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Prevalence and causes of musculoskeletal impairment in Fundong District, North West Cameroon: Results of a population based survey

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Abstract

Objectives: Epidemiological data on musculoskeletal conditions such as degenerative joint diseases and bone fractures are lacking in low- and middle-income countries. This survey aimed to estimate the prevalence and causes of musculoskeletal impairment in Fundong Health District, North-West Cameroon.

Methods: Fifty-one clusters of 80 people (all ages) were selected using probability proportionate to size sampling. Households within clusters were selected by compact segment sampling. Six screening questions were asked to identify participants likely to have a musculoskeletal impairment (MSI). Participants screening positive to any screening question underwent a standardized examination by a physiotherapist to assess presence, cause, diagnosis and severity of impairment.

Results: In total, 3,567 of 4,080 individuals enumerated for the survey were screened (87%). The all-age prevalence of MSI was 11.6% (95% CI: 10.1-13.3). Prevalence increased with age, from 2.9% in children to 41.2% in adults 50 years and above. The majority of MSI cases (70.4%) were classified as mild, 27.2% as moderate and 2.4% as severe. Acquired non-trauma comprised 67% of the diagnoses. The remainder included trauma (14%), neurological (11%), infection (5%) and congenital (3%). The most common individual diagnosis was degenerative joint disease (43%). Over one third (38%) of individuals with MSI had never received medical care or rehabilitation for their condition.

Conclusions: This survey contributes to the epidemiological data on MSI in low- and middle-income countries. Nearly half of adults aged over 50 years had an MSI. There is a need to address the treatment and rehabilitative service gap for people with MSI in Cameroon.

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Introduction

Musculoskeletal disorders are one of the leading contributors to loss in healthy life expectancy (1) and include conditions that can affect muscles, bones and joints, such as degenerative joint diseases and bone fractures. People with disabilities, of which physical disability is one of the most common forms (2), frequently experience exclusion from education and employment opportunities (3) and barriers to accessing health and rehabilitation services (4) and are at greater risk of poverty (3).

The Bone and Joint Decade (2000 – 2010) (5), endorsed by the United Nations and WHO, was established to raise awareness about the impact that musculoskeletal conditions have on communities. Despite this, there is lack of data on prevalence and causes of MSI in low and middle income countries (LMIC) (6). This reflects, in part, the complexities of MSI and lack of agreement in case definition and survey methodology (2). Estimates of disability in LMIC have often relied on self-report of disability asked as a single question, which is likely to lead to underestimates (7) or reported functional limitations (8) which may not capture all MSI. Surveys using objective standardized screening criteria to generate reliable and comparable estimates of prevalence, cause and severity of MSI are lacking (9). These data are needed to understand and address the health and rehabilitation service needs of persons with MSI.

To address this gap, the Rapid Assessment of MSI (RAM) was developed as an all-age population based survey method to estimate the prevalence and causes of MSI, providing data to help plan and advocate for medical, rehabilitation and other services (9). A survey using this method estimated the prevalence of MSI as 5.2% in Rwanda (10). These data are needed in other LMIC settings to provide locally relevant data for planning services and to build the global evidence base with regards to the epidemiology of MSI.

The aim of this study is to estimate the prevalence and causes of musculoskeletal impairments in Fundong Health District, North West Cameroon.

Methods

Sampling

The population-based survey included people of all ages. Data were collected from August to October 2013 in Fundong Health District, North West Cameroon. The expected prevalence of MSI was estimated to be 4% (6, 10). This required a sample of 4,056 individuals and assumed a precision of 20%, 95% confidence, a design effect of 1.5 and 20% non-response.

A two-stage sampling procedure was used. Fifty-one clusters of 80 people were selected using probability proportionate to size sampling. The 2005 census data were used as the sampling frame. Compact segment sampling was used to select households within clusters. Maps showing the approximate distribution of the population were divided into segments of 80 people and one segment was randomly selected. The enumerators visited all houses door-to-door in that segment until 80 people were included.

