# 1. INTRODUCTION

## 1.1 Context

Sudan is the largest country in Africa. It has an area of 2.5 million km². It is characterized by a strategic geographical location that links the Arab world to Sub Saharan Africa. Sudan shares borders with nine countries, where the Sudanese population and those of the neighboring countries move freely across these borders (see the map). The climate ranges from damp rainy in the south, to desert in the northern areas.

The population of the country is estimated at 32 million (projected from 1993 census). The population is unevenly distributed in the 26 States, where the majority is concentrated in six States of the Central Region with a mean population density of 10 people per square kilometer, increasing to 50 in agricultural areas. Natural disasters and civil conflicts resulted in high rates of rural-urban migration reaching 15%. The growth rate is 2.6%, which shows that the population doubles every 27 years (population census 1993).

The box below shows a summary of some of the demographic indicators including life expectancy at birth that showed some improvement during the past few decades.

- Total population estimated for year 2002, 32 million
- Children under the age of five years are 16.4%.
- Children under 15 years of age 45%
- Rural population accounts for 68%
- Total fertility rate 5.9 child
- Life expectancy at birth (46 for males and 50 years for females in 73, compared to 54 for males and 57 years for females in1993)
- Contraceptive utilization rate 7%
- Infertility rate 7.2%
- Crude death rate 14/1000

Sources population data sheet (UNFPA, CBS), MICS2000

Sudan is rich in terms of natural and human resources, but economic and social development since independence in 1956 have been below expectations. Sudan remains a poor country, with an estimated GDP per capita of US$340. Agriculture continues to be the most important production sector and about 80% of the labor force is employed in agriculture and related

activities. The start up of oil production, government macro-economic reforms and the favorable weather conditions for agriculture contributed to high economic growth recently. However, evidence suggests that poverty is wide spread with wide economic disparities.

## 1.2 Health Indicators

The country has scarce and inconsistent information on health. Communicable diseases coupled with high vulnerability to outbreaks dominate the health scene. Chronic diseases of life style and aging are starting to be faced by the urban elite. The health system is not well equipped to cope with such complicated situations. The prevalence of malaria, tuberculosis, kala-azar, schistosomiasis are high and recently the prevalence of HIV/AIDS is on the increase. There are frequent outbreaks of other diseases like meningitis and diarrheal diseases. The limited and inequitable access to essential child and motherhood health care services accounts for the high infant and maternal mortality rates. These rates are 68 per 1000 for infants mortality and 509 per 100,000 live births for maternal mortality. Neonatal deaths are estimated at 31/1,000 live births which represent 40% of total infant deaths.

In the Sudan, 86% of the women deliver at home. Less than 57% would be attended by trained and skilled personnel. Safe motherhood programme, aiming at improving motherhood services by "making pregnancy safer" initiative, eradication of harmful traditional practices and the establishment of emergency obstetrics care, is constrained due to widely scattered populations, lack of trained personnel and a high illiteracy rate.

The government health system in Sudan was challenged during the 90s by a combination of decentralization and funding cuts. Government spending on health is less than 1% - Sudan ranks among the lowest in the world. Recently an increase in public expenditure on the health sector is seen because of increased government revenues. In addition to that, decentralization, mid – 1990s reforms including a national health insurance scheme, institution of user fees at public facilities and encouragement of the private sector contributed to increase in the total health expenditure. However, evidence shows that the poor have less access to health services.

**1.3 Description of Stake Holders in Health Research**

The history of health research in the Sudan goes back to the end of nineteenth and the beginning of twentieth centuries, mainly in the areas of tropical diseases and public health, at that time prominent and highly learned research and academic institutions were the sole protectors and guardians of research in the Sudan under the patronage of Sudan Government. Currently, the stakeholders in health research in the Sudan could be divided into the following categories:

1. **The government**

   Under the auspices of the government many ministries i.e. Federal Ministry of Health and States Ministries of Health, Ministry of Science and Technology, Ministry of Higher Education and Scientific Research, Ministry of Agriculture, Ministry of Animal Recourses are involved in conducting health and health related research.

2. **The Universities**

   Most of the faculties of medicine, pharmacy, dentistry, laboratory technology, paramedical colleges, nursing and imaging technology schools are considered as stakeholders and involved in health research. Faculty, post and under graduates are major players in health research.

3. **National Council for Research (NCR)**

   In 1970, the National Council for Research was established to conduct and finance research in Sudan. It functioned through four councils that included the Medical Research Council. In 1990, the NCR the NCR as a coordinator and financier of research was abolished and it became the National Centre for Research and ever since functioned like any other research institute in the country.

4. **The private sector**

   In recent years the private sector was attracted by certain research centers in universities to contribute to health research either by giving financial support or by participating in the governing boards or both.

5. **The United Nations (UN) Agencies**

   The United Nations Agencies such as WHO, UNICEF, UNFPA, UNAIDS and others provide technical and financial support to the health research through existing programmes.

6. **The European Union (EU)**

   Although the contribution of EU to health research is yet not significant it is expected that in the future the EU would give support to institutions involved in health research. Such support will be realized by submitting sound research proposals.

7. **National and International NGOs**

   Few national and international NGOs as actors in the area of health could be considered as stakeholders in health research

8. **The community**

   The local communities do participate in health research; however, their contribution is limited.


**1.4 Rationale**

There is gross imbalance in health research in developing countries including the Sudan. This issue needs to be addressed to find possible solutions for existing inequities in health and health research. Developing counties have limited resources, so it is vital that the health care provided should be effective .This is why policy – makers, clinicians, and consumers need to be assisted in making informed decisions.

Sudan is characterized by diversity of health problems. These problems are further enhanced by the upheaval due to war, displacement, famine, refugees and the changing pattern of diseases with the emergence of diseases of affluence particularly in major cities. All health indicators show that endemic and communicable diseases are considered among major health problems in the Sudan. All these need to be addressed through well-orchestrated health research mechanisms.

Health related research has a great tradition in Sudan since 1903. However, as in many developing countries research in Sudan is facing many obstacles not only in conducting research, but also in dissemination of research results to users and policy makers. The contribution of research in changing practice or policy formulation appears to be minimum or some times nil.

For this reason this study was conducted among the different stakeholders in the health system to find out weaknesses in the health research system, infra structure, human and

financial resources, dissemination of research findings, and more importantly how research findings are being understood and used

It was useful to review the history of research in important health issues and identifying gaps in issues that need to be addressed.

## 1.5 Expected Outcome

It is hoped that, based on the outcome of this exercise, the strengths and weakness of health research in the country will be known and recommendations will be made to correct any inadequacies in the system. A health policy and a strategy of health research will be formulated.

## 1.6 Coordination Steps Following Situation Analysis

After the completion of the work and after analyzing the situation of health research in Sudan, a series of workshops will be under taken. The workshops aim to discuss and to evaluate the process and the future projection of health research. The target groups are: -

- o Policy makers in health
- o Researchers
- o Practitioners
- o NGOs.
- o Health - related sectors.
- o The community

## 1.7 The Time Frame

The duration of the project is two years.

# 2. OBJECTIV ES

## 2.1 General Objectives:

To critically assess the current situation of health research and to develop appropriate mechanisms for enhancing and improving health research in the Sudan.

## 2.2 Specific Objectives

1. To identify and evaluate functions of institutions involved in health research.
2. To assess the documentation, publication, utilization and dissemination of the results of health research.
3. To assess priority settings in health research at institutional and national levels.
4. To determine the mechanisms of research funding.
5. To evaluate the contribution and participation of the private sector and the community in health research.
6. To assess the work environment conducive to health research and training facilities in the country.
7. To investigate if health research covers the needs of the least developed and poor communities in the country.

