

# Teaching of major communicable diseases in Sudanese medical schools: a critical look

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## تدريس الأمراض السارية الرئيسية في كليات الطب السودانية: نظرة ناقدة

سميرة حامد عبد الرحمن، الفاتح محمد مالك، أحمد عبد الله محمداني، محمد المختار محمد، سميرة محمد الفاضل، طارق دفع الله الحسن، حاتم سيد أحمد الخلاصة: تهدف هذه الدراسة الوصفية المستعرضة لكليات الطب السودانية إلى وصف وتحليل مكونات المنهج التدريسي المخصص في الوقت الراهن فيها لتدريس الأمراض السارية، ولتقييم طرق التعليم، ووسائل تقييم الطلاب. وقد جمع الباحثون المعطيات الكيفية والكمية من رؤساء الأقسام ومن الطلاب في عشرين كلية من كليات الطب التي يبلغ عددها سبعة وعشرين، ومن العاملين في وزارة الصحة على المستوى الاتحادي، وعلى مستوى الولايات. وتبين للباحثين أن تصميم المنهج التدريسي يتراوح بين البرامج التقليدية والبرامج المبتكرة المجتمعية التوجه. وتعرف الباحثون على المشكلات في تقييم الطلاب. واتضح للباحثين أن أوجه القصور الرئيسية تتضمن نقص أعداد العاملين والمراجع التعليمية والمواد المساعدة في التعليم. واتضح للباحثين ضعف معرفة الطلاب بالجوانب المختلفة للأمراض المتوطنة في السودان. وأوصى الباحثون بتطوير المنهج التدريسي، وتوظيف وتدريب العاملين، وتحسين التعليم والتدريب للطلاب.

ABSTRACT This descriptive, cross-sectional study of Sudanese medical schools aimed to describe and analyse the proportion of their curricula currently allocated for teaching of communicable diseases and to assess the teaching methods and student assessment tools. Qualitative and quantitative data were collected from heads of departments and students in 20 of the 27 medical faculties and from ministry of health staff at federal and state levels. Curriculum designs ranged from traditional to innovative, community-oriented programmes. Problems regarding student evaluations were identified. Major limitations included shortages of staff, reference materials and teaching aids. Poor knowledge of students about different aspects of diseases endemic in Sudan was found. Recommendations include curriculum development, staff recruitment and training, and improvement of teaching and training of students.

## Regard critique sur l'enseignement des principales maladies transmissibles dans les facultés de médecine soudanaises

RÉSUMÉ La présente étude descriptive et transversale des facultés de médecine soudanaises a tenté de décrire et d'évaluer la part de leurs programmes actuellement consacrée à l'enseignement des maladies transmissibles, et d'analyser les méthodes d'enseignement et les outils d'évaluation des étudiants. Des données qualitatives et quantitatives ont été recueillies auprès des responsables de départements et des étudiants dans 20 facultés de médecine (sur les 27 existantes), et auprès du personnel des ministères de la Santé au niveau de la fédération et des États. La structure des programmes était soit traditionnelle, soit innovante avec une orientation communautaire. Des difficultés ont été identifiées au sujet des évaluations des étudiants. Le manque de personnel, de documents de référence et de matériel pédagogique comptent parmi les freins à l'enseignement les plus importants. L'étude a révélé que les étudiants avaient des connaissances médiocres sur les différents aspects des maladies endémiques au Soudan. Les recommandations portent sur l'élaboration de programmes, le recrutement et la formation de personnel et l'amélioration de l'enseignement dispensé aux étudiants.

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## Introduction

The First International Conference on Primary Health Care in Alma-Ata in 1978 confirmed the need for a new look at the education of health professionals. This global perspective on the world's health problems and, subsequently, the promotion of the target of health for all by the year 2000 brought with it a growing recognition the need to adjust health manpower development to the real health needs and demands of the community [1]. This new focus on medical education that is relevant to community health needs means that the subject matter studied by medical students should have direct relevance to the priority health problems of the society for which these students are trained [2].