At the household, the name, age, sex and contact details of each household member was recorded. Household members were informed about the survey and invited to attend a previously identified central location over the next two days. If an eligible person did not attend the central location the enumerators visited their household at least twice to encourage attendance. If they were unable to travel to the central location (e.g. due to mobility impairment) the survey team visited them at their house at the end of the second day.

Screening for musculoskeletal impairment

We used the RAM method for this study (9). Six initial screening questions were used to assess a) difficulty using the musculoskeletal system, b) use of mobility aids, and c) whether the participant considered any of their body parts to be misshapen. This screening tool has been shown to have high sensitivity (99%) and specificity (97%) (9). A physiotherapist examined participants with a positive response to any screening question. The examination included standardised observation of activities (e.g. walking and picking up small items) to assess functioning. The physiotherapist also examined the affected area of the body. The diagnoses were categorised as congenital, traumatic, infective, neurological, or acquired non-traumatic non-infective. Up to two diagnoses were permissible per identified case of MSI. Aetiology was recorded where it was known by asking the participants about when and how the impairment developed. Based on these examinations, the participant was categorised as having either mild, moderate or severe musculoskeletal impairment. Participants were also asked about treatment or rehabilitation that they had received for their impairment and the physiotherapists made referral recommendations, with consideration to available services in Cameroon.

Self-reported functional difficulty

In addition to clinical screening, participants were screened for self-reported functional limitations using the Washington Group (WG) extended set (adult or child version) (11, 12). The primary caregiver was interviewed as a proxy for children under eight years. The domain on mobility for children asks: “Compared with children of the same age, does [name] have difficulty walking?”; and for

adults: “Do you have difficulty walking or climbing steps?” These questions are assessed using a four-point response scale (“no difficulty”, “some difficulty”, “a lot of difficulty” or “cannot do at all”). We compared these responses with clinically measured MSI.

Training

Three survey teams received 10 days training. The inter-observer variation for the measurement of MSI level and diagnosis of cause was assessed to ensure an acceptable standard (i.e. Kappa ≥0.6). The questionnaires were cognitively tested and checked for context relevance, and the survey protocol was pilot tested for suitability.

Data analysis

Data were analysed using STATA 14.0 (StataCorp LP, College Station, Texas). The confidence around the prevalence estimates accounted for the cluster sampling design. Sensitivity, specificity and positive and negative predictive values were estimated in the comparison of clinical measures to self-reported mobility difficulties.

Ethics

Ethical Approval for the study was granted by the National Ethics Committee for Research in Human Health (Cameroon), the Cameroon Baptist Convention Health Board Institutional Review Board and the London School of Hygiene & Tropical Medicine.

Informed written/finger print consent was obtained from all participants. For children <21 years, a caregiver was required to provide written/finger print consent and to remain present throughout the screening as per national requirements.

Referral services available in the region were mapped pre-emptively to ensure appropriate onward referral for any individuals identified with unmet healthcare needs. All people identified as having an impairment in the study, regardless of health or other need, were referred to a Community-based Rehabilitation (CBR) or Self Help Group program for additional support. Clinical team members distributed basic medicines where appropriate.

Results

A total of 4,080 individuals (51 clusters of 80 people) were enumerated for the population-based survey, of whom 3,567 were screened (response rate 87.4%). Among non-responders 0.5% (n=17) refused and 12.7% (n=521) were unavailable. Mean age was higher amongst non-responders (39.4 years 95% CI: 26.1 - 52.8 amongst refusers, 28.1 years 95% CI: 26.4 - 29.7 amongst those who were unavailable) compared to people who were examined (24.4 years 95% CI: 23.6 - 25.1). The propor-

tion of male and female participants was similar across those examined and those unavailable, but refusers were more likely to be female (those examined 59% female, unavailable 56% female and refused 65% female).

