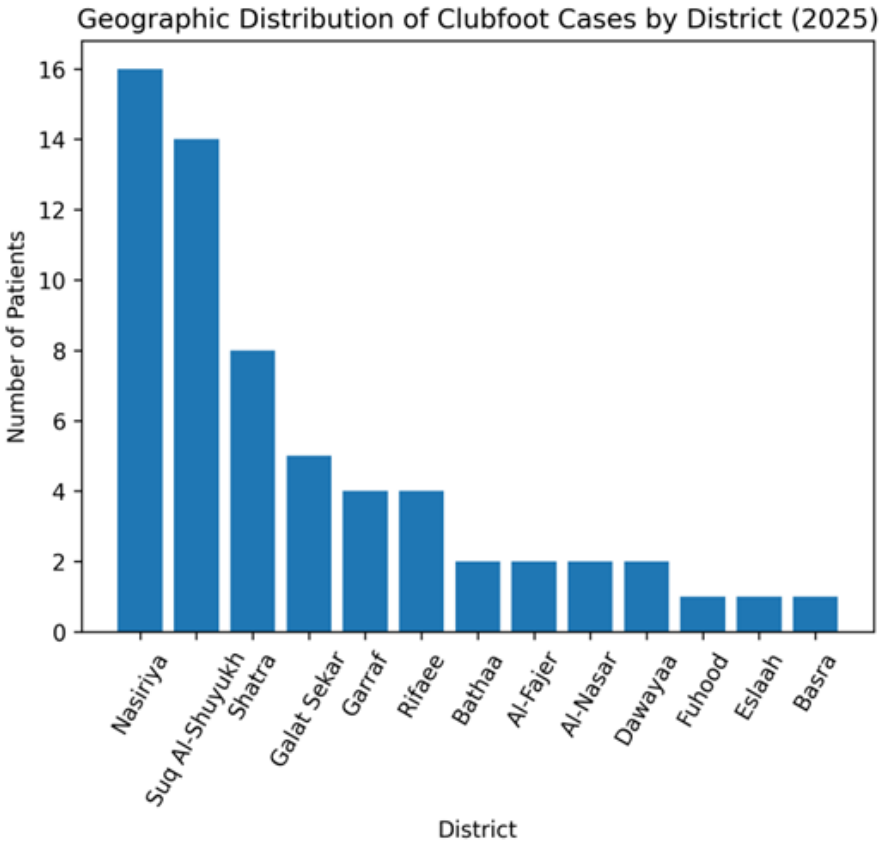

Figure 5. Geographic distribution of congenital clubfoot cases by district in Dhi

Treatment Characteristics

The mean number of casts required to achieve correction was approximately ranging between 4 casts to 9 casts with mean of six casts.

Percutaneous Achilles tenotomy was performed in 55 patients, representing approximately 89% of the study population.

Discussion

The present study provides important epidemiological data on congenital clubfoot in Dhi Qar Governorate, southern Iraq, a region from which published epidemiological data on this condition remain limited. The estimated incidence of congenital clubfoot in the present study was 1.05 cases per 1,000 live births, which falls within the globally reported range of 1–2 cases per 1,000 live births. These findings are consistent with epidemiological studies conducted in North America and Europe,

suggesting that the occurrence of congenital clubfoot in southern Iraq is comparable to that reported internationally [7].

A clear male predominance was observed in this study, with a male-to-female ratio of approximately 2.6:1. This observation is consistent with previous epidemiological studies reporting a higher prevalence of congenital clubfoot among male infants. Dobbs and Gurnett suggested that the male predominance observed in clubfoot may reflect genetic susceptibility and differences in developmental pathways affecting musculoskeletal formation during fetal development [8]. Similar sex distributions have been reported in population-based studies from the United States and Australia [9].

Regarding laterality, bilateral deformity was observed in 61% of patients in the present study. This proportion closely corresponds with the findings reported in previous studies. Ponseti described bilateral involvement in approximately 50–60% of clubfoot cases, which aligns with the distribution observed in our cohort [10].

Similar patterns of bilateral involvement have also been reported in epidemiological studies from Europe and Asia [11].

The vast majority of cases in the present study were classified as idiopathic clubfoot (95.2%), while only a small proportion of cases were associated with syndromic conditions. This observation is consistent with findings reported in previous literature, where idiopathic clubfoot represents the predominant form of deformity. Syndromic clubfoot is typically associated with underlying neuromuscular or genetic conditions such as arthrogryposis, spina bifida, or skeletal dysplasias [12].

The treatment characteristics observed in the present study are also consistent with the established outcomes of the Ponseti method, which is currently considered the gold standard treatment for idiopathic clubfoot. The mean number of casts required for correction in this study was approximately six casts, which is comparable to the number reported in previous clinical studies evaluating the effectiveness of the Ponseti technique [13].

Furthermore, percutaneous Achilles tenotomy was required in approximately 89% of patients, which is consistent with previously published data indicating that 80–90% of patients undergoing Ponseti treatment require tenotomy to achieve full correction of equinus deformity. Morcuende et al. reported similar tenotomy rates in large clinical series, highlighting the importance of this procedure as a key component of successful clubfoot correction [14].