Communicable diseases dominate the health scene in Sudan, with its high vulnerability to outbreaks of malaria, schistosomiasis, tuberculosis (TB), leishmaniasis, leprosy, cholera and many others. Despite a major expansion in higher education in Sudan since 1993, especially in the area of medical education, unpublished examination reports from some medical schools suggest that a high proportion of medical students lack the clinical skills and other competencies necessary for the prevention, control and management of major endemic diseases in Sudan. There is also concern about the coordination and partnership between medical schools and relevant programmes of the Sudan federal ministry of health (MOH) in designing and implementing the necessary educational programmes.

The main objective of the study was to describe and identify the problems and limitations of the current teaching of major endemic diseases in Sudan in the curricula of Sudanese medical schools and to propose recommendations for strengthening and further development of education in this area.

## Methods

The study was conducted in 2007–08 and used a descriptive design in which both qualitative and quantitative instruments were used to fulfil the study objectives.

### Sample

The sampling frame consisted of all Sudanese medical faculties ( $n = 27$ ) in all 4 regions of the country and the capital city Khartoum. In order to guard against confounding factors related to recently established medical schools we included only medical schools that had graduated at least 2 batches of graduates. Out of the 23 medical schools that satisfied the inclusion criteria, 20 were included in the study; 3 schools were not investigated due to security problems or a student strike that led to closure of the university concerned. The distribution of the study medical faculties in the different regions of Sudan is shown in Table 1.

### Data collection

A total of 14 forms were designed for the different stages of data collection. Data was collected by 6 team members, comprising academic staff of the universities and staff from the federal MOH, all of whom were PhD holders with a rich experience in similar research. The data collection team met all the deans of faculties to explain the study objectives and its expected outcomes and to conduct structured interviews with the heads of the departments of medicine, community medicine, pathology and paediatrics.

Data were collected on: background information about the medical school; the curriculum content concerning diseases endemic in Sudan; the proportion of the overall curriculum dedicated to teaching endemic diseases (contact hours); the educational methods used; and the availability of reference materials (books, training and learning materials, Internet resources).

Written assessments were done on a sample of students who had already completed all courses related to endemic diseases. The total number of eligible students at each school was provided by the faculty registrar and 10% of them were randomly selected, with proportionate representation of males and females. The total number of students who agreed to participate in the assessment was 290. The assessments covered knowledge about 24 major diseases that are endemic in Sudan in the following areas: disease epidemiology (causative agent(s), vector, reservoir, route(s) of transmission); laboratory diagnosis; and federal MOH strategies and protocols for treatment, prevention and control of those diseases [3–11].

To collect qualitative data about the teaching of endemic diseases and how to improve it, focus group discussions (FGDs) were conducted with students at the medical faculties. One FGD was conducted in each medical school (20 groups in total), each group consisting of 8–10 students (males and females). FGDs were also carried out with managers of disease programmes ( $n = 6$ ) at the federal MOH and in-depth interviews were conducted with the directors general ( $n = 12$ ) at the MOH in the states where the investigated faculties were located.

For analysis the curricula of the medical schools were categorized into 3 main types: innovative (community-oriented), traditional or hybrid (mixture of the 2 types).

### Data analysis

SPSS, version 7.5 was used to analyse quantitative data. Descriptive statistics was also used to quantify the existence of different types of educational resources. Qualitative data was analysed manually.

## Results

The length of the academic programme was 5 years in 7 (35%) of the medical

**Table 1 Distribution of public and private medical faculties in the different regions of Sudan (n = 20 faculties)**

Type of medical school	No. of faculties					
	Northern	Eastern	Central	Western	Southern	Khartoum
Public	3	3	4	1	2	4
Private	0	0	0	0	0	3
Total	3	3	4	1	2	7

faculties and 6 years in 13 (65%). Student intake per batch varied considerably between the faculties, ranging from 95–250. It was generally larger in government-run medical faculties than private ones.

### Review of curriculum and teaching in medical faculties

#### Curriculum

The curriculum was documented in 18 (90%) of the faculties and the documents of different courses were available to faculty staff in 16 of these. Curriculum handouts were distributed to students in 9 of the faculties (45%). As reported by the faculties, 17 of them had an existing curriculum review committee. However, a curriculum review had been conducted in only 9 faculties: 13 years ago in 1 faculty, 3 years ago in 5 faculties, 2 years ago in 1 faculty, 1 year ago in 2 faculties. Students were represented in the review committees of only 7 (35%) faculties. In 10 faculties (50%), staff from the federal MOH had participated in the initial development of the faculty curriculum and in 5 medical schools (25%) there had been participation by state MOH staff.