The age distribution of the study population was similar to that of the national population according to the census data but females were over represented in the sample (Table 1). Of the 3,567 individuals screened, 415 cases of MSI were identified giving an all-age MSI prevalence of 11.6% (95% CI: 10.1 – 13.3) (Table 2). The prevalence of MSI increased with age from 2.9% (95%CI: 1.9 – 4.3) among children aged 0-17 years to 41.2% (95%CI: 36.1 – 46.4) in individuals aged 50 years or higher (Table 2). The prevalence of MSI in women was higher 12.9% (95%CI: 11.2 – 14.9) than men 9.8% (95%CI: 8.0 – 11.8) but this difference was not statistically significant. The majority of MSI cases (70.4%) were classified as mild, 27.2% as moderate and 2.4% as severe.

Extrapolating these findings to the population of Cameroon, we estimate there are a total of 35,000 people per million population with a moderate or severe MSI and 116,000 people per million population with any MSI in this setting. By age there are an estimated; 15,950 children with MSI aged 0-17 years (95% CI: 10,450 – 23, 650), 34,920 aged 18-50 years (95%CI: 27,000 – 44, 640) and 37,080 adults > 50 years (95%CI: 32,490 – 41,760).

Table 1. Age and gender distribution of district (census) and study sample population

	Males		**Females**		**Total**	
Age group	**District***	**Study sample**	**District**	**Study sample**	**District**	**Study sample**
0-9	285,644 (31.4%)	609 (42%)	279,340 (28.2%)	630 (30%)	564,984 (29.7%)	1,239 (35%)
10-19	258,047 (28.4%)	399 (27%)	257,261 (26.0%)	423 (20%)	515,308 (27.1%)	822 (23%)
20-29	136,854 (15.0%)	77 (5%)	174,712 (17.6%)	307 (15%)	311,566 (16.4%)	384 (11%)
30-39	83,977 (9.2%)	70 (5%)	107,390 (10.8%)	197 (9%)	191,367 (10.1%)	267 (7%)
40-49	55,672 (6.1%)	67 (5%)	70,492 (7.1%)	152 (7%)	126,164 (6.6%)	219 (6%)
50-59	38,749 (4.3%)	61 (4%)	47,397 (4.8%)	146 (7%)	86,146 (4.5%)	207 (6%)
60-69	28,845 (3.2%)	60 (4%)	32,158 (3.2%)	127 (6%)	61,003 (3.2%)	187 (5%)
70-79	15,709 (1.7%)	66 (5%)	14,930 (1.5%)	86 (4%)	30,639 (1.6%)	152 (4%)
80+	6,436 (0.7%)	46 (3%)	6,934 (0.7%)	44 (2%)	13,370 (0.7%)	90 (3%)
Total	909,933 (47.9%)	**1,455 (40.8)**	990,614 (52.1%)	**2,122 (59.2%)**	1,900,547 (100%)	**3,567**

NB: * Cameroon Census 2005 demographic projection for North West Region 2014

Table 2. Prevalence of musculoskeletal impairments by age, gender and impairment severity

	Total		**0-17 years**		**18-49 years**		**50+ years**		**Male**		**Female**	
	N	**% (95% CI)**	**N**	**% (95% CI)**	**N**	**% (95% CI)**	**N**	**% (95% CI)**	**N**	**% (95% CI)**	**N**	**% (95% CI)**
Any MSI	415	11.6 (10.1 – 13.3)	58	2.9 (1.9-4.3)	95	9.7 (7.5 – 12.4)	262	41.2 (36.1 – 46.4)	142	9.8 (8.0 – 11.8)	273	12.9 (11.2 – 14.9)
Mild	292	8.2 (6.8 – 9.8)	32	1.6 (1.1 – 2.5)	67	6.8 (5.1 – 9.2)	193	30.3 (25.3 – 35.9)	100	6.9 (5.2 – 9.0)	192	9.1 (7.6 – 10.9)
Moderate	113	3.2 (2.5-4.0)	24	1.2 (0.7-2.1)	24	2.4 (1.6-3.8)	65	10.2 (7.8-13.3)	39	2.7 (1.9-3.8)	74	3.5 (2.7-4.6)
Severe	10	0.3 (0.2-0.5)	2	0.1 (0.03-0.4)	4	0.4 (0.2-1.1)	4	0.6 (0.2-1.7)	3	0.2 (0.07-0.6)	7	0.3 (0.2-0.7)

Age at impairment

Among all individuals with MSI, just over two-thirds of the impairment (68%) was aquired above the age of 50 years, with 6% present at birth. Among the children with MSI, 30% were born with their condition and 28% aquired the impairment before they were 5 years. Among adults aged 18-50 years with MSI, just under half (47%) aquired their impairment during their adult years (i.e. >17years). Among adults aged >50 years with MSI, the vast majority (96%) had developed their impairment above the age of 40 years.

