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BRIEF REPORT

Frequency and spectrum of outpatient musculoskeletal diagnoses at a pediatric hospital in Kenya

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Abstract

Chronic pediatric musculoskeletal (MSK) conditions are a major cause of morbidity. The burden of pediatric rheumatic diseases in East Africa is largely unknown. The purposes of this study were to estimate frequencies and assess the spectrum of MSK-related diagnoses using ICD-10 diagnostic codes among outpatients at a pediatric hospital in Kenya and to evaluate the accuracy of the assigned codes used for the 'arthropathies' category. All pediatric outpatient diagnoses classified under the ICD-10 codes for 'diseases of the MSK system and connective tissue' (M00-M99) recorded between January and December 2011 were extracted from the electronic medical record system at Gertrude's Children's Hospital (GCH). For each of the ten MSK disease categories, frequencies were calculated. The assigned ICD10 code for cases in the 'arthropathies' (M00-M25) category was assessed by two rheumatologists. MSK diagnoses ($n = 1078$) accounted for 0.5% of all GCH outpatient consults available for analysis. 'Soft tissue disorders' were the most frequent MSK diagnoses ($n = 614$, 57%), followed by 'arthropathies' ($n = 332$, 30.8%), 'dorsopathies' ($n = 81$, 7.5%), 'osteopathies and chondropathies' ($n = 39$, 3.6%), and 'other' disorders ($n = 12$, 1.1%). No patients were classified in the category of 'systemic connective tissue disorders'. In cases classified as 'arthropathies', there was poor agreement (Kappa 0.136) between the ICD10 code assigned by the treating physicians and that assigned by the rheumatologists. However, when the rheumatologists' classification was loosened, agreement was moderate (Kappa 0.533). This study provides estimates of the frequency of outpatient MSK diagnoses at a pediatric hospital in Kenya in 2011. MSK diagnoses were not rare. Despite limitations of administrative databases to estimate frequencies of specific diagnoses, they provide a snapshot of the overall burden and spectrum of MSK conditions.

Keywords Arthropathies · East Africa · ICD-10 codes · Juvenile arthritis · Pediatric rheumatology

Introduction

Few studies have estimated the overall prevalence of rheumatic diseases in Sub-Saharan Africa. Data suggest that musculoskeletal (MSK) diseases such as rheumatoid arthritis and systemic lupus erythematosus are increasing in prevalence in this area [1–5]; however, there is a paucity of large epidemiological evidence to support this [6, 7].

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Impaired MSK health can lead to acute and chronic pain, cause burden in other health domains, account for physical limitation with loss of participation and withdrawal from usual social, community, and occupational activities, and result in decreased quality of life [8]. Specifically, the burden of pediatric MSK disorders is amplified by the effect on the family and caregivers, and by the fact that these conditions may have lifelong repercussions resulting in compounding burdens over time [9]. To improve pediatric MSK health care, it is a priority to define their frequency and to assess determinants for accurate diagnoses. Generating this data in lower-income countries is uniquely relevant as it could lead to the development of context-specific targeted public health measures [8].

Kenya, with a population of ~ 48 million, is a lower-middle income status country with a Human Development Index of 0.55 (ranked 146 out of 188 in the world) [10]. Kenya has a young population, with 73% residents aged below 30, and 43% of the total population under age 15 [11]. As in other East African countries, the burden of pediatric MSK disorders in Kenya is currently unknown. Our group reported that in 2011, pediatric rheumatic conditions accounted for 0.32% of admissions at one pediatric hospital in Kenya [12]. Acute inflammatory arthropathies and septic arthritis were the two most frequent in-patient rheumatic diagnoses [12].

The objectives of this study were to estimate the frequency and spectrum of outpatient pediatric MSK diagnoses based on the International Statistical Classification of Diseases and Related Health Problems-10th Edition (ICD-10) codes at a pediatric hospital in Kenya and to evaluate the accuracy of the assigned codes for the 'arthropathies' category.