# 3. METHODOLOGY

## 3.1 Study Design:

This was a descriptive cross-sectional study. It will be divided into three sub-studies. The division is arbitrary and the sub-studies tackled the following areas:

Sub study 1:  Evaluation of institutions involved in health research

Sub study 2:  Publication, dissemination and utilization of health research results

Sub study 3:  Volume and impact of the health research directed towards solving the health problems of the least developed communities.

## 3.2 Methodology of sub-study 1 and sub–study 2

### 3.2.1 Study Area:

Research institutes involved in health research in the twenty-six States of the Sudan were included in this study.

### 3.2.2 Sampling Frame:

o  All institutes and centres involved in health research in Sudan(n=34 including health related sectors like veterinary, agriculture…etc) were investigated

o  Fourteen of the 21 medical and health colleges in the country were covered by this study. The remaining seven are new colleges where no research is being conducted.

o  Senior health policy makers and managers were interviewed. The frame consisted of all current MOH directorates and disease control programme managers. Eleven directors of key directorates and programmes were interviewed.

### 3.2.3.Tools and Techniques of data collection:

   Instruments used for data collection included:

### 3.2.3.1 Questionnaires and Structured interviews:

**For research institutes:**  pre-coded questionnaires including qualitative and quantitative information was designed for research institutes. They include questions about the following issues (Annex 1& 2):

- o Identification and evaluation of the charges and functions of health research institutions, involved in planning and implementation of health research.
- o Documentation, dissemination and utilization of research
- o Staff and training activities
- o Assessment of funding sources including the private sector.
- o Evaluation of the contribution and participation of the private sector and the community in health research.
- o Assessment of the work environment conducive to health research and training facilities ( Presence of documentation unit, computer facilities, software & internet, web site, periodicals, link internally & externally).

**For health directors and policy makers:** guidelines were set for interviews with policy makers, which includes (Annex 3):
- Research activities.
- Utilization of research results for policies.

### 3.2.3.2 Secondary data:

Documents review; National Health Research Strategy, National Health Research Priority List, Annual Health Statistical Book 2001, the 25 Years Health Strategy plus other important documents and the database for health research in Sudan.

### 3.2.4 Methods of data collection:

Ten data collectors (interviewers) were selected and trained for two days to fill the questionnaires. Two field supervisors were employed to supervise this activity. Some interviewers were assigned to go to research institutes, medical and health colleges in Khartoum and Gezira states. Others were assigned to the FMOH directorates and programmes. Data collected was both qualitative and quantitative.

The informant in the academic institutes was either the head of the institute or an assignee by the head of the institute. In the FMOH the informant was either the director, deputy director or programme coordinator.

**3.3 Methodology of Sub-study 3**

**3.3.1 Study design:**

Information was obtained about all publications from Sudan in the area of health and reviewed to determine the number of research directed to solve the problems of the marginalized communities.

The implementation of research results of some important health problems concerning marginalized communities was assessed. The health problems were selected according to the following criteria:

- o The problem was considered a priority according to Sudan National list of priorities and the Annual Statistical list and is associated with underdevelopment and poverty
- o The problem was researched by research institutes
- o Distribution of problems addressed to represent different geographical areas.

Accordingly five health problems were selected: malaria, kalaazar, mycetoma, tuberculosis and endemic goiter. Published papers originating from the results of operational research directed to the prevention, diagnosis or treatment of these diseases were identified and used to deign questionnaires (Annex 4) that are given to practitioners to assess utilization of these materials.

**3.3.2 Study area:**

After reviewing the statistical records in the Federal Ministry of Health, hospitals receiving high numbers of cases of the targeted diseases were purposefully selected to conduct the study. These were Khartoum Teaching Hospital, Tropical Hospital in Omdurman, Abu Anja Chest Hospital in Omdurman, Soba University Hospital in Khartoum, Al Shaab Hospital in Khartoum, Wad Medani Teaching Hospital in Gezira State and Elgadaref Hospital in Gedaref State.

**3.3.3 Techniques of data collection:**

Data was collected through pre-tested, pre-coded questionnaires. Each questionnaire included an abstract of the article, the author and the journal where it was published (see 3.3.4). Variables included:

- ❑ Basic information about the respondent
- ❑ Whether he/she read and critiqued the paper

❑ If the respondent read the article whether he/she accepted or rejected the findings.

❑ Whether the respondent obtained the information in the questionnaire from other sources for similar information.

Seven medical officers were trained to conduct the interviews. All medical doctors present in the medical and surgical wards on the day of data collection were interviewed. They included consultants, registrars, medical officers and house officers. All laboratory technicians in the laboratories of the covered hospitals were interviewed.

### 3.3.4 Summery of the articles addressed in the questionnaires:

### 3.3.4.1 Malaria

Treatment of malaria: Assessment of Chloroquine Resistance of Plasmodium Falciparum in Children of Wad Medeni (Central Sudan): Adil M. Ibrahim, Mohi Eldin M. Ali. Journal of Clinical Pediatrics, vol38.

The paper reports on chloroquine resistance of plasmodium falciparum among Sudanese children (6 months to 16 years) living at Wad Medeni, central Sudan. All R1 to 3 levels of resistant response were confirmed while in vitro sensitivity test indicated that 25 percent of P. falciparum isolates examined had exhibited maturation of schizonts at CQ level $> 1.6$pmol/µl blood. Patients were successfully treated by an age –measured dose of parenteral quinine (10mg/kg).

### 3. 3.4.2 Tuberculosis

Diagnosis of Tuberculosis: The Relation of Grading of Sputum smears with Clinical Features of Tuberculosis Patients in Routine Practice in Sudan: A.Elsony, D. Enarson, A. Khamis, O Baraka, G. Bjune

The paper demonstrates a relation between the grade of smear positivity and the clinical features of tuberculosis patients. Multiple chest symptoms are positively and duration of symptoms negatively associated with grade of positivity. A high smear positive and longest duration of symptoms of less than one year were significant predictors of the presence of a sick household member.

### 3.3.4.3 Kala-azar

Diagnosis of Kalaazar: Zijlstra, E.E., Ali, M.S., ElHassan, A.M. et al 1991 Direct agglutination test for diagnosis and sero- epidemiological survey of kala-azar in Sudan. Transactions of the Royal Society of Tropical Medicine & Hygiene, 85, 474-476. The main findings were that DAT is positive at titre 1: 6400. Test is useful for surveys and supporting diagnosis in a suspect case of VL. DAT does not distinguish between past leishmania infection, sub clinical infection and post kala-azar dermal leishmeniasis.

Treatment of Kala-azar: Khalil, E. A. G., ElHassan, A., M., Zijlstra E.E. et al 1998 The treatment of visceral leishmaniasis by stibogluconate in the Sudan: management of those who do not respond. Annals of Tropical Medicine and Parasitology, 92, 151-158. The main findings are:

Pentostam should be given at a dose of 20mg/kg/day for 30 days. The full dose should be given from the start i.e. not to start with a test dose and gradually increase to the full dose.

### 3.3.4.4 Endemic goiter

Treatment and prophylaxis of endemic goiter: Oral Iodized Oil in the Treatment and Prophylaxis of Endemic Goiter: M. Eltom, F.A. Karlsson, A. M. Kamal, H. Bostrom and P-A Dahlberg, Journal of Clinical Endocinology and Metabolism (1985)
The topic concluded that a single oral dose of iodized oil is effective in the correction of iodine deficiency, reducing the goitre size and preventing the recurrences of goitre for at least 2 years.