Diagnoses

The causes of MSI are shown in Table 3. There were a total of 455 diagnoses for the 415 participants with MSI. Overall, 67% of all MSI diagnoses were acquired non-traumatic non-infective causes, 14% were due to trauma, 11% had neurological causes, 5% were due to infection and 3% were congenital. Extrapolating these estimates to the total population of Cameroon suggests there are approximately 1,736,000 MSI diagnoses in the country. Prevalence and MSI diagnoses varied by age (Figure 1). Among the children aged 0-17 years, neurological, trauma and infective diagnoses were the most common. With increasing age there was a proportional increase in MSI due to acquired non-traumatic causes so that 83% of the diagnoses for older adults (aged >50 years) were in this category. Among the 415 people with a MSI, 8% had a vision impairment, 15% had a hearing impairment and 2% had epilepsy. Overall 21% of people with a MSI also had at least a vision or hearing impairment or epilepsy.

Aetiology

Aetiology was unknown for the majority (59%) of the individuals with MSI. Fifteen percent of MSI was due to trauma, 8% was congenital (without family history) and 6% was due to infection. Other aetiologies that include iatrogenic (1%), neoplasm (1%), family history (2%), developmental (1%) and perinatal hypoxia (0.3%) were relatively rare.

Previous Treatment

Participants were asked about previous interventions that they had received relating to their impairment. Previous interventions that were commonly reported were medication (49%) followed by traditional medicine (18%), mobility aids (11%) and physiotherapy (7%). Over one third of individuals with MSI (38%) reported they had never received any medical or rehabilitation services.

Recommended Treatment

At least one medical or rehabilitation services was recommended for 74% of individuals with MSI by the clinician during the survey. Medication (66%) and physiotherapy (65%) were the most commonly recommended treatments, followed by mobility aids (30%), surgery (9%) and long-term care (e.g. in a hospital) (9%).

Table 3. Cause of MSI in survey, and extrapolated to population of Cameroon

Diagnosis	Number	Total in category (%)		Extrapolated total number of diagnostic category to nearest 1,000 (95%CI)
Total Congenital		**14**	**3%**	**52,000 (42,000-65,000)**
Polydactyly	2			
Congenital absence of all/part of tibia	1			
Clubfoot	2			
Other congenital abnormality of lower limb	6			
Congenital deformity of thoracolumbar spine	1			
Multiple congenital abnormalities	2			
Total Infective		**21**	**5%**	**87,000 (69,000-108,000)**
Joint infection	5			
Bone infection	3			
Skin/soft tissue infection/wound	13			
Total trauma		**65**	**14%**	**278,000 (221,000-346,000)**
Burn contracture	7			
Fracture malunion	11			
Spinal injury	1			
Recurrent/chronic dislocation	1			
Post traumatic joint stiffness	3			
Tendon Problem	6			
Muscle problem	4			
Peripheral nerve problem	4			
Amputation	10			
Other trauma	18			
Total neurological		**51**	**11%**	**208,000 (166,000 -260,000)**
Epilepsy	11			
Developmental delay	6			
Cerebral palsy	8			
Paraplegia	1			
Hemiplegia	5			
Peripheral nerve palsy/facial weakness	8			
Polio	1			
Other neurological	11			
Total Acquired non-traumatic		**304**	**67%**	**750,000 (358,000-845,000)**
Degenerative joint diseases	196			
Non-infective non traumatic joint disease	4			
Knock knees	5			
Other joint deformity	3			
Bone/skin/soft tissue tumour	7			
Scoliosis	1			
Spinal pain limiting spine function	41			
TB/spine infection	1			
Limb pain	8			
Lymphoedema	2			
Other acquired non-traumatic	36			
Total		**455**		**1,736,000 (1,383,000-2,169,000)**