Materials and methods

This study was approved by the Institutional Review Boards of McGill University (Canada) and Gertrude's Children's Hospital (GCH) (Kenya). GCH is a private, not-for-profit hospital located in Nairobi, Kenya. GCH is one of the largest pediatric centers in East Africa, is the only dedicated pediatric hospital in Nairobi, and since 2010 has an electronic medical record system (Kranium). When this study was conducted, there were no pediatric rheumatologists in Kenya.

This was a retrospective cross-sectional study evaluating ICD-10 codes for 'diseases of the musculoskeletal system and connective tissue' (M00-M99) from outpatient consults at GCH between January and December 2011. The ICD was used as it is the foundation for the identification of health trends and statistics globally, and the international standard for reporting diseases and health conditions both for clinical and research purposes [13].

In the Kranium electronic record system, diagnoses are entered by ICD-10 codes only. In 2011, it captured all emergency room visits as well as many of the clinic visits. For this study, all patients with an ICD-10 code for 'diseases of the musculoskeletal system and connective tissue' (M00-M99) and their linked clinical information were extracted. Information available for review included sex, age, date of appointment, ICD code, brief history, physical examination, and investigations requested. After eliminating duplicates, entries with missing clinical information and entries from adult consults, the frequency of each ICD-10 MSK category was calculated.

Subsequently, two Canadian rheumatologists (RS, IC) reviewed the information available of every visit coded as 'arthropathies' (M00-M25). They independently assigned an ICD-10 diagnostic category to each of these patients' visits (i.e. 'infectious arthropathies' (M00-M03), 'inflammatory polyarthropathies' (M05-M14), 'arthrosis' (M15-M19), or 'other joint disorders' (M20-M25)] (referred to as direct coding). If a case did not meet criteria for one of those categories, the rheumatologists determined whether it met the criteria for another M-code or for a non-M code (i.e. S code). Any discrepancies between the rheumatologists were resolved by consensus. As a second step, rheumatologists reviewed the ICD10 codes assigned by GCH physicians and decided whether the assigned code fit with the reported clinical information (referred to as reverse coding leading to a loosened classification). In addition to the ICD10 code, a pediatric rheumatologist (RS) assigned a presumptive clinical diagnosis based on the available clinical information.

Data analysis

The frequency of MSK conditions was summarized with descriptive statistics. For the category of 'arthropathies', the agreement between the ICD10 codes assigned by the treating physicians and those assigned by the rheumatologists either by direct or reverse coding was calculated. Cohen's kappa coefficient (κ) was used to measure inter-rater agreement [14].

Results

Frequency of MSK diagnostic categories

From a total of 215,761 outpatient pediatric consults evaluated at GCH in 2011, clinical information was available for 199,247 (92.3%). Of these, 1078 cases had an ICD10-MSK code. This accounted for 0.5% of all outpatient consults available for analysis. The majority of these were seen in the emergency room by medical officers, who are general practitioners, and have completed 1 year of internship following medical school. The age of the patients was 8.3 ± 4.5 years (mean ± SD, min: 1–max: 17) and 41.1% of them were females (n = 443).

Table 1 ICD10-MSK diagnostic categories among GCH outpatient consults in 2011

ICD10 code	Description	Count (%)	
M00-M25	Arthropathies	332	(30.8)
M00-M03	Infectious arthropathies	19	(1.8)
M05-M14	Inflammatory polyarthropathies	123	(11.4)
M15-M19	Arthrosis	39	(3.6)
M20-M25	Other joint disorders	151	(14)
M30-M36	Systemic connective tissue disorders	0	
M40-M54	Dorsopathies	81	(7.5)
M40-M43	Deforming dorsopathies	10	(0.9)
M45-M49	Spondylopathies	0	
M50-M54	Other dorsopathies	71	(6.6)
M60-M79	Soft tissue disorders	614	(57)
M60-M63	Disorders of muscles	89	(8.3)
M65-M68	Disorders of synovium and tendon	7	(0.6)
M70-M79	Other soft tissue disorders	518	(48.1)
M80-M94	Osteopathies and chondropathies	39	(3.6)
M95-M99	Other disorders	12	(1.1)
M00-M99	All musculoskeletal disorders	1078	(100)