### 3.3.4.5  Mycetoma

Treatment of Mycetoma (maduromycosis): Mahgoub E S(1994) Medical treatment of Mycetoma. Sudan Medical Journal, 32, 88-97?

The article states that the treatment of Mycetoma is a combination of medical and surgical approach. This reduces the duration and cost of treatment. The medical treatment for actinomycetoma is a combination of strepromycin and cotrimoxazole. If there is no response a combination of streptomycin with one of the following drugs is given: dapsone. For

euomycetoma due to Madurella mycetomatis, the commonest in the Sudan, the drug of choice is Ketoconazole.

## 3.4 Data Management:

One data officer was assigned to supervise the process of data analysis. The questionnaires were checked, entered into the SPSS computer programme, cleaned and analyzed by a trained team. Qualitative data was analyzed manually.

# 4. RESULTS AND DISCUSSION

## 4.1 Health Research Structure and Development:

### 4.1.1 Historical prospective:

#### 4.1.1.1 Pre-Independence:

Since the beginning of the 20th Century, health research has been a very important factor in the development of Sudan health services and in the shaping of health policy. The need for it was seen by the colonial administration as early as 1903 when the Welcome Tropical Research Laboratories (WTRL) were established as part of Gordon Memorial College (GMC). This was not only a significant development in the medical history of the country, but also an important one on a continent-wide basis. The revealing objectives of the WTRL and their multidisciplinary approach were the most appropriate way of successfully tackling the health problems of a vast country like the Sudan. Their contributions to health science in that era of pioneering health research were acknowledged by commemorating the name of their second director, A J Chalmers, in the Chalmers' Medal of the Royal Society of Tropical Medicine and Hygiene (RSTMH). His most important contributions were in tropical diseases notably schistosomiasis. Chalmers in Khartoum confirmed Leipers discovery of the snail intermediate host in Ismailia in 1915. Christopherson in 1919 successfully treated the disease in Khartoum Civil Hospital using potassium antimony tartrate. These were probably the most significant contributions made to health science and research by two members of the Sudan Medical Service (SMS).

A land mark in the history of medicine in the country was the establishment of the Kitchener School of Medicine (KSM) in 1924, as the first medical school in tropical Africa, to serve, in conjunction with WTRL, as a great civilizing factor in north-east Africa. In 1927 the Stack Medical Research Laboratories (SMRL) were established and formed the bacteriological wing of WTRL. The reorganization of the services dealing with scientific research in 1935 made the SMRL the official research organ of the SMS and the WTRL became the Wellcome Chemical Laboratories (WCL). By the late 1930s the research complex of the SMS had a tripartite structure: SMRL, WCL and the Entomological Laboratories. This

reshaping of health research administration marked the beginning of a new epoch of health research in the Sudan, which reached its zenith in the 1940s. A series of officially directed applied research projects were designed around the public health problems of the country. These are:

1. Malaria control and *Anopheles gambiae* entomological survey in the Gezira.

2. The first Yellow fever serological survey in Africa (southern and western Sudan).

3. The first employment of the yellow fever 17D vaccine in an epidemic in Africa (Nuba Mountains epidemic).

4. Research on Kala-azar, cerebrospinal meningitis, enteric fever, smallpox, rabies, typhus fever, diphtheria and onchocerciasis.

5. The establishment of a vaccine institute in 1937 for the local production of smallpox, TAB, cholera and rabies vaccines.

6. Outstanding research on the transmission and chemotherapy of leishmaniasis Established *phlebotomus orientalis* as the vector and sodium antimony gluconate (pentostam) as a satisfactory therapeutic agent.

On account of outstanding contributions to tropical medicine and medical entomology another two members of SMS were awarded the Chalmers' Medal of the RSTMH, Robert Kirk in 1943, and DJ Lewis in 1953

### 4.1.1.2 Post-Independence:

The creation of a Sudanese Ministry of Health (MOH) in 1949 during the transitional period resulted in the Sudanization of senior posts and Robert Kirk was succeeded by MA Haseeb as Assistant Director for Research in charge of SMRL. Simultaneously with the start of Sudanese research leadership, some outstanding developments took place in health research. Both Hasseeb and Satti, the first nationals to pioneer research in the country, were awarded the Shousha Foundation Prize for outstanding contribution to medical education and research in the Sudan in 1963 and 1970, respectively. Other mile stones include:

1952     : A unified policy for the training of laboratory assistants in the North and South was designed and the School for Laboratory Assistants at SMRL became a WHO collaboration training centre.

1953    : The Sudan Medical Journal was launched as the official organ of Sudan Medical Association and a venue for research communication. The journal, however, has faced financial difficulties periodically.

1954    : The initiation of Sudanese Laboratory Technicians training.

1956    : WHO assistance to deal with major public health problems.

1960    : United States Naval Medical Research Unit Number Three (NAMRU-3) started a five-year investigation to elucidate the epidemiology of visceral leishmaniasis.

1963    : Satti's (Hasseeb's successor) discovery of a new experimental host for leishmaniasis, the bush baby *Galago senegalensis senegalensis.*

1963    : Design of a concerted programme for postgraduate training of Sudanese researchers in Britain to cater for the broadening base of health research activities.

1963    : The Faculty of Medicine, University of Khartoum (U of K) started to grant postgraduate research degrees in the health sciences.

1970    : The inauguration of the National Public Health Laboratories incorporating SMRL, WCL, Entomological Laboratories together with accommodating the Departments of Pathology and Microbiology of the Faculty of Medicine, University of Khartoum.


Further developments took place in the 1970s towards reorganization of health research and scientific research in the country:

1970    : The National Council for Research was established with five specialized research sub-councils: Agricultural, Animal Resources, Economic and Social, Industrial Research Center and Medical Research Council (MRC)

1971    : A Ministry of Higher Education and Research was created.

1972    : The MRC established the Institute for Tropical Medicine and the Hospital for Tropical Medicine.

1976    Gezira Faculty of Medicine and later Juba and other medical schools were established with new concepts of medical education

1978    : The Postgraduate Medical Studies Board in the Faculty of medicine, University of Khartoum awards post graduate clinical degrees. Research is considered as an integral component of the degree and a thesis is a prerequisite for its award.

In 1991 the National Council for Research of the Ministry of Higher Education and Research became the National Research Centre and the sub-councils were renamed, institutes. Within the health sector, the Institute for Tropical Medicine continued to exist.

## 4.1.2 RECENT DEVELOPMENTS: RESUME OF CURRENT NATIONAL HEALTH RESEARCH STRUCTURE:

### 4.1.2.1 Federal Ministry of Health

**The Research Directorate:**

In 1998, the FMOH changed its Health System Research Unit established in 1996 to the Research Directorate (RD) to be responsible to the Under-Secretary. The RD has four units: Administration and Finance, Training, Documentation and Information and Research Implementation. The RD is guided by a multi-disciplinary Research Council (RC). The Research Council consists of all Directorates of the FMOH, States MOH, medical schools, health institutions, individual researchers, health–related sectors, NGOs and the community. The objectives of the Research Directorate are as follows:

- o To formulate research policies, work plans and follow-up their implementation.
- o To facilitate collaboration between all sectors involved in health research.
- o To ensure maximal use of meager financial and manpower resources
- o To set priorities for health research.

**Preparation of the priority research agenda in the country:**

At least thirty priority research problems were identified in each state using the WHO selection criteria. Ten were epidemiological, ten biomedical and ten health system research problems.

