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Contributors

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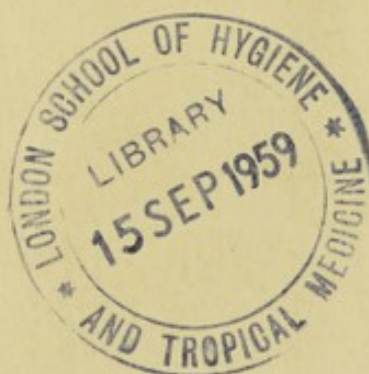
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OF THE


MEDICAL SERVICES, MINISTRY OF HEALTH
REPUBLIC OF THE SUDAN

FOR THE YEAR

1956/57



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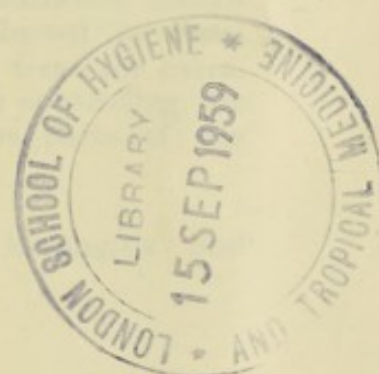
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CHAPTER I

INTRODUCTION

The year under review has witnessed more progress and consolidation in both curative and preventive medicine. Nine hospitals are under construction at the time of the writing of this report.

Tuberculosis Demonstration Centre with World Health Organization Assistance started its work which comprises treatment of cases, for which 120 beds were allotted, training of Home Visitors of whom there are 11 now, and mass miniature X-ray survey and follow up of arrested cases and examination of contacts. This scheme will gradually cover the whole of the Gezira population estimated at 482,549 and will serve as a pilot scheme for copying in other provinces. B.C.G. vaccination campaign continues in the three Southern provinces.

The Malaria Control Pilot Project, also with the Assistance of World Health Organization started its operation in 1956 and during the first phase 117,779 rooms were sprayed protecting 222,028 people. This project also serves the purpose of training national staff who will take over on the expiration of World Health Organization Assistance and execute a National Anti Malaria Programme.

Venereal diseases eradication scheme in Upper Nile and Sleeping Sickness in Equatoria continued during the year with World Health Organization contribution. A comprehensive Anti-Kala-Azar Campaign was conducted in Fung and Upper Nile Province to stem the spread of the disease and treat the cases. This campaign has fulfilled its aim successfully in reducing and controlling the disease. Waves of localised epidemics have occurred in various parts of the country and the following are the diseases encountered :—

Measles, Whooping-cough, Chicken-pox, Cerebro-Spinal Meningitis and sporadic cases of Small-pox.

Adequate and prompt measures were taken in each case.

On the curative side, more doctors-general and specialists were recruited and the situation was easier than in previous years.

Specialist Departments were created in province Headquarter hospitals as will appear in detail later.

Reports from all provinces speak highly of the work rendered by the Mobile Rural Treatment Units of which there are 65 now operating in the Country.

11 Fellowships were granted to members of this Ministry for training in various fields abroad, and the Sudan has welcomed one Personnel in fellowships programme to study the Health Organization of this Country.

12 W.H.O. experts visited the country in connection with the projects mentioned above.

13 Delegates from the Ministry have attended the following Conferences:—

Dr. Mohd. Ahmed Ali	Attended	The 24th. Arab Medical Conference in Jerusalem 17-22 July 1956.
Dr. Tigani El Mahi	„	The Conference of International Congress against Alchoholism.
Dr. Abdalla Omer A/Shamma	„	Regional Committee of the W.H.O. in Tehran 19-25 September 1956.
Dr. Tigani El Mahi	„	The Meeting of W.H.O. Advisory Expert Committee.
Dr. Mansour Abdel Magid	„	The Environmental Sanitation Conference in Beirut November, 1956.
Dr. Mohi El Din Mahdi	„	The International Conference of Tuberculosis in Delhi 24-26-27 January, 1957.
Dr. Ibrahim El Maghrabi	„	The Anaesthesia Course in London 24.2. 1957 to 9.3.1957.
Dr. Ahmed Ali Zaki and Dr. Zein El Abdin Ibrahim	„	10th Meeting of World Health Assembly in Geneva in May, 1957.
Dr. Ahmed El Balla Hamza	„	First Dental Congress in the Middle East held in Cairo 16-19 March, 1957.
Dr. Ahmed Bukhari	„	The Arab Medical Congress in Cairo 30.4. 1957 to 4.5.1957.
Dr. Abdel Halim Mohd.	„	Harvey Tercentenary Congress held in London 3-8 June, 1957.

CHAPTER II

ADMINISTRATION

(a) STAFF AND FUNCTIONS

Table I shows the establishment of classified staff. Some categories of professional and technical staff were still under establishment. The table includes officials serving on secondment with Local Government Authorities.

PERSONNEL.

TABLE I

*Statistics of Classified Staff Establishment covering the period 1.7.1956
to 30.6.1957 :—*

CATEGORY	Establishment			
	British	Sudanese	Egyptians	Syrians and Others
HEADQUARTERS.				
Director	—	1	—	—
Deputy Director	—	1	—	—
Asst. Director (Public Health)	—	1	—	—
Asst. Director (Hospitals)	—	1	—	—
Deputy A. Director (Public Health)	—	1	—	—
Deputy A. Director (Hospitals)	—	1	—	—
Chief Public Health Inspector	—	1	—	—
Senior Establishment Officer	—	1	—	—
Inspector of Administration	—	1	—	—
Establishment Officer	—	1	—	—
Principal School of Hygiene	—	1	—	—
Principal Matron	—	1	—	—
Asst. Principal Matron	—	1	—	—
Head Staff Clerk	—	1	—	—
Secretary to Minister of Health	—	1	—	—
Staff Clerk	—	4	—	—
Senior Clerk	—	10	—	—
Clerk (including Nursing College and T.B.T. Centre)	—	24	—	—
Junior Clerk (including Ministry of Health Office)	—	9	—	—
FINANCE BRANCH.				
Controller of Accounts	—	1	—	—
Inspector of Accounts	—	1	—	—
Head Accountant	—	1	—	—
Accountant	—	4	—	—
Senior Book-keeper	—	4	—	—
Book-keeper	—	18	1	—
Junior Book-keeper	—	2	—	—

CATEGORY	Establishments			
	British	Sudanese	Egyptians	Syrians and Other
STORES SECTION.				
Controller, Medical Stores	—	1	—	—
Asst. Controller Med. Stores	—	1	—	—
Supt. of Stores	—	2	—	—
Stock verifier	—	1	—	—
Senior Storekeeper	—	3	—	—
Storekeeper	—	17	—	—
Storekeeper Under Training (Northern Hospitals)	—	10	—	—
Junior Storekeeper	—	8	—	—
Telephone Operator	—	1	—	—
		137	1	
HOSPITALS AND DISPENSARIES.				
Senior Physician and Director Khartoum Hospital	—	1	—	—
Senior Surgeon	—	1	—	—
Senior Obstet. and Gynaecologist	—	1	—	—
Senior Ophthalmologist	—	1	—	—
Senior Psychiatrist	—	1	—	—
Physicians (including Chest Physicians—3)	1	10	—	—
Surgeons (including E.N. and T.)	2	3	2	3
Psychiatrist	—	1	—	—
Radiologist	—	1	—	—
Anaesthetist	1	—	—	—
Gynaecologist	—	5	1	1
Ophthalmologist	—	6	2	—
General Duty Doctors (including Study Courses)	—	93	30	10
House Officers (Housemen)	—	39	—	—
Senior Dental Surgeon	—	1	—	—
Dental Surgeon	—	—	2	2
Dental Officer	—	4	—	—
Dental Mechanic	2	—	—	—
Dental Mechanic Trainee	—	3	—	—
Pharmaceutical Registrar	—	—	—	1
Pharmacist	—	2	—	—
Lay Administrator	—	1	—	—
Supt. Radiography... ..	1	—	—	—
Clinical Pathologist	—	—	—	1
Senior Dispenser	—	5	—	—
Dispenser	—	21	—	—
Dispenser Under Training	—	6	—	—
Senior Radiographer	—	2	—	—
Radiographers	—	17	—	—
Asst. Radiographers U.T.... ..	—	16	—	—
X-Ray Technician (T.B. Training Centre)	—	2	—	—
Hospital Manager	—	5	—	—
Dark Room Technician	—	1	—	—
Electrical Engineer	—	—	—	1
Laboratory Technician	3	—	—	—
Senior Medical Assistant	—	15	—	—
Medical Assistant	—	491	—	—
Mental Health Assistants... ..	—	2	—	—
Ophthalmic Assistant	—	2	—	—
Refractionists	—	17	—	—
Senior Nursing Instructor	—	2	—	—
Nursing Instructor	—	33	—	—

CATEGORY	Establishment			
	British	Sudanese	Egyptians	Syrians and Others
Theatre Attendant	—	56	—	—
Head Mumarid	—	50	—	—
Senior Clerk... ..	—	8	—	—
Clerk	—	31	—	—
Junior Clerk	—	17	—	—
Record Clerk (New K.H.)	—	1	—	—
Senior Book-keeper	—	14	—	—
Book-keeper	—	20	—	—
Junior Book-keeper	—	30	—	—
Senior Storekeeper	—	2	—	—
Storekeeper	—	15	—	—
Asst. Store-keeper (Ex-Ration Clerk)	—	44	—	—
Storekeeper U.T. (Southern Hospitals)	—	10	—	—
Telephone Operator	—	6	—	—
Quarantine Overseer	—	2	—	—
Southern Trainee	—	10	—	—
NURSING STAFF.				
Matron, Khartoum Hospital	1	—	—	—
Matron, Omdurman Hospital and N.T. School	1	—	—	—
Hospital Matrons W/Medani, Port Sudan, Fasher, Juba, Obeid and Atbara	6	—	—	—
Asst. Matron	8	2	—	3
Physiotherapist	5	—	—	1
Senior Nursing Sister	4	15 (including Nursing College)	—	—
Nursing Sister (Expatriate)	15	—	3	5
School Hostess (Nursing C.)	—	1	—	—
Nursing Sister (Sudanese)	—	27	—	—
Dietician Sister (New Khartoum Hospital)	1	—	—	—
Theatre Sister (New Khartoum Hospital)	1	—	—	—
Sister Tutor (New Khartoum Hospital)	2	—	—	—
Ward Sister (New Khartoum Hospital)	16	—	—	—
Nurse U.T. Abroad	—	2	—	—
MILITARY HOSPITALS.				
Miralai (Dr.) O.C.M. Corps	—	1	—	—
Kaimakam (Doctor)	—	1	—	—
Bimbashi (Doctor)	—	2	—	—
Yuzbashi (Doctor)	—	3	—	—
Fagh (Doctor)	—	2	—	—
Yuzbashi (Dispenser)	—	1	—	—
TOTAL	70	1184	40	28
PUBLIC HEALTH.				
Province Medical Officer of Health	—	11	—	—
Asst. Province Medical Officer of Health	—	9	—	—
Woman Doctor	—	1	—	—
Senior Public Health Inspector	—	11	—	—
Public Health Inspector	—	12	—	—
Post Health Officer	—	1	—	—
Public Health Officer	—	48	—	—
Principal, M.T. School	1	—	—	—
Principal, H.V.T. School	—	1	—	—
Asst. Principal H.V.T. School	—	1	—	—
Asst. Principal M.T. School	—	1	—	—
Health Visitor	1	10	—	—
Senior Staff Midwife	—	6	—	—

CATEGORY	Establishment			
	British	Sudanese	Egyptians	Syrians and Others
Staff Midwife	—	16	—	—
Asst. Supt. Nursing Officer	—	2	—	—
Senior Health Visitor	—	6	—	—
Supt. M. T. Sch.	—	6	—	—
Supt. Nursing Officer	4	8	—	—
Senior Sanitary Overseer	—	1	—	—
Sanitary Overseer	—	168	—	—
Public Health Student Under Training	—	5	—	—
Sanitary Overseer (Public Health Student Under Training)	—	5	—	—
Senior Clerk	—	1	—	—
Clerk (Including T.B. Campaign)	—	5	—	—
Junior Clerk	—	13	—	—
Junior Book-keeper	—	1	—	—
TOTAL	6	349	—	—
RESEARCH AND LABORATORIES.				
(a) <i>Stack Medical Research.</i>				
Asst. Director Research	—	1	—	—
Bacteriologist	1	—	—	—
Pathologist	1	—	—	—
Registrar	—	1	—	—
Supt. Laboratory	1	—	—	—
Laboratory Technician	1	7	—	—
Laboratory Technician Trainee	—	7	—	—
Senior Laboratory Assistant	—	12	—	—
Laboratory Assistants	—	64	—	—
Head Laboratory Attendant	—	2	—	—
Junior Technical Assistant	—	1	—	—
Senior Clerk	—	1	—	—
Clerk	—	1	—	—
Junior Clerk	—	1	—	—
(b) <i>Chemical Laboratories (W.R.L.).</i>				
Government Analyst	1	—	—	—
Asst. Government Analyst	—	3	—	—
Scientific Officer Under Training	—	2	—	—
Senior Technical Assistant	—	2	—	—
Technical Assistant	—	5	—	—
Junior Technical Assistant	—	3	—	—
Clerk	—	1	—	—
Library Clerk	—	1	—	—
(c) <i>Medical Entomology.</i>				
Medical Entomologist	—	—	—	1
Asst. Scientific Officer Under Training	—	1	—	—
Entomological Technician	—	1	—	—
Technical Assistant	—	1	—	—
Junior Technical Assistant	—	2	—	—
Junior Clerk	—	1	—	—
(d) <i>Schistomiasis.</i>				
Biologist	—	—	—	1
Senior Technical Assistant	—	1	—	—
Technical Assistant	—	1	—	—
Clerk	—	1	—	—
Storekeeper	—	1	—	—
	5	125	—	2

SECTION	Establishment			
	British	Sudanese	Egyptian	Other
<i>Graphic Museum.</i>				
Technical Assistant	—	1	—	—
Museum Attendant	—	2	—	—
TOTAL	—	3	—	—

SUMMARY OF CLASSIFIED STAFF

SECTION	Establishment			
	British	Sudanese	Egyptians	Syrians and Others
Headquarters	—	137	1	—
Hospitals and Dispensaries	70	1184	40	29
Public Health	6	349	—	—
Stack Medical Research	4	98	—	—
Chemical Analytical Section	1	17	—	—
Medical Entomology	—	6	—	1
Schistomiasis	—	4	—	1
Graphic Museum	—	3	—	—
GRAND TOTAL	81	1798	41	31

Unclassified Staff excluding Casual Labour numbered 7632 approximately.

PHYSICIANS ETC. PRACTISING IN THE SUDAN

OCCUPATIONS	Government Officials Serving in M.H.	Private Practice
Physicians (including Chest Physicians)	12	80
Surgeons	11	—
Obstet. and Gynaecologists	8	—
Ophthalmologists	9	—
Psychiatrists	2	—
Radiologists	1	—
Anaesthetists	1	—
General Duty Doctors	133	—
Dentists	9	29
Pharmacists	3	37
Dispensers	26	—
Medical Assistants	506	—

(b) LEGISLATION

The following legislations affecting public health were enacted during the year :—

(1) *The Medical Council Ordinance (Second Amendment) 1957 :—*

In Sub-Section (1) of Section 4 of the Medical Council Ordinance, 1955.

(a) In Clause (c) the words “ Registered Medical Practitioners in practice in the Sudan ” shall be omitted.

(b) After Clause (c) the following new Clause shall be inserted :—

“ (d) two members elected by the registered Medical Practitioners in practice in the Sudan; in accordance with regulations made under this Ordinance.”

(2) *The Prohibited and Registered Goods Ordinance 1939. (The third Schedule Amendment) Order 1957.*

The Council of Ministers, in exercise of the powers conferred on it by Sub-Section (1) of Section 5 of the Prohibited and Registered Goods Ordinance, 1939, hereby makes the following amendments in the Third Schedule thereto :—

In Part I (Restriction upon Import) and after Item 14 the following new Item shall be added :—

COLUMN 1	COLUMN 2
15. Insecticides other than	Import prohibited except under
(a) Insect Dusts Mineral Dusts Containing no toxin, or any unrestricted Toxin.	licence from Director, Medical Services.
(b) Toxins of Vegetable Origin. The insect toxins of Vegetable origin, including such materials as Pyrethrum, Derries etc.	
(c) Synthetic Toxins. All insecticides of the chlorinated hydrocarbon other than Aldrine, Dieldrin, Endrin and Toxaphene.	

(3) *The Poison Ordinance 1939, Amendment 1957.*

The Central Board of Public Health in exercise of its powers under Section 23 of the Pharmacy and Poisons Ordinance 1939 hereby adds the following drugs to Part 3 of the Poisons List namely :—

Drugs containing not less than 95 per cent of 1 : 2 : 3 : 4 : 10 : 10-hexachloro—1 : 4 : 4a : 5 : 8 : 8a—hexahydro—1 : 4 : 5 : 8-di-menthanonaphthalene and not more than 5 per cent of insecticidally active related compounds.

Drugs containing not less than 85 per cent of 1: 2: 3: 4: 10 10-hexachloro—6:7—epoxy- 1: 4: 4a: 5: 6: 7: 8: 8a-octahydro-1: 4: 5 8:—dimethanonaphthalene and not more than 15 per cent of insecticidally active related compounds.

Hexa chloro-octahydro-endo, dimetha-nonaphthalene.

Ch orinated comphene (67-69 per cent Chlorine).

Any mixture of demeton O (diethyl S-2-Ethyl phosphorothionate and demeton S (diethyl S—(2-ethyl thioethyl) phosphorothionate.

Bis (diemethylamino) flourophosphine oxide.

Azidobi-ideethylaminophosphine oxide,

Bis (moniosoprophylamine) flourophosphine oxide. OO—diethyl O-P-nitrophenyl—thiophosphate

Octamethyl pyrophosphoramide.

Tetraethyl dithio pyrophosphate.

(c) FINANCE

TABLE II (A)

Income and Expenditure of the Ministry of Health over the last 4 years.

	1953/54	1954/55	1955/56	1956/57
	LS.	LS.	LS.	LS.
Revenue... ..	48,063	49,327	46,778	497,064
Expenditure :—				
Personnel	1,438,574	1,538,775	1,519,170	1,621,150
Services	1,186,427	1,423,176	1,350,863	1,306,032
Extraordinary	34,421	31,219	5,715	6,436
TOTAL	2,659,422	2,993,170	2,875,748	2,933,618

TABLE II (B)

*Analysis of Expenditure of Ministry of Health for 1956/1957
From 1-7-1956 to 30-6-1957.*

SECTION	Personnel	Services	Extra-ordinary	Total
	LS.	LS.	LS.	LS.
Headquarters	97,520	315,472	—	412,992
Hospitals	1,274,358	821,244	6,436	2,102,038
Hygiene and Public Health... ..	186,783	162,756	—	349,539
Researches	61,073	6,560	—	67,633
Graphic Museum	1,416	—	—	1,416
Seconded Staff	—	—	—	—
TOTAL	1,621,150	1,306,032	6,436	2,933,618

Remarks :— 1956/57 (1) Figures are based on actual expenditure up to 31-3-1957 plus (2) Estimated expenditure for the period 1-4-1957 to 30-6-1957.

CHAPTER III

PUBLIC HEALTH

(a) HEALTH OF OFFICIALS

TABLE III

NATIONALITY	Number of officials employed	Number placed on sick list	No. of days sick	Average days sickness		Died	Invalided
				For all officials	For those who were sick		
Sudanese	1955/56	11,521	2,304	17,854	1.54	7.74	4
	1956/57	12,378	2,087	18,987	1.53	9.09	2
British	1955/56	259	28	234	0.90	8.36	1
	1956/57	189	17	143	0.76	8.41	—
Others	1955/56	347	32	146	0.42	4.56	—
	1956/57	363	22	215	0.59	9.77	—

(b) GENERAL HEALTH

Expansion and consolidation continued during the year.

Clinics established were as follows :—

3 Dental Clinics at :—

Juba, Port Sudan and Atbara.