#### Staff

Considering both full- and part-time staff, the range of staff:student ratios in the 4 studied departments in the different medical faculties was as follows:

- Medicine: 1:10 (7 faculties), 1:11–1:15 (10 faculties), > 1:15 (3 faculties);
- Pathology: 1:15–1:20 (8 faculties), 1:21–1:30 (8 faculties), 1:31–1:70 (4 faculties);

- Paediatrics: 1:10 (7 faculties), 1:11–1:15 (4 faculties), 1:16–1:30 (9 faculties);
- Community medicine: 1:11–1:15 (4 faculties), 1:16–1:30 (10 faculties), 1:40 (2 faculties), 1:50 (2 faculties), 1:100 (2 faculties).

In 3 of the faculties (15%) a proportion of the faculty staff (mainly from the departments of medicine, paediatrics, pathology and community medicine) were also affiliated to the state MOH. Participation of faculty staff in MOH activities addressing endemic diseases are shown in Table 2. The most common activity was training of health workers by staff in 60% of faculties.

Only 4 faculties (20%) had set plans for regular staff orientation and updating in the different aspects of endemic diseases. Technical updates regarding endemic diseases were received from the federal MOH by only 10 (50%) of the faculties. In 4 of these faculties the updates were disseminated to faculty staff on a personal basis only, with no mechanism identified for dissemination to ensure coverage of all relevant departments if not all faculty staff. The

received updates were mainly related to TB (DOTS), diarrhoeal diseases, polio eradication and malaria protocols for the treatment of cases.

#### Teaching

The type of curriculum was classified as traditional in 7 medical schools, innovative in 8 and hybrid in 5. Of the faculties 11 (55%) had discipline-based systems and 9 (45%) adopted the integrated, system-based block system; 5 of the latter group followed a problem-solving approach. Theoretical and clinical training about endemic diseases were implemented in teaching hospitals in all the faculties, whereas training in a primary health care setting was conducted in only 5 (25%) of the faculties.

The total contact hours allocated for the teaching of endemic diseases in the curriculum varied between 6368–7310, credit hours from 180–271 and the number of weeks from 140–180.

#### Coverage of endemic diseases in the curriculum

Table 3 shows the coverage of the 24 major endemic diseases in the medical faculty curricula. Only 11 of the diseases

**Table 2 Participation of medical faculty staff in Ministry of Health activities (n = 20 faculties)**

Aspect of staff participation	No. of faculties	%
Training of health workers	12	60
Setting priorities	8	40
Treatment protocols	8	40
Guidelines for diagnosis	7	35
Preparation of training packages	6	30
Monitoring and evaluation	6	30
Research projects	5	25
Guidelines for control and prevention	4	20
Development of communication plans	4	20

**Table 3 Medical faculties with coverage in their curriculum of specific diseases endemic in Sudan (n = 20)**

Disease	No. of faculties teaching disease	Faculties with excellent to moderate coverage of:							
		Epidemiology		Diagnosis		Management		Control & prevention	
		No.	%	No.	%	No.	%	No.	%
Malaria	20	18	90	18	90	18	90	18	90
Schistosomiasis	20	18	90	18	90	18	90	18	90
Leishmaniasis	20	18	90	19	95	18	90	18	90
Tuberculosis	20	18	90	19	95	18	90	18	90
Diarrhoeal diseases	20	16	80	18	90	18	90	16	80
Cholera	20	16	80	18	90	18	90	16	80
Typhoid	20	14	70	18	90	18	90	18	90
Brucellosis	20	16	80	19	95	18	90	18	90
Hepatitides	20	18	90	19	95	18	90	18	90
Meningitis	20	18	90	19	95	18	90	18	90
Diphtheria	20	16	80	16	80	16	80	16	80
AIDS	19	15	79	17	89	17	89	17	89
Leprosy	18	14	78	16	89	16	89	14	78
Tetanus	18	16	89	16	89	16	89	14	78
Whooping cough	18	14	78	14	78	14	78	14	78
Measles	18	14	78	14	78	14	78	14	78
Trachoma	17	6	35	6	35	7	41	6	35
Scabies	17	4	24	6	35	6	35	6	35
Intestinal worms	16	12	75	14	88	14	88	12	75
Filariasis	15	8	53	10	67	8	53	8	53
Haemorrhagic fevers	15	7	47	3	20	8	53	3	20
Trypanosomiasis	15	5	33	7	47	5	33	5	33
Poliomyelitis	15	13	87	13	87	13	87	12	80
Anthrax	9	1	11	1	11	2	22	1	11