A National Health Research Conference was convened in September 2000. It endorsed the national priority health research problems according to rank and recommended capacity strengthening for health research, commitment to the priority research agenda, conduction of operational research and utilization of research results.
A National Ethical Committee for Health Research was established.

### 4.1.2.2 Ministry of Sciences and Technology:

Recently, a new Ministry of Science and Technology was created which implies an expected restructuring and strengthening of the organization of scientific research in the country.

**4.1.2.3 Other stakeholders:**

These included the medical colleges and institutes: The universities of Khartoum, Gezira and Juba. In each of these institutes there is a research committee that receives research proposals for technical and ethical review. Training in research methodology is part of the under and post graduate training programmes.

## 4.2 Sub-study one:

### 4.2.1 Research institutes

These include research institutes, centres and universities involved in health and health related research. The total number of research institutes involved in health research was 34 of which twenty-eight were investigated. The major areas of research were biomedical, epidemiological, clinical, genetics, herbal medicine, health system research, and zoonotic diseases.

All research institutes share similar objectives. Beside the main objectives of conducting health research the institutes provide training and services in their areas of expertise. However, services to the community are provided by a limited number of research institutes. Twenty-three research institutes (82.1%) clearly stated their priorities of research. Endemic and tropical diseases such as malaria, shistosomiasis, tuberculosis and measles top the list of priorities. Other topics e.g. new drugs, laboratory techniques, health system research, health economics and related topics were also among the set priorities. Most of the institutes priorities coincided with the priority setting in health research emanated from a series of workshops carried out in 1999 under the auspices of the Federal Ministry of Health, COHRED and WHO. However, the communication between the Research Directorate in FMOH and the institutes conducting health research concerning priority setting is weak. There were priorities being set by FMOH and SMOH in different states which were not included in the list of priorities of the research institutes.

More than 64% of the research institutes have up to 4 departments, while 18% of them have more than 9 departments. The majority of the institutes are small establishments (Table 1). The distribution of researchers in various research institutes is summarized in Table 2. There were only 3 research institutes (10.7%) where the number of researchers exceeded 40, while more than 50% had only up to 10 researchers.

The number and qualification of the researchers is shown in Table 2. The number of PhD holders exceeded that of MSc. and BSc. holders 4 to 5 times. The impact of such imbalances

would affect the output and training activities of those institutes unless young scientists holding basic degrees are recruited.

The results of the availability of information centers, libraries, distribution of reports and issuing and contribution to periodicals are summarized in Tables 3 and 4 respectively. Three quarters (75%) of the research institutes keep records in computers, 68% keep hard copies and only 14% use other means of keeping records (Table3).

The majority of the research institutes (85.7%) have libraries, 46% have web sites and about 68% have an access to the internet (Table 3). Few of research institutes (21.4%) issue their own publications i.e. scientific journals and monographs (Table 4). However, many of them distribute reports to MOH (68%), researchers (93%), practitioners (71%) and donors (57%). Twenty-two research institutes (78.6%) collaborate with external research institutions, while 85.7% collaborate with local research institutions (Table 5).

The form of collaboration consisted of joint research projects (85.7%), secondment (50%), publications (42.9%), training (67.9%), finance (50%) and networking (28.6%) (Table 5). Usually the collaboration is confined to the United Nations Agencies with few exceptions where the collaboration is bilateral and very rare as multilateral.

Funding of research institutes is weak and many suffer from the lack of funding. The main source of funding is the government (46.4%) followed by United Nations Agencies (28.8%), regional Agencies (14.4%) and lastly private sector (25%) (Table 6). The contribution of International Agencies such as INGOs, EU and the World Bank is meager and not up to the expectations of the researchers and research institutes.

Fourteen universities including 159 departments were investigated. About 48% of the university departments conduct health research.

The majority of the departments (70%) are engaged in basic, clinical and epidemiological research (Table 7). Few of them conduct social (8.8%) and economic (3.1%) research. Not all departments and staff in the universities conduct health research.

Many of the departments (69%) have their own library and only one third of them subscribe to periodicals (Table 7). About 60% of the departments had an access to the Internet and about 20% established a web site (Table 8).

Only 28.9% of all researchers were Staff, while 31.4% were postgraduates and 32.1% were undergraduates. Lack of funding and non-conducive research environment are the main reasons behind the refraining of Staff from conducting health research. The main contribution of staff to research is done through supervision of postgraduate students.

The objectives of university departments conducting health research did not differ much from those of the research institutes. Objectives are directed towards research, training and services. However, the research topics in the universities are diversified.

Universities distinguished themselves from research institutes by providing training for staff, postgraduate and undergraduates in research methodology.

More than 50% of the university departments organize courses in research methodology for undergraduate students. Some of the departments (8.8%) teach more than 60 hours of research methodology.

Once more as the case of research institutes the funding of health research in universities is meager and appalling. Less than one fifth (18.9%) of the departments are financed by the universities themselves, while only 2.5% of them were financed by International Agencies (Table 11). The contribution of ministries concerned is scarce (1.9%).

Staff complained of lack of funding and scarcity of resources. Sometimes health research is financed by the researchers themselves (1.3%). Universities are not in a position to finance research projects, because the approved budget for them barely covers other expenses such as salaries and running costs.

**4.2.1 Research institutes -other than universities - involved in health research in Sudan**

**General characteristics**

Total number of research institutions= 34

The number investigated=28(82%) –( 14 of them are research and clinical institutes/centres involved in health research, 12 involved in health related research while 2 are postgraduate studies centres ); (Annex 5)

**a. Objectives**

The following is the summary of the set objectives of the investigated research institutions ranked according to priority:

**To conduct research on:**
- Endemic and tropical diseases
- Reproductive health
- Health and nutrition
- Herbal medicine
- Endocrinology
- Cancer
- Clinical research e.g. mycetoma, renal failure and others
- Zoonoses
- Genetics and genetical engineering
- Health system research
- Health economics
- Health information system management

**To carry out training activities in order to train:**
- Health cadres in relevant fields
- Under and post graduate students
- Production of teaching materials
- Curricula design for academic and in service training

**To contribute to services in the following areas:**

- Epidemic and communicable diseases

- Cancer and radiotherapy

- Laboratory investigations

- Imaging (MRI, CT Scan, X-ray, etc. …)

- Health promotion

- Control of epidemics

    - Food and potable water surveillance

    - Establishment of laboratories in health facilities

    - Promote appropriate technology

    - Food production and food security

**b. Priority research areas**

Those who had priorities were 23(82.1%). The following are the priorities stated by the institutes:

- Malaria, schistosomiasis, leishmaniasis, tuberculosis, trypanosomiasis, measles and other endemic diseases

- Iodine deficiency and endemic goitre

- New drugs

- Cancer

- New laboratory techniques e.g. for diagnosing parasitic infections and leishmania

- Health system research

- Health economics

- Food safety

- Sustainable development

Table 1. The number of departments in research institutes, Sudan 2002 (N=145)

| No of departments | No of centers N (%) |
|---|---|
| Up to 2 | 10 (35.8) |
| 3-4 | 8 (28.6) |
| 5-6 | 3(10.7) |
| 7-8 | 2 (7.1) |
| > 9 | 5 (18.0) |

Table 2. The number and qualification of researchers in Research institutes, Sudan 2002

| Item | Number |
|------|--------|
| **No of researchers:** | **Number of institutes (%)** |
| Up to 10 | 15 (53.6) |
| 11-20 | 4 (14.3) |
| 21-30 | 4 (14.3) |
| 31-40 | 2 (7.2) |
| > 40 | 3 (10.7) |
| | |
| **Qualification of Researchers:** | **Number of researchers (%)** |
| BSc | 18 (15.7) |
| MSc | 44 (38.3) |
| PhD | 53 (46.1) |
| Total | 115 (100) |
| | |