1 Eye Clinic was opened in Malakal.

1 X-Ray Department was also established at Sennar.

TABLE IV

Work done in Hospitals and Dispensaries

YEAR							Admissions	Attendances	Operations
1947	...	...	...	...	...	...	142,294	9,253,251	16,785
1948	...	...	...	...	...	...	140,511	9,820,304	17,573
1949	...	...	...	...	...	...	151,011	10,186,668	21,327
1950/51 (18 months)	...	...	...	...	...	...	302,526	16,503,371	31,459
1951/52	...	...	...	...	...	...	168,251	12,181,931	26,021
1952/53	...	...	...	...	...	...	164,331	13,966,390	26,114
1953/54	...	...	...	...	...	...	172,675	14,483,366	34,432
1954/55	...	...	...	...	...	...	171,092	16,453,892	38,285
1955/56	...	...	...	...	...	...	154,903	17,694,550	38,287
1956/57	...	...	...	...	...	...	176,716	20,430,070	53,839

There were 80 licensed private practitioners working independently during the year under review whose statistics are not included above.

(c) VITAL STATISTICS

No accurate figures could yet be quoted in spite of the continuation of the official census which was started towards the second half of 1954-55. Provisional estimated population is shown in Table V.

TABLE V

Provision Estimated Population by Provinces.

PROVINCE	Men	Women	Children	Total
Bahr-El-Ghazal	300,000	304,000	453,000	1,057,000
Blue Nile	582,000	584,000	985,000	2,151,000
Darfur	360,000	446,000	572,000	1,378,000
Equatoria	265,000	297,000	375,000	939,000
Kassala	303,000	271,000	400,000	974,000
Khartoum	164,000	138,000	223,000	523,000
Kordofan	516,000	550,000	774,000	1,840,000
Northern	208,000	267,000	433,000	908,000
Upper Nile	274,000	268,000	388,000	930,000
TOTAL	2,972,000	3,125,000	4,603,000	10,700,000

TABLE VI

*Estimated population of towns of Khartoum,
Khartoum North, Omdurman.*

TOWN	Men	Women	Children	Total
Khartoum	42,001	33,740	37,412	113,153
Khartoum North	19,422	18,853	27,622	65,897
Omdurman	40,046	49,076	55,981	145,103

TABLE VII

*Crude birth rate,
Khartoum, Khartoum North, Omdurman.*

TOWN	No. of Registered Births	Crude Birth Rate
Khartoum	3,248	28.7
Khartoum North	1,441	21.8
Omdurman	4,239	29.2

These figures are calculated from births attended by Trained Midwives who usually register these cases, but, by no means, must these be taken as accurate representation of the real picture. Registration of births and deaths is nowhere complete.

TABLE VIII

Species of parasite in 10,398 positive slides.

PROVINCE						<i>P. falciparum</i>	<i>P. vivax</i>	<i>P. malaria</i>
Bahr El Ghazal	...	...	...	...	...	560	267	—
Blue Nile	...	...	...	...	...	441	42	—
Darfur	...	...	...	...	...	80	75	—
Equatoria	...	...	...	...	...	6,005	1,562	150
Kassala	...	...	...	...	...	32	27	—
Khartoum	...	...	...	...	...	139	11	—
Kordofan	...	...	...	...	...	450	74	350
Northern	...	...	...	...	...	64	—	—
Upper Nile	...	...	...	...	...	42	—	27
TOTAL						7,813	2,058	527

(ii) *Blackwater fever*. Number of cases recorded was 22 as compared to 10 last year.

TABLE IX

(iii) Relapsing fever : cases and deaths over 10 years.

YEAR						Cases	Deaths
1947	...	...	...	...	...	568	67
1948	...	...	...	...	...	287	8
1949	...	...	...	...	...	376	3
1950/51	...	...	...	...	...	36	2
1951/52	...	...	...	...	...	12	0
1952/53	...	...	...	...	...	97	14
1953/54	...	...	...	...	...	91	8
1954/55	...	...	...	...	...	3	1
1955/56	...	...	...	...	...	1	—
1956/57	...	...	...	...	...	4	—

(iv) *Leishmaniasis*. This disease invaded new areas adjacent to old foci as a result of mass movement of population from one district to another. Conditions were favourable and the spread has reached epidemic proportions especially in Upper Nile Province. An extensive campaign was organised in Upper Nile and that which started in Fung Area in the previous year, continued. 8 Units were operating in the infected areas of both provinces, and Mobile spraying teams operated in this zone to destroy sandflies.

Table X shows the cases.

PREVENTIVE MEDICINE

Insect Borne Disease

- (i) Malaria still tops the list of the major endemic diseases in this country in spite of the yearly expanded efforts of combating it through systematic spraying with Gammaxane in all Provinces. It is not claimed that the whole country is covered by this spraying and the main setback lies in the communication difficulties once the rains set in.

MALARIA INCIDENCE 1956/57

YEAR	BAHR EL GHAZAL			BLUE NILE			DARFUR			EQUATORIA			KASSALA			KHARTOUM			KORDOFAN			NORTHERN			UPPER NILE		
	Cases	D	Mean Rain	Cases	D	Mean Rain	Cases	D	Mean Rain	Cases	D	Mean Rain	Cases	D	Mean Rain	Cases	D	Mean Rain	Cases	D	Mean Rain	Cases	D	Mean Rain	Cases	D	Mean Rain
	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
1951/52	7,442	17	877	85,727	70	358	17,987	18	567	26,652	87	1,264	22,169	32	284	13,679	8	112	41,612	26	517	18,884	10	24	11,497	21	850
1952/53	6,116	20	1,063	89,074	58	401	29,210	8	564	32,717	129	1,140	28,891	27	335	16,326	7	163	79,907	55	626	22,065	3	94	14,252	11	913
1953/54	5,873	21	869	83,720	53	487	24,025	20	541	54,567	105	1,220	41,846	26	341	15,116	3	200	76,685	43	565	16,706	2	93	17,692	23	891
1954/55	12,952	33	1,023	103,589	38	481	45,927	18	614	56,617	135	1,115	44,586	29	156	16,901	10	247	113,105	61	604	16,017		50	28,492	12	899
1955/56	10,945	19	1,013	85,771	59	407	26,607	24	510	37,503	93	1,230	33,933	23	257	15,513	2	174	100,504	36	456	13,851	4	15	28,667	1	865
1956/57	15,890	78	1,167	116,925	48	538	59,134	5	716	47,737	137	1,546	57,510	29	304	19,296	3	264	140,698	55	683	16,115	9	70	26,645	29	979

* Figures include Gezira Irrigated Area.

Separate figures for the Gezira Irrigated Area, which is more controlled and wholly covered by spraying teams, show a great improvement in incidence.

SPRAYING ACTIVITY IN THE WHOLE COUNTRY

YEAR	No. of Cases Diagnosed as Malaria	Recorded Rainfall
1950/51	20,684	327.3 m.m.
1951/52	4,336	255.6 m.m.
1952/53	4,351	414.4 m.m.
1954/55	4,781	303 m.m.
1955/56	1,614	271.6 m.m.
1956/57	1,133	442.0 m.m.

The number of rooms sprayed in Gezira Irrigated Area was ... 255,665
The number of rooms sprayed in Managil adjacent area as an additional measure was 27,321
The number of villages sprayed including Managil Area was ... 1,189
The total amount of B.H.C. or DDT for 2 sprayings - LBS ... 203,312
The total population of G.I.A. (including Abdel Magid Scheme) ... 482,549
Estimated total population of Managil Area ... 130,000

PROVINCE	Provisional Census Population	No. of Population Protected	No. of Rooms etc. Sprayed
Bahr El Ghazal	1,057,000	107,936	227,484
Blue Nile	2,151,000	1,427,341	806,585
Darfur	1,375,000	120,000	38,037
Equatoria	939,000	25,553	19,794
Kassala	974,000	415,262	110,021
Khartoum	523,000	309,430	153,758
Kordofan	1,846,000	563,511	55,486
Northern	905,000	399,112	572,483
Upper Nile	930,000	114,133	26,782
TOTAL	10,700,000	3,682,278	2,012,430

TABLE X

Leishmaniasis: Recorded incidence in 10 years.

YEAR						No. of Cases
1947	...	...	...	...	...	327
1948	...	...	...	...	...	460
1949	...	...	...	...	...	523
1950/51	...	...	...	...	...	638 (18 months period)
1951/52	...	...	...	...	...	1,063
1952/53	...	...	...	...	...	613
1953/54	...	...	...	...	...	895
1954/55	...	...	...	...	...	1,106
1955/56	...	...	...	...	...	1,889
1956/57	...	...	...	...	...	7,463

TABLE XI

Leishmaniasis, 1956/57: distribution by provinces.

PROVINCE						Cases	Deaths
Bahr El Ghazal	...	...	...	...	...	—	—
Blue Nile	...	...	...	...	...	5,008	148
Darfur	...	...	...	...	...	6	2
Equatoria	...	...	...	...	...	46	6
Kassala	...	...	...	...	...	388	32
Khartoum	...	...	...	...	...	34	3
Kordofan	...	...	...	...	...	3	—
Northern	...	...	...	...	...	1	—
Upper Nile...	...	...	...	...	...	1,977	51
TOTAL						7,463	242

(v) *Trypanosomiasis*. The Campaign was restarted with National Staff after a visit by Dr. H. Haddad, the expert sent by W.H.O. in April, 1955. The work was organised and proceeded smoothly.

More cases were detected in the affected area, and a total of 80,000 received prophylactic injections of Pentamidine.

TABLE XII

Trypanosomiasis: distribution of cases in Equatoria in 10 years.

YEAR	Yubu	Yambio	Yei	Kajo-Kaji	Meridi	Imported	Other Localities
1947	18	6	21	—	2	—	—
1948	32	23	20	—	—	—	—
1949	5	12	17	—	—	—	—
1950/51	15	33	12	—	—	—	—
1951/52	—	93	3	—	26	—	—
1952/53	—	53	13	—	—	2	—
1953/54	12	148	44	—	—	—	—
1954/55	—	467	92	—	1	1	—
1955/56	2	210	98	—	—	—	—
1956/57	18	871	74	2	4	—	—

(vi) *Filariasis*. 633 cases were microscopically diagnosed during the year.

575 cases of this total came from Bahr El Ghazal, Equatoria and Upper Nile Provinces of the South.

2. EPIDEMIC AND ENDEMIC DISEASES

(i) *Anthrax*. 82 cases with 2 deaths were reported.

(ii) *Cerebrospinal Meningitis*. Again, this year the disease appeared in all provinces of the Sudan occurring in most places sporadically but has reached epidemic proportions in the two same Provinces as last year *i.e.* Bahr-El-Ghazal and Upper Nile. This is the 5th. year that the disease has been going on fairly large incidence in Bahr-El-Ghazal. There was a higher incidence in Blue Nile and Kordofan, and it is believed that the infection spread from Upper Nile Province.

TABLE XIII

Cerebrospinal meningitis : Recorded incidence and fatality 1956/57.

PROVINCE						Cases	Deaths	Fatality Rate
Blue Nile	...	...	...	...	...	593	91	15.3
Darfur	...	...	...	...	...	60	16	26.6
Kassala	...	...	...	...	...	50	14	28.0
Khartoum	...	...	...	...	...	127	9	7.1
Kordofan	...	...	...	...	...	442	74	16.8
Northern	...	...	...	...	...	14	6	42.8
TOTAL NORTHERN PROVINCE						1,286	210	16.3
Bahr El Ghazal	...	...	...	...	...	2,987	284	9.5
Equatoria	...	...	...	...	...	546	42	7.7
Upper Nile	...	...	...	...	...	1,069	42	3.9
TOTAL SOUTHERN PROVINCE						4,602	368	7.9
OVERALL TOTAL						5,888	578	9.9

TABLE XIV

Cerebrospinal meningitis : Recorded incidence and fatality over 10 years.

YEAR						Recorded Cases	Recorded Deaths	Fatality Rate
1947	...	...	...	...	...	443	159	35.9
1948	...	...	...	...	...	170	59	34.7
1949	...	...	...	...	...	353	102	28.9
1950/51 (18 months)	...	...	...	...	...	57,575	7,710	13.4
1951/52	...	...	...	...	...	14,527	2,031	14.0
1952/53	...	...	...	...	...	2,938	644	21.9
1953/54	...	...	...	...	...	8,942	827	9.2
1954/55	...	...	...	...	...	3,470	492	14.2
1955/56	...	...	...	...	...	9,028	828	9.2
1956/57	...	...	...	...	...	5,888	578	9.9

TABLE XV

(iii) *Diphtheria : Recorded incidence and fatality 1956/57.*

PROVINCE						Recorded Cases	Recorded Deaths	Fatality Rate
Bhar El Ghazal	...	...	...	...	...	—	—	—
Blue Nile	...	...	...	...	...	78	8	10.2
Darfur	...	...	...	...	...	13	2	15.4
Equatoria	...	...	...	...	...	5	—	20.0
Kassala	...	...	...	...	...	125	14	11.2
Khartoum	...	...	...	...	...	1,196	11	0.9
Kordofan	...	...	...	...	...	45	9	20.0
Northern	...	...	...	...	...	31	8	25.7
Upper Nile	...	...	...	...	...	4	—	25.0
TOTAL						1,497	52	3.5

TABLE XVI

Diphtheria : Recorded incidence and deaths in 10 years.

YEAR								Cases	Deaths
1947	...	...	...	...	...	...	...	319	37
1948	...	...	...	...	...	...	...	326	27
1949	...	...	...	...	...	...	...	264	36
1950/51	(18 months)							573	77
1951/52	...	...	...	...	...	...	...	280	30
1952/53	...	...	...	...	...	...	...	717	37
1953/54	...	...	...	...	...	...	...	335	27
1954/55	...	...	...	...	...	...	...	369	61
1955/56	...	...	...	...	...	...	...	356	38
1956/57	...	...	...	...	...	...	...	1,497	52

(iv) *Dysentery.* 3,984 cases were treated in Hospitals and 106,643 as Out-patient cases.

(v) *Enteric Fever.* Admissions to Hospital showed some more decrease this year, but the main foci of infection remained the same with the Blue Nile Province heading the list then Northern Provinces and Khartoum. More investigation into causes lead to no conclusive answer, but prophylactic campaigns amongst population had a satisfactory effect in controlling the disease. More research and water analysis will be carried out to locate the source of infection.

TABLE XVII
Enteric fever : Distribution 1956/57

PROVINCE							Cases	Deaths
Bahr El Ghazal	...	...	...	...	...	...	—	—
Blue Nile	...	...	...	...	...	...	161	16
Darfur	...	...	...	...	...	...	1	—
Equatoria	...	...	...	...	...	...	20	1
Kassala	...	...	...	...	...	...	28	1
Khartoum	...	...	...	...	...	...	75	3
Kordofan	...	...	...	...	...	...	5	—
Northern	...	...	...	...	...	...	89	6
Upper Nile	...	...	...	...	...	...	31	4
TOTAL							410	31

TABLE XVIII
Enteric fever : Incidence over 10 years

YEAR							Recorded Cases
1947	...	...	...	...	...	...	144
1948	...	...	...	...	...	...	202
1949	...	...	...	...	...	...	311
1950/51 (18 months)	...	...	...	...	...	...	560
1951/52	...	...	...	...	...	...	578
1952/53	...	...	...	...	...	...	598
1953/54	...	...	...	...	...	...	560
1954/55	...	...	...	...	...	...	548
1955/56	...	...	...	...	...	...	449
1956/57	...	...	...	...	...	...	410

(vi) *Gastro-enteritis of Children.* Records of Hospitals and Dispensaries registered 79,705 cases of which 2,301 required hospitalization, with 277 deaths, a fatality rate of just over 12 per cent.

(vii) *Leprosy.* The total number of inmates in settlements in the country was 2,585.

During the year 1,495 were diagnosed, of which 709 came from Equatoria the known heavily endemic zone, and 336 came from Bahr-El-Ghazal.

The policy of making supplies of sulphone available in all dispensaries to encourage domiciliary treatment was continued and special treatment cards were to be kept for out-patient cases.

(viii) *Poliomyelitis.* 38 cases were recorded this year. 9 received hospital treatment.

(ix) *Rabies.* 17 human cases were recorded during this year.

(x) *Small pox.* The total number of cases reported was 25 with 4 deaths in the whole country.

However, vaccinations against the disease continued.

The total number of small-pox vaccinations done were :—

Bahr El Ghazal	...	...	...	...	10,856
Blue Nile	...	...	...	...	311,671
Darfur ...	...	...	...	...	76,787
Equatoria	...	...	...	...	24,778
Kassala	...	...	...	...	90,107
Khartoum	...	...	...	...	67,706
Kordofan	...	...	...	...	3,352
Northern	...	...	...	...	18,226
Upper Nile	...	...	...	...	45,018
TOTAL					648,501

TABLE XIX

Tuberculosis : Admissions to hospitals in 10 years.

YEAR					Pulmonary	Non-Pulmonary	Total
1947	...	...	...	...	877	599	1,476
1948	...	...	...	...	1,019	604	1,623
1949	...	...	...	...	1,176	650	1,826
1950/51 (18 months)	...	...	...	...	1,611	883	2,494
1951/52	...	...	...	...	1,325	747	2,072
1952/53	...	...	...	...	1,879	671	2,072
1953/54	...	...	...	...	2,075	798	2,873
1954/55	...	...	...	...	2,868	915	3,783
1955/56	...	...	...	...	2,697	823	3,520
1956/57	...	...	...	...	3,175	1,005	4,180

TABLE XX

Tuberculosis, 1956/57 : Hospital Admissions by Provinces.

PROVINCE					Pulmonary	Non-Pulmonary	Total
Bahr El Ghazal	...	...	...	...	191	25	216
Blue Nile	...	...	...	...	796	195	991
Darfur ...	...	...	...	...	106	102	208
Equatoria	...	...	...	...	248	40	288
Kassala	...	...	...	...	668	174	842
Khartoum	...	...	...	...	509	87	596
Kordofan	...	...	...	...	236	195	431
Northern	...	...	...	...	263	53	316
Upper Nile	...	...	...	...	158	134	292
TOTAL					3,175	1,005	4,180

TABLE XXI

Tuberculosis, 1956/57 : Distribution of all cases diagnosed.

PROVINCE				Pulmonary	Non-Pulmonary	TOTAL
Bahr El Ghazal	...	...	...	260	46	306
Blue Nile	...	...	...	1182	400	1582
Darfur	...	...	...	174	130	304
Equatoria	...	...	...	258	40	298
Kassala	...	...	...	1044	672	1716
Khartoum	...	...	...	720	327	1047
Kordofan	...	...	...	426	235	661
Northern	...	...	...	494	161	655
Upper Nile	...	...	...	320	317	637
TOTAL				4,878	2,328	7,206

Total B.C.G. Vaccination carried out in 1956/57 :—

B.C.G. Team 192,101

3. HELMINTHIC DISEASES

(i) *Ankylostomiasis*. 8,918 of 9,685 cases reported were in the two southern provinces i.e. Bahr El Ghazal and Equatoria.

(ii) *Drancontiasis*. 3,815 cases were treated.

(iii) *Bilharzia*. *Snail eradication project*. P.M.O.H., G.I.A., in his report writes, our object of the comprehensive campaign was mass eradication of the then existing vectors, reduction of case incidence to a certain level where it will no longer cause any degree of suffering or loss of efficiency in the community and then finally the control of re-infestation from either the main canal or the reservoir.

Except for a few young snails which were occasionally detected here and there, most of the canals were free through the whole year round. Samples of snails encountered were examined for cercaria, but all found non-infected.

The weapons for control were both mechanical and chemical trapping together with yearly chemical treatment of the main canal and reservoir.

The snail population has dropped considerably from a maximum of 1000 per metre and a minimum of 100 to an overall average of 0.8 snails per Kilometre. Most of the then badly infested canals remained without a single snail for the whole year. Again the incidence in both the reservoir at Sennar and the main canal (*uncontrolled areas*) has also dropped. This was shown by the snail load on both the mechanical and the chemical traps.

The following figures which were taken from equidistant sections all along the main canal from Kilo 51 to Kilo 209 down stream the mechanical trap, give a clear picture as to the efficiency of that especially devised trap.