assessed were covered by all 20 faculties and only 9 of the medical schools (45%) addressed all 24 diseases. Important endemic diseases such as poliomyelitis, tetanus, leishmaniasis and AIDS were not covered by some faculties. Leprosy and trypanosomiasis were also neglected. Anthrax were addressed by 11 of the faculties.

Each disease was also analysed by 4 content areas (epidemiology, diagnosis, management, prevention and control) with each area further divided into subareas. Faculties that covered all major areas and all identified subareas were considered to have excellent coverage, while the schools whose curricula did not cover all 4 major areas or did not cover all subareas

(but still covered 7–9 subareas) were considered to have moderate coverage (Table 3). Diseases addressed by all (100%) of the medical schools had excellent coverage in all aspects (epidemiology, diagnosis, management, control and prevention). Moderate coverage was found in the group of diseases addressed by 90%–95% of the schools, while the majority of diseases that were addressed by < 85% of the schools had deficient coverage of these aspects.

In Table 4 medical faculties were further described by their type of curriculum (traditional, innovative or hybrid). Epidemiology, diagnosis, management and prevention and control of malaria, schistosomiasis, leishmaniasis,

TB and the hepatitides were addressed in the curriculum by 80% or more of medical faculties of all 3 curriculum types. Diseases that were covered by less than 80% of medical schools in all 3 curriculum types included: trachoma, filariasis, trypanosomiasis, scabies and anthrax. Haemorrhagic fevers were neglected in some areas, but diagnosis was addressed by more than 80% of the traditional and innovative faculties. The percentage of faculties addressing the specified endemic diseases fell below 40% for scabies and anthrax for each of the 3 curriculum types. For the remaining list of diseases, the table shows clear variations between the 3 categories of medical faculties with regard to the teaching in the 4 main areas.

Table 4 Medical faculties with coverage of diseases endemic in Sudan according to type of curriculum: traditional, innovative (community-oriented) or hybrid (mix of both)

Disease	% of faculties with coverage of:											
	Traditional curriculum (n = 7)				Innovative curriculum (n = 8)				Hybrid curriculum (n = 5)			
	Epidemiology	Diagnosis	Management	Control & prevention	Epidemiology	Diagnosis	Management	Control & prevention	Epidemiology	Diagnosis	Management	Control & prevention
Malaria	86	100	100	86	100	88	88	100	80	80	80	80
Schistosomiasis	86	100	100	86	100	88	88	100	80	80	80	80
Leishmaniasis	86	86	86	100	100	100	100	88	80	100	80	80
Tuberculosis	86	86	86	86	100	100	100	88	80	100	80	100
Diarrhoeal diseases	71	86	86	86	88	100	100	75	80	80	80	80
Cholera	71	86	100	86	88	100	88	88	80	80	80	60
Typhoid	57	86	100	86	63	88	88	100	80	100	80	80
Brucellosis	71	100	100	100	88	100	88	88	80	100	80	80
Hepatitis	100	86	86	86	88	100	100	88	80	100	80	100
Meningitis	86	86	86	100	100	100	88	88	80	100	100	80
Diphtheria	71	86	86	86	88	88	88	88	80	60	60	60
AIDS	71	86	86	86	88	88	88	88	80	100	100	100
Leprosy	71	86	86	86	100	88	100	75	60	100	80	80
Tetanus	100	86	86	86	75	88	100	75	100	100	80	80
Whooping cough	86	71	71	86	75	88	88	88	80	80	80	60
Measles	86	86	86	86	75	75	88	75	80	80	60	80
Trachoma <sup>a</sup>	14	14	43	29	50	38	38	38	20	40	60	20
Scabies <sup>a</sup>	14	43	29	14	13	38	38	50	40	0	20	20
Intestinal parasites	71	86	86	86	88	88	100	88	80	100	80	60
Filariasis <sup>a</sup>	43	71	57	57	63	75	50	50	60	40	60	60
Haemorrhagic fevers <sup>a</sup>	29	86	43	14	38	88	50	13	60	60	60	40
Trypanosomiasis <sup>a</sup>	14	29	14	29	38	38	50	38	40	60	20	20
Polio-myelitis	100	86	86	86	88	88	88	75	80	100	100	80
Anthrax <sup>a</sup>	0	0	14	0	13	13	13	13	20	20	40	20