Table 1 summarizes the frequency of MSK ICD-10 diagnostic categories. The majority of these cases were coded as 'soft tissue disorders' (M60-M79, $n = 614$) (57%) followed by 'arthropathies' (M00-M25, $n = 332$) (30.8%). The largest subcategory of 'soft tissue disorders' was 'other soft tissue disorders' (M70-M79, $n = 518$) and included two major subgroups: 'soft tissue disorders related to use, overuse, and pressure' (M70, $n = 149$) without further sub-classification, and 'other soft tissue disorders, not elsewhere classified' (M79, $n = 344$). The most frequent codes among the latter (M79) were M79.1 ('myalgia', $n = 123$) and M79.6 ('pain in limb', $n = 143$).

Among those coded as 'arthropathies', the largest subcategory was 'other joint disorders' (M20-M25, $n = 151$), which included 'acquired deformities of fingers, toes, and limbs' (M20-M21, $n = 65$) and 'pain in joint' (M25.5, $n = 57$). The next largest category under 'arthropathies' was 'inflammatory polyarthropathies' (M05-M14, $n = 123$). Among those, 24 cases were coded as 'Juvenile Arthritis' (JA) (M08) (2.22% of all M codes). There were no cases coded for 'systemic connective tissue disorders' (M30-M36).

Agreement between the ICD10 codes for 'arthropathies'

The age and sex of the 332 consults coded as 'arthropathies' (M00-M25) were similar to the entire cohort (age 8.1 ± 4.5 years; % of females 48.2, $n = 160$).

Direct coding of the 'arthropathies' category (M00-M25) resulted in 34.3% (114/332) agreement between the ICD10 codes assigned by GCH physicians and rheumatologists (Kappa = 0.136, SE = 0.027, 95% CI 0.082–0.190, poor agreement) (Table 2). Highest agreement was found in the 'infectious arthropathies' (M00-M03) (16/19, 84.2%), followed by 'other joint disorders' (M20-M25) (80/151, 53%), and 'inflammatory polyarthropathies' (M05-M14) (18/123, 14.6%). There was zero agreement in the 'arthrosis' (M15-M19) category in which 77% (30/39) would have been coded by the rheumatologists with a non-M-code. For most of these (27/30, 90%), the S code 'injury, poisoning, and certain other consequences of external causes' (S00-T98) would have been used.

From the cases coded as 'other joint disorders' (M20-M25) in which there was disagreement between rheumatologists and GCH physicians ($n = 71$), 4 cases (5.6%) would have been coded as 'infectious arthropathies' (M00-M03), 1 (1.4%) as

Table 2 'Arthropathies' category: agreement between codes used by GCH physicians and rheumatologists' direct coding

GCH coding (n)	**Rheumatologists coding (*n*)**				
	Infectious	Inflammatory	Arthrosis	Other	X = (Other M code + Non M code)
Infectious[1] (**19**)	**16**	2	0	1	0
Inflammatory[2] (**123**)	13	**18**	0	65	27 = (3 + 24)
Arthrosis[3] (**39**)	1	1	**0**	7	30 = (0 + 30)
Other[4] (**151**)	4	1	0	**80**	66 = (3 + 63)
Other M code + Non M code (**0**)	0	0	0	0	**0**
Total (**332**)	***34***	***22***	***0***	***153***	***123***

Kappa = 0.136, SE of Kappa = 0.027, 95% confidential interval 0.082–0.190. The strength of the agreement was considered to be poor. Codes used by GCH physicians are presented in light gray with the number of entries in each diagnostic code category between brackets. Dark gray boxes indicate the number of agreements for each diagnostic category between GCH and rheumatologists' codes

Table 3 'Arthropathies' category: agreement between codes used by GCH physicians and rheumatologists' reverse coding