SECTION	POINTS	Survey before Campaign		Survey after Campaign	
		B	B.L.	B.	B.L.
At K-51 ...	K. 10	25	—	—	—
	K. 20	27	—	—	—
	K. 30	23	—	8	—
	K. 40	37	36	22	—
	K. 50	95	87	75	62
K. 51-K. 57 ...	K. 52	127	126	—	—
	K. 54	150	165	5	8
	K. 57	159	171	13	19
K. 57-K. 77 ...	K. 62	87	89	—	—
	K. 67	92	90	3	7
	K. 72	131	135	10	12
K. 77-K. 99 ...	K. 77	160	167	15	21
	K. 83	86	88	—	—
	K. 88	95	97	2	3
	K. 93	115	123	12	15
	K. 99	120	135	14	23
K. 99-K. 108 ...	K. 101	93	95	—	—
	K. 103	115	120	—	—
	K. 105	117	124	2	5
	K. 107	135	139	8	12
	K. 108	156	159	9	15
K. 108-K. 114 ...	K. 110	89	99	2	3
	K. 111	126	135	2	3
	K. 112	150	163	3	7
	K. 113	159	168	10	13
	K. 114	161	167	14	26
K. 114-K. 127 ...	K. 117	75	89	2	5
	K. 120	125	137	5	7
	K. 123	137	149	4	9
	K. 125	171	192	5	12
	K. 127	175	197	13	20
K. 127-K. 150 ...	K. 132	65	95	2	2
	K. 137	97	125	2	5
	K. 142	115	129	4	5
	K. 147	120	133	6	9
	K. 150	176	198	15	23
K. 150-K. 169 ...	K. 154	79	83	2	3
	K. 158	95	125	2	5
	K. 162	127	139	3	7
	K. 166	150	168	5	11
	K. 169	176	193	16	25
K. 169-K. 177 ...	K. 171	105	135	—	—
	K. 173	115	143	—	—
	K. 175	117	145	2	3
	K. 176	121	179	3	5
	K. 177	120	103	9	12

SECTION	POINTS	Survey before Campaign		Survey after Campaign	
		B.	B.L.	B.	B.L.
K. 177-K. 183	K. 179	98	127	—	—
	K. 180	112	139	—	—
	K. 181	95	167	2	3
	K. 182	97	193	2	5
	K. 183	75	225	6	13
K. 183-K. 188	K. 184	65	127	—	—
	K. 185	61	175	—	—
	K. 186	62	185	2	2
	K. 187	75	209	1	5
	K. 188	65	227	3	15
K. 188-K. 204	K. 192	63	215	—	—
	K. 195	60	227	—	—
	K. 198	46	245	—	—
	K. 204	42	251	—	—
	K. 204	42	265	—	—

Regular Checking of Canals. All the area is divided into 35 Zones of 140 Kilometre canalisation each. To each Zone is posted a competent checker who checks his area twice monthly according to the detailed programme drawn for him. The whole area is again divided into 4 big sections to enable the 4 Senior Supervisors to check on the work in the Zones. The inspectorate staff have to tour the whole area and check on the supervisors by taking random samples of the canals.

Any snail encountered is destroyed by chemicals on the spot and a good area above and below that spot is also treated. Through the whole year only about 4000 young snails were detected in the whole system of 4800 kilometres giving an incidence of 0.8 snails per kilometre.

Work done by the 5 Treatment Teams. For the last two years, the 5 examination and treatment teams have been engaged in treating the random sample villages which were examined just before the eradication. In addition they have lately examined 20 representative sub-grade schools of the area. The yearly joiners of this sample of schools will be examined until those who were at the age of one or two years at the time of eradication, are examined. This complies with the practised measure of check for the success of such pilot schemes as recommended by the World Health Organization authorities.

Although it is still early to expect a decline in the incidence, because most of those already infected did not yet seek treatment, yet the figures from the Gezira Dispensaries and Abu Usher Hospital show a marked decrease for both types. As shown below, the incidence among those examined was 4.2 per cent for Mansonia and 2.2 per cent for Haematobium against 7.3 per cent and 3.4 per cent respectively for 1955/56.

It is worth mentioning that we are controlling Bilharzia as cheaply as 10 piastres per capita per year.

GEZIRA IRRIGATED AREA-BILHARZIA

YEAR	HAEMATOBIMUM						MANSONI					
	CHILDREN			ADULTS			CHILDREN			ADULTS		
	No.	Inf.	%	No.	Inf.	%	No.	Inf.	%	No.	Inf.	%
1955/56	15,153	665	4.4	28,697	819	2.8	15,153	1,255	8.3	28,697	1,942	6.7
1956/57	45,662	1,188	2.5	61,762	1,136	1.8	45,662	1,620	3.5	61,762	2,907	4.7

The Physician at Wad Medani has started a clinical Research in Bilharzia and Kala-Azar but data are not yet complete for print.

Distribution of Bilharzia cases recorded in the whole Country was as follows :—

	Cases	Deaths
Bahr El Ghazal	674	1
Blue Nile Province	17,631	12
Darfur Province	3,379	1
Equatoria	2,962	6
Kassala	154	—
Khartoum	1,740	2
Kordofan	13,376	—
Northern	3,886	—
Upper Nile	61	—
	43,863	22

The increase in the figures is attributed to the expansion of medical facilities taking place in the Country—more of the population are being seen and examined than before.

E. SANITARY CIRCUMSTANCES

Water Supplies. Piped clean water supply has been established in Singa, Rufaa, Hasaheisa and Berber towns. More deep wells in Gezira have been dug totalling 161 supplying some number of villages. Protected Haffirs and dams programme continues in the rural areas.

Refuse Disposal. Methods of disposal remained the same i.e. collection burning and dumping.

Sewage Disposal. Aqua privy latrines are now being introduced wherever the soil permits. Bucket system in small towns and pit latrines in several areas are the means of disposal while in bigger towns septic tanks are becoming more popular.

Housing and Town Planning. Improvements continue and Public Health requirements guarding against overcrowding and allowing proper ventilation are always stuck to. Open spaces in towns and replanned villages is now the rule.

Food in Relation to Health. Some cases of food poisoning, mainly from polluted milk, have occurred. No serious shortage of food was experienced.

Industrial Hygiene. Routine inspection of factories and workshops continue to ensure that no adverse conditions exist.

CHAPTER IV

SOCIAL HYGIENE

Midwifery. Table XXII shows the midwifery training schools working at the end of the year, date of foundation of each school, total number of midwives trained in the school since opening and the number trained in 1956/57.

TABLE XXII

SCHOOL	Date of opening	Total Midwives trained since opening	Total trained in 1956/57
Omdurman	1920	816	22
El Obeid	1948	56	12
Juba	1950	17	5
Malakal	1952	17	4
Wad Medani	1953	43	12
Atbara	1955	16	10
Kassala	1957	4	4 (Still under training)
TOTAL		969	69

TABLE XXIII

Distribution of licensed midwives trained in the Sudan 1956/57.

PROVINCE	District Midwives	Certificated Nurses	Uncertificated Nurse Midwives	Health visitors	Total
Bahr El Ghazal	—	6	2	—	8
Blue Nile	144	11	3	6	164
Darfur	33	5	1	1	40
Equatoria	1	1	16	—	18
Kassala North	15	6	—	2	23
Kassala South	1	4	1	1	7
Khartoum	114	41	3	11	169
Kordofan	82	8	3	1	94
Northern	123	5	3	2	133
Upper Nile	18	—	3	1	22
TOTAL	531	87	35	25	678

New Midwifery Certificates issued during the year :—

PROVINCE					Certificated Nurses	Nuns	Village Midwives	Total
Blue Nile	...	...	...	...	3	—	12	15
Darfur	...	...	...	...	2	—	1	3
Equatoria	...	...	...	...	1	—	—	1
Kassala (S)	...	...	...	...	2	—	—	2
Kassala (N)	...	...	...	...	1	—	1	2
Khartoum	...	...	...	...	11	3	7	21
Kordofan	...	...	...	...	1	—	12	13
Northern	...	...	...	...	3	—	10	13
Upper Nile	...	...	...	...	—	—	4	4
TOTAL					24	3	47	74

Refresher courses were given to Midwives of the following Provinces :—

PROVINCE					No.
Blue Nile	...	...	...	...	6
Kassala	...	...	...	...	2
Khartoum	...	...	...	...	4
Kordofan	...	...	...	...	8
Northern	...	...	...	...	3
TOTAL					23

Cases attended to by Student Midwives, were as follows :—

SCHOOL		Normal Delivery	Still Births and Abortion	Transferred to Hospital	By Doctors	Total
Omdurman	...	1,973	7	136	—	1,216
El Obeid	...	1,109	60	30	20	1,219
Wad Medani	...	306	13	22	—	341
Juba	...	47	22	237	—	306
Atbara	...	200	15	6	5	226
TOTAL		2,735	117	431	25	3,308

Maternal and Child Health. Improvements and expansion in this important service continued. 4 Health Centres were opened and training of staff maintained.

UNICEF is assisting in this service by provision of necessary equipment and books for training and supply of milk and vitamins for use in the Centres.

25 centres were assisted in this manner, during the year.

Sudanese health visitors were working in the following stations :—

Khartoum	...	...	...	...	...	3
Omdurman	...	...	...	...	...	4
Khartoum North	...	...	...	...	...	2
Wad Medani	...	...	...	...	...	2
Kosti	...	...	...	...	...	1
El Fasher	...	...	...	...	...	1
Port Sudan	...	...	...	...	...	2
El Obeid	...	...	...	...	...	1
Atbara	...	...	...	...	...	2
Dueim	...	...	...	...	...	1
Singa	...	...	...	...	...	1
Kassala	...	...	...	...	...	1
Malakal	...	...	...	...	...	1
River Hospital	...	...	...	...	...	1
El Hosh	...	...	...	...	...	1
Nyala	...	...	...	...	...	1

25

The actual number of anti-natal and child health centres which were operating during the year, was as follows :—

LOCATION	Ante-Natal Centre	Child Wel. Centre
Wau	1	—
Kwajok (Mission)	1	—
Wad Medani	2	2
Hasaheisa	1	—
El Dueim	1	1
Kosti	1	1
Sennar	1	—
Singa	1	1
Roseires	1	—
El Hosh	1	1
Bakht-El Roda	1	—
El Fasher	1	1
Nyala	1	1
Geneina	1	—
Juba	1	—
Lui (Mission)	1	1
Mundri (Mission)	1	—
Amadi	1	—
Torit	1	—
Kassala	1	1
Khatmia	1	—
Gharb-El Gash	1	—
Sawagi	1	—
Gedaref	1	—
Port Sudan	2	2
S.R. Deim	1	—
Deim El Arab	1	—
Khartoum	7	3
Khartoum North	1	1
Kober	1	1
Omdurman	3	4
Morada	1	—
Deim Abu Saeed	1	—
Shambat	1	—
Halfayat El Mouluk	1	—
Tuti Island	1	—
El Obeid	1	1
Tendelti	1	—

LOCATION								Anti-Natal Centre	Child Wel. Centre
Um Ruaba...	...	...	...	...	...	...	...	1	—
Nahud	...	...	...	...	...	...	...	1	—
Kadugli	...	...	...	...	...	...	...	1	—
Talodi	...	...	...	...	...	...	...	1	—
Abu Zabad	...	...	...	...	...	...	...	1	—
Moglad	...	...	...	...	...	...	...	1	—
Abri (Mission)	...	...	...	...	...	...	...	1	—
Heiban (Mission)	...	...	...	...	...	...	...	1	—
Atbara	...	...	...	...	...	...	...	2	2
Dakhla	...	...	...	...	...	...	...	1	—
Berber	...	...	...	...	...	...	...	1	—
Police Camp.	...	...	...	...	...	...	...	1	—
Merowe	...	...	...	...	...	...	...	1	—
Wadi Halfa	...	...	...	...	...	...	...	1	—
Debeira	...	...	...	...	...	...	...	1	—
Malakal	...	...	...	...	...	...	...	1	1
Hillat Gallaba	...	...	...	...	...	...	...	1	—
Fangak	...	...	...	...	...	...	...	1	—
Tonga	...	...	...	...	...	...	...	1	—

*Activities of Health Centres and Anti-Natal Clinics
throughout the Sudan for the year 1956/57.*

PROVINCE	No. of Clinics	Attendance at Anti- Natal Clinics	Home Visits	No. of Health Centres	Attendance at Child Health Centres	Delivery by Trained Midwives
Bahr El Ghazal	2	1,920	—	—	—	—
Darfur	2	5,145	26	2	—	—
Port Sudan	4	11,050	—	4	5,317	1,562
Kassala Area	6	2,231	—	1	—	—
Northern	9	4,280	—	1	7,358	—
Kordofan	11	2,401	—	1	564	263
Blue Nile	10	11,459	1,158	9	3,579	3,476
Khartoum	16	49,659	4,884	15	32,644	—
Equatoria	5	496	—	1	—	—

MEDICAL EXAMINATION OF SCHOOL CHILDREN.

School Medical Service. The number of pupils medically examined was :—

Bahr El Ghazal	...	...	...	...	5,510
Blue Nile	...	...	...	...	36,681
Darfur	...	...	...	...	6,807
Equatoria	...	...	...	...	1,772
Kassala	...	...	...	...	11,863
Port Sudan	...	...	...	...	9,082
Khartoum	...	...	...	...	11,130
Kordofan	...	...	...	...	9,772
Northern	...	...	...	...	29,026
Upper Nile	...	...	...	...	2,014
TOTAL	...	...	...	...	123,657

Results of Examinations of Different Diseases.

PROVINCE	No. Exami- ned	Trach- oma	Bil- harzia	Spleen	Pulm. T.B.	Ankyl- ostoma	Dental caries	All other diseases
Bahr El Ghazal	5,510	418	313	1,207	—	797	—	—
Blue Nile ...	22,069	1,900	576	862	—	36	1,031	176
Gezira Irrigated Area ...	14,612	1,828	1,011	589	—	—	—	—
Darfur ...	6,807	1,212	608	1,321	—	15	108	623
Equatoria ...	1,772	44	139	271	—	163	—	6
Kassala ...	11,863	1,307	32	629	—	—	—	—
Port Sudan ...	9,082	233	—	17	—	—	—	—
Khartoum ...	11,130	1,892	25	85	—	—	—	—
Kordofan ...	9,772	762	1,689	2,176	—	9	—	—
Northern ...	29,026	8,303	1,511	633	—	3	2,111	—
Upper Nile ...	2,014	287	22	195	18	9	—	—
TOTAL ...	123,657	18,186	5,926	7,985	18	1,032	3,250	805
PERCENTAGE		14.71	4.8	6.5	—	0.8	2.6	0.6

Mental Health. The total number of cases seen during the year by the Psychiatrist at the clinic for nervous disorders was 6 498 of which 872 were new cases and the balance of 5,626 represented the return attendances. 4 697 males against 1,801 females were registered. 880 children mostly epileptics, mentally defectives or with organic cerebral lesion, were seen.

The number of inmates in confinement at Kober Institution is 125 (115 males and 10 females). Five cases were admitted during the year against 7 which were transferred for custody in Province prisons. One case was discharged.

The Mental Diseases Board saw 26 classified as follows :—

Fit for Government Service	...	...	...	...	...	...	1
Fit to carry on with their duties on temporary basis or referred for treatment and to appear before the board after a certain period	...	...	...	...	...	...	8
Unfit for Government Service	...	...	...	...	...	...	14
To appear before the board to decide their fitness for managing their affairs or otherwise	...	...	...	...	...	...	3

Health Education. The main media for Health Education remains to be weekly Radio talks, Mobile exhibitions in tribal gatherings, lectures in graphic museums to school boys and other categories of officials and through the District Midwife in villages.

CHAPTER V

PORT HEALTH. QUARANTINE

No seaport or airport was declared infected.

Disinfection of aircraft and quarantine control of air travellers was undertaken at Wadi Halfa, Port Sudan, Khartoum, Juba, Malakal, Geneina, El Fasher, El Obeid and Kassala Airports.

The Aedic index was calculated on an inspection of all habitations within the area concerned. Table XXIV shows the Aedic index throughout the year at certain airports on international routes.

TABLE XXIV
Aedes Aegypti Index

MONTH	Fasher	Juba	Kassala	Port Sudan	Khar-toum	El Obeid	Wadi Halfa	Malakal
July ...	0	0	0	0	0	0.7	0	0
August ...	0	0	0	0	0	0	0	0
September ...	0	0	0	0	0	0	0	0
October ...	0	0	0	0	0	0	0	0
November ...	0	0	0	0.009	0	0	0	0
December ...	0	0	0	0	0	0	0	0
January ...	0	0	0	0	0	0	0	0
February ...	0	0	0	0	0	0	0	0
March ...	0	0	0	0	0	0	0	0
April ...	0	0	0	0	0	0	0	0
May ...	0	0	0	0	0	0	0	0
June ...	0	0	0	0	0	0	0	0

Port Sudan Quarantine. 672 ships entered Port Sudan harbour. The number of sambuks entering Flamingo Bay was 426. Radio pratique was granted to 592 ships.

Suakin Quarantine. The number of pilgrims who have left Suakin for Jeddah in the past 10 years has been :

1948/49	...	...	...	...	...	...	11,105
1949/50	...	...	...	...	...	...	5,091
1950/51	...	...	...	...	...	...	4,666
1951/52	...	...	...	...	...	...	6,491
1952/53	...	...	...	...	...	...	13,051
1953/54	...	...	...	...	...	...	13,950
1954/55	...	...	...	...	...	...	13,921
1956	...	...	...	...	...	...	11,427
1957	...	...	...	...	...	...	23,811
1958	...	...	...	...	...	...	29,618

2,911 pilgrims left Port Sudan for the Hedjaz by air in 1957.

All outgoing pilgrims were immunised against cholera, small-pox, yellow fever and typhoid

The pilgrimage was declared clean. Returning pilgrims were detained in quarantine only for medical formalities to be undertaken.

Wadi Halfa Quarantine. Routine examination for Schistosomiasis of persons entering the Sudan from the north was stopped. Delousing with D.D.T. powder was imposed on third class passengers on reports of typhus fever in Egypt. 682 river vessels were inspected.

Geneina Quarantine. 31,974 persons passed through the post. Delousing with D.D.T. powder was imposed 12,033 persons were vaccinated against small-pox.

Medical Mission to the Hedjaz. The mission consisted of two doctors and 16 other staff. Treatment centres were established at Jeddah, Mecca, Muna and Medina. Medical care was afforded to many nationalities, including pilgrims and local population.

CHAPTER VI
EXISTING HOSPITALS AND DISPENSARIES

TABLE XXV
Number of existing Hospitals and beds available

PROVINCE	HOSPITAL	Beds in Hospital			No. of Disps. and Dressing Stations	Beds in Dispensaries.	Total Beds	Popula- tion	Beds per 1,000 Population
		General	Tuberculosis	Maternity					
Bahr El Ghazal	Wau	189	36	23	42	208	625	1,057,000	0.58
	Rumbek	129	—	—					
	Aweil	40	—	—					
		358	36	23	42	208	625	1,057,000	0.58
Blue Nile	Medani	322	120	59	188	63	1,423	2,151,000	0.66
	A/Usher	186	—	—					
	Kosti	148	—	4					
	Dueim	74	—	—					
	Sennar	146	—	10					
	Singa	88	24	38					
	Roseires	73	—	28					
	Rufaa	40	—	—					
		1,077	144	139	188	63	1,423	2,151,000	0.66
Darfur	Fasher	177	13	12	64	310	787	1,378,000	0.57
	Geneina	88	4	8					
	Nyala	82	4	14					
	Zalingei	75	—	—					
		422	21	34	64	310	787	1,378,000	0.57

PROVINCE	HOSPITAL	Beds in Hospital			No. of Disps. and Dressing Stations	Beds in Dispensaries.	Total Beds	Population	Beds per 1,000 Population
		General	Tuberculosis	Maternity					
Equatoria	Juba	239	64	14	101	349	1,309	939,000	1.39
	Meridi	106	5	5					
	Yei	81	—	—					
	Kapoeta	82	—	—					
	Torit	107	—	—					
	S. Yubu	119	—	2					
Li Rangu	119	12	5						
		853	81	26	101	349	1,309	939,000	1.39
Kassala	Kassala	225	20	28	81	206	1,078	974,000	1.12
	Gedaref	211	—	3					
	P/Sudan	225	68	40					
	Tokar	52	—	—					
		713	88	71					
Khartoum	Khartoum	606	—	72	52	—	1,524	523,000	2.91
	Omdurnan	223	—	38					
	Khartoum N.	98	—	12					
	A-Deleig	40	—	—					
	River	—	84	—					
	A/Anga	—	93	—					
	Mill. Base	100	—	—					
	Omd. Mat.	—	—	40					
	Eye	118	—	—					
		1,185	177	162						52	—	1,524	523,000	2.91

PROVINCE	HOSPITAL	Beds in Hospital			No. of Disps. and Dressing Stations	Beds in Dispensaries.	Total Beds	Population	Beds per 1,000 Population
		General	Tuberculosis	Maternity					
Kordofan	...								
	El Obeid	257	48	55					
	Nahud	118	—	2					
	Kadugli	125	—	3					
	Dilling	66	—	20	84	550	1,404	1,840,000	0.76
	Talodi	60	—	—					
	A/Gebeila	90	—	10					
		716	48	90	84	550	1,404	1,840,000	0.76
Northern	...								
	Atbara	202	36	19					
	W/Halfa	142	46	14					
	Merowe	74	—	9					
	Dongola	63	—	1	128	70	848	908,000	0.93
	Shendi	68	—	4					
	Berber	91	—	9					
		640	82	56	128	70	848	908,000	0.93
Upper Nile	...								
	Malakal	284	28	8					
	Bor	92	—	8	48	188	608	930,000	0.65
		376	28	16	48	188	608	930,000	0.65
		6,340	705	617	788	1,944	9,606	10,700,000	0.90
GRAND TOTAL									

SPECIAL DEPARTMENTS

The following centres have been established during the year :—

Dental Clinics	...	...	...	...	...	...	3
Eye Clinics	...	...	...	...	...	...	2
X-Ray Depts.	...	...	...	...	...	...	1

Aroma hospital was opened during the year.