Table 3. Availability of Information Centers and libraries, in Research Institutes, Sudan 2002

| Item | Number of institutes (%) |
|------|--------------------------|
| **Availability of information center** | 28 (100) |
| **Records keeping:** | |
| -Computer | 21 (75.0) |
| -Hard copies | 19 (67.9) |
| -Other forms | 4 (14.1) |
| | |
| **Availability of library services:** | |
| - Classical library | 24 (85.7) |
| - Electronic library | 12 (42.9) |
| - Audiovisual Library | 12 (42.9) |
| - Website | 13 (46.4) |
| - Internet | 19 (67.9) |

Table 4 . Dissemination of Research Results by Research Institutes (n=25(89.2%), Sudan 2002

| Item | Number of institutes (%) |
|---|---|
| **Issuing and contribution to periodicals:** | |
| - Issuing | 6 (21.4) |
| - Contributing to international periodicals | 24 (85.7) |
| - Contributing to local periodicals | 19 (67.9) |
| | |
| **Distribution of research reports to:** | |
| - MOH | 19 (67.9) |
| - Researchers | 26 (92.9) |
| - Practitioners | 20 (71.4) |
| - Donors | 16 (57.1) |
| - Others | 9 (32.1) |

Table 5. Collaboration with Other Research Institutes, (N=28)

| Item | Number of institutes (%) |
|---|---|
| **Collaboration with :** | |
| - International institutes | 22 (78.6) |
| - Local institutes | 24 (85.7) |
| - Others | 1 (3.6) |
| | |
| **Type of collaboration:** | |
| - Research project | 24 (85.7) |
| - Secondment | 14 (50.0) |
| - Publication | 12 (42.9) |
| - Training | 19 (67.9) |
| - Finance | 14 (50.0) |
| - Networking | 8 (28.6) |

Table 6. Sources of Local and International Funding for Research Institutes (N=26), Sudan 2002

| Item | Number of institutes (%) |
|------|--------------------------|
| **Local funding:** | |
| - Government | 13 (46.4) |
| - Corporations | 2 (7.2) |
| - NGOs | 1 (3.6) |
| - Private sector | 7 (25.0) |
| - Community | 3 (11.8) |
| | |
| **International funding:** | |
| - UN Agencies | 8 (28.8) |
| - Regional Agencies | 4 (14.4) |
| - EU | 1 (3.6) |
| - World Bank | 1 (3.6) |
| - INGOs | 1 (3.6) |
| | |

### 4.2.2 Universities involved in health research in Sudan

**General characteristics:**
- Total number of universities investigated 13 ( Annex 6)
- Total number of departments 159
- Total number of departments conducting health research 76 (47.8%)

**A. Areas of research**

Table 7: Types of Health Research Conducted by University Departments, Sudan 2002

| Type of research | N (%) |
|------------------|-------|
| Basic | 38 (23.9) |
| Clinical | 33 (20.8) |
| Epidemiological | 25 (15.7) |
| Social | 14 (8.8) |
| Economic | 5 (3.1) |
| Others | 3 (1.9) |

**B. Research Objectives of University Departments**

The following are the objectives of the faculties in the studied universities:

**a. To conduct research in the following areas:**
- Endemic and tropical diseases
- Laboratory investigations
- cancers and radiotherapy
- Mycetoma
- Reproductive health
- Health economics
- Zoonoses
- Food and nutrition
- Genetic engineering

**b. Training**
- Postgraduate and under graduate medical, allied health and non medical students in research methodology
- Production of teaching materials
- Curriculum development

**c. Services**
- Provision of health services in the areas of endemic diseases, diabetes, renal disease, infertility, cancer and endoscopy
- Health promotion
- Diagnostic services
- Control of diseases arising from the use of snuff in particular cancer
- Prevention of exposure to radioactive materials
- Herbal medicine
- Control of epidemics i.e.
    - Water, food and drug surveillance
    - Quality control for health facilities e.g. laboratories, health centers and hospitals
    - Herbal and medical practices
    - Food screening and rational use of local resources for food production

Table 8: Documentation and dissemination of research results by universities, Sudan 2002

| Item | Number of institutes (%) |
|---|---|
| **Library services** | |
| - Presence of library | 11 (6.9%) |
| - Availability of audiovisuals | 93 (58.5%) |
| | |
| **Subscription in periodicals and internet:** | |
| - Periodicals | 50 (31.4%) |
| - Internet | 95 (59.7%) |
| - Web site | 31 (19.5%) |

Table 9: Number of Researchers in Medical and Health Departments, Sudan Universities 2002

| Researcher | N (%) |
|---|---|
| Staff | 46 (28.9) |
| Post graduate | 50 (31.4) |
| Under graduate | 51 (32.1) |

Table 10: Training in Research Methodology to Undergraduate Students in Medical and Health departments, Sudan Universities 2002

| Item | Number of institutes (%) |
|---|---|
| Total number of departments teaching research methodology | 81 (50.9%) |
| **Academic year of teaching research methodology:** | |
| - First | 15 (9.4) |
| - Third | 20 (12.6) |
| - Fourth | 35 (22.0) |
| - Fifth | 11 (6.9) |
| **Teaching hours of research methodology:** | |
| - Up to 30 | 11 (6.9) |
| - 31-60 | 40 (25.2) |
| - > 60 | 14 (8.8) |

Table 11: Sources of Finance for Health Research in University Departments, Sudan 2002

| Source of funding | N (%) |
|---|---|
| University | 30 (18.9) |
| Agencies | 4 (2.5) |
| Ministries | 3 (1.9) |
| Researchers | 2 (1.3) |
| Banks | 1 (0.6) |

## 4.3 Sub-study Two

**Publication, dissemination and utilization of health research results**

The total number of research institutes was 34, but the number investigated was 28, the majority of them were in Khartoum State, the remaining were in Gezira State.

Five universities were selected for inclusion in this sub-study. The criteria for selection were based on the fact that the selected universities have a long history of conducting research on health related issues. Four out of them were in Khartoum State and the fifth was in Gezira State. Health directors were also interviewed (Annex 7).

The information collected was about publishing and dissemination of research findings to the end users. The study showed that the commonly used methods of dissemination were publication, conferences and mass media. Research institutes (85.7%) publish in international periodicals (Table 12). About eighty six percent of the research institutes publish in newsletters and the majority present papers in conferences. However, it is worthwhile mentioning here that the actual published scientific articles in both local and international reputable journals were limited in number.

Though, FMOH is considered as one of the main end users of the results obtained from the research conducted by the academic and research institutes, the researchers and donors were found to be other beneficiaries of research findings. Table 13 shows that 64.3% of them forward their research results to FMOH, 22 (78.6%) disseminate their information to donors and the community, 60.7% of them to doctors and 21.4% to NGOs.

Table 12. Methods used in dissemination of research results in Sudan, 2002( n=28)

| Methods of dissemination | No. of research institutes | Percentage |
|---|---|---|
| Publication in an international periodical | 24 | 85.7 |
| Publication in a local periodical | 19 | 67.9 |
| Through a conference | 24 | 85.7 |
| Through mass media | 12 | 42.9 |

The research institutes, colleges and universities indicated that they have obstacles in publishing in both local and international journals. The obstacles can be summarized as follows:

- Lack of funds.

- Scarcity of locally published journals and periodicals.

- High cost of printing materials in the country.

- Failure to get papers accepted in reputable journals due to the quality and scope of research conducted.

