Incidence of Clubfoot in Uganda

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ABSTRACT

Background: While the congenital clubfoot deformity is a common deformity recorded in Uganda, the incidence of the condition had never been accurately determined. The objective of this study was to measure the overall incidence of congenital clubfoot deformity in a representative sample of births.

Methods: A study of all babies born with foot anomalies took place from March 2006 to October 2007. The study was based at 8 Regional Hospitals with active maternity units and a functioning clubfoot clinic. All babies with foot deformities at birth at any of eight centres as detected by the delivery room staff were referred to the respective centre's clubfoot clinic. The children were examined by clubfoot clinic orthopedic officers who diagnosed the specific deformity. Children referred to the clinic from any source and born at the maternity unit were included in the study. The denominator was all live births at the centre during the study period.

Results: The total number of live births during the study period was 110,336. The maternity units of the centres identified 290 infants with a foot deformity. One hundred and thirty infants born during the study period were diagnosed in the clubfoot clinic as having a congenital clubfoot deformity. The proportion of infants with a clubfoot deformity was 1.2 per 1000 births over the 20-month period. The male to female ratio was 2.4:1.

Recommendation: The rate of clubfoot deformities in the newborn can be used to estimate the numbers of children who should be treated and to estimate resource needs for the identification and management of this treatable congenital malformation. By comparing the number of those treated with the expected number of cases, the numbers of children with neglected clubfoot can be calculated.

Key words: Clubfoot; incidence; gender ratio

La traduction du résumé se trouve à la fin de l'article.

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Clubfoot is a major structural birth defect of the foot. It may occur as part of a greater syndrome or as an isolated malformation. A combination of genetic and environmental factors appears to be associated with the congenital clubfoot deformity. Its incidence varies with genetic background, gender and race.[1-3] Suggestions of a genetic association include studies that have revealed that the concordance of clubfoot is about 33% for monozygotic twins versus only 3% for dizygotic twins.[4] A higher risk among first-degree relatives than among more distant relatives has been noted in several epidemiological studies.[1,5-7] Furthermore, the risk among first-degree relatives of female clubfoot cases is higher (4.3%) than that in male clubfoot cases (1.3%).[8] These studies explain only the minority of clubfoot occurrences, leaving most as idiopathic or unknown cause.

Although clubfoot is one of the most common visible congenital deformities seen in Uganda, there is a scarcity of research and data on its incidence. In Uganda, the deformity, while recognized by the local populace, has a variety of local names.[9] It is often neglected as the conventional treatment of surgical correction is simply not possible with the resources available within the Ugandan medical system.[10,11] In order to properly plan and evaluate a program to use the Ponseti method[12] to correct the congenital clubfoot deformity, it was necessary to accurately assess the incidence and patterns of clubfoot deformity in Uganda. Such a study would assist in quantifying the magnitude of the problem and the expected number of cases and would allow for resource planning in the management of this condition.

METHODS

This was a study identifying all abnormal feet occurring in live births at eight regional hospitals that had both a maternity unit and a clubfoot clinic. The recruitment process was prospective over a 20-month period. The clubfoot clinic is a unit in the hospital that treats clubfeet and receives technical support from the Uganda Sustainable Clubfoot Care Project (USCCP). The maternity unit staff were requested to identify any abnormal foot, either unilateral or bilateral, and to refer the neonate to the clubfoot clinic. It was emphasized that they did not need to, and were encouraged not

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Conflict of Interest: None to declare.

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Table 1. Incidence of Clubfoot per 1000 Live Births in Male and Female Babies by Centre for the 20-month Period

	Live Births	M	F	M Foot Def.	F Foot Def.	M with Clf	F with Clf	Total Clf	Inc. M	Inc. F	Inc. Total
Centre 1	10,183	4949	5234	18	12	7	3	10	1.41	0.57	0.98
Centre 2	7923	4051	3872	14	8	9	4	13	2.22	1.03	1.64
Centre 3	7777	4087	3690	12	12	7	6	13	1.71	1.63	1.67
Centre 4	10,142	5232	4910	15	14	7	3	10	1.34	0.61	0.99
Centre 5	6788	3460	3328	6	10	6	4	10	1.73	1.2	1.47
Centre 6	10,992	5625	5367	17	10	12	3	15	2.13	0.56	1.36
Centre 7	48,463	25,315	23,148	74	53	40	12	52	1.58	0.52	1.07
Centre 8	8068	4060	4008	11	4	7	1	8	1.72	0.25	0.99
Total	110,336	56,779	53,557	167	123	95	36	131	1.7	0.7	1.19

M = Male, F = Female, Def. = Deformity, Inc. = Incidence, Clf = Clubfoot

to, make a diagnosis. An in-service training was held with the maternity unit staff at the outset of the study. The total numbers of live births by gender were submitted to the study each month. The participating centres were in the southern part of Uganda from the eastern to western borders. The centres were told that their results would be sent to them; this was only in order to reduce concerns they may have had that if their responses were different than other centres, this may reflect adversely on them. The results are reported without identifying the centre. Participating centres were Mbarara, Jinja, Mbale, Rubaga, Masaka, Nsambya, Mulago, and Mengo.