The four hospitals shown in last year's report *viz* Raga, Kurmuk, Rigl-El Fula and Bentiu are still under construction.

Medical Services buildings completed during the year include :—

PROVINCE	Locality	Buildings Erected
Bahr El Ghazal ...	Wau Rumbek	Hospital Store room for Pharmacy. 2-4 seater latrines for dressers quarters.
Blue Nile ...	Wad Medani " Singa " " " " " " Kosti " " " " " " Dueim " " " " " " " " " " " " " " " " Sennar Abu Usher " " " " " " Fasher " " Geneina " " " "	Lecture room. S/S Quarter for expatriate Doctor. J/S Quarter for A Matron. Class II Quarter for Senior Nurse. Roofing in G.C.I. in lieu of thatch in Medical Assistants quarters at Suki, Qesi, Lakandi, Abu Hogar and Suad. Boundary walls to Med. Assts. quarters at Abu Hogar, Suki, Qesi and Korkoj. Drug Store. M/S quarter for P.H.I. Mumarideen dressing room. Additions to Med. Assts. house Taweela. 8 bedded 2nd. Class ward for female. J/S quarter for P.H.O. 16 quarter for 3rd. Class ward for male. Class II quarter for Health Visitor. 8 T.B. wards for males. 8 T.B. wards for females. 10 T.B. wards Geteina Building of Med. Assts. house Shigeig. Store for Drugs. Lecture room X-Ray. Reconditioning of Kitchen. Quarter for Clerk. Class II Quarters for Ration Clerk and Staff Nurse. 4 Class I quarters for married Mumarideen. One M/S quarter. 3 J/S quarters. O.P. Block. One J/S quarter. Maternity Block.
Equatoria ...	Juba " " S. Yubu " " Torit " " Meridi " " Li-Rangu Yei	Dental Unit. Conversion of tukls into a big store. Store. Dairy. 4 bedded 2nd. Class Wards—Male. 4 bedded 2nd. Class Wards—Female. 4 bedded 2nd. Class Wards—Male. 4 bedded 2nd. Class Wards—Female. Store Dimo Dispensary.

PROVINCE	Locality	Building Erected
Kassala	Kassala	Midwives Training School.
	"	Housing for Beja Hospital.
	"	Aroma Hospital.
	"	16-bedded Eye Ward.
	"	S/S Quarter for A/P.M.O.H.
	"	M/S quarter for M.O.
	"	2 S/S quarters for M.O. and Ophthalmologist.
	"	S/S quarter for Gynaecologist.
	Kassala and Beja	Bucket Latrine for M.A. quarter and Dispensary at Goz Ragab. Construction of Verandah for Goz Ragab, Dispensary.
	Gedaref	Store.
	"	Construction of room for M.I.
	"	Mumarids house—Hillat Hukoma.
	Port Sudan	Class VII S/Q for Surgeon.
Kassala	" "	S/S Quarter for Dental Surgeon.
	" "	S/S Quarter for Ophthalmologist.
	" "	Disp. and Quarter for M.A. and well for water at Agetay.
	" "	Disp. and Quarter for M.A. and well for water at Khor Baraka.
	" "	
Khartoum	Port Sudan	Dental Centre.
	" "	Extension to drug store.
	" "	Maternity Block.
	Tokar	20 bedded ward.
	"	Office for M.O.
Kordofan	"	Store for Drugs.
	Omdurman	Isolation Ward.
	"	Maternity Hospital.
	Khartoum	New Hospital canteen.
	"	Patients relatives Rest-House.
	"	Referred O.P. new Hospital.
	"	Eye Hospital—Improvement to Verandah.
Kordofan	"	Eye Hospital—Retiling of verandah.
	"	Eye Hospital—Two Ghaffir Sheds.
	Abu Gebeiha	Hospital.
	"	Housing State.
	Nahud	Welfare Centre.
	"	Public Health Office.
	Kadugli	Trogi Dispensary.
	El Obeid	Extension to Theatre.
	"	S/S house for Dental Surgeon.
	"	M/S house for M.O.
	"	12-bedded Maternity ward in M.T. School.
	Nuba-Area	Kujuria Dispensary.
	" "	3 Durdurs at Um Heitan.
	Tegale "	3 Durdurs at Abu Karshola.
	Central "	3 Durdurs at Abu-Haraz.
	Eastern "	3 Durdurs at Kadada.
	Northern,,	4 Durdurs at Hamrat-El-Wiz.
	" "	2 Durdurs at Um Badir.
	" "	House for M.A. Mugnas.
	Hamar "	2 Durdurs at Abu Zabab.
	" "	3 Durdurs at Saata.

PROVINCE	Locality	Buildings Erected
Northern	Halfa	20-bedded T.B. Wards-female.
	Atbara	Eye Clinic.
	"	M/S quarter for Hospital Supt.
	"	Lecture Room
	"	M/S quarter for Supt. Nursing Officer.
	"	2 S/S quarters for A.P.M.O.H. and Ophthalmologist.
	"	M/S quarter for P.H.I.
	"	2 M/S quarters for S.P.H.I. and Dentist.
	"	M/S quarter for P.M.A.
	"	Dental Clinic.
	"	M/S quarter for M.O.
	"	Hostel for Housemen
	"	J/S quarter for A/Radiographer.
	Halfa	10-bedded childrens wards.
	Abri	12-bedded ward.
	Delgo	12-bedded ward.
	Dongola	12 T.B. wards.
	"	Maternity Block with Isolation room.
	"	Medical Inspector's House.
	"	Improvement to O.P.
Upper Nile... ..	Merowe	Ration Store.
	"	2.W.C.
	Karima	Female Ward.
	Ghaba	Dispensary and M.A. House.
	Shendi	S/S quarter for M.I.
	Malakal	New O.P. Eye Department.
	"	Hospital Drainage.
	"	House for Ophthalmologist.

The programme of expansion of dispensary services was maintained. Additions include :—

PROVINCE	New Dispensaries	New dressing Stations	Dispensaries Improved
Bahr El Ghazal	—	5	4
Blue Nile	1	2	4
Darfur	—	—	4
Equatoria	1	4	—
Kassala	—	1	2
Kordofan	2	6	8
Northern	3	6	1
Upper Nile	2	—	—
TOTAL	9	24	23

CHAPTER VII MEDICAL MISSIONS

Missions. The following table shows the work carried out by the Medical Missions :—

	Inpatients	Outpatient Attendance	Operations	No. of Beds
CHURCH MISSIONARY SOCIETY.				
Omdurman (Khartoum Province) ...	1,190	10,889	171	69
Katcha (Kordofan Province) ...	353	35,484	—	20
Lui (Equatoria Province) ...	1,512	142,641	647	94
AMERICAN MISSION.				
Nasir (Upper Nile) ...	76	47,234	—	—
Akobo (Upper Nile) ...	40	7,382	—	—
Pibor (Upper Nile) ...	—	1,375	—	—
SUDAN UNITED MISSION.				
Tabanya (Kordofan Province)...	170	23,401	—	20
Abri (Kordofan Province) ...	612	31,873	—	14
Kauda (Kordofan Province) ...	642	20,116	—	14
Heiban (Kordofan Province) ...	335	46,385	—	—
Moro (Kordofan Province) ...	448	8,653	—	—
Nyakama (Kordofan Province) ...	343	6,877	—	—
Salara (" ") ...	—	3,158	—	20
SUDAN INTERIOR MISSION.				
Abayath (Upper Nile Province) ...	—	18,180	—	—
Banjang (Upper Nile Province) ...	—	4,052	—	—
Doro (Upper Nile Province) ...	—	15,032	—	—
TOTAL ...	5,721	422,932	818	251

MEDICAL TRAINING

School of Hygiene. 33 students were under training of whom 13 took the R.S.H. examination in March, 1957. Of these 13, ten were successful in passing the examination. The other 3 have been referred for a period of 3 months.

Nine Sanitary Overseers (from Juba Training School) have received a course of training in the School. An examination was set at the end of the course with a satisfactory result.

A course of lectures on public health was given to —

- 25 Medical Assistants.
- 4 Health Visitors.
- 29 Hospital Nurses.

Medical Assistants Training School. 32 students were under training and sat for their final examination. Of these, 29 have successfully passed and were qualified.

The School Library has succeeded considerably and now a collection of no less than 250 books is in continuous circulation among the students. Each book is lent to the student for one renewable week and the average daily number of borrowing operations is something between 30 and 50.

Nurses Training School. 75 Mumaridat and 43 Mumarideen were under training. Of these 49 have passed the final nursing examination.

Laboratory Technicians. 6 students are under training.

Radiographers. 7 are under training.

CHAPTER VIII

LABORATORY SERVICES

(a) STACK MEDICAL RESEARCH LABORATORIES

By

DR. M. A. HASEEB

This report covers the period from July 1st 1956 to June 30th 1957. During this period *ad hoc* investigations were carried out on kala-azar, schistosomiasis, yellow fever, blood and neoplasms. Summaries of these and other research activities will be found under the appropriate headings.

A great part of the time of the staff was devoted to the teaching of laboratory technician trainees recruited from the secondary schools.

Among visitors to the laboratories were Prof. Mario Giaquinto, consultant to the World Health Organisation on Tropical Diseases. His visit was in connection with research and control of Onchocerciasis in Bahr El Ghazal Province. He visited the endemic area in the Southern Sudan and made useful discussions on the problem.

The writer attended the Second symposium of the International Association of Microbiological Societies held by the Instituto Superiore di Sanita, Roma, from September 10th to 14th 1956. The symposium discussed the Immuno-microbiological standardisation and control of pertussis vaccine, typhoid vaccine, small-pox vaccine and lactobacillus products. The symposium was attended by 94 delegates from numerous countries.

EDUCATIONAL AND ROUTINE ACTIVITIES

Twelve laboratory assistants were given refresher courses of two to three months duration on advanced laboratory technique including the kahn test. It was possible to give training to members of the staff of the Anatomy Department of the Faculty of Medicine, University of Khartoum on the care of laboratory animals.

Seven laboratory assistant trainees were trained and employed to fill vacancies in newly built hospitals in the country.

Six female students for the Nursing College Khartoum, were given practical classes on bacteriology, haematology and other laboratory tests.

As usual the teaching of theoretical and practical bacteriology to the Medical Students of the Faculty of Medicine, University of Khartoum and also the teaching of Forensic Medicine to the same students have made heavy demands on the time of the laboratory staff.

TECHNICIANS CLASS

Two technician trainees completed the course on advanced bacteriology, haematology, biochemistry, pathology and passed the final examination successfully in April 1957. One of them was posted to the laboratory of the New Khartoum Civil Hospital and the other to the W.H.O. tuberculosis laboratories at Wad Medani; these two technicians met a real urgent need.

Seven technician trainees were recruited in September 1956 from the secondary school graduates for the 3 years advanced course. They are undergoing training in the laboratories at the present time and they have already covered a great deal of their training. In April 1957 two laboratory technicians were sent to the U.K. to do a year's course on advanced laboratory techniques at Mearskirk Hospital laboratory under Dr. Bruce to qualify them to sit for the examination of the Institute of Medical Laboratory.

ROUTINE WORK

A summary of the work and examinations carried during the period under review is appended to the report. The total number of examinations was 42,436 as compared with 31,880 in the previous year and 31,703 in 1954-55.

As in previous years histopathological work of rather highly specialised type continued to increase; demands for examination of testicular and endometrial biopsies became commoner and bronchial biopsies for carcinoma of the bronchus continued to come.

The issue of lymph vaccine was 3,100,000 doses last year compared to 1,068,500 doses this year. The demand for anti-rabic vaccine continued to increase; the issues increased from 43,200 doses in the previous year to 489,200 doses this year.

POST-MORTEM EXAMINATIONS

35 post-mortem examinations were performed in Khartoum Civil Hospital in the year under review, of which 22 were medico-legal.

PATHOLOGICAL SPECIMENS

The total was 1,044 excluding brains for rabies, the total of the previous year was 1,246.

NEOPLASMS

111 Neoplasms were received of which the following table is a summary :—

SITE					Carcinoma	Sarcoma	Melanoma	Mixed Tumour	Total
Cervix	...	...	...	...	18	2	1	—	21
Lip	...	...	...	...	2	—	—	—	2
Breast	...	...	...	...	14	2	—	1	17
Lung	...	...	...	...	2	—	—	—	2
Rectum	...	...	...	...	3	—	—	—	3
Endometrium	...	...	...	...	6	1	—	—	7
Prostate	...	...	...	...	3	—	—	—	3
Pharynx	...	...	...	...	1	—	—	—	1
Mouth	...	...	...	...	1	—	—	—	1
Bladder	...	...	...	...	7	—	—	—	7
Leg	...	...	...	...	5	—	—	—	5
Liver	...	...	...	...	—	—	2	—	2
Elbow	...	...	...	...	—	2	—	—	2
Toe	...	...	...	...	2	—	—	—	2
Lung	...	...	...	...	1	2	—	—	3
Ulcer	...	...	...	...	4	—	—	—	4
Gums	...	...	...	...	1	—	—	—	1
Eye	...	...	...	...	5	—	—	—	5
Urethra	...	...	...	...	1	—	—	—	1
Foot	...	...	...	...	2	2	1	—	5
Tongue	...	...	...	...	1	—	—	—	1
Uterus	...	...	...	...	3	—	—	—	3
Palate	...	...	...	...	—	—	—	1	1
Abdomen	...	...	...	...	—	1	—	—	1
Lymphgland	...	...	...	...	3	—	1	—	4
Vulva	...	...	...	...	5	—	—	—	5
Colon	...	...	...	...	2	—	—	—	2
TOTAL					92	12	5	2	111

RABIES

306 brains were received of which 17 were decomposed and useless for examination ; of the remaining, 70 were positive for negri bodies. This contrasts with 67 positive out of 270 received last year.

The species and distribution of the positives and negatives in the past year's series are shown in the following table.

TABLE
Rabies Examination

NAME					Positive	Negative	Decomposed	Total
Dog	...	...	...	...	48	171	11	230
Donkey	...	...	...	...	12	10	—	22
Cat	...	...	...	...	—	17	2	19
Goat	...	...	...	...	1	11	2	14
Monkey	...	...	...	...	—	4	—	4
Horse	...	...	...	...	3	2	—	5
Cow	...	...	...	...	6	2	—	8
Camel	...	...	...	...	—	1	2	3
Hyena	...	...	...	...	—	1	—	1
TOTAL					70	219	17	306

RABIES VACCINE

489,200 mls. were issued this year compared with 43,200 mls. issued last year. The amount issued this year is sufficient to treat 6988 cases. The animals used for the preparation of the vaccine are goats and the technique is that recommended by the W.H.O. seminar at Muguga, Nairobi, 1955.

Anti-rabic treatment is still decentralised and therefore a certain amount of waste in the vaccine is bound to take place.

LYMPH VACCINE

109 sheep were used for the production of 6018 grams of pulp with an average of 55 grams per sheep.

Owing to the incidence of cases of small-pox at Port Sudan, in June 1957, many revaccination campaigns were envisaged and it was considered wise to augment the production of the vaccine by ordering one million doses of freeze dried small-pox vaccine which had not been received till the end of the period under review.

ENTERIC FEVER

Small outbreaks of enteric fever continued to appear in various parts of the country wherever the sanitary measures were neglected. The commonest organism is *Salm. typhi*. Further typing of the strains confirmed that type E is the predominant type in the country.

POLIOMYELITIS

Lately progress in various fields of poliomyelitis research has been rapid, specially in development of a new vaccine for immunising susceptible persons. The Salk vaccine in the United States of America gave good immunity to a significantly high percentage of children vaccinated with it.

It became necessary, therefore, to perform surveys in the Sudan to evaluate the position in the country as regards the incidence and spread of poliomyelitis. Dr. J. H. S. Gear, Director of Research Laboratories of the poliomyelitis Research Foundation, the South African Institute for Medical Research, kindly agreed to test sera from individuals in the Sudan for polio-virus anti-bodies. 50 specimens of blood were, therefore, collected from children in Khartoum and an equal number from the same age groups of children living in a more remote part of the Sudan, Kassala.

The specimens were collected under aseptic conditions in venules and despatched by air mail to Dr. Gear. The following table gives the results of the tests showing locality and presence or absence of anti-bodies against the three types of polio-virus :

**TABLE SHOWING TYPES OF POLIOMYELITIS VIRUS TO WHICH ANTIBODIES WERE PRESENT
IN SERA OF SUDANESE CHILDREN**

Type of anti-body present			Rural Kassala Children	Urban Khartoum children
1 only	...	...	1	3
2 only	...	...	2	1
3 only	...	...	4	Nil
1 and 2	...	...	1	2
1 and 3	...	...	6	2
2 and 3	...	...	3	3
1, 2 and 3	...	...	31	35
None detected	...	...	Nil	Nil
TOTAL			48	46

As it is obvious from the above results, all sera whether from children in the urban city of Khartoum or the rural district of Kassala, are positive to one or other of the three types of virus. It would appear that the infection is heavy and takes place rather early in life. This picture is, of course, in conformity with the prevailing pattern of poliomyelitis disease in the studied countries of Africa. It is contrary to the prevailing pattern in Europe where the incidence has shifted from early life to the ages of thirty or forty years and where the infection is generally much more severe in effect.

SCHISTOSOMIASIS

Carefully controlled trials on a small scale were performed to test the effect of Miracil D and Triostam preparations on cases of Schistosomiasis. Miracil D is a Bayer preparation and was given in the form of enteric coated tabs. of 0.1 gram each. Triostam is a Burroughs Wellcome preparation given in the form of intravenous injections.

Miracil D.: Seven cases of Schistosomiasis haematobium were given the tablets by mouth according to the directions of the manufacturers. The patients were put under close observations, their weights were noted and their urines were examined daily. Toxic side-effects were so severe that by the 3rd day the patients flatly refused to take the drug. Vomiting, nausea, loss of appetite, abdominal colic and loss of weight were severe. Treatment was therefore discontinued.

TRIOSTAM

Triostam brand Sodium Antimony Gluconate is a powder which contains 30 per cent of trivalent antimony. It is synthesised at the Wellcome Laboratories. Six cases of Schistosomiasis haematobium were treated with daily intravenous injections according to the instructions given by the makers. There were no toxic effects and the treatment was well-tolerated but the cure results of this drug were inclusive and there would certainly be good reasons for further investigations on the cure value of this preparation.

BLOODS

A small survey was carried out to estimate the total proteins, albumin, fibrin and globulin, in the bloods of inmates from Kober Central Prison and from persons who report to Khartoum Civil Hospital outpatient for having their bloods tested for syphilis. In the following paragraphs the methods employed and the results of the tests are summarised.

Proteins by Nesslerisation method

Reagents

1. 50% W/V A.R. Sulphuric acid containing 1% Selenium Dioxide (Se O₂)
2. 10% W/V A.R. Zinc sulphate (10ml of this should=10.8)
3. 11.2ml of (2) using phenolphthalin indicator
4. Sodium sulphite cryst. 42%

5. Standard ammonium chloride.
Ammonium chloride A.R. 153 mgm
dissolved in distilled water 100ml
take 25ml of this solution and 10ml N/1
sulphuric acid and dilute to 1 litre with
distilled water (IMI=0.01mgm N.)
6. Solution calcium chloride A.R. 2.5% W/V
7. Sodium chloride A.R. 0.9% W/V

Method for total protein.