The response of the researchers in both research institutes and university departments on how such obstacles could be overcome as regards publishing and disseminating information to users was as follows:

- Stakeholders should avail enough funds to enable the researchers to conduct good quality research.

- Establishing research committees by stakeholders for coordinating research activities and plans including the dissemination of research results to researchers, decision makers and the community.

- Reactivation of Sudan Medical Journal to become again a reputable journal.

In spite of the problems facing academic and research institutions concerning the dissemination of information  to the end users, the study showed that some of the  research findings were disseminated to the different end users in report form for action. Below are examples of different research projects the results of which were sent to decision makers:

1. Malaria:
- Economic impact of malaria in the family income in Khartoum State.

- Chloroquine resistant malaria in Sudan.

- Prevalence of malaria in Khartoum State.

2. Shistosomiasis:
- Prevalence of shistosomiasis in relation to hepatitis in Elgomouia, Khartoum State.

3. Child health:

o            Weight, height and head circumference norms in Sudanese children.

o            Comparison of weight and head circumference normative of Sudanese children with other countries.

o            KAP in FGM (female genital mutilation) in Khartoum State.


4. Tuberculosis:

▪            Extra pulmonary tuberculosis.

▪            Tuberculosis in relation to HIV infection

5. Nutrition:-

▪            Nutritional status among the elderly.

▪            Relationship between hemoglobin level and dietary habits among the under 5 children in Khartoum State.

6. Others:

▪            Risk factors of cancer in Sudan.

▪            Prevalence of communicable diseases in Elkamleen, Matammah and Atbera towns.

▪            Utilization of farmers school for proper use of insecticides.


**4.3.2  Utilization of research results by policy makers in health**

Table 13.  Type of users of research results in Sudan (n=28)

| Type | No | % |
|------|----|----|
| FMOH | 18 | 64.3 |
| NGOs | 6 | 21.4 |
| Doctors | 17 | 60.7 |
| Donors | 22 | 78.6 |
| Community | 22 | 78.6 |
| Others | 2 | 7.1 |

Key persons interviewed in different health directorates and programmes in the FMOH stated that the majority of research conducted inside MOH was initiated and commissioned by them. So they used research findings to help in decision making as shown below. Those researches

initiated by different health and programme managers were conducted in collaboration with either research institutes or universities. Others were carried out in collaboration with expatriates associated with funding agencies.

Below as shown in Table (14) are examples of research that was commissioned by directorates or programs in FMOH and the action taken based on research results.

Table 14. Example of research that lead to action by decision makers.

| No | Research topic | Action taken |
|---|---|---|
| 1- | Prevalence of schistosomiasis in relation to hepatitis in Elgomouia – Khartoum State | Establishment of schistosomiasis control project in Elgomouia area. |
| 2- | Prevalence of communicable diseases in Elkamleen, Matammah and Atbra towns. | - Rehabilitation and staffing of health centers in the towns.<br>- Provision of safe water. |
| 3- | Utilization of farmers schools for proper use of insecticides. | - Farmer's school system in Elgazira was adopted in training on how to use insecticides Safely. |

With regards to the extent to which researchers outside ministry of health involve policy makers in the research process, the health and programme managers believe that researchers- with some exceptions- work in isolation from them. However they do involve them sometimes in one or another stage of the research process. Few of them stated that researchers involve them in all the research chain process.

But when asking about the dissemination of research reports few stated that they rarely received a research report. These results emphasize that there should be clearly worked out mechanism of dissemination of information from the researchers to the users. Further more a feedback mechanism to the researchers at all the stages of the research process should be established in order to facilitate using research results for changing practice, planning or policy formulation.

These results agree with the regional consultative process for the African Region presented at the International Conference on Health for Development in Bangkok (October 20001) which noted that in Africa research has not been an effective tool for health action.

On their suggestion to influence the direction of research activities, health and programme managers stated the following:

a. FMOH should allocate budget for research to supplement areas of high priority through a competitive system.

b. Establishing research units in all different MOH directorates and programmes.

c. Establishing an advisory body representing the scientific and research communities in relevant fields.

## 4.4 Sub-study Three

**Number and Utilization of Publications Addressing the Problems of the Poor and Under Developed Communities**

This part of the study focused on two things: the number of publications addressing the problems of the most marginalized people in Sudan and if the results of the publications were utilized and to what extent this has resulted in solving the health problems of the least advantaged communities.

Information was obtained about all publications from Sudan in the area of health. The information obtained does not reflect the true record of all published work since the response of the institutes to research published by them was inadequate. Furthermore some of the research was in the form of theses that were not traceable. Despite this limitation it was clear that most of the publications dealt with health problems of the least developed communities. 38.3% of the researches are about communicable diseases (e.g. malaria, leishmaniasis, and tuberculosis), 69% are targeting maternal and child health while 38% non communicable diseases. However, the majority of the research was conducted in Khartoum (46.2%) and central states (14.8%). The results of research were hardly applied to better diagnose, manage or prevent these health problems. The main reason for this is that the research was published mainly in foreign journals to which most medical practitioners and other health workers do not have an access.

Table 15 and 16 show the distribution of respondents according to their professional status and state. Most of the respondents were medical and house officers; the majority were in Khartoum State which reflects the actual distribution of physicians in the country. Table 17 shows that between 69% and 94% of the respondents did not read the articles. The main reason for not reading the article was because the journal was not available (Table No 18). All those who read the article accepted the findings (Table No 19). Only 44% out of the total had heard about the findings of the paper from other sources such as conferences and colleagues.

The results of the questionnaire put to the laboratory technicians are shown in Tables 20-24. Questions were asked regarding the direct agglutination test (DAT) and its value in the diagnosis of visceral leishmaniasis. The majority of technicians (74%) were in Khartoum

State; About 60% hold a BSC degree. A surprising finding is that 30% were unemployed. Most of them them were graduated in the last 5 years. 37% had not heard or performed training on DAT. Only 5.5% had both theoretical and practical training in the test (Table No 22).

The majority(85.4%) of the technicians did not perform the test after graduation (Table No 23). This was either due to the fact that the reagent was not available or because the test was not requested by the clinicians (Table No 24). The test was not introduced in the hospitals in the endemic areas which were considered as referral centres for visceral leishmaniasis in the country.

Table 15: Distribution of interviewed practitioners according to professional status, Sudan Hospitals 2002-2003

| Article | Consultant | Registrar | Medical officer | House officer | Total |
|---|---|---|---|---|---|
| Malaria, Kalaazar and TB | 15 (13.7%) | 17 (15.5%) | 24 (22%) | 53 (48.6%) | 109 (100%) |
| Mycetoma | 10 (13.5%) | 10 (13.5%) | 20 (27%) | 34 (46%) | 74 (100%) |
| Endemic goitre | 25 (13.6%) | 27 (14.7%) | 44 (24%) | 87 (47.5%) | 183 (100%) |

Table 16: Distribution of interviewed practitioners according to state, Sudan Hospitals 2002-2003

| Article | Khartoum | El Gezira | Gedaref | Total |
|---|---|---|---|---|
| Malaria, Leishmania and TB | 76 (69.7%) | 17 (15.6%) | 16 (14.7%) | 109 (100%) |
| Mycetoma | 35 (47.3%) | 19 (25.7%) | 20 (27%) | 74 (100%) |
| Endemic goiter | 111 (60.7%) | 36 (19.7%) | 36 (19.7%) | 183 (100%) |