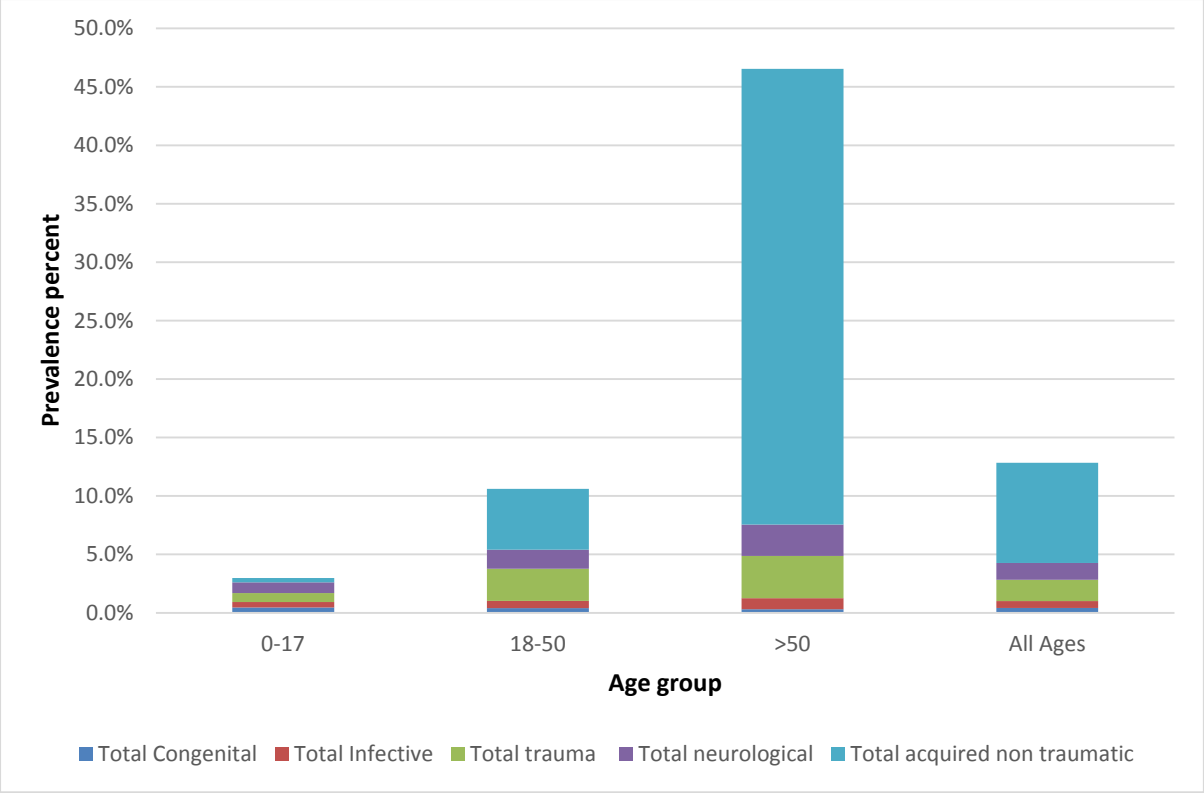

Figure 1. Diagnostic categories of MSI, by age group

Table 4. Recommended intervention for individuals with MSI

	Intervention previously received[ab]		Intervention recommended[ac]	
	N	**%**	**N**	**%**
None	148	38%	98	26%
Medication	192	49%	246	66%
Plaster/Splintage	10	3%	16	4%
Physiotherapy	26	7%	244	65%
Special Seating	0	0%	3	1%
Mobility aid	45	11%	114	30%
General assistive aid	9	2%	11	3%
Orthosis/prosthesis	0	0%	6	2%
Wheelchair	2	1%	4	1%
Surgery	11	3%	33	9%
Long-term care (e.g. hospital/institution)	14	4%	33	9%
Traditional medicine	69	18%	0	0%
Other:	9	2%	23	6%

[a] More than one intervention could be recommended for each person, hence totals equal more than 100%

[b] data were missing for 42 individuals and they were excluded from analysis.