There are no screening procedures for clubfoot available, therefore hospital referrals for delivery would not be on the basis of a clubfoot deformity. A relatively large number of births, estimated to be as high as 60% or more, take place at home. However, because accurate numbers are not known, the cases of clubfoot from this population are not included in the numerator. Excluding home deliveries from both the numerator and denominator of the incidence calculation results in an unbiased estimate.

All neonates with an abnormal foot detected by the maternity unit staff had the deformity recorded on the delivery record and referred. The referral was to take place immediately as the duration of hospital stay after an uncomplicated delivery was about 24 hours. In the clubfoot clinic, all children seen were recorded and those with a clubfoot were enrolled into the Clubfoot clinic register for treatment. The clinics are staffed by orthopedic officers and overseen by orthopedic surgeons or residents. The orthopedic officers had received training in the diagnosis and treatment of clubfoot in a course run by the USCCP at Mulago Hospital, Makerere University, Kampala, Uganda. Any child seen at the clinic with a clubfoot who was born at the hospital during the study period but who had not been referred by the maternity unit, presenting with a parent or guardian, was also enrolled in the study. The clinic diagnosis was recorded as either positional, syndromic or idiopathic congenital clubfoot. There were no other known clinics treating clubfeet in any of these centres, although it is possible that some patients could have visited traditional healers or private surgeries.

The Institutional Review Board of Uganda and the Office of Research Services, University of British Columbia Clinical Research Ethics Board reviewed and approved the study.

RESULTS

There were a total of 110,336 live births – 56,779 (51.5%) male and 53,557 (48.5%) female – over the study period of February/March 2006 to October 2007. The total number of babies with foot deformities reported from the maternity units of all eight centres was 290, a proportion of 2.6/1000 live births over the 20 months. After examination of all babies with foot deformities at the clubfoot clinics by orthopedic officers or orthopedic surgeons, 131 were diagnosed as clubfoot. This represents 45% of infants with a foot deformity recognized at the maternity unit and referred. The incidence of clubfoot was therefore 1.19/1000 live births (95% CL 1.3-0.98). Findings of this study showed higher incidence of both foot deformities and clubfoot among males compared with females. The incidence of foot deformities was 2.9/1000 among male babies compared with 2.3/1000 among females (M:F ratio = 1.26). The incidence of clubfoot among males, on the other hand, was 1.7/1000 and only 0.7/1000 among females, with a M:F ratio of 2.4. As seen in Table 1, the incidence of clubfoot was higher in males in all centres.

The rates of foot deformities and clubfoot deformities varied among the centres (Table 1). However an analysis based on the numbers of clubfoot in different centres revealed that there was no statistically significant difference between the centres (X-square = 21, df = 7, p-value = 0.28).

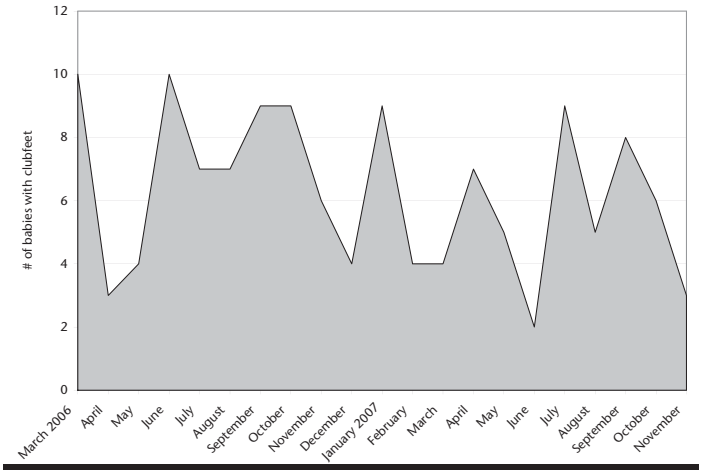
Figure 1 represents the total number of babies born with clubfoot each month over the study period. There is no particular pattern with regard to number of babies born with clubfoot and time of year over the study period.

DISCUSSION

The incidence of clubfoot found in Uganda was 1.2/1000 live births. This measure is actually the proportion of babies with clubfoot at birth. Based on one observation at a single point in time, it should probably be best described as the prevalence of clubfoot at birth. Because the cases are new in the community, however, the term "incidence" is the one more widely used for this measurement and it is the term that is used in this paper. The incidence of clubfoot varies widely among different populations. Studies conducted in the US estimate the incidence of clubfoot to be between 0.6 to 2.57 per 1000 live births, with males more affected than females in a ratio of 2:1.[13-15] Studies done in other countries indicate an incidence rate of approximately 0.5 per 1000 live births in Japan,[16] 7 per 1000 in natives of the South Pacific islands,[17] 0.64 per 1000 in Sweden,[18] 1.65 per 1000 with a 2:1 male to female ratio in Spain,[19] 1.25 per 1000 in Western Australia,[20] 6.8 per 1000 in natives of Hawaii,[21] and 6 to 7 per 1000 among the Maori population in New Zealand.[22]