<sup>a</sup>Disease addressed by < 80% of each of the different categories of medical faculties.

### Contact hours allocated for teaching of endemic diseases

Around 107–276 total contact hours for the curriculum were allocated for the teaching of endemic diseases in the different faculties.

- Theoretical teaching: contact hours per subject ranged from 1–22. The lowest coverage was for anthrax (50% of faculties). Scabies, haemorrhagic fevers, trypanosomiasis, cholera, filariasis, leprosy and diarrhoeal diseases were covered by between 70%–90% of the faculties. The remaining diseases were covered by 100% of faculties.
- Practical training: contact hours per subject ranged from 0–9. None of the faculties (0%) had practical training for 9 subjects (AIDS, trachoma, haemorrhagic fevers, polio, diphtheria, tetanus, whooping cough, scabies and anthrax). Practical training was done only for the major diseases that were covered by 100% of schools.
- Field training: contact hours per subject ranged from 1–3. There was no field training for 11 subjects (AIDS, trachoma, haemorrhagic fevers, filariasis, polio, diphtheria, tetanus, whooping cough, scabies, measles and anthrax) not covered by any type of field training. Field training was done for the major diseases that were covered by 100% of schools.
- Clinical training: contact hours per subject ranged from 1–4. All faculties (100%) covered malaria, TB, diarrhoeal diseases, meningitis and hepatitis.

### Use of MOH protocols on endemic diseases

The utilization by the medical faculties of federal MOH strategies, guidelines and protocols in diagnosis, treatment, prevention and control of endemic diseases was very variable. The guidelines on treatment were used by 16 faculties, on diagnosis by 13 and on prevention and control by only 2 faculties

### Availability of teaching materials

Regarding the availability of reference books and some other learning aids, a minimum acceptable standard was the availability of a well-known textbook of endemic diseases and other directly related disciplines, such as microbiology, parasitology, medical entomology, etc.). Less than 25% of the faculties, both government and private, had all the references available. The US Centers for Disease Control and Prevention's *Control of Communicable Diseases Manual*, which is essential for teaching of endemic diseases, was available in only 7 (35%) of the faculties. There is no standard textbook for microbiology, but there were diverse types of reference materials for parasitology, bacteriology and virology available at all faculties. Other related books on medicine, paediatrics and general pathology were available in all of the faculties. The best student/book ratio was 4 students/book and the worst was 56 students/book, with an average ratio of 10 students/book.

Concerning the other teaching aids (e.g. slides, museum specimens, CDROMs and information, education and communication materials) all faculties had at least 1 of them available, especially the older established faculties that had museums with pathology specimens of endemic diseases. However, the availability of all these aids was zero. CDROMs about different aspects of endemic diseases were available in 7 (35%) of the faculties, while video films were already obsolete at university libraries. Only 1 faculty among the studied group provided posters on endemic diseases at the library.

Museum specimens for the study of endemic diseases were available in only 20% of the faculties, and Internet services were available in 65%.

### Instructional methods

Lectures were the main method for theory-based instruction, utilized by all (100%) of the faculties, while some faculties used seminars and tutorials

(40%), problem-based learning (10%) and a few faculties used the case-study approach (10%). Practical laboratory training and slide demonstrations were used in only 10% and 40% of faculties respectively. Field training was done as follows: in villages (15% of faculties), health centres (40%) and rural hospitals (15%). Visits to disease programme administrations to study managerial aspects were done by a few faculties (10%). Clinical training in teaching hospitals was done by all faculties (100%) and in outpatient departments by only 20%.

### Assessment methods

Assessment of students was done through a range of methods. Long and short essays, multiple choice questions (true/false) and clinical examinations were used by all faculties (100%); other used case scenarios (20%), clinical problems (15%), practical examinations (10%), objective structured clinical/practical examinations (10%) and students' seminars (15%).