[c] Data were missing from 23 individuals and they were excluded from analysis

Comparison of clinically measured and self-reported difficulties with mobility

Of the 406 participants with clinically assessed MSI (mild, moderate or severe) and Washington Group responses in the domain of "walking/climbing", 286 reported 'some' or 'more' problem with mobility (sensitivity = 70%) using the Washington Group (WG) questionnaire. Of the 2,902 people who did not have an MSI according to the clinical assessment, 2,346 reported no difficulty with mobility (specificity: 81%). Of the 2,465 who reported no difficulty, 2,346 also had no MSI (negative predictive value: 95%). Among the 841 who reported 'some' or 'more' difficulty, 286 had a clinically assessed MSI (positive predictive value: 34%). If a narrower self-reported definition of 'a lot of difficulty' or greater is used, the sensitivity decreased to 18%, specificity increased to 99%, and positive and negative predictive values were 72% and 90% respectively.

Table 5 Relationship between clinically assessed impairment and self-reported difficulties with mobility

	Self-reported difficulties			
Clinically assessed MSI	**None N (%)**	**Some N (%)**	**A lot N (%)**	**Extreme/ Cannot do N (%)**
No MSI (n=2902)	2,346 (81%)	526 (18%)	29 (1%)	0
Mild (n=287)	90 (32%)	172 (60%)	25 (9%)	0
Moderate (n=110)	27 (25%)	41 (37%)	40 (36%)	2 (2%)
Severe (n=8)	2 (25%)	0	4 (50%)	2 (25%)
Any MSI* (n=405)	2,465 (75%)	739 (22%)	98 (3%)	4 (0.1%)

*****NB: WG data were missing for 30 people

Summary of results

This all age population-based survey conducted in Fundong district in North-West Cameroon estimated an MSI prevalence of 11.6% (95% CI 10.1 – 13.3). The majority of MSI cases (70.4%) were classified as mild, 27.2% as moderate and 2.4% as severe. The prevalence of MSI increased dramatically with age, with 41.2% of cases of MSI found in people >50 years. Overall, 67% of MSI were due to acquired non-traumatic non-infective causes. The remainder of causes included trauma (14%), neurological (11%), infection (5%) and congenital (3%). Among participants ≥50 years, the cause of MSI was largely attributed to a broadly defined condition called degenerative joint disease (e.g. osteoarthritis).

Discussion

The data from this survey provide useful information to assist planning of rehabilitation and other services for persons with MSI in Cameroon. For example, this study estimates that there are approximately of 35,000 people per million population in Cameroon with a moderate or severe MSI and 116,000 with any MSI. Throughout the country, approximately 800,000 people will have mild or worse degenerative joint conditions. The need for equipment (e.g. assistive devices) can also be estimated from this information and production and supply can be anticipated accordingly. Potential requirements for services such as rehabilitation and surgery can be similarly estimated. If these results are combined with a situational analysis of existing capacity and resources, as well as availability and affordability of services, this can inform advocacy and planning of future rehabilitation and service provision. For example, the information collected in this survey on recommended interventions suggest that approximately 1,130,000 people in Cameroon could benefit from physiotherapy and 156,000 from surgery, yet there are currently 130 physiotherapists and physiotherapy assistants and 45 orthopaedic surgeons estimated in the country(13).