In a large test tube place the following :—

Plasma 0.2ml
Sodium chloride 0.9% 19.8ml

In a digestion/centrifuge tube place the following :—

Plasma / Saline dilution 0.5ml (=0.005ml plasma)
distilled water 4.0ml
zinc sulphate 10% 0.5/N 0.1ml
Sodium Hydroxide 0.5/N 0.1ml

Mix well stand for 2-3 mins. then centrifuge at high speed (3500 R.P.M.)
for 2-3 mins.

Discard supernatant fluid invert tube on filter paper and allow to
drain 1-2 mins, then add :—

50% sulphuric acid / SeO₂ 0.2ml
Porus pot. one small piece.

Place on digestion stand at low heat until blackening occurs, and
white fumes appear, continue heating until colourless then for 20-30 mins. longer,
remove, cool and add :—

Iced distilled water 5.0ml
shake well and add.
Iced nessler's solution 3.0ml

shake well and compare with standard preparation as follows :—

5ml standard ammonium chloride + 1.0ml iced nessler's + 2ml ice
water.

Calculation.

$$\frac{U}{S} \times 6.25 \text{ (using 2xOB2 filters.)}$$

Method for Fibrin.

In a narrow test tube place the following :—

Plasma / saline (from total protein) 10.0ml
calcium chloride 2.5% 0.2ml

Keep at 37°C for 3-4 hours, preferably overnight, until clotting occurs.

Remove clot on glass rod, dry on filter paper, then remove from rod and place in digestion / centrifuge tube.

Add sulphuric acid and porus pot. and digest as for total protein.

Calculation.

$$\frac{U}{S} \times 0.3125 = \text{mgm\% fibrin}$$

Method for albumin.

In a test tube place the following :—

plasma 0.2ml
caprylic alcohol 1 microdrop
42% sodium sulphite 10ml

Keep at room temperature for 10 mins. then filter through a Whatman filter paper. (No. 42)

In a centrifuge / digestion tube place 0.5ml of filtrate then add 4ml distilled water and 0.1ml zinc sulphate and 0.1ml sodium hydroxide ; after centrifuging procede with digestion as for total protein.

N.B. This solution turns deep red when acid is added but is a normal reaction.

Calculation.

$$\frac{U}{S} \times 3.125 = \text{gm\% albumin.}$$

Globulin = protein — (Albumin + fibrin).

KOBEL PRISONERS PLASMA ANALYSIS

No.	Age	Total Protein	Albumen	Fibrin	Globulin	Remarks
1	27 yrs.	7.0 gms%	3.5 gm%	225 mgm%	3.2 gm%	
2	27 "	7.0 "	3.8 "	192 "	3.0 "	
3	23 "	8.5 "	3.7 "	150 "	4.6 "	A/G Ratio Reversed.
4	45 "	7.0 "	3.9 "	175 "	3.2 "	
5	35 "	8.5 "	3.3 "	150 "	5.0 "	A/G Ratio Reversed.
6	42 "	7.0 "	3.5 "	225 "	3.2 "	
7	43 "	8.5 "	3.7 "	175 "	4.6 "	
8	28 "	7.0 "	3.7 "	174 "	3.1 "	
9	32 "	6.5 "	3.5 "	174 "	2.8 "	
10	41 "	5.5 "	3.0 "	200 "	3.3 "	A/G Ratio Reversed.
11	33 "	8.5 "	3.7 "	200 "	4.6 "	
12	23 "	8.5 "	3.0 "	200 "	5.3 "	" " "
13	29 "	10.0 "	4.0 "	275 "	5.7 "	" " "
14	28 "	6.5 "	3.7 "	200 "	2.6 "	
15	21 "	7.6 "	2.8 "	150 "	3.6 "	
16	46 "	7.0 "	3.7 "	175 "	3.1 "	
17	32 "	5.9 "	3.8 "	174 "	1.9 "	
18	30 "	7.0 "	3.7 "	170 "	3.1 "	
19	23 "	6.5 "	3.7 "	175 "	2.6 "	
20	31 "	6.5 "	3.5 "	225 "	2.7 "	
21	32 "	6.0 "	3.5 "	200 "	2.2 "	
22	37 "	7.5 "	4.0 "	200 "	3.3 "	
23	36 "	7.0 "	4.3 "	124 "	2.5 "	
24	37 "	7.6 "	2.9 "	182 "	4.5 "	A/G Ratio Reversed.
25	39 "	7.6 "	3.1 "	200 "	4.6 "	
26	28 "	6.0 "	3.5 "	192 "	3.3 "	
27	31 "	7.0 "	3.8 "	150 "	3.3 "	
28	42 "	6.5 "	3.2 "	124 "	3.1 "	
29	32 "	8.0 "	3.8 "	174 "	5.0 "	A/G Ratio Reversed.
30	29 "	7.0 "	3.8 "	175 "	3.0 "	
31	37 "	8.0 "	3.3 "	175 "	4.5 "	A/G Ratio Reversed.
32	31 "	7.6 "	2.9 "	192 "	3.7 "	" " "
33	35 "	7.5 "	4.0 "	174 "	2.7 "	
34	39 "	8.5 "	3.7 "	210 "	4.5 "	A/G Ratio Reversed.
35	29 "	7.0 "	3.5 "	174 "	3.3 "	
36	32 "	7.5 "	3.7 "	225 "	3.5 "	
37	25 "	7.6 "	3.1 "	270 "	5.9 "	A/G Ratio Reversed.
38	27 "	7.5 "	3.7 "	200 "	3.3 "	
39	23 "	10.1 "	3.9 "	300 "	3.8 "	A/G Ratio Reversed.
40	25 "	7.0 "	3.2 "	175 "	2.8 "	
41	25 "	7.5 "	3.7 "	174 "	3.8 "	A/G Ratio Reversed.
42	26 "	7.0 "	4.0 "	150 "	2.8 "	
43	45 "	7.4 "	4.2 "	124 "	3.1 "	
44	29 "	7.5 "	3.5 "	200 "	3.8 "	A/G Ratio Reversed.
45	44 "	6.5 "	3.5 "	150 "	2.8 "	" " "

NESSLERISATION TEST FOR PROTEINS

No.	Total Protein	Albumen	Fibrin	Globulin	Remarks
1	6.8	3.5 gm%	280	3.0 gm%	
2	6.2	4.0 "	250	1.9 "	
3	6.8	3.5 "	300	3.0 "	
4	7.2	3.3 "	200	3.7 "	A/G Ratio Reversed.
5	7.6	4.0 "	275	3.3 "	
6	6.5	4.3 "	175	2.0 "	
7	7.5	3.5 "	175	3.8 "	A/G Ratio Reversed.
8	6.5	3.5 "	150	2.8 "	
9	7.5	3.5 "	174	3.8 "	A/G Ratio Reversed.
10	6.5	4.0 "	175	1.8 "	
11	6.5	4.0 "	200	2.3 "	
12	6.5	3.3 "	175	3.0 "	
13	6.8	4.3 "	300	2.2 "	
14	7.5	3.7 "	200	3.6 "	
15	6.5	2.9 "	174	3.4 "	A/G Ratio Reversed.
16	7.2	3.5 "	175	3.5 "	
17	6.8	4.6 "	200	2.0 "	
18	6.8	3.5 "	275	3.0 "	
19	6.5	4.0 "	200	2.3 "	
20	7.0	3.7 "	200	3.1 "	
21	7.5	3.7 "	200	3.6 "	
22	7.0	3.7 "	180	3.1 "	
23	7.8	3.5 "	250	4.0 "	A/G Ratio Reversed.
24	8.2	4.3 "	275	4.7 "	A/G Ratio Reversed.
25	7.0	4.2 "	300	2.4 "	
26	7.0	4.0 "	250	3.3 "	
27	8.6	4.0 "	350	4.2 "	A/G Ratio Reversed.
28	7.5	4.2 "	250	3.0 "	
29	10.4	4.3 "	320	5.7 "	A/G Ratio Reversed.
30	7.8	4.1 "	250	3.4 "	
31	7.6	4.0 "	175	3.4 "	
32	7.6	4.1 "	175	3.4 "	
33	7.5	3.5 "	250	3.7 "	A/G Ratio Reversed.
34	8.2	4.2 "	300	3.7 "	
35	7.9	3.0 "	250	3.0 "	
36	6.8	3.8 "	175	2.7 "	
37	7.8	4.2 "	200	3.4 "	
38	7.6	4.1 "	200	3.3 "	
39	7.8	3.8 "	250	3.7 "	

KALA-AZAR OUTBREAK IN THE FUNG AND UPPER NILE PROVINCE

In the year under review kala-azar for the first time in its history in this country, attained an unprecedented scale in its epidemic spread. The disease flared up in areas which were known to be loosely endemic. This endemicity, in the past, used to assert itself by producing few cases at intermittent periods, which are gauged by several years in the case of the Southern Fung and the north-easterly part of Upper Nile Province. In any case paucity of cases was one of the main distinguishing features of Sudan kala-azar and this point had been commented upon by various writers at different times. Thus Archibald (1923) described the disease as sporadic in its distribution, Kirk (1939) confirmed and stressed the same thing.

EPIDEMIOLOGY

As previously stated kala-azar in the Sudan used to be sporadic and very erratic in its distribution, although a few small outbreaks had been reported from military posts and patrolling sometimes in uninhabited country contributed some cases. Even then, these were localised outbreaks and did not extend to other areas. The local inhabitants were mostly stationary people and did not like to travel much and the area itself was very much under-developed. There is nothing in the endemic area in the past that attracted new-comers as it was poor and under-developed in every sense of the term.

Conditions are now very different from what they used to be a few years ago, as development, particularly agricultural, is now going full swing and these areas are becoming very prosperous. Pumping schemes are being established on both sides of the Blue Nile and the production of cotton in appreciable quantities is attracting many new-comers to the area either as cultivators or labourers. The majority of these are non-immune, and are therefore susceptible to the infection. Cotton picking alone needs thousands of hands that had to be imported from neighbouring regions.

Moreover, new villages had been started in places that were once uninhabited. It is quite possible that these sites were either deserted some years ago, or harboured some animal reservoir host, which might be capable of transmitting infection without harm to itself. In the autumn of 1956 a violent outbreak suddenly blew up and it is so interesting that a short description of it is regarded pertinent.

THE 1956-57 EPIDEMIC

In September, 1956, news came that an epidemic of a killing disease broke out amongst the "Jum Jum" at and round Wadeka. It was alleged that several people had died. One of us, had therefore, been flown to the area of the epidemic in a small plane. He stayed there about four days during which he carried out several examinations and tests of which spleen punctures were performed on about 58 persons of whom about 32 were found positive for leishmania i.e. a percentage of 55 per cent. In view of this result as well as the clinical and blood picture which fitted into that of visceral leishmaniasis, it was concluded that this disease was kala-azar.

It was soon evident that the disease was wide-spread and as a matter of fact all the Southern Fung had been infected, with the heaviest incidence amongst

the "Jum Jum", Surkum, Uduk and the Maban round Ulu, Wadeka and Goz simma, Maiak and Chali. In Upper Nile Province, however, the heaviest incidence was round Abayat and Paloic in Melut-subdistrict.

By October, however, there were 10 treatment centres in the Southern Fung and seven in Upper Nile. Each of these is fed by a cluster of villages.

At Wadeka, in the first few days of the epidemic the cases were about 136 and rose to over 200 in a matter of a week.

To give an idea of the age and sex distribution, it is considered relevant to give the cases treated at Wadeka and the treatment centres in its immediate neighbourhood at 25.10.56.

Wadeka treatment centre :			
M	F	C	Total
70	72	133	275
Es sama treatment centre :—			
18	13	133	164
Er Ragreig treatment centre :—			
5	1	11	17

At the same time about 167 cases were treated in the various centres in the Ingassana Hills, 305 cases at Abayat and 260 at Gelhak. The two latter are in Upper Nile.

By then it was realised that nothing short of a whole-sale campaign in which survey and mass treatment should be instituted, could be hoped to ameliorate the fury of this outbreak. The survey had to be a comprehensive one and everybody in the epidemic area should be subjected to examination and preferably gland punctured, especially if he has an enlarged spleen, liver or fever. This was done in the Fung, after consultation and discussion with the P.M.O.H. Blue Nile and some of his staff. Very interesting facts emerged as a result of this survey.

1. The disease had been conveyed to the Southern Fung through Nomadic Arabs : in this particular case it was brought to this area through the agency of the Rufaa El Hoi tribe from the Northern Fung and from Singa in particular where the disease, of late, attained epidemic proportions.

2. The Ingassana shepherds who used to graze their cattle with Rufaa' El Hoi had been also hit, but their women were practically spared. The women did not leave the hills.

3. The disease was found in healthy subjects and in some of them there was nothing at all to suggest ill-health. In some there is slight enlargement of the spleen and may be also the liver. This is not unparalleled in protozoal infections and an analogy can be drawn from premunition in malaria. In 1948 and 1949 Corkill recorded very interesting observations on the activation of a latent kala-azar by malaria, relapsing fever and stress of battle. These findings partly confirm his views. Some of these cases had enlargement of lymph glands, especially the groin and saphenous group.

As far back as 1937-38 the writer had reason to believe that some cases were suffering from kala-azar but he could not prove them as the spleen and sternal punctures were repeatedly negative, and there was very little deviation from health. The gland puncture had not been then adopted as a method of diagnosis.

4. The value of the gland puncture as a method of diagnosis which is very reliable and safe has been further affirmed especially in mass surveys. In experienced hands it had been found to be superior to other methods. Without it, it would have been impossible to carry the survey referred to above.

5. Pentostam has asserted its value in an ever increasing scale and the results are very convincing. It would not have been possible to treat the cases of kala-azar in the Sudan in the field and under very adverse conditions with any other drug. Anybody who had experience in the treatment of kala-azar in the Sudan would have easily seen this.

In the past even with hospitalisation the death rate was high in spite of the high standard and meticulous nursing care required. In fact Pentostam has revolutionised the treatment. The average period of hospitalisation before Pentostam was three months. Now cases are treated as outpatients and for not more than 2-3 weeks.

6. *Resistance to Pentostam.* In the olden days, when Pentostam was tried in this country (Kirk and Sati (1946)) most cases were cured with 6-8 injections. In this epidemic the majority of those that were given 6 injections relapsed. The standard course now advocated is 10-14 daily injections.

Several relapses even with this regime were recorded and some few cases were given 2-3 or even four courses.

In the field, of course, no reliable tests of cure were carried out as this is not always feasible and the available accommodation does not warrant it. Lomidine (Pentamidine) has been used for resistant cases in hospital.

TRANSMISSION

Collection of sandflies from various places had been going on and it is not yet considered by any means exhaustive but sandflies suspected by Kirk and Lewis to be the vectors of kala-azar in the Sudan had not been encountered in the areas of the epidemic so far. This does not mean much as it may be true only for the time of the year during which collection was carried out. These sandflies might have been in abundance just before the epidemic.

Animal reservoir host. A search for an animal reservoir host had been also proceeding but no luck so far.

Rabies Examination

NAME	Positive	Negative	Decomposed	Total
Dog	48	171	11	230
Donkey	12	10	—	22
Cat	—	17	2	19
Goat	1	11	2	14
Monkey	—	4	—	4
Horse	3	2	—	5
Cow	6	2	—	8
Camel	—	1	2	3
Hyena	—	1	—	1
TOTAL	70	219	17	306

Summary of Laboratory Examination

MONTH	Kahn Test	Blood	Faeces and Urine	General Bact. Vaccine	Histo- path	Total
July	1,417	374	443	386	72	2,692
August	1,478	285	347	565	51	2,726
September	1,404	1,510	358	1,050	65	4,387
October	1,342	696	601	896	90	3,625
November	1,668	3,286	262	659	81	5,956
December	1,108	4,306	310	571	89	6,384
January	1,382	673	392	698	95	3,240
February	1,165	420	297	691	86	2,659
March	1,267	401	294	668	116	2,746
April	1,021	466	154	709	79	2,429
May	1,335	370	167	836	115	2,823
June	1,203	518	167	836	112	2,769
TOTAL ...	15,790	13,305	3,792	8,498	1,051	42,436

Summary of Faeces Examination

<i>Shigella flexneri</i>	14
<i>Shigella Shiga</i>	—
<i>Shigella Schmitz</i>	1
<i>Shigella Sonne</i>	1
<i>Salm-typhi</i>	8
<i>Paratyphi A</i>	1
<i>Paratyphi B</i>	—
<i>Entamoeba histolytica</i>	7
Ova present	5
Negative	2,037
TOTAL	2,074

Summary of Urine Examination

<i>Salm typhi</i>	3
Ova	3
Negative	1,714
TOTAL	1,720

Kahn Test

	July	August	September	October	November	December	January	February	March	April	May	June	
POSITIVE	236	246	219	186	274	150	222	235	237	171	185	132	2,493
NEGATIVE	1,181	1,232	1,185	1,156	1,394	958	1,160	930	1,030	850	1,150	1,071	13,297
TOTAL...	1,417	1,478	1,404	1,342	1,668	1,108	1,382	1,165	1,267	1,021	1,335	1,203	15,790

*List of Publications during the year by Members
of the Staff*

Name and Initials of Author	Date of Publication	Title of Article	Title of Journal in which Published	Volume Number of Journal	Page Number of Journal
Satti M. H. and Kirk R.	1957	Observations on the Chemotherapy of Onchocerciasis in the Bahr El Ghazal Province, Sudan.	Bulletin of World Health Organisation.	Vol. 16	531—540

(b) MEDICAL ENTOMOLOGY

By

M. QUTUBUDDIN

On 14th July 1956, Mr. Mohamed Qutubuddin from Pakistan took over as Medical Entomologist to fill the post vacated by Dr. D. J. Lewis in May, 1955. The new Entomologist was a Senior Research Officer in the Insecticide and Drug Testing Section of the Pakistan Council of Scientific and Industrial Research before he joined here. He also held posts of Entomologist in the Malaria Institute of Pakistan previously and that of Medical Entomologist in Hyderabad.

Most of the reprints received in exchange for the publications that emanated from the section were missing, but for the new Medical Entomologist's personal collection of necessary literature on various subjects, work in the section would have been difficult.

Several changes have been effected and improvisations made in the insectary of the section which was not in a satisfactory condition.

In order to acquaint himself and make a thorough study of the insect fauna of the country the new Medical Entomologist started going over the collection in the Department, in which also existed serious lacunae. He studied the available specimens of insects belonging to (1) Culicinae (Culicini and Anophelini) (2) Phlebotominae (3) Tabanidae (4) Calliphoridae (5) Simuliidae (6) Muscidae etc.

Besides the above he visited Wadi Halfa, Kordofan Province and the Fung Area in the Blue Nile Province in connection with various problems mentioned below.

Mosquitoes

Wadi Halfa

On receiving a report of the occurrence of *Anopheles gambiae* on the other side of the Sudan Egyptian border in September 1956 the Medical Entomologist visited the area between Saras and Faras in the Northern Province where the mosquito has been exterminated since 1945. A thorough inspection of the possible breeding places of *gambiae* revealed the fact that the mosquito has not been able to re-establish itself in the area. Nevertheless recommendation was made for more strict control at Faras basin.

Kordofan

On receiving report of a very high incidence of *Aedes aegypti* in certain villages in Kordofan, the Medical Entomologist visited a number of villages in the Province. Since it was felt that the topography and means of water supply and other factors varied in the province in different places which greatly influenced the breeding of *Aedes aegypti*, endeavour was made to make survey of such places that offered representative conditions obtained in the region and in the villages around it. Hence places were selected in the Central and Eastern Kordofan in the plains; and the Eastern and Western Jebels in the Nuba mountains. Thus

a large number of villages were examined (the names of which are omitted for the sake of brevity) around El Obeid, Rahad, Um Ruwaba, Dilling, Delami, Heiban and Talodi.

The highlights of the report were :

1. A survey of the water supply in the province and its effect on breeding of *Aedes aegypti*.
2. A table showing the pre and post-spray indices of *Aedes aegypti* in a number of villages demonstrates a remarkable reduction in the index as a result of spraying with Gammexane P. 520, 15 m.g. per sq. foot which was recommended to be raised to 20 mg. per sq. ft.
3. A second table provides information on the Aedic index as well as other species of mosquitoes collected in a house to house search and around the villages.
4. Culicine (*Culex* and *Aedes*) and Anopheline species found in larval form are mentioned. Species of *Phlebotomus* are also listed.
5. Control measures including recommendations for permanently improving water supply in the area have been suggested that may well reduce the high incidence of Guinea Worm diseases in certain villages. Other insects of medical importance were also taken such as *Simulium* and *Sarcophaga* bugs as well as some ticks.