Table 17: Response of practitioners according to whether they read the articles or not, Sudan Hospitals 2002-2003

| Article | Reading the article about the disease | | Total |
|---|---|---|---|
| | Yes | No | |
| Malaria | 11 (10%) | 98 (90%) | 109 (100%) |
| Leishmania | 6 (5.5%) | 103 (94.4%) | 109 (100%) |
| TB | 15 (13.7%) | 94 (86.3%) | 109 (100%) |
| Mycetoma | 23 (31%) | 51 (69%) | 74 (100%) |
| Endemic goiter | 21 (11.4%) | 162 (88.6%) | 183 (100%) |

Table 18: Reasons of not reading the research article by practitioners, Sudan hospitals 2002-2003.

| Article | Reasons of not reading | | | Total |
|---|---|---|---|---|
| | Journal not available | Journal available but didn't read | Other | |
| Malaria | 81 (82.6%) | 10 (10%) | 7 (7%0) | 98 (100%) |
| Leishmania | 79 (76.6%) | 11(10.6%) | 13 (12.6%) | 103 (100%) |
| TB | 77 (81.9%) | 10 (10.6%) | 7 (6.5%) | 94 (100%) |
| Mycetoma | 44 (86%) | 5 (10%) | 2 (4%) | 51 (100%) |
| Endemic goitre | 134 (83%) | 11 (7%) | 17 (10%) | 162 (100%) |

Table 19: Acceptance of research finding by practitioners, Sudan Hospitals 2002-2003

| Article theme | Acceptance of findings | | Total |
|---|---|---|---|
| | Yes | No | |
| Malaria | 9 (81.8%) | 2 (18.2%) | 11 (100%) |
| Leishmania | 6 (100%) | 0 (0%) | 6 (100%) |
| TB | 14 (93.3%) | 1 (6.7%) | 15 (100%) |
| Mycetoma | 22 (92%) | 1 (8%) | 24 (100%) |
| Endemic goitre | 19 (90.4%) | 2 (9.6%) | 21 (100%) |

Table 20 Distribution of interviewed laboratory technicians according to their present position, Sudan Hospitals 2002-2003

| Position | Number | Percentage |
|---|---|---|
| Employed | 38 | 70% |
| Unemployed | 16 | 30% |
| Total | 54 | 100% |

Table 21: Distribution of interviewed laboratory technicians according to time after graduation, Sudan Hospitals 2002-2003

| Time after graduation | Number | Percentage |
|---|---|---|
| 1 to 5 years | 39 | 72.2% |
| 6 to 10 years | 8 | 14.8% |
| More than 10 years | 7 | 12.9% |
| Total | 54 | 100% |

Table 22: Theoretical and practical training of laboratory technicians about DAT in the undergraduate education, Sudan Hospitals 2002-2003

| Use of DAT | Yes | | | No | Total |
|---|---|---|---|---|---|
| | Theoretically | Practically | Both | | |
| Number | 24 | 7 | 3 | 20 | 54 |
| Percent | 44.4% | 12.9% | 5.5% | 37% | 100% |

Table 23: Performance of the DAT by technicians as part of on job training after graduation, Sudan Hospitals 2002

| Performing the test | Number | Percent |
|---|---|---|
| Yes | 6 | 14.6% |
| No | 35 | 85.4% |
| Total | 41 | 100% |

Table 24: Reasons for not performing the test by laboratory technicians after graduation, Sudan Hospitals 2002

| Reason | Number | Percent |
|---|---|---|
| The reagent and equipment were not available | 18 | 52.4% |
| There was no request from clinicians | 17 | 48.6% |
| Total | 35 | 100% |

## 4.5 History of Research in Sudan (Annex 8):

Papers about history of research on six priority health areas are written by distinguished researchers in the country (Annex 8). These included:

- Research review on endemic goiter and iodine nutrition in Sudan.

- History and stream of health research in Sudan: mycetoma research.

- Onchocerciasis Research in the Sudan

- Situation Analysis of  Health Research in Sudan : Bilharzia Research

- History of leishmania research in Sudan

- History of tuberculosis research in Sudan

- The History of malaria research in Sudan

# 5. CONCLUSIONS:

- Research Institutes and universities departments conduct health research in important areas, the ultimate aim of which is to promote the health of the population. The majority of the research institutes and university departments are engaged in basic, clinical and epidemiological research. Health system research is conducted by some of the institutes but is not given priority.

- Research institutes suffer badly from lack of resources. An extraordinary effort is needed by research institutes to convince stakeholders (i.e. government, UN agencies and other donors) to contribute to health research.

- Lack of funding has a negative impact on issuing publications, dissemination of information and the establishment of the health information systems in the research institutes.

- The morale of researchers is low, their contribution to reputable scientific journals and participation in conferences is minimum compared to the available potential resources.

- Dissemination of research results is not adequate. Methods used in dissemination of research results are limited to international periodicals, conferences, local periodicals and mass media. Many obstacles face researchers and academic community in publishing.

- Stakeholders' involvement of MOH directors is limited in seeking funds or information or literature review. The link between research and policy making is not properly understood between different stakeholders. It has an affect on the demand for research and scientific information among the end users on one hand and the initiation of research to action projects on the other.

- Despite the fact that there is quite a lot of research done on major health problems affecting the poor communities in the Sudan, the results of these researches were not utilized to any great extent for prevention, diagnosis or better management of disease.

- Most of the practitioners in the Sudan were not aware of the research carried out in the country. The reasons for this are:
  - Research is published in foreign journals to which practitioners do not have access.
  - Results of research did not find their way to the under graduate and post graduate training programmes.

## 6. RECOMMENDATIONS

- It is recommended that research institutes and university departments should consider investing on health system research in particular operational research and health economics. Health research on control of infectious and communicable diseases namely emerging diseases such as HIV/AIDS, epidemiological and cancer research and health problems such as cardiovascular disease should be given priority by research institutes and university departments.

- Allocation of fund for health research by the government is recommended to be in the range of 3-5% of all ministries of health and programmes approved budget.

- The research institutes and university departments should give particular attention to training through conduction of training courses in research methodology and how to write research proposals in particular for young researchers.

- There is a need to raise the morale of researchers by encouraging external links and create opportunities to participate in regional and international scientific meetings.

- To foster utilization of research findings researchers should generate a demand for research among policy- makers, health workers and the community. This link should be created by active involvement of the stakeholders in the different phases of the research process.

- There is a need to support a local medical journal with good local circulation where researchers can publish their findings. One of the reasons why scientists publish in foreign journals is that often-academic institutions pay more regard to research published in prestigious foreign journals when assessing candidates for promotion. It is important that universities should give better weight to good research published in local journals.

- Abstracts of published papers about health problems in the Sudan in foreign journals should also be published in the local journals.

- Medical colleges and other academic institutions should update their curricula to incorporate research results published about important health problems in the Sudan.

- Regular Conferences are a good vehicle for disseminating information. The practice of the Research Directorate, Federal Ministry of Health who hold a monthly meeting to discuss proposed or published work in Sudan is to be commended.

- Better means of collecting information about publications from the institutes should be developed. The institutes should deposit a reprint of their papers in the Research Directorate, FMOH.

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**Annex 1**

## Situation Analysis of Health Research in Sudan
Research Institutes Questionnaire

1.  Date:

2.  Ser. No.  ………………………

3.  Researcher Name: ………………………………………………………………

4.  Source of information (name):  ……………………………………………………

5.  Position: ……………………………………………………………………..

6.  Name of the centre:

    ……………………………………………………………………………….

7.  Affiliation:

    ………………………………………………………………………………….

8.  Location and Address:

    ………………………………………………………………………………….