### Opinions of students and programme managers

#### Students

In the FGDs with students it was clear that not all the studied diseases were covered by the curriculum. Students mentioned that diseases covered to a large extent included malaria, TB, schistosomiasis, meningitis and poliomyelitis. Some diseases, such as diarrhoeal diseases, leishmaniasis, typhoid, hepatitis, leprosy and other childhood vaccine-preventable infectious diseases, were moderately covered. Poorly covered diseases (or even not covered at all) includes AIDS, filariasis, trachoma, scabies, anthrax, trypanosomiasis, cholera, haemorrhagic fevers and intestinal worms.

Students mentioned that their training on endemic diseases lacked practical and field sessions, and even clinical training was inadequate, as students had no chance to see the clinical

presentation(s) of some diseases even in slides or photographs (e.g. filariasis, haemorrhagic fevers, trypanosomiasis). Such diseases were only mentioned during the discussion of differential diagnoses of other diseases.

Students' suggestions to promote the teaching of endemic diseases included: more focus on clinical management of cases, more focus on common endemic diseases in the region around each school, adapting teaching to the situation in Sudan, content to include MOH protocols and guidelines and more focus on disease prevention and control measures, provision of more references and educational materials (CDROMs, slides, models, museum specimens, etc.). Students suggested that the endemic diseases curriculum should be unified across all the medical schools and called for stronger integration between departments within each faculty. They suggested that endemic diseases should be a separate course in the faculty programme.

#### ***Programme managers (federal and state MOH)***

FGDs with MOH programme managers at federal and state levels indicated that they were generally not involved in the development or review of the endemic diseases curricula in medical faculties. Few of them from the federal level participated because they were mainly part-time staff in those schools. Participation in teaching by state MOH staff was infrequent and was mainly done on an individual basis. The teaching methods commonly used by MOH staff were lectures followed by group discussions. Some federal MOH staff participated in student evaluations, through designing examination questions on subjects they had taught, mainly through multiple choice questions, long or short essays; there was no participation in clinical or practical tests. Staff from the state MOH did not participate in student evaluations.

Only the malaria control programme at federal level distributed materials to medical schools including the protocol for management of malaria. Furthermore, only the malaria control unit carried out staff orientation at medical faculties as part of orientation for all doctors at federal and state levels.

Few of the programmes at federal and state levels involved any of the medical school staff in training activities and there was no binding policy at the MOH to involve medical school staff. No partnerships were planned between MOH and medical schools in research, services or training. Participation in research activities were achieved on an individual basis. All MOH staff were in favour of partnerships with medical schools to develop a unified curriculum to achieve the objectives of both MOH programmes and medical schools.

#### **Knowledge of medical students about endemic diseases**

The knowledge of students who had completed their study of endemic diseases within the faculty curriculum is summarized in Table 5. An appreciable number of students were not clear about what is a vector, route of infection or what a causative agent meant. Many of them were even confused between the terms vector, causative agent and reservoir. Only a few students understood the DOTS strategy for treatment of TB. Few knew about rapid diagnostic techniques for laboratory diagnosis of malaria. Leprosy was considered by some students as a sexually transmitted infection (STI). There was no knowledge of the concept of notification of diseases or disease surveillance.

### **Discussion**

This study was a huge undertaking, covering 20 medical schools in Sudan and a list of 24 diseases. Sudan is a vast country with varying geographical and socioeconomic conditions; hence it

might be expected that some schools will give priority to diseases prevalent in their locality. On the other hand, they are expected to cover a full range of other diseases because graduates are likely to practise medicine in other parts of the country, in other countries in the region and internationally. The role of a medical school should include teaching, service delivery, research and advocacy as well as active participation in national programme planning, implementation and evaluation [12].

The missions and philosophies of the investigated schools were very variable. Not all of them had clear missions and objectives and some had no written curriculum. Radical changes are taking place in undergraduate medical education worldwide [12]. The general trend is towards innovative curricula with problem-based learning, integration of basic, clinical and social sciences and perhaps multidisciplinary education [12].