There is limited information on the incidence of clubfoot in African countries. One study conducted in Zimbabwe in 2002[23] found the incidence of clubfoot to be 0.9 per 1000 births. A recent single-hospital study conducted in Malawi found a cumulative incidence rate of 2 per 1000 births with a male to female ratio of 1.3:1.[24] In another study conducted in Malawi, the incidence of clubfoot

Figure 1. Number of babies born with clubfoot in each month



was estimated to be 2 to 3 per 1000 births.[25] A recent study conducted in Uganda estimated the incidence of clubfoot to be 2 to 4 per 1000 births, and suggested there are 10,000 children living with the condition uncorrected.[9] Based on the findings of our multicentre study, the cumulative incidence of clubfoot was 1.2 per 1000 births, with a male to female ratio of 2.4:1.

Some studies have shown that there is a significant seasonal variation in the incidence of clubfoot. One study, for instance, showed a highest incidence rate during summer and then concluded it could be related to the summer and fall peak of Enterovirus infections in temperate climates.[26] It is important to note that to be able to infer a seasonal pattern from a dataset, an adequate time series is needed. Our study failed to show a seasonal variation. Geographical pattern for clubfoot is documented in some studies.[27] While the results of our study revealed varying incidence rates among eight centres, they showed no statistically significant difference among the centres.

In all epidemiological studies, there are uncertainties regarding variation in diagnostic criteria and in registration methods. Within a defined population, there are two main options for case finding: referrals from various health care services and direct examination of the whole population sample. The latter is particularly valuable for direct generalization of findings for two main reasons: 1) in Uganda it is already acknowledged that the total clubfoot 'burden' in most subpopulations is not identified. Many clubfoot cases go unnoticed by the health care system since there is no organized population-based effort directed at the early detection of this disorder; 2) selection bias caused by the referral of patients from primary to secondary or tertiary care centres can directly affect results of clinical or epidemiological studies.[28] The diagnosis of idiopathic clubfoot is based on clinical examination and depends on the level of expertise of clinicians. Appropriate education of the staff and different methods for the detection of subjects were used in this study to reduce diagnostic bias to as low as possible. Although the denominator is not a particular issue in studies with an incidence as low as one per thousand births, it is critical to have as efficient a detection system for the numerator as possible because missing even a few cases will affect the estimate. By studying all hospital births during a defined period and collecting place of birth data on all cases seen at the only treatment centres in the area, a nearly complete capture of all children who were born with the condition at a particular facility was possible. However, the estimate of the number of children born with a foot deformity may be an underestimate due to detection and referral issues on busy maternity units.

From this study, with the expected number determined from this rate and from the birth data, we will be able to estimate numbers of children who do not present to the clubfoot treatment clinics being initiated across Uganda. The male to female ratio will be used to monitor cases to ensure that a gender bias does not occur in the children presenting to the clinics for treatment. We will also be able to estimate the numbers of children who should be treated and those with neglected clubfoot in the country in order to estimate resource needs for the management of this treatable congenital malformation.

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RÉSUMÉ

Contexte : Quoique le pied bot soit une déformation congénitale fréquente en Ouganda, cette déformation n'a jamais été observée en détail. L'objectif de cette étude est de mesurer la fréquence du pied bot parmi un échantillon représentatif de naissances.

Méthode : En mars 2006, les données ont été recueillies dans huit hôpitaux généraux ayant une pouponnière et une clinique pour le pied bot. Parmi l'ensemble des nouveaux nés, ceux ayant une déformation ont été dirigés vers une clinique se spécialisant dans le traitement du pied bot. Les orthopédistes de cette clinique ont posé leur diagnostique pour chacune des déformations. Ce sont uniquement les bébés référés à la clinique par les huit hôpitaux qui font l'objet de cette étude.

Résultats : Pendant la durée de l'étude (mars 2006 à octobre 2007), un total de 110 336 naissances vivantes a été enregistré. Les pouponnières ont identifié 290 bébés ayant une déformation. Puis, les orthopédistes de la clinique spécialisée ont diagnostiqué 130 bébés avec une déformation congénitale du pied bot. Proportionnellement, les enfants avec une déformation du pied bot se chiffre à 1,2 par 1000 naissances, pour cette période de 20 mois. Le ratio garçon/fille est de 2,4 :1.

Recommandations : Le taux de déformation congénitale du pied bot chez les nouveaux nés peut être utilisé pour déterminer le nombre d'enfants devant être traités, ainsi que pour évaluer les montants nécessaires pour l'identification et l'administration de cette déformation inhérente soignable. En comparant la quantité d'enfants traités avec le nombre prévu de cas, il est possible de calculer le nombre d'enfants ayant un pied bot négligé.

Mots clés : pied bot; fréquence; ratio garçon/fille

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