Early initiation of treatment was also observed in the majority of patients in the present study, with more than 80% of patients beginning treatment within the first month of life. Early treatment initiation is widely recognized as an important factor influencing treatment success and long-term outcomes in children with congenital clubfoot. Early intervention allows gradual correction of the deformity while the tissues remain more flexible and responsive to manipulation [15].

The geographic distribution of patients in this study demonstrated that the majority of cases originated from Nasiriya and Suq Al-Shuyukh districts, which likely reflects both the population distribution of the governorate and the referral pattern to the Nasiriya Clubfoot Center. The presence of patients from multiple districts indicates that the center functions as an important referral facility for congenital clubfoot management within the region.

Overall, the epidemiological and clinical characteristics observed in this study are consistent with findings reported in international literature. Importantly, this study provides baseline epidemiological data on congenital clubfoot in southern Iraq, which may contribute to improved healthcare planning, early detection strategies, and the development of specialized treatment services for children with congenital clubfoot in the region.

Epidemiological patterns similar to those observed in the present study have also been reported in several developing countries, particularly in Asia and Africa. Studies from India have reported incidence rates ranging between 1.0 and 1.5 cases per 1,000 live births, which are comparable to the incidence observed in the present study. Sharma et al. reported a similar male predominance and a high proportion of bilateral cases in their epidemiological analysis of congenital clubfoot in northern India [6].

Comparable findings have also been reported in African populations. In a population-based study conducted in Uganda, Pirani and colleagues reported an incidence of approximately 1.2 cases per 1,000 live births, with the majority of cases presenting as idiopathic clubfoot and a similar

predominance among male infants [7]. Similar epidemiological patterns have also been described in studies from Ethiopia and Malawi, indicating that the demographic and clinical characteristics of clubfoot remain relatively consistent across different geographic regions [8].

In the Middle East, epidemiological data on congenital clubfoot remains relatively limited. However, available studies from countries such as Iran and Saudi Arabia have reported incidence rates within the global range of 1–2 cases per 1,000 live births, supporting the observation that the epidemiological characteristics of congenital clubfoot in the present study are consistent with those reported in neighboring regions [9].

These similarities across developing regions suggest that the fundamental epidemiological characteristics of congenital clubfoot are relatively stable worldwide. Nevertheless, differences in healthcare infrastructure, early diagnosis programs, and accessibility to specialized treatment centers may influence the timing of presentation and treatment outcomes. The establishment of specialized centers such as the Nasiriya Clubfoot Center therefore plays an important role in improving early detection and management of this condition in resource-limited settings.

Strengths

This study provides important epidemiological data on congenital clubfoot in Dhi Qar Governorate, a region from which published data on this condition is currently scarce. To the best of our knowledge, this study represents one of the first epidemiological analyses of congenital clubfoot in southern Iraq.

Another strength of this study is that all patients were evaluated and treated at a specialized clubfoot center using a standardized treatment protocol, which reduces variability in diagnosis and management. The use of a structured data collection form also allowed systematic recording of demographic and clinical variables.

Furthermore, the study includes patients from multiple districts within Dhi Qar Governorate, reflecting the regional referral pattern of the Nasiriya Clubfoot Center and providing a broader representation of the population in the governorate.

Limitations

Several limitations should be acknowledged. First, the study was conducted at a single treatment center, and therefore some cases of congenital clubfoot within the governorate may not have been captured if patients sought care at other facilities or were not present for treatment.

Second, the incidence estimation was based on regional birth registry data, which may be subject to minor inaccuracies in population reporting.

Third, the retrospective design of the study relied on the availability and completeness of medical records. Although efforts were made to ensure data accuracy, some variables may have been subject to incomplete documentation.

Despite these limitations, the present study provides valuable baseline epidemiological information on congenital clubfoot in southern Iraq and may serve as a foundation for future multicenter or prospective studies in the region.

Conclusion

In summary, this research sheds light on the epidemiological and clinical aspects of congenital clubfoot in Dhi Qar Governorate, where the incidence was identified at a rate of approximately 1.05 cases per 1,000 live births, consistent with global figures. The results indicate a significant male preponderance, elevated rate of bilateral engagement, and recency of idiopathic cases, all of which are in line with worldwide literature. Finally, the work validates the strategy of early intervention with the Ponseti method, which has a relatively low number of casts needed and a high rate of successful correction with Achilles tenotomy. Thus, emphasizing the significance of early diagnosis and prompt treatment essential for improving clinical outcomes and preventing long-term disability. These findings have important implications for health care policy planning considering the need for targeted strategies to enhance clubfoot health service delivery, improve access to specialist clubfoot treatment facilities, strengthen early detection programs, and increase awareness of clubfoot among health care providers and communities in the region. In addition the study provides important baseline information that

could help allocate resources and guide policy in southern Iraq. Multicenter and prospective studies are needed to confirm the findings, determine long-term functional outcomes, and possible genetic/environmental risk factors for the condition which will translate to broader prevention and management strategies in the future.

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