The overall prevalence of MSI in this study is double the 5.2% (95% CI 4.5–5.9) reported in Rwanda which used similar survey methods. While the estimated prevalence of moderate MSI (Cameroon 3.2%, Rwanda 2.4%) and severe (Cameroon 0.3%, Rwanda 0.4%), the number of participants assessed as having mild MSI was considerably higher in Cameroon (8.2% vs 2.4%). The reasons for this are unclear, but may, in part, reflect the higher proportion of older adults (>50 years) included in the survey in Cameroon where the prevalence of mild MSI was particularly high. The assessment of mild MSI deserves further attention in future studies using this method. Concerning causes of MSI, our findings support those in Rwanda where a non-traumatic non-infective cause was the most common diagnostic category and the most common individual diagnosis was joint problems (13% of MSI diagnoses).

The Global Burden of Disease Study estimates that in 2015 the most important contributors to global years lived with disability were musculoskeletal disorders (18.5% [16.4 – 20.9%]) (14). Lower back and neck pain were estimated in 2013 as the leading cause of years lived with disability in Cameroon (15). There are few other data in the region with which to compare our findings. Population prevalence of all disability was estimated as 6.2% (95% CI 5.2-7.2%) (16) through self-report in the North West Region of Cameroon. Cameroon's Demographic and Health and Multiple Indicator Survey (2011) estimated that 5.4% of the population in Cameroon lives with a disability, with 6.6% in the North-West Region (17). However, it is not clear what proportion of these estimates were physical disability. More comparable data from studies employing the same sampling methods and case definition are needed in different settings to strengthen the evidence on epidemiology of MSI in LMIC

settings (6).

Our study highlights the high prevalence of MSI among older people. This finding supports studies of older person's health in Botswana and Malawi that demonstrate increased probability of musculoskeletal disease (18) and functional limitations (19) respectively. As the prevalence of musculoskeletal disorders increases with age, it follows that there will be a marked increase in requirements for health care and community support in the coming years. Despite having great need for rehabilitation services than younger age groups, evidence suggests that older people in sub-Saharan Africa use these services less frequently (20). Access to health and other services (for all ages) may be encouraged through community-based rehabilitation (CBR) programmes in rural communities. In addition, the development of programmes that serve populations at the district level (21), where needs can be assessed and resources identified, may improve access to preventative services and rehabilitation.

Medical or rehabilitation services were recommended for the majority of the people identified as having an MSI in this survey, 38% of people with MSI had not previously received any such services. These data demonstrate a large treatment gap for MSI in Cameroon, similar to that of Rwanda (10). The challenge of improving access both to preventative and rehabilitation services is experienced globally (22-25). As the burden of MSI is predicted to increase as populations age, there is a need to recognise musculoskeletal conditions as a global public health priority. Innovative ways to fill this health service gap are required. For example, the use of mobile tools for the delivery of a home exercise programme in low resource settings (26) warrants further investigation.

The extent of overlap between the populations identified by clinical assessment and self-report varied considerably according to the severity of self-reported difficulties. The broader category of 'some or more difficulty' identified many people who did not have a moderate/severe clinical MSI; however sensitivity and specificity were within acceptable range with the inclusion of mild MSI. Using the narrower category 'a lot of difficulty' missed a considerable number of clinically confirmed cases. These two measurement approaches capture different aspects of disability (8) and a recent analysis has suggested that, where resources permit, using the two measures together in disability surveys may be helpful to identify the majority of people with disability (8). The need for RAM is highlighted as the self-reported measures alone at the level of 'some or more difficulty' underestimate MSI and do not provide information on clinical need.

This was an all-age population based survey that used a standardised examination protocol to provide estimates of musculoskeletal impairment, with assessment by physiotherapists. Compact segment sampling reduced the likelihood of selection bias (27) and facilitated call back at households where people were unavailable. There were also study limitations. The study relied on simpli-

fied examination procedures that could be conducted in the field. Diagnostic tools were limited to history and clinical examination, which restricted the identification of aetiologies reliant on complex investigations. For example, we did not use the neutral-zero-method with joint conditions because the method requires a goniometer and expertise to measure the precise available range of motion. This study provides an overview of the treatment needs, but details on specific recommendations (such as classification of medication recommended) were not collected and deserve further attention in future research.

Conclusions

This paper contributes data to the epidemiology of MSI globally and provides useful information on planning services for persons with MSI in Cameroon.

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