This study showed a number of weaknesses in the teaching of major communicable diseases in Sudanese medical schools which can be summarized as follows: small numbers of faculty staff and inadequate training for them; lack of facilities (lecture and tutorial rooms, laboratories, teaching aids, books, etc.); lack of a written curriculum in some schools or a curriculum that has never been reviewed; practical and clinical training that is inadequate or absent; lack of or inadequate coordination and partnership between the faculties and MOH (both at federal and state level); lack of references and teaching materials in general; and problems with student assessments and evaluations.

Given the vital role of medical schools in national efforts to control endemic diseases, it is mandatory to reform medical school curricula to cater for this role. This was clearly shown by a World Health Organization (WHO) report of 7 Asian countries in 2000. Although the study focused on enhancing the role of medical schools in control of

**Table 5 Medical students' knowledge about diseases endemic in Sudan (n = 290 students)**

Disease	% of students with correct answers						
	Causative agent(s)	Vector	Reservoir	Route(s) of transmission	Laboratory diagnosis	Treatment	Control & prevention
Malaria	76	79	59	79	94	34	64
Schistosomiasis	67	63	47	57	69	38	63
Leishmaniasis	53	65	50	56	37	37	40
Tuberculosis	86	-	70	85	53	65	71
AIDS	39	-	71	93	39	27	66
Diarrhoeal diseases	64	-	50	78	69	45	67
Cholera	60	-	56	80	44	43	45
Haemorrhagic fevers	31	27	-	34	13	11	22
Typhoid fever	73	-	46	74	61	44	49
Brucellosis	20	-	51	57	33	22	43
Hepatitides	74	-	56	75	32	20	51
Meningitis	74	-	62	37	69	34	58
Filariasis	32	18	37	33	19	10	17
Intestinal worms	49	-	40	54	46	12	36
Leprosy	60	-	46	47	-	30	22
Trypanosomiasis	15	45	36	44	15	7	23
Trachoma	16	-	26	21	-	11	13
Poliomyelitis	55	-	46	42	10	9	53
Diphtheria	18	-	35	37	-	12	32
Tetanus	47	-	32	40	-	19	48
Whooping cough	21	-	34	46	-	8	38
Measles	35	-	35	39	-	10	42
Scabies	30	-	12	12	5	3	7
Anthrax	9	-	10	18	6	6	7

- = not applicable.

STIs, HIV and TB, the findings can be generalized to other endemic diseases. The study concluded that the growing burden of these diseases called for a broad-based multisectoral response and that the role of medical schools was crucial. Urgent action was needed by medical schools to coordinate state, national and WHO programmes [13].

Although medical schools have a role to play in national disease control programmes, their participation in control programmes in Sudan has so far been inadequate. Medical academics and practitioners lack a consensus on the rationale and practices of national control programmes, largely due to an absence of information and involvement in these. National control programmes in turn, according to

statements of medical school directors and programme managers, have not been successful in reaching out to medical schools and providing them with the necessary information to make useful contributions. Similar conclusions and recommendations were made by another WHO report, following an inter-country meeting on TB and medical schools in 2000, attended by 14 countries in the Eastern Mediterranean region with representatives from medical schools and TB control programmes [14].

The majority of medical schools in our study had problems regarding the teaching of endemic diseases because there was a dichotomy between national programmes and the teaching in these schools. There was inadequate

utilization of the national guidelines and protocols and of MOH expertise in the teaching and training of medical students. Also, partnership, coordination and collaboration between MOH at federal and states level and medical schools in the issue of teaching and research on endemic diseases was very weak and not institutionalized in many cases. This limitation was reflected in poor training of students in MOH programmes, protocols and guidelines and hence the likely creation of a dichotomy between pre-service training in medical schools and medical practice thereafter.

Based on the findings of this study we recommend adoption of the policies, strategies and protocols of the federal MOH, reviews of existing



curricula, adoption of active teaching/ learning methods, better provision of educational and training materials and adoption of appropriate student assessment and evaluation strategies. Participation of faculty staff in formulation of national policies and disease control programmes is also very essential. Better links are needed with the Sudan

Medical Council, the national disease control programmes and the Ministry of Higher Education and Research. WHO and other organizations have an important role in the provision of technical support, monitoring and evaluation of activities related to education, training and research in collaboration with the federal MOH.

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