GCH coding (n)	Rheumatologists coding (*n*)				
	Infectious	Inflammatory	Arthrosis	Other	X = (Other M code + Non M code)
Infectious[1] (**19**)	**18**	1	0	0	0
Inflammatory[2] (**123**)	3	**79**	0	22	19 = (3 + 16)
Arthrosis[3] (**39**)	1	1	**0**	7	30 = (0 + 30)
Other[4] (**151**)	1	1	0	**128**	21 = (1 + 20)
Other M code + Non M code (**0**)	0	0	0	0	**0**
Total (**332**)	***23***	***82***	***0***	***157***	***70***

Kappa = 0.533, SE of Kappa = 0.031, 95% confidential interval 0.471–0.594. The strength of the agreement was considered to be moderate. The codes used by GCH physicians are presented in light gray with the number of entries in each diagnostic code category between brackets. Dark gray boxes indicate the number of agreements for each diagnostic category between GCH and rheumatologists codes

'inflammatory polyarthropathies' (M05-M14), 3 (4.2%) with another M code, and 63 (88.7%) with a non-M code of which 85.7% ($n = 54$) would have been assigned an S code. From these 71, reverse coding lead 48 to be classified as 'other joint disorders' (M20-M25) (under the code 25.5 'pain in joint' instead of S code and under the code 25.4 'effusion of joint' instead of M02 or M03). Therefore, if the rheumatologists' classification was loosened, agreement for the 'other joint disorders' (M20-M25) category would have been 84.8% (128/151) instead of 53% (Table 3).

In the 'inflammatory polyarthropathies' (M05-M14) category, disagreement was seen in 105 cases. Thirteen cases would have been coded by the rheumatologists as 'infectious arthropathies' (M00-M03). With reverse coding, 10 of these could be coded as M13 ('other arthritis') within the 'inflammatory polyarthropathies' category. Sixty-five cases were coded as 'other joint disorders' (M20-M25) by the rheumatologists. Of these, 43 (66.2%) were considered inflammatory but did not have documented arthritis to justify the 'inflammatory polyarthropathies' category with direct coding. Twenty-two cases originally classified by GCH physicians into the 'inflammatory polyarthropathies' category were coded by the rheumatologists with an S code and 8 of these could be classified under the M12.5 code ('traumatic arthropathy') with reverse coding. Therefore, if the rheumatologists' classification was loosened, agreement between the diagnostic codes used by GCH physicians and rheumatologists for the 'inflammatory polyarthropathies' (M05-M14) category increased to 64.2% (79/123) from 14.6% (Table 3).

Out of the 24 cases coded JA (M08) by GCH providers, upon review of the clinical information, rheumatologists classified only 4 as JA (M08); 17 as 'other joint disorders' (M20-M25) since there was no documented arthritis on examination; and 3 as 'infectious arthropathies' (M00-M03).

For 'infectious arthropathies' (M00-M03), with reverse coding, agreement increased from 84.2% (16/19) to 94.7% (18/19). When these and the cases from the 'other joint disorders' (M20-M25) and 'inflammatory polyarthropathies' (M05-M14) categories are included, overall agreement for the 'arthropathies' category (M00-M25) improved to 67.8% (18/19 + 79/123 + 0/39 + 128/151 = 225/332) from 34.3% (Kappa = 0.533; SE = 0.031; 95% CI 0.471–0.594; moderate agreement).

Diagnoses in the 'arthropathies' category

To assess the spectrum of MSK conditions, a pediatric rheumatologist reviewed and interpreted the clinical information available in Kranium from the 'arthropathies' category (M00-M25), and assigned a clinical diagnosis. The most frequent diagnoses included arthralgias (acute, chronic), trauma-related, arthritis (acute, chronic), foot/knee deformities, and septic arthritis (Table 4).