Sandflies

Kordofan

Sandflies were collected by the Medical Entomologist and his staff from a number of places in Kordofan. A report on the species identified has already been given as mentioned above. The species are :

1. *Phlebotomus christophersi* var. *calaratus* Parrat.
2. *P. affinis* Theodor.
3. *P. antennatus* Newstead.
4. *P. bedfordi* var. *congolensis* Begnaert and Walravens.
5. *P. freetwonensis* Sinton.
6. *P. F. magnus* Sinton.
7. *P. F. niger* Parrat and Schwetz.

The Fung

Sandflies were also collected by the Entomologist accompanied by his staff from 10 villages in the area where last year there had broken out an epidemic of kala-azar. Efforts to collect sandflies by oil traps proved abortive. A total number of 444 sandflies were caught by oil traps laid in suitable places near human dwellings or cattle sheds and in some places inside the houses while in others near

the mountains, soil cracks and caves. No specimens were taken while biting human beings. Villages surveyed were:—

1. Dali 2. Mazmum 3. Wadaka 4. Kurmuk 5. Bikori 6. Banglul and 7. Roseires.

1. *P. antennatus* 2. (i) *P. bedfordi* (ii) *P. bedfordi* var. *bereiri*, 3. *P. freetwonensis* 4. *P. clydei* 5. *P. squamipleuris* and 6. *P. adleri* were the six species taken. They are arranged in order of their numerical strength in which they were caught.

The hitherto unknown male of *P. bedfordi* var. *bereiri* appears to have been collected. It is being further studied.

Melut

A collection of sandflies has been recently made in the Upper Nile Province from Renk, Melut, Bounq, Ora, and Kosti, Gablein, Kurmuk and Bao in the Blue Nile Province. These are the kala-azar affected areas. So far, six species have been identified in the collection including one *P. roubaudi* var. *fourtoni* which shows some variations. A detailed report will be submitted on the collection after the whole lot has been examined.

Identifications

The D.M.S. was requested to kindly issue letters to P.M.O.H's and S.P.H.I's of all provinces to send collections of insects of medical importance to the Section. Although the response was fairly encouraging still it is felt that more specimens should have come forward. In all 400 specimens sent to us from 31 places were identified. Most of these comprised mosquitoes, adult and larvae; and a few Tsetse flies, Tabanidae, Diapsidae, Tachinidae, Muscidae and Chironomidae etc. were also received, and reports on identifications given. Among other insects received though not of medical interest, were Hymenoptera (family Chrysididae), Hemiptera (family Membracidae), and Coleoptera (family Dytiscidae). (Please see appendix).

Specimens sent

Identified specimens of insects of medical importance were sent to the Graphic Museum to replace the old ones that were damaged. On his request, a large number of sandflies were sent to Prof. R. M. Gordon of the Liverpool School of Tropical Medicine for demonstration to the classes. Efforts were also made to obtain in the laboratory eggs from sandflies fed in nature, but in spite of changing the conditions of temperature etc. success was not achieved. It is therefore suggested that perhaps there existed a pre-gravid period in *Phlebotomus* also as it was recently observed in certain mosquitoes. Further experiments continue.

To Prof. P. Sen of the Calcutta School of Tropical Medicine pinned specimens of *Glossina* sp. were sent on his request. *Gambusia* fish was sent to the Fisheries Department and to the Palace at Khartoum, tadpoles to the Kitchener School of Medicine, Khartoum.

Houseflies

Experiments to ascertain the fly densities at Medani, and the Gezira area

have been started and are in progress long since. A year's observation of densities will give an idea of the seasonal incidence so that effective control measures may be adopted.

Insecticides

Experiments on testing of insecticides are performed from time to time, but in order to study the effect of newer insecticides such as Diazimon and other organic phosphorus compounds to detect the development of resistance if any, construction of a special hut has been ordered which is almost reaching completion.

Insectary

The insectary has been much improvised but still there remains much to be desired such as, for example, (1) an Incubator (2) a Hair Hygrometer (3) a Refrigerator (4) a Precision Micro-chemical balance.

A colony of *Aedes aegypti* from larvae received from El Obeid is very successfully being maintained, and various interesting experiments have been started. It is proposed to collect *Aedes aegypti* var. *queenslandensis* from Port Sudan and start cross-breeding experiments in the laboratory.

A colony of *Musca* sp. is also being maintained for a time. Interesting observations are being made on the bionomics of *Phlebotomus* in the insectary which is already mentioned above.

Number of Public Health Workers Trained

During the year 9 Assistant Overseers from the Town Council, Wad Medani and 9 mosquitomen from Blue Nile Province, were trained. Exhibits of insects of medical interest were displayed to many visitors including medical students from Khartoum University, and some of the nursing staff from Wad Medani Hospital.

APPENDIX

PLACE	Ref. No.	Identification	Remarks
Juba	2039	<i>Teaniorhynchus</i> sp. Chironomids	Aircraft
Port Sudan	2036	<i>Aedes aegypti</i> <i>Culex pipiens fatigans</i> Chironomids <i>Anopheles turkhudi</i> <i>Theobaldia longiareolata</i>	
Khartoum	2040	<i>Culex pipiens fatigans</i> Chironomids	Aircraft
Sherkeila... ..	2038	" " " "	
" " " "		<i>Aedes aegypti</i>	
Dilling		" "	
" " " "		<i>Culex</i> sp.	
El Obeid		Chironomids	
Dilling		<i>Culex univittatus</i>	
" " " "		" "	
" " " "		<i>Aedes aegypti</i>	
" " " "		" vittatus	
Khor Tagat		<i>Culex decens</i>	
Abu Haraz		" univittatus	
" " " "		" laticinctus	
" " " "		<i>Anopheles</i> sp.	
Suakin	2036	<i>Ornithonyssus bursa</i>	
Port Sudan	2047	Dytiscidae	
El Obeid, Soderi		<i>Aedes aegypti</i> <i>Culex nebulosus</i>	
Port Sudan	2044	<i>Aedes aegypti</i>	
Gedaref	2045	<i>Telmatoscopus</i>	
El Obeid	2051	<i>Aedes aegypti</i>	
Talodi	2055	" "	
El Sawagi, El Obeid	2049	" "	
Tabaldiya	"	" metallicus	
Banu	"	" aegypti	
Port Sudan		<i>Anopheles</i> sp.	
Torit	2063	<i>Chrysops pusillula</i>	
Torit	"	<i>Culex univittatus</i> <i>Glossina</i> sp. <i>Teaniorhynchus cretatus aureus</i> Hymenoptera Chrysididae <i>Sarcophaga</i> sp. <i>Culex duttoni</i> <i>Chrysomyia marginalia</i>	
Juba	2058	<i>Ficalbia lacustria</i> <i>Culex univittatus</i> <i>Anopheles coustani</i>	
Port Sudan	2068	Membracidae (Hemiptera)	
" " " "	2061	<i>Culex pipiens fatigans</i>	Aircraft
El Obeid, Khorabulein	2067	<i>Ficalbia splendens</i> <i>Aedomyia africans</i> <i>Culex tigripes</i> <i>Culex pipiens fatigans</i> <i>Sarcophaga</i> sp. Hymenoptera	
Omdurman			

SANDFLIES

PLACE				Identification	Remarks
FUNG AREA	...	...	...	<i>P. antennatus</i>	
				<i>P. adleri</i>	
Dali, Mazum.	...	...	...	<i>P. bedfordi</i>	
Ula, Wadaga,	...	...	...	<i>P. clydei</i>	
Kurmuk,	...	...	...	<i>P. freetwonensis</i>	
Bikori,	...	...	...	<i>J. squamipleuris</i>	
Banglulu	...	...	...	<i>J. bedfordi</i> var. <i>tereiri</i>	

(c) THE WELLCOME CHEMICAL LABORATORIES

The Wellcome Tropical Research Laboratories were founded in 1903. The laboratories and the equipment together with a library and museum were a generous gift to the Sudan Government by Sir Henry Wellcome, and they were housed in the then Gordon Memorial College (now the University).

Dr. William Beam was appointed in 1904 as the first Government Chemist and the Chemical Section was opened. After the First World War, the Chemical Section expanded rapidly and branch laboratories were opened at Atbara and Wad Medani.

In 1935, the Wellcome Tropical Research Laboratories Khartoum were disbanded, and the Khartoum Chemical laboratories were placed under the control of the Ministry of Agriculture. In 1939 the laboratories were transferred to the Ministry of Health and they now form part of the Research Section of that Ministry.

STAFF

Government Analyst

E. H. W. J. BURDEN, B.Sc. (London), A.R.I.C.

Assistant Government Analysts

RIAD EFF. MANSOUR.

ABDEL HAMID EFF. IBRAHIM SULEIMAN, M.Sc. (London), D.I.C.

RIFAT EFF. BUTROS SALAMA, B.Sc. (Alex.) (on study leave in England)

Assistant Scientific Officers

MUBARAK EFF. ALI KARRAR, B.Sc. (London).

(1 vacancy)

Senior Technical Assistants

ABU BAKR EFF. AHMED AKOUR.

AFIFI EFF. AHMED HUSSEIN.

(1 vacancy)

Technical Assistants

MAHDI EFF. EL TAYEB HABOURA.

HASSAN EFF. AHMED YASSIN.

SALAH EL DIN EFF. BEDAWI EL SAWAHLI.

AHMED EFF. ABDULLA NAGI.

Junior Technical Assistants

EL TAHIR EFF. BEDAWI.

ALI EFF. EL HAG IBRAHIM.

FADUL EFF. EL RAYIH.

Librarian

MAHMOUD EFF. ABDEL GHAFfour.

Library Clerk

(1 vacancy)

Clerk

MEKKI EFF. BURAI SULEIMAN. ,

ADMINISTRATIVE REPORT

A. Staff

Abdel Hamid Eff. Ibrahim Suleiman returned to Khartoum for duty after spending 4 years in England. During this period he obtained :—

- (a) B.Sc. (Special Chemistry) (1st. Class Honours) (London).
- (b) M.Sc. (London) in Food and Drugs.
- (c) Diploma of the Imperial College.

He is to be congratulated on his fine achievements.

Sayed Eff. Ahmed Sabri, Senior Technical Assistant, retired on 5.12.1956 after 31 years service in the laboratories.

Rifat Eff. Butros Salama started his course at Imperial College, London to study for an M.Sc. in food and drugs.

The following appointments were made during the year :—

Mubarak Eff. Ali Karrar as Assistant Scientific Officer.

Ahmed Eff. Abdulla Nagi as Technical Assistant.

Fadul Eff. El Rayih, Head Attendant, as Junior Technical Assistant.

B. General

It is pleasing to record the acquisition of a Hilger Uvispek Ultraviolet Spectrophotometer. It has proved its worth on a number of occasions, and analyses have been made that would otherwise have been impossible. A thirty year old Hilger Wavelength Spectrometer hitherto unused was also pressed into service as a spectrograph.

ANALYTICAL REPORT

Summary

The following table shows the number of samples received in the different categories during the last two years.

	1956/57	1955/56
Waters and Sewages	336	371
Foods	362	551
Drugs and Poisons... ..	52	50
Clinical Specimens	8	40
Toxicological Specimens	141	137
Forensic Specimens	140	35
Edible Oils, Seeds and Oil Cakes	463	484
Damaged Materials	106	221
Miscellaneous	314	332
	<hr/> 1,922	<hr/> 2,221

The following table gives the number of samples submitted by Government Departments and other sources :—

	1956/57	1955/56
Ministry of Health... ..	574	810
„ „ Agriculture	58	58
„ „ Animal Resources	52	56
„ „ Commerce, Industry and Supply	5	12
„ „ Communications	49	58
„ „ Education	2	0
„ „ Finance and Economics	40	86
„ „ Irrigation	0	1
„ „ Mineral Resources	5	12
„ „ Social Affairs... ..	1	0
„ „ Stores and Equipment	14	44
„ „ Works	143	103
Mechanical Transport Dept.	1	0
Sudan Army	4	2
Sudan Police	154	44
Local Authorities	8	5
Egyptian Irrigation Department	0	6
Khartoum University	12	13
Sudan Gezira Board	35	86
Equatoria Projects Board	1	0
Province Governors	0	13
Commercial Firms and Others	764	812

The analytical fees for commercial work totalled £s. 1563 compared with £s. 1971 for last year.

There has been an appreciable reduction in samples, caused partly by the closure of the Suez Canal, which resulted in a reduction of the samples submitted in association with insurance claims, and some reduction in analyses of commercial oilseeds for export. There was also a considerable reduction in the number of foodstuffs submitted for analysis.

2 Waters and Sewages

Samples of water and sewage were received from the following sources :—

	1956/57	1955/56
Ministry of Health...	118	97
Drilling Engineer, Ministry of Works ...	126	103
Sudan Gezira Board ...	16	71
Khartoum Main Drainage Contractors ...	6	0
Other Sources ...	70	100
TOTAL ...	336	371

The following table gives details of some unusual waters received :—

No.	Source	Remarks
B. 59	Abu Awa ...	Nitrate Nitrogen ... 70 P.P.m.
B. 60	Jebel El Hilla ...	Total Solids ... 7190
		Sulphate (SO) ... 2160
		Chloride (Cl) ... 2100
		Magnesium (Mg) ... 325
		Calcium (Ca) ... 155
		(see further comments below)
B. 706	Um Shanga Bore 616	on 13.11.56 Total Solids... 640
B. 868	" " " "	on 30.11.56 Total Solids ... 7760
B.1107	" " " "	on 18.2.57 Total Solids ... 11850
B.1003	Um Sagoun ...	Nitrate Nitrogen ... 190
B.1199	Wad Radalla ...	" " " " ... 87
B.1417	El Fula ...	" " " " ... 260
B.1521	Abu Irwa ...	" " " " ... 406
B.1705	Nahud ...	" " " " ... 116
B.1723	Um Brembita ...	Flooride ... 17

Reference was made in last year's Annual Report to the problem of high salinities in water supplies in certain areas of the Sudan. During the year some time was spent in searching and abstracting some of the literature. It is hoped to complete this task in the near future. As an example of the problem of interpretation of the analyses of such waters, attention is drawn to sample B.60 noted above. Most water chemists would not think of recommending the use of such a supply, and yet it has been in use for over two years by man and beast, apparently without ill effect.

Nitrates in water supplies are an allied problem. The latest edition of Thresh states that the inherent toxicity of nitrates is no more than chlorides and that in some supplies 70 P.P.m. nitrate nitrogen are found. In the Sudan, such a concentration would be regarded as unsafe and during the last year cases of deaths in animals have been recorded with the supplies associated with samples B. 1417 and B. 1521. In previous years similar deaths have been recorded in connection with supplies containing lower concentrations of nitrate. Unfortunately, most of these supplies are in remote areas, and much of the evidence has decomposed before a responsible person can reach the scene. Apparently, after ingestion, part of the nitrate is converted into nitrite which reacts with haemoglobin to form methaemoglobin which prevents oxygen transport in the blood. The

concentration that is required to do this seems to vary with the age and species of the animal. The present apparent conflict in evidence may be caused by :—

- (a) the greater volumes of water drunk in a hot climate ;
- (b) many animals are watered only once or twice a day, and tend to take a large volume at one time.
- (c) deaths and illness may have had a bacterial origin associated with high nitrate in some cases,
- (d) poisoning may have been caused by a high nitrite in the original supply. Nitrites are much more toxic than nitrates and are also unstable, so that they may not be detected when they reach the laboratory after a few weeks storage at high temperatures. The only satisfactory way to answer these problems is to conduct watering trials on animals.

SEWAGES

Part of the new water-borne sewage system for Khartoum came into operation recently. At present, only the new hospital is connected, but other parts of the town will be connected in the near future. The present influent is diluted with river water to maintain a reasonable flow and takes about 24 hours to reach the sewage works. At the high temperatures prevailing considerable anaerobic decomposition occurs before the sewage reaches the works.

3. Foods

The following samples were received during the year :—

						1956/57	1955/56
Official Samples	...	...	...	...	...	294	470
Other Samples	...	...	...	...	...	68	81
TOTAL	...	...	...	...	...	362	551

A. Official Samples

These samples were submitted in order to test for absence of adulteration and fitness for human consumption. A summary of these samples is given below :—

DESCRIPTION	Number of Samples	Number Unsatisfactory
Milk ...	59	16
Assalia (mead) ...	6	2
Bananas ...	1	0
Beans ...	2	2
Beer ...	11	0
Biscuits ...	14	13
Bread ...	5	1
Capsicum-powdered ...	31	12
Cheese ...	1	0
Coffee ...	7	0
Cornflour ...	3	3

DESCRIPTION							Number of Samples	Number Unsatisfactory
Date Wine	...	...	...	...	...	...	2	0
Dura	...	...	...	...	...	...	12	3
Fish-dried	...	...	...	...	...	...	9	9
Flour	...	...	...	...	...	...	12	10
Honey	...	...	...	...	...	...	2	2
Jam	...	...	...	...	...	...	5	5
Mineral Water	...	...	...	...	...	...	12	6
Oil-edible	...	...	...	...	...	...	1	0
Samna	...	...	...	...	...	...	1	1
Sardines-canned	...	...	...	...	...	...	6	4
Squash	...	...	...	...	...	...	8	4
Soap-dried	...	...	...	...	...	...	1	0
Sugar	...	...	...	...	...	...	21	9
Tahnia	...	...	...	...	...	...	3	2
Tea	...	...	...	...	...	...	14	10
Tomato Paste-canned	...	...	...	...	...	...	15	9
Wine	...	...	...	...	...	...	29	16
Yeast	...	...	...	...	...	...	1	0
TOTAL							294	139

Milk. There was an apparent worsening in the supplies of this commodity. A greater proportion of the samples was adulterated (27 per cent compared with 22 per cent last year). In addition, the watered samples contained more than last year. 10 samples contained between 7 and 13 per cent added water, and 5 contained between 15 per cent and 38 per cent added water. One sample was deficient in fat.

These are still no grounds for complacency and there is an obvious need for closer control.

Biscuits. All of the condemned samples came from old stocks, and were rancid and inedible.

Bread. The condemned sample contained 4 p.p.m. lead.

Capsicum. Powdered capsicum is widely used as a spice in the Sudan, and it is easy to adulterate. Nine of the condemned samples contained between 40 and 60 per cent. of dried bread. Two samples were infested and another sample had lost pungency and seemed to be very old.

Cornflour. The three samples submitted as cornflour were found to be equal mixtures of rice and wheat flour. Cornflour should consist entirely of maize.

Honey. The two condemned samples were heavily contaminated with insect parts and in addition they contained too much water 27.9 and 28.9 per cent.

Jam. One jar of German jam contained a dense layer of mould on the surface when it was opened. The soluble solids of the mixed sample were only 60.2 per cent. instead of a minimum of 68.5 per cent which is required to prevent mould growth. Even if the sample had been sterile when packed, it would have rapidly gone mouldy when it was opened. The purchaser is obviously prejudiced since he does not expect to keep jam in the refrigerator.

Four tins of Australian jam were "blown."

Mineral Waters. Three samples contained wild yeast and two samples contained vegetable fibres probably from dirty sugar. One sample was found to contain 10 p.p.m. zinc; whilst this concentration was not seriously high, it shows a lack of supervision which might at some time cause an excessive amount of zinc to be present which would result in an outbreak of food poisoning. The factory was inspected and galvanised containers which came into contact with the lemonade were replaced. A later sample showed freedom from zinc. This is an example of how cooperation between public health inspectors and the laboratories can help to eliminate careless food processing and to prevent outbreaks of poisoning.

Samna. The one sample of samna submitted was found to consist entirely of hydrogenated vegetable oil. Samna should consist of the rendered milk fat of cows, buffaloes, sheep and goats. The sale of hydrogenated vegetable oil under such names as samna, Dutch butterfat (Samna hollandia) vegetable ghee (Samna nebbatia) is common in the Sudan. An example was given in the last Annual Report.

Squash. One sample of orange squash contained 1380 p.p.m. benzoic acid, an excessive amount of preservative. Another condemned sample contained considerable amounts of iron, showing obvious neglect in preparation. Two other samples were mouldy.

Tea. Reference was made in the last Annual Report to the sale of teas containing enormous amounts of stalk and pieces of fibre and wood which although they may come from the tea-plant can hardly be called tea.