Discussion

Musculoskeletal ICD 10 codes were assigned to 0.5% of the outpatient consults at GCH in 2011. Among the diagnostic categories, 'soft tissue disorders' (M60-M79) and 'arthropathies' (M00-M25) were the most commonly used codes. This study focused on codes for 'diseases of the musculoskeletal system and connective tissue' (M00-M99). These codes encompass the conditions more likely to be seen by a rheumatologist. We purposely did not include diagnostic codes related to MSK injury (S00-T98) and congenital MSK abnormalities (Q65-Q79). Considering that injury and related conditions were the most frequent reasons for contact with the healthcare system in other pediatric studies [15–17], the true burden of all MSK conditions in GCH is expected to be much greater than what was estimated here. Specifically, in a previous study from Rwanda, congenital deformities, neurologic and trauma cases made up half of the pediatric MSK conditions seen [17].

Table 4 Diagnoses among the 'arthropathies' category based on available clinical data

Diagnoses	Count (%)
Arthralgia	111 (33.5)
Acute (< 4 weeks of symptoms)	53 (16)
Chronic* (≥ 4 weeks of symptoms)	33 (10)
Recurrent* (more than 1 episode)	10 (3)
Unspecified (length of time not specified)	15 (4.5)
Trauma-related	102 (30.7)
Arthritis	46 (13.9)
Acute*** (including post-infectious 14/31)	31 (9.4)
Chronic**	3 (0.9)
Recurrent**	2 (0.6)
JIA	3 (0.9)
Unspecified***	7 (2.1)
Foot/knee deformities (e.g., genu varum, pes planus)	23 (6.9)
Septic arthritis	19 (5.7)
Other (miscellaneous)	10 (3)
Hemarthrosis from factor deficiencies	6 (1.8)
Osgood-Schlatter disease	4 (1.2)
Congenital deformities	3 (0.9)
Ganglion cyst	2 (0.6)
Rickets	2 (0.6)
Finger deformity	2 (0.6)
Knee internal derangement	1 (0.3)
Legg-Calvé-Perthes disease	1 (0.3)
All diagnoses	332 (100)

*Some patients with chronic or recurrent arthralgias could have an inflammatory arthritis (such as JA) but did not have findings of arthritis on physical examination

**Some of these patients may have JA or another inflammatory arthritide but not enough information was available to make a firm diagnosis

***Some of these patients may have an evolving JA or other inflammatory arthritide

This study shows discrepancies in the use of the 'arthropathies' codes between GCH physicians and rheumatologists. This could relate to rheumatologists using more specific codes and not using the 'inflammatory polyarthropathies' code (M05-M14) without documenting arthritis. Further, GCH providers use 'arthrosis' (M15-M19) or 'other joint disorders' (M20-M25) codes instead of an S code for joint pain related to injury. In addition, true misdiagnoses, unfamiliarity with the ICD10 coding system, or incomplete documentation in Kranium could have contributed to coding discrepancies.

We recently reported a paucity of cases of JA and systemic connective tissue disorders (CTD) among in-patients at GCH [12]. A limited number of these conditions were also documented among outpatients. This may reflect the lack of pediatric rheumatology specialized care at GCH, limited awareness or expertise of the medical providers in diagnosing rheumatic conditions (including limited skills to detect arthritis), the use of non-specific M codes, coding errors, or the limitation of M-codes in identifying multisystem diseases such as lupus. Alternatively, the low number of JA/CTD cases seen at GCH could be accurate and reflect that patients with these diagnoses were followed at other hospitals with access to adult rheumatologists since there were no pediatric rheumatologists in Kenya at the time of this study. We suspect that over time, with increasing pediatric rheumatology expertise and improved disease awareness, estimates of the frequency and spectrum of rheumatic diseases will be more accurate.

Overall, 'diseases of the musculoskeletal system and connective tissue' in outpatient consults at GCH were not rare. This is important as centers in East Africa are building medical expertise capacity in Pediatric Rheumatology. However, to truly estimate the burden of pediatric MSK diseases, much more rigorous population-based epidemiological studies need to be conducted. This study confirms that while ICD codes do not allow for the estimation of the frequency of specific rheumatic diagnoses, they provide a snapshot of the spectrum and burden of MSK conditions.

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Compliance with ethical standards This study was approved by the Institutional Review Boards of McGill University (Canada) and Gertrude's Children's Hospital (GCH) (Kenya).

Disclosures None.

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