The samples to which objection was taken contained up to 56 per cent of stalk, wood fibre and shavings. It is probable that all of this comes from the tea plant, and it is understood that it consists mainly of separated stalk, prunings and other material that would otherwise be classified as rubbish. Whilst I have no objection to the sale of a cheap article that makes an infusion resembling tea, I think it is most objectionable to sell it under a name which confuses it with the traditionally accepted article. Very little further information has come to light since the last report and it is hoped to make suitable recommendations for application in the Sudan in the near future.

Wine. The wines to which objection was made contained 0.3. to 2.0. p.p.m. arsenic as As. They were the aftermath of the legal proceedings which were referred to in the last Report.

OTHER FOODSTUFFS

The majority of the foodstuffs in this section were from manufacturers or importers for quality control.

4. Drugs and Poisons

These consisted of

- (i) Unknown drugs for identification.
- (ii) Samples from the Ministry of Health to see if they complied with pharmacopoeial specifications.

- (iii) Samples of drugs from the Customs Department for classification according to the Poisons List.

5. Clinical Specimens

These consisted of:

2. Stools for fat analysis.
6. Calculi for identification.

As was foreseen in the last Annual Report, the advent of some experienced technicians to the Stack Medical Research Laboratories has reduced the numbers in this category considerably.

6. Toxicological Specimens

The following interesting cases were included in the 141 samples submitted:—

A Human Poisoning.

- (i) One case of barbiturate poisoning;
- (ii) One case of phenylethyl glutarimide poisoning Ciba's ("Doriden"). This is a new drug and no literature could be found on the examination of toxicological specimens containing this substance. The only sample received was a small volume of stomach washings (the patient recovered). This was examined using Broughton's Method of extracting chloroform extract with 0.45 N. NaOH. and plotting the extinctions at different wavelengths. (Biochem. J. 1956, 63 No. 2, 207). Phenylethyl glutarimide was found to have a well-defined maximum absorption at 222.6 m m. The extract from the stomach washings had an almost identical extinction curve, and the presence of about 5 mg. phenylethyl glutarimide in the sample submitted was deduced.
- (iii) 8 men suffered delirium and coma after eating honey they had extracted themselves. The honeycomb was found to contain appreciable quantities of an unknown alkaloid. No signs of foreign matter were observed. Previous instances of the occurrence of alkaloids in honey have been recorded in the literature.
- (iv) Two cases of alcohol poisoning.
- (v) One case of aspirin poisoning.
- (vi) Two cases of strychnine poisoning. In one case 1.0 gm. strychnine was recovered from the stomach.
- (vii) Two cases of datura-poisoning. In one case, the poison was administered as datura seeds mixed with sesame seeds. A large group of people suffered severe poisoning. In the other case, the poison was suspected to have been administered by a smoking mixture which contained spent tea, barley, senna leaves, bamia (ladies fingers) and datura—a rather potent mixture—even without the datura.

B. Animal Poisoning

One case of arsenic poisoning.

C. Plant Materials

- (i) A soft drink which was suspected to contain poisons was found to contain a suspension of ground fenugreek.
- (ii) One drug submitted in a case of suspected poisoning was found to be the dried corms of *Gloriosa Virescens*, which contains an appreciable amount of colchicine. It was stated that the drink name was "Malual Dit."
- (iii) A sample of "milgat" seeds submitted as a suspected abortifacient was kindly identified by the Economic Botanist as *Ipomoea hederecea* Linn. Milgat (melgat, mulkat) has been known as a purge for many years in the Sudan, but as far as is known an exact identification has not been made.
- (iv) 4 ampoules discovered with an unlicensed drug pedlar, one of whose patients had died, were found to be one ampoule of oily bismuth and three ampoules of dapsone.
- (v) One sample of datura.
- (vi) One sample of opium.
- (vii) Five samples of hashish.
- (viii) One sample consisting of a mixture of hashish and datura.
- (ix) Local medicines.
 - (a) Senna Leaves for the treatments of gonorrhoea.
 - (b) Roots of *Ipomoea* sp. as a purge.
 - (c) A mixture of ginger, senna leaf, aniseed, fennel, fenugreek, cumin, sugar and salt, probably as a laxative and carminative.
 - (d) A mixture of sugar, pimento and galena (lead sulphide) for an unknown purpose.

7. Forensic Specimens

These included :

2 Erased Documents for deciphering the erasure ;

116 fragments from the scenes of two bomb explosions together with articles found in suspect's possession, and explosives for comparison.

2 Brake Fluids.

8 Perfumes.

Two explosions occurred during the year. The first caused the destruction of a newspaper office and appeared to have political motives. The second was caused by letter bomb. In both cases, fragments from the scene were collected in order to identify the explosive and the detonating mechanism and in the second case, articles found in the possession of a suspect were submitted for comparison with the bomb components.

Five suspected perfumes were shown to be adulterated when compared with two genuine samples.

8. Edible Oils, Seeds and Oilcakes

The following were submitted for analysis by commercial companies :

						1956/57	1955/56
Cottonseeds	...	...	...	...	...	139	172
Groundnuts	...	...	...	...	...	41	20
Sesame Seeds	...	...	...	...	...	18	51
Safflower Seeds	...	...	...	...	...	5	0
Castor Seeds	...	...	...	...	...	39	0
Maize...	...	...	...	...	...	0	1
Beans	...	...	...	...	...	0	3
Dari Meal	...	...	...	...	...	0	2
Edible Oils	...	...	...	...	...	35	73
Oil Cakes	...	...	...	...	...	186	162
TOTAL						463	484

9. Damaged Materials

These samples are submitted in connection with insurance claims. 106 samples were submitted compared with 221 last year, a reduction which reflects the effect of the closure of the Suez Canal.

10. Miscellaneous Samples

The very wide variety of miscellaneous samples included the following main categories :

- (i) Samples of perfume and cloth from the Customs Department for classification for duty purposes ;
- (ii) Samples of soap, blankets, pesticides, coals and metals as supplied to various government departments on tender or purchase ;
- (iii) Batch samples of pesticide for production control from a commercial company.

RESEARCH REPORT

1. Composition of the Niles at Khartoum

The regular analyses of water samples taken from the Blue and White Niles at Khartoum and the Khartoum Mains Supply were continued. This series was started last year.

The results are given in the appended tables. All the results except PH and temperature are given in parts per million.

2. Vitamin A in Cattle Liver

At the request of the Chief Veterinary Research Officer a large number of livers from tuberculous and non-tuberculous cattle were examined for vitamin A content in order to see if the disease had any effect. Statistical analysis of the results showed that the differences were insignificant.

3. The Estimation of D.D.T. in Aqueous Emulsions

During the course of a series of analyses of D.D.T. emulsion from batches prepared by Pest Control (Sudan) Ltd., it became apparent that the methods of analysis were inadequate for this type of sample. A collaborative study of the problem was made with Mr. Garden of Fisons Pest Control Ltd., England. A preliminary study was made of a number of modifications of the Stepanow reduction method and the alcoholic potash dehydrochlorination method. The methods tried at first had not the desired reproducibility. These investigations were discontinued when it was found that the World Health Organisation "Preferred" methods of dehydrochlorination, followed by a potentiometric titration which gave results that were very reproducible and were simple and rapid to obtain.

PUBLICATIONS AND REPORTS

The following list shows some of the problems about which the laboratories have been consulted during the year:

1. Control of Pesticides.
2. Revision of definitions in Customs Ordinance.

In addition, the laboratories have assisted other government departments by the preparation of special reagents and chemicals.

The following report was published:

The Annual Report of the Government Analyst for the year 1955/56.

COMPOSITION OF KHARTOUM MAINS SUPPLY

TABLE 1

(Blue Nile Water Treated with Alum, Filtered and Treated by Marginal Chlorination).

	DATE	1.7.56	6.8.56	1.9.56	5.10.56	4.11.56	2.12.56	16.1.57	3.2.57	11.3.57	14.4.57	7.5.57	2.6.57
PH	...	7.8	7.4	7.1	7.1	7.3	7.5	7.3	7.5	7.3	7.0	6.6	7.5
Total Solids	...	140	190	125	80	85	90	110	125	120	130	130	170
Total Hardness (CaCO ₃)	...	80	120	95	68	70	75	78	118	86	100	90	124
Total Alkalinity (CaCO ₃)	...	70	40	60	62	80	75	73	100	80	60	50	122
Calcium (Ca)	...	25	40	30	25	20	20	21	30	21	23	22	29
Magnesium (Mg.)	...	5	5	5	2	5	6	6	11	8	10	8	13
Silicate (SiO ₂)	...	n.d.	n.d.	20	30	30	20	50	40	20	20	20	20
Sulphate (SO ₄)	...	nil	65	20	nil	nil	nil	nil	nil	nil	30	48	10
Chloride (Cl)	...	5	nil	nil	nil	nil	nil	nil	nil	nil	6	6	8
Nitrate (N)	...	nil	nil	nil	nil	nil	nil	0.4	0.4	0.5	0.5	0.7	0.7
Ammoniacal Nitrogen (N)	...	nil	nil	nil	nil	0.04	0.06	nil	nil	0.04	nil	nil	nil
Albuminoid Nitrogen (N)	...	n.d.	n.d.	n.d.	0.06	0.06	0.14	0.06	0.4	0.26	n.d.	n.d.	n.d.

COMPOSITION OF BLUE NILE WATER AT KHARTOUM

TABLE 2

Date	3.7.56	6.8.56	1.9.56	5.10.56	4.11.56	2.12.56	16.1.57	5.2.57	11.3.57	14.4.57	7.5.57	2.6.57
Water Temperature °C	27.0	26	28	26	26	24	20	18	21	25	26	30
PH	7.5	7.5	7.5	7.7	7.5	7.5	7.7	7.8	8.1	8.0	7.5	8.1
Total Dissolved Solids	120	135	95	80	85	85	110	125	118	120	130	160
Total Hardness (CaCO ₃)	70	80	80	70	68	75	75	118	84	84	84	108
Total Alkalinity (CaCO ₃)	80	95	85	85	80	90	94	100	100	90	100	100
Calcium (Ca)	20	25	25	20	18	22	21	30	20	23	21	26
Magnesium (Mg)	5	5	5	5	5	5	6	11	8	6	8	10
Silicate (SiO ₂)	n.d.	n.d.	20	30	30	30	60	40	20	20	30	30
Sulphate (SO ₄)	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil
Chloride (Cl)	5	nil	nil	2	nil	nil	nil	nil	nil	8	6	8
Nitrate (N)	nil	nil	nil	nil	nil	nil	0.4	0.4	0.5	1.2	0.7	0.7
Ammoniacal Nitrogen (N)	nil	0.04	nil	0.06	0.04	nil	0.02	0.04	0.04	nil	0.04	nil
Albuminoid Nitrogen (N)	n.d.	n.d.	0.04	0.14	0.04	0.04	0.06	0.4	1.6	nil	n.d.	n.d.
Dissolved Oxygen	3.9	5.8	5.4	5.8	5.4	7.7	8.3	9.2	9.1	7.2	5.6	6.2
Biochemical Oxygen Demand	n.d.	2.0	1.4	2.0	0.2	1.4	0.6	1.8	6.7	1.9	0.3	2.7

COMPOSITION OF WHITE NILE WATER AT KHARTOUM

TABLE 3

DATE		6.8.56	1.9.56	5.10.56	4.11.56	2.12.56	16.1.57	3.2.57	11.3.57	14.4.57	7.5.57	2.6.57
Water Temperature °C	...	27	30	30	27	25	19	18	21	24.5	27	30
pH	...	7.5	7.5	8.8	8.6	8.0	8.0	7.5	7.7	8.1	8.4	8.2
Total Dissolved Solids	...	135	90	80	95	90	110	110	116	154	170	180
Total Hardness (CaCO ₃)	...	80	55	50	52	55	56	94	58	72	84	74
Total Alkalinity (CaCO ₃)	...	105	100	80	90	88	93	100	100	130	140	120
Calcium (Cl)	...	25	15	15	14	11	12	21	12	18	15	13
Magnesium (Mg)	...	5	5	3	4	7	6	10	6	7	11	10
Silicate (SiO ₂)	...	n.d.	20	20	20	20	60	40	20	20	20	10
Sulphate (SO ₄)	...	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	10
Chloride (Cl)	...	nil	10	5	nil	nil	nil	nil	nil	8	14	16
Nitrate (N)	...	nil	nil	nil	nil	nil	0.4	0.4	0.5	0.6	0.6	0.7
Ammoniacal Nitrogen	...	0.04	nil	0.12	0.08	0.02	0.02	0.2	0.04	0.02	0.04	nil
Albuminoid Nitrogen	...	n.d.	0.06	0.3	0.36	0.30	0.16	0.3	0.04	n.d.	n.d.	n.d.
Dissolved Oxygen	...	6.4	6.5	7.0	7.2	7.2	8.3	8.9	7.0	6.9	3.8	5.2
Biochemical Oxygen Demand	...	2.3	1.2	4.1	6.8	5.6	3.3	3.1	4.0	5.1	3.1	2.6

CHAPTER IX

SCHOOL OF HYGIENE

School Facilities.

The school occupies its own buildings which has the great advantage of being next door to the Graphic Museum. The Graphic Museum which is also directly supervised by the Principal of the School of Hygiene, and which is extensively used by the students provides very useful material of demonstrations and other visual studies.

Staff

Principal
A/Principal
Public Health Officer
Sanitary Overseer
Clerk

Board of Studies

The Board of Studies in association with the school which consists of the A/PH. as Chairman, the Principal, School of Hygiene as Secretary, the Chief Public Health Inspector and A/Principal as Members have held two Meetings during the year to discuss the different aspects of the school policy.

Basis of Education for School

The basis of education on which training is superimposed is that of the 4th year Secondary Standard.

General

Asst. Sanitary Overseers

These are Local Government Officials and their training is made to laid curriculum prepared by the Principal School of Hygiene. Their training outside is undertaken by the Local Senior Public Health Inspectors and those in Khartoum Province receive an organised course of training in the School of Hygiene.

Sanitary Overseers

These are Ministry of Health Officials and candidates are drawn from the A/Sanitary Overseers category by examination.

On selection, the candidates receive a six months training in the School of Hygiene, which includes an adequate number of demonstrations to supplement the lectures.

Public Health Officer Students

The basic education now required is that of the secondary standard. Candidates for the school are required to be from those who have completed their secondary education. The selection is made by interview only.

The Students take up 3 years full time course at the end of which they must pass the R.S.H. examination before being awarded the qualifying certificate.

The curriculum is briefly as follows:—

1st Year

General Science, Building Science, Drawing and Construction, Levelling and Geometry given at Khartoum Technical Institute.

2nd Year

Entomology and Pest Control, Helminthology, Protozoology, Bacteriology, Water Supply and Disposal of waste matter.

3rd Year

Food and food control, meat inspection, milk food preparation and manufacture, housing, urban and rural planning, communicable diseases, school health, prison health, quarantine, airports and seaports control statistics, sanitary law, relations between Councils and Public Health Staff, notes on training within industries.

The necessary demonstrations that supplement the lectures include visits to water works, food preparation places, schools, prison manufactures and factories of public health interest and certain council meetings.

During the year 33 students were under training in the following classes—

First Year	10
Second Year	10
Third Year	13

The 13 third year students took the R.S.H. examination on 9th, 11th, 13th and 16th March, 1957.

The examination which was held in Khartoum, was conducted by Dr. Abdalla Omdar Abu Shamma, Dr. Mansour Ali Haseeb, and Sayed Abdel Rahman El Agib, with the Principal of the school in attendance.

Of the 13 entrants 10 were successful in passing the examination. They were:—

Mustafa Hasson Ahmed.

Zein El Abdin Ibrahim.

Ahmed Abdel Hafiz Banaga.

Mohammed El Hassan Zein El Abdin.

El Sayed Ahmed El Hag.

Mohammed El Hassan El Sayed.

Abdel Gadir El Tahir El Tilib.

Onesimo Vuni Luba.

Bakri Osman Mohammed.

Hassan Abdel Galil.

Of the unsuccessful entrants, 3 have been referred for a period of three months to be examined at the end of July, 1957.

Second Year

The terminal examination for 2nd Year was held on 19th, 20th, 21st and 23rd. March, 1957.

The 10 students took the examination with the result of one failure and 4 border line passes.

All students who attained a pass mark below 60 per cent have been warned in writing in order to work hard in the final term.

First Year

The first year students entered the Building Department of the Khartoum Technical Institute on 28th August, 1956 and continued their training till 15.4.1957.

The first year course covers:—

- (a) Technical drawing.
- (b) General Science.
- (c) Mathematics.
- (d) Building Construction.
- (e) Surveying.
- (f) Painting.
- (g) Building Materials.
- (h) Sanitation.

Practical Training

The daily practical training is being carried out in Khartoum city and its Rural area. Second and third year students have specific districts for their daily practical training hour and on Thursdays they do full time inspection and report on insanitary premises and other food preparation places. Water and milk samples from Khartoum Province are handled by the students.

As a part of the practical training the students used to visit the Gezira to obtain practical information on the Bilharzia and Malaria control and to attend certain Rural council meetings and to have information on their Health Schemes and their actual relations with the Public Health Inspectorate Staff.

In the practical work scheme the students used to visit Kosti Meat Factory and when possible they visit Port Sudan and Suakin to have information on port sanitation and disinfection work.

Annually during the school vacation between April and August the students, after being granted their leave, were posted to the different provinces to work under qualified Public Health Staff.

Unfortunately during this year financial difficulties have arisen which will curtail the practical scheme so as to exclude all outside visits.

However the possibility of confining the practical work to Khartoum Province only is now being considered.

The danger of this application has been elucidated by the Principal School of Hygiene and the Board of Studies in correspondences and minutes of the Board to draw the attention of the Director for further steps.

Sanitary Overseers

9 from Juba training School have received a course of training in the School from 15.7.1956 to 7.4.1957. An examination at the end of the course was set with a satisfactory result.

Medical Assistants

25 students have been given a course of lectures on Public Health.

Health Visitors

4 Pupils have attended a course on Public Health during the year. An examination was set with the result that all passed.

Hospital Nurses

29 Hospital Nurses have received a course of Public Health lectures from 1.4.1957 to 30.5.1957.

Buildings

School

Ministry of Works had built a Buffet and Zeers room in the School of Hygiene. Also instalation of florescent lamps had taken place in the library of the School.

Hostel

At the meeting held on 10th August, 1957 at the Municipal Council Chamber, it was agreed that the Hostel of the School of Hygiene could expand on the existing sanitary Hamla (Block 5.L.W.).

General

UNICEF Grants

The UNICEF had kindly granted this school a truck, use by the School of Hygiene of a Cinema 16 m m. and projector with films and a good number of books. These were found to be of great value to our training scheme.

Ghaffir

Financial approval has been given for appointment of one Ghaffir for the Hostel of the School of Hygiene.

Staff Change

Public Health Inspector Mahdi Eff. Masoud El Hillo has taken over the post of Asst. Principal, School of Hygiene with effect from 20.5.1957. He came from Halfa Town and replaced Mohammed Osman El Zubeir.

Public Health Officer Hassan Eff. Mohamed Mustafa has been appointed as lecturer and demonstrator in the School of Hygiene, and he assumed duties from 21.5.1957.

CHAPTER X

THE GRAPHIC MUSEUM

There were no changes of staff during the year.

Revision of sections, the up keeping of exhibits up to date and routine work require much of the museum staff's time. In addition extensive programme of work on outside and agricultural shows was carried out, at the same time maintaining a good standard of the museum.

As in the past the teaching facilities which the museum affords were taken advantage of by the senior class of Medical Students, students of the School of Hygiene, Medical Assistants, Health Visitors, Midwives and junior Hospital Staff. More use was made of the Museum by the pupils of the Secondary Schools and Elementary Schools, both boys and girls.

Recorded visits to the museum by the General Public during the year were 11,956.

The Arabic Translation of all matter in the museum is carried forward. Translation of the Malaria, Sleeping Sickness, Filaria, Yaws, and Bilharzia sections was completed. The translation of these sections was dealt with first as it is believed that information on these subjects is most useful to General Public. When the whole work is completed the museum will have an even greater teaching value for Health Education.

Permanent Exhibitions :—

The following Material was added during the year :

Photographs	...	...	...	...	100
Charts and Graphs	...	...	...	...	2
Drawings	...	...	...	...	50
Models	...	...	...	...	—
Specimens	...	...	...	...	—
Posters	...	...	...	...	—

The exhibitions now comprise :—

Photographs	...	...	...	...	2,261
Graphs and Charts	...	...	...	...	236
Drawings	...	...	...	...	266
Posters	...	...	...	...	15
Descriptive Notes	...	...	...	...	1,658
Specimens	...	...	...	...	666

It is a pleasure to report that the following distinguished persons have visited the museum this year :—

Dr. M. S. Sastradihardja	...	...	Soural aja, Indonesia.
Dr. M. A. Farid	...	...	E.M.R.O., W.H.O., Alexandria.
Miss S. Rahman	...	...	UNESCO, Tech. Asst. Mission.
Mr. S. G. S. Rou	...	...	Head UNESCO, Tech. Asst. Mission.
Dr. Fowad Korshed	...	...	Belz. Adviser, W.H.O.
Dr. Herwolls Horn	...	...	Institute of Hygiene, Berlin, Humboldt University.
Abdel Rahman Bahr el Din	...	...	Sultan Dar Masalit.
Mr. Barnaba T. Kisanga	...	...	A/Governor Equatoria.
Dr. J. C. Vedamanikkam	...	...	Pilot Scheme, Malaria Project, Sennar.

Sections of the museum are :—

- | | |
|-------------------------------|---------------------------------|
| 1. Malaria | 29. Typhus |
| 2. Trypanosomiasis | 30. Quarantine Arrangements |
| 3. Leishmaniasis | 31. Phlebotomus Fever |
| 4. Syphilis | 32. Disinfection Methods |
| 5. Yaws | 33. Meteorology |
| 6. Relapsing Fever | 34. Water Supply |
| 7. Filariasis | 35. Influenza |
| 8. Diphtheria | 36. Pneumonia |
| 9. Ancylostomiasis | 37. Dysentery |
| 10. Schistosomiasis | 38. Enteric Fever |
| 11. Madura Disease | 39. Maternity and Child Welfare |
| 12. Nutrition | 40. School Medical Service |
| 13. Gonorrhoea | 41. Town Planning |
| 14. Cholera | 42. Housing |
| 15. Tetanus | 43. Undulant Fever |
| 16. Tuberculosis | 44. Black Water Fever |
| 17. Anthrax | 45. Eye Diseases |
| 18. Cerebro-Spinal-Meningitis | 46. Medical Entomology |
| 19. Plague | 47. Skin Diseases |
| 20. Rabies | 48. Disposal of Waste Matter |
| 21. Leprosy | 49. Folk Medicine |
| 22. Measles | 50. Propaganda |
| 23. Mumps | 51. Rural Health |
| 24. Yellow Fever | 52. Hydatid Disease |
| 25. Smallpox | 53. Venomous Snakes |
| 26. Chickenpox | 54. Historical Medicine |
| 27. Vaccinia | 55. Tumours |
| 28. Dengue | |

CHAPTER XI

METEOROLOGY

Table XXVIII shows the mean rainfall recorded in provincial meteorological stations :—

TABLE XXVIII

PROVINCE	No. of Stat.	Mean Rain Fall mms.	Highest Recorded mms.	Lowest Recorded mms.
Bahr El Ghazal	12	1,167	1,450	958
Blue Nile	20	538	1,285	157
Darfur	10	716	1,023	334
Equatoria	17	1,546	2,559	1,033
Kassala	17	304	682	1
Khartoum	7	264	405	204
Kordofan	14	683	1,412	239
Northern	11	70	172	28
Upper Nile	15	979	1,314	570



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80	John	100	John

TABLE I. 1956/57

OUT-PATIENTS

NEW CASES BY DISEASES AND TOTAL ATTENDANCES

DISEASE	B. EL-GHAZAL	BLUE NILE	DARFUR	EQUATORIA	KASSALA	KHARTOUM	KORDOFAN	NORTHERN	UPPER NILE	TOTAL	
1. Cholera ...	—	—	—	—	—	—	—	—	—	—	1
2. Plague ...	—	—	—	—	—	—	—	—	—	—	2
3. Smallpox ...	1	4	8	3	2	—	—	—	—	—	3
4. Typhus ...	—	—	—	—	—	—	—	—	7	25	4
5. Yellow Fever ...	—	—	—	—	—	—	—	—	—	—	5
6. T.B. Pulmonary ...	260	1,182	174	258	1,044	720	426	494	320	4,878	6
7. T.B. Non-Pulmonary ...	46	400	130	40	672	327	235	161	317	2,328	7
8. Pneumonia ...	422	20,729	5,289	3,584	4,039	12,217	6,761	8,725	5,782	67,548	8
9. Influenza ...	18	6,126	2,174	419	3,290	13,196	894	6,347	58	32,532	9
10. Other Respiratory diseases ...	35,041	415,100	96,050	124,033	141,121	165,702	198,751	177,381	47,676	1,400,855	10
11. Cerebro-spinal Meningitis ...	2,987	593	60	546	50	127	442	14	1,069	5,888	11
12. Chicken-Pox ...	640	9,113	350	974	3,157	3,498	2,840	5,110	665	26,347	12
13. Diphtheria ...	—	78	13	5	125	1,196	45	31	4	1,497	13
14. Encephalitis Lethargica ...	—	—	—	—	—	1	—	—	—	1	14
15. Measles ...	45	5,518	142	437	2,299	2,196	2,540	4,269	474	17,920	15
16. Mumps ...	238	10,810	311	110	1,983	2,358	2,496	5,336	1,488	25,020	16
17. Poliomyelitis, acute ...	—	2	—	—	—	34	2	—	—	38	17
18. Rheumatism, acute ...	1,627	3,111	866	386	556	3,130	1,723	1,429	592	13,420	18
19. Whooping Cough ...	17	5,390	35	494	1,341	1,263	1,928	4,755	1,625	16,848	19
20. Dysentery ...	1,587	20,882	12,645	2,371	7,155	16,793	15,903	18,817	10,490	106,643	20
21. Enteric Fever ...	—	161	1	20	28	75	5	89	24	410	21
22. Gastro-enteritis of children ...	104	29,803	3,819	154	1,765	23,395	5,353	11,484	3,828	79,705	22
23. Undulant Fever ...	—	35	—	—	12	2	2	—	36	87	23
24. Filariasis ...	7	2	28	527	17	8	3	—	41	633	24
25. Leishmaniasis ...	—	5,008	6	46	388	34	3	1	1,977	7,463	25
26. Malaria ...	15,890	116,925	59,134	47,737	57,510	19,296	140,698	16,115	26,645	499,950	26
27. Blackwater Fever ...	—	1	1	—	2	4	—	—	14	22	27
28. Onchocerciasis ...	78	—	—	12	—	—	—	—	—	90	28
29. Phlebotomus Fever ...	—	—	—	—	—	—	—	—	—	—	29
30. Relapsing Fever ...	—	—	—	—	3	—	—	—	1	4	30
31. Trypanosomiasis ...	—	—	—	971	—	—	—	—	—	971	31
32. Ancylostomiasis ...	4,018	88	316	4,900	13	84	65	179	22	9,685	32
33. Dracontiasis ...	1,136	255	3	1,331	84	9	618	1	379	3,815	33
34. Schistosomiasis ...	674	17,631	3,379	2,962	154	1,740	13,376	3,886	61	43,863	34
35. Gonorrhoea ...	2,593	6,781	9,220	3,100	4,464	6,331	8,999	8,365	3,334	53,187	35
36. Soft Sore ...	10	621	1,082	238	470	804	428	45	85	3,783	36
37. Syphilis ...	9,022	17,706	38,700	17,436	9,044	11,187	26,112	22,009	13,771	164,987	37
38. Yaws ...	15,000	—	—	14,938	—	28	—	—	12,831	42,797	38
39. Anthrax ...	—	3	3	—	70	1	5	—	—	82	39
40. Hydrophobia, human ...	2	6	2	—	2	—	4	1	—	17	40
41. Leprosy ...	336	89	82	709	17	73	81	63	45	1,495	41
42. Madura Disease ...	—	262	24	—	24	1,130	55	109	37	1,641	42
43. Tetanus ...	14	82	11	16	8	41	8	12	27	219	43
44. Heat Stroke Syndrome ...	—	7	—	—	30	5	—	1	—	43	44
45. Confinements ...	335	860	675	492	174	524	1,173	254	90	4,577	45
46. Gynaecological ...	204	11,540	2,415	97	2,739	17,239	15,098	2,068	277	52,277	46
47. Diseases of Pregnancy and Parturition ...	10	5,590	223	287	2,704	5,538	4,262	410	10	19,034	47
48. Puerperal Fever ...	3	112	40	3	5	51	53	31	2	300	48
49. Wounds and Injuries ...	59,034	389,500	147,587	166,915	145,581	168,231	199,156	135,490	67,553	1,479,947	49
50. Tropical Ulcer ...	5,458	1,284	5,482	8,793	644	93	8,902	1	2,756	33,413	50
51. Diabetes ...	5	253	24	—	1,133	1,635	288	498	6	3,842	51
52. Pellagra ...	—	—	—	—	—	1	—	—	1,079	1,080	52
53. Scurvy ...	—	606	36	128	293	11	315	3	33	1,425	53
54. Neoplasms, Malignant ...	15	124	102	10	178	129	158	78	11	805	54
55. Neoplasms, non-malignant ...	259	13,690	2,089	65	1,199	880	607	277	349	19,415	55
56. Trachoma ...	409	32,242	9,320	621	6,357	51,786	4,145	65,566	4,443	174,889	56
57. All other eye diseases ...	13,175	269,634	83,400	44,670	105,065	229,231	94,169	137,321	47,197	1,023,862	57
58. Ear diseases ...	5,797	76,347	22,369	9,871	31,729	25,300	27,343	34,293	10,963	244,012	58
59. Skin diseases ...	11,373	45,882	30,835	40,965	14,221	23,565	34,630	20,042	12,812	233,823	59
60. Alimentary diseases ...	18,646	524,037	130,068	101,138	161,014	171,197	227,251	228,803	37,149	1,599,303	60
61. Circulatory diseases ...	106	17,335	5,028	137	10,355	16,618	13,372	18,794	540	82,285	61
62. Genito-Urinary diseases ...	502	62,358	29,917	7,033	12,730	26,761	20,326	32,279	2,091	193,997	62
63. Organic Nervous diseases ...	8	3,724	2,071	10	653	1,733	4,945	5,600	1,154	19,898	63
64. Functional Nervous diseases ...	90	431	8	48	23	580	—	2,398	1	3,579	64
65. Fever of uncertain origin ...	11,323	37,949	603	47,516	10,815	79,979	17,439	21,204	35,089	261,917	65
66. All other conditions ...	50,377	319,467	64,008	121,253	123,785	143,738	117,131	72,983	51,460	1,064,202	66
67. Poisoning ...	—	95	—	—	157	439	1	814	—	1,506	67
68. Hydatid Cyst ...	—	—	—	12	—	—	—	—	—	12	68
69. Taenia Saginata ...	—	—	—	28	—	—	1	—	—	29	69
Total New Cases	268,942	2,507,064	770,357	778,849	872,493	1,252,264	1,221,566	1,075,036	408,790	9,155,361	
ATTENDANCES: MEN ...	328,045	1,697,900	558,084	462,082	647,688	989,149	889,899	720,603	264,819	6,558,269	
WOMEN ...	484,333	1,294,220	452,093	363,483	294,635	1,132,105	719,831	814,823	209,784	5,765,307	
CHILDREN ...	98,391	2,168,822	689,187	355,975	678,449	1,169,766	931,305	1,321,344	270,323	7,683,562	
Total Attendances	910,769	5,160,942	1,699,364	1,181,540	1,620,772	3,291,020	2,541,035	2,856,770	744,926	20,007,138	
MISSIONS	—	—	—	142,641	—	10,889	176,147	—	93,255	422,932	
Grand Total	910,769	5,160,942	1,699,364	1,324,181	1,620,772	3,301,909	2,717,182	2,856,770	838,181	20,430,070	

ADMISSIONS AND DEATHS BY DISEASES

DISEASE	BAHR-EL-GHAZAL		BLUE NILE		DARFUR		EQUATORIA		KASSALA		KHARTOUM		KORDOFAN		NORTHERN		UPPER NILE		TOTAL	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1. Cholera	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
2. Plague	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
3. Smallpox	1	—	4	—	8	2	3	—	2	2	—	—	—	—	—	—	7	—	25	4
4. Typhus	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5
5. Yellow Fever	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6
6. T.B. Pulmonary	191	18	796	53	106	9	248	19	668	56	509	37	236	29	563	11	158	17	3,175	249
7. T.B. Non-Pulmonary	25	1	195	13	102	1	40	4	174	3	87	7	195	7	53	2	134	14	1,005	52
8. Pneumonia	346	44	1,151	57	796	23	1,111	78	865	50	1,318	45	2,383	94	848	50	534	14	9,352	455
9. Influenza	18	—	135	—	199	—	83	1	29	—	173	—	41	—	44	—	—	—	723	1
10. Other Respiratory diseases	550	8	1,452	43	965	15	956	7	1,479	34	636	8	1,325	19	874	4	565	19	8,782	158
11. Cerebro-spinal meningitis	2,987	284	575	91	62	16	543	42	49	14	70	9	442	74	13	6	996	42	5,727	578
12. Chicken-Pox	400	13	312	1	216	—	896	1	388	1	288	—	1,149	—	81	—	288	—	4,018	16
13. Diphtheria	—	—	78	8	13	2	5	—	110	14	253	11	45	9	31	8	4	—	539	52
14. Encephalitis Lethargica	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
15. Measles	41	—	158	1	98	2	137	—	244	3	62	1	734	8	35	—	65	1	1,554	15
16. Mumps	34	—	154	—	114	4	28	—	194	10	125	1	409	3	70	1	109	—	1,237	19
17. Poliomylitis, acute	—	—	1	—	—	—	—	—	—	—	6	—	2	—	—	—	—	—	9	17
18. Rheumatism, acute	148	3	161	—	61	3	32	—	64	—	137	—	125	6	141	—	66	—	935	12
19. Whooping Cough	1	—	153	1	2	—	163	3	39	—	51	2	106	4	54	—	43	5	612	15
20. Dysentery	299	166	405	9	555	7	312	13	469	11	459	6	419	14	434	1	632	30	3,984	107
21. Enteric Fever	—	—	161	16	1	—	16	1	28	—	73	3	5	—	89	6	31	4	404	31
22. Gastro-enteritis of children	3	1	610	70	132	6	122	9	314	39	229	53	223	20	558	78	110	1	2,301	277
23. Undulant Fever	—	—	35	—	—	—	35	1	—	—	1	—	3	—	—	—	1	—	51	—
24. Filariasis	3	—	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	46	2
25. Leishmaniasis	—	—	4,594	148	6	2	39	6	388	32	34	3	3	—	1	—	491	51	5,556	242
26. Malaria	1,119	78	2,055	48	971	5	4,847	137	1,839	29	397	3	3,104	55	545	9	827	29	15,704	393
27. Blackwater Fever	—	—	1	—	1	—	—	—	2	1	4	—	—	—	—	—	14	1	22	2
28. Onchocerciasis	—	—	—	—	—	—	7	—	—	—	—	—	—	—	—	—	—	—	78	—
29. Phlebotomus Fever	74	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	4	—
30. Relapsing Fever	—	—	—	—	—	—	969	6	—	—	—	—	—	—	—	—	1	—	969	5
31. Trypanosomiasis	—	—	—	—	—	—	192	—	25	—	—	—	—	—	—	—	—	—	4	—
32. Ancylostomiasis	496	1	18	—	76	—	2,247	13	9	2	8	—	1	—	35	—	11	—	2,901	16
33. Dracontiasis	66	—	16	—	2	—	192	—	25	—	—	—	72	—	1	—	59	—	433	—
34. Schistosomiasis	54	1	483	12	48	1	634	6	33	—	69	2	50	—	98	—	41	—	1,480	22
35. Gonorrhoea	355	1	35	—	264	—	986	—	83	—	35	—	156	1	35	—	94	—	2,043	34
36. Syphilis	9	—	7	—	24	—	28	—	7	—	1	—	11	—	4	—	—	—	91	—
37. Soft Sore	505	5	103	2	1,532	9	1,159	2	59	—	106	—	775	2	88	—	579	—	4,906	20
38. Yaws	133	—	4	—	—	—	421	—	—	—	5	—	6	—	—	—	295	—	8,664	38
39. Anthrax	—	—	1	—	3	—	—	—	22	2	—	—	5	—	—	—	—	—	31	2
40. Hydrophobia, human	2	2	6	6	2	2	—	—	2	2	—	—	4	4	1	—	—	—	17	40
41. Leprosy	43	—	11	1	17	—	15	—	9	2	—	—	1	—	10	—	12	—	144	4
42. Madura Diseases	—	—	110	—	22	—	21	—	131	—	131	—	14	1	25	—	—	—	323	1
43. Tetanus	13	—	82	27	11	3	12	—	14	3	21	3	8	2	12	3	16	10	189	59
44. Heat Stroke Syndrome	—	—	6	—	—	—	—	—	26	4	4	—	—	—	—	—	—	—	36	4
45. Confinements	335	8	750	11	123	1	450	7	218	4	458	4	604	9	243	8	283	—	3,464	52
46. Gynaecological	78	1	957	16	351	2	86	2	1,177	10	970	6	1,070	5	682	9	47	—	5,418	51
47. Diseases of Pregnancy and Parturition	6	—	1,239	5	76	1	169	5	—	—	872	8	123	1	72	1	10	—	2,567	1
48. Puerperal Fever	3	—	88	3	40	2	3	—	5	—	25	—	39	6	24	5	—	—	227	17
49. Wounds and Injuries	2,069	27	4,006	77	4,333	55	4,924	70	3,533	55	2,365	48	3,426	62	1,959	34	2,164	24	28,507	441
50. Tropical Ulcer	491	5	15	—	322	—	668	6	47	—	22	—	1,016	2	—	—	404	—	2,985	13
51. Diabetes	5	—	84	11	8	1	—	—	76	10	166	2	15	2	177	5	3	—	534	31
52. Pellagra	—	—	3	—	—	—	—	—	—	—	1	—	—	—	—	—	399	—	403	—
53. Scurvy	—	—	11	1	7	—	12	—	17	—	2	—	14	—	1	—	2	—	66	—
54. Neoplasms, malignant	7	—	111	18	20	4	10	2	110	10	110	12	53	3	41	—	6	—	473	59
55. Neoplasms, non-malignant	59	—	241	2	44	1	58	1	148	1	247	—	133	1	66	—	60	5	1,056	11
56. Trachoma	—	—	34	—	55	—	12	—	89	—	47	—	20	—	38	—	118	—	413	—
57. All other eye diseases	71	—	474	—	339	5	442	—	340	—	1,455	—	476	—	792	—	479	—	4,868	5
58. Ear diseases	60	—	52	—	148	—	149	—	77	—	77	—	102	—	65	—	66	—	816	—
59. Skin diseases	212	4	208	2	378	3	624	—	78	1	138	1	208	—	146	—	125	—	2,117	11
60. Alimentary diseases	572	36	2,709	111	1,387	53	1,781	33	1,857	78	1,613	35	1,202	67	1,379	39	348	18	12,848	470
61. Circulatory diseases	63	10	657	76	212	17	33	10	725	38	613	75	357	30	612	54	76	7	3,620	328
62. Genito-Urinary diseases	61	3	704	21	291	12	50	5	530	4	527	22	337	20	332	17	30	1	3,102	105
63. Organic Nervous diseases	3	1	130	8	30	1	9	—	105	2	104	4	102	6	95	2	2	1	580	25
64. Functional Nervous diseases	19	1	134	10	10	2	14	—	3	—	26	2	—	—	122	—	1	—	329	15
65. Fever of uncertain origin	141	6	600	40	603	13	386	6	535	36	577	23	252	6	432	13	169	6	3,695	149
66. All other conditions	2,039	51	1,579	45	1,379	39	1,749	51	1,686	33	1,718	53	598	13	744	23	996	26	12,488	334
67. Poisoning	—	—	13	—	—	—	—	—	67	—	7	—	—	—	29	—	—	—	120	11
68. Hydatid Cyst	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	4
69. Taenia Saginata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	—
Total	14,210	638	28,809	1,065	16,556	324	27,937	551	19,117	604	17,463	492	22,223	585	12,684	395	11,996	333	170,995	4,987
Missions	—	—	—	—	—	—	1,512	34	—	—	1,190	64	2,903	19	—	—	116	—	5,721	117
Grand Total	14,210	638	28,809	1,065	16,556	324	29,449	585	19,117	604	18,653	556	25,126	604	12,684	395	12,112	333	176,716	5,104