    …………………………………………………………………………………

9.  P.O. Box:  …………………. 10. Fax: …………………. 11. Tel. …………

12.  E - mail : …………………………………………………………………………

13.  Date of establishment: …………………………………………………………

14.  Development (if found):

    ……………………………………………………………………………….....

    …………………………………………………………………………………..

    …………………………………………………………………………………..

    …………………………………………………………………………………

15.  Organizational  structure ( chart ) of the centre:

    …………………………………………………………………………………..

…………………………………………………………………………………

16. Objectives of the centre :

   1.
   2.
   3.
   4.
   5.
   6.

17. Functions of the centre.

   1.       Training.
   2.       Community services.
   3.       Others (specify).

18. Duties of the centre:

   1. …………………………………………………………………………
   2. …………………………………………………………………………
   3. ………………………………………………………………………….
   4. ………………………………………………………………………….
19. Number of departments in the centre:  …………………………………….

20. Number of the researchers  classified as :

   1. Professor                                2. Associate Professor

    3. Researcher                           4. Assistant researcher

21. Number of technicians  classified by specialty ( if found):

22. Availability   of information centre       1. Yes          2. No

 23. If the answer is yes method of keeping  information (you may have more than one

    answer)

1. Computer          2 . Records          3.  Others ( specify)

24.  Is there a library in the centre          1.  Yes          2.  No

25. If the answer is yes   (you may have more than one answer) type of the library

       1.  Traditional library          2.  Electronic library

       3.  Audiovisual library          4.  Other (specify)

26 .  Does the library keep research reports produced by the centre?

       1.  Yes          2. No.

27.      If the answer is no what is the reason of not keeping them in the centre:

    ………………………………………………………………………………….

    …………………………………………………………………………………

    …………………………………………………………………………………

28.       If the answer is yes state how the reports are kept?

    …………………………………………………………………………………

    …………………………………………………………………………………

    …………………………………………………………………………………

    …………………………………………………………………………………

29.      Since when does the centre keep the reports

30.      Did the centre distribute copies of the reports to specialized bodies

       1.Yes   ,     2.  No.

31.      Did the centre issue periodicals ?

       1.  Yes          2.  No.

32.      If the answer is yes  what is the name of the periodical

    …………………………………………………………………………………

    …………………………………………………………………………………

33.  Details of the centre's departments involved in health research

| Department | Number of researchers | Qualifications of researchers | Areas of research |
|---|---|---|---|
|  |  |  |  |
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|---|---|---|---|
|  |  |  |  |

34. Did the centre have research activity with other research institutes?

                      1. Yes       2. No.

35. If the answer is yes what is the type of the institute (may have more than one answer)

    1. Local            2. International            3. Other (specify)

36. If the answer is yes what sort of activity?

         1.              Common  research projects

         2.              Secondment  of  researchers

         3.              Training

         4.              Publications

         5.              Other (specify)

37. Has the centre defined its research priorities?

                      1. Yes        2. No

38. If the answer is yes what methods used to determine those priorities?

   …………………………………………………………………………………….

. ……………………………………………………………………………………

   …………………………………………………………………………………….

   …………………………………………………………………………………….

39.      How is the centre funded

1. …………………………………………………………………………………...

2. ………………………………………………………………………………….

3. ………………………………………………………………………………….

4. ………………………………………………………………………………….

40. Type of funding agency (more than one answer is possible)

|  *Local* | *International* |
|---|---|
| 1. UN Agencies ( specify) | 1. Governments ( specify) |
| 2. Regional organization ( specify) | 2. Corporations and Funds |
| 3. E E C ( specify) | 3. NGOs  ( specify) |
| 4. World Bank | 4. Private sectors  ( specify) |
| 5. National funds ( specify) | 5. Community ( specify) |
| 6. Foreign private sector ( specify) | 6. Other ( specify) |

7.Other  ( specify)

<br/>

**Annex 2**

**Situation analysis of Health Research in Sudan**

**Evaluation of Publication & Dissemination**

**Of Research Results in the research institutions**

1.  Institute:
2.  Position held by respondent in the institution
3.  Main areas of research.

> 1) Biomedical.
>
> 2) Clinical.
>
> 4) Health System Research
>
> 5) Socio behavioral
>
> 6) Others (special).

4.  Please indicate the number of research projects carried by the institution in the last 5 years?

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

5.  What multidisciplinary research projects or programs is your institution involved in?

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

6.  How many of these (Q4) researches were published?
    a. In local journals (      )
    b. In international journals (    )
7.  How many of these publications were in the form of reports?
8.  Who are the main target audiences?
9.  Is dissemination to policy makers of consideration to your institution (explain)?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

10. If yes, how many research reports have been disseminated to policymaker?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

11. From those reports (Q$_{10}$) how many researches have been used by policymakers, for action? Please give example.

…………………………………………………………………………………………………

…………………………………………………………………………………………………

12. If no (Q10) what problems do you face in disseminating research results?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

13. What do you suggest to improve the information dissemination of research results?

**Annex 3**

**Situation Analysis of Health Research in Sudan**

**Individual In-depth Interview**

**For Decision-Makers in Health**

1. Name of the directorate/ programme:-

2. Does your directorate/ programme conduct research?

   Yes                         No

3. If yes, please indicate the number of researches initiated by your directorate/ programme?

4. How many of the above have been used by your institution to alter policy or to act?

   Please give examples:-

   1)…………………………………………..
   2)…………………………………………..
   3)…………………………………………..
   4)…………………………………………...

5. Is the directorate/ programme's leadership involved in research carried by academic institutes?

   Yes                         No

6. If yes, at what stage of the research process are you being involved?

7. How many research reports received by your directorate/ programme from research institutes?

   Please give examples.

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

……………….

8. How many of the above (Q$_7$) were used by you to alter a policy or to act?

   Please give examples.

   …………………………………………………………………………………………………

   …………………………………………………………………………………………………

   ……………………

9. Who are the beneficiaries (Q8) of those policies/actions?

10. How these (Q8) actions, affect the health of the beneficiaries?

11. What problems do you face in utilizing research findings?

………………………………………………………………………………………
……………

………………………………………………………………………………………
……………

12. What do you suggest to increase the impact of research on health?.

**……………………………………………………………………………………**

**……………………………………………………………………………………**

**……………**

**Questionnaire 1**

**Utilization of Materials Published about Visceral Leishmaniasis**

**In the Sudan (for practitioners)**

Serial No……….
1. Occupation:
    1. Consultant      2. Registrar         3. Medical officer
    4. house physician     5. Medical assistant
2. State……………..
3. City……………….
4. Health facility
    1. Hospital        2. Health centre        3. Other( specify)

## Diagnosis of Kalaazar

5. Did you read the following paper
Zijlstra, E.E., Ali, M.S., ElHassan, A.M. et al 1991 Direct agglutination test for diagnosis and sero- epidemiological survey of kala-azar in Sudan. Transactions of the Royal Society of Medicine & Hygien, 85, directorate/ programme supporting diagnosis in a suspect case of VL. DAT does not distinguish between past leishmania infection, sub clinical infection and post kala-azar dermal leishmeniasis.
    1. Yes                2. No
6. ( If no) Why didn't you read it
    1. Journal not available
    2. Journal available but I did not read it
    3. Other( specify)
7.     (If       yes)      Did      you      accept      the       findings:
    1. Yes            2. No
 8. Do you have information about the use of DAT from other sources?
    1. Yes              2. No
       Ministry of health
       Conference
       Other( specify)
9. If the answer for Q7 or Q8 was yes , do you use the test?
    1. Yes                2. No
10. If no, why?
    1. The test is not available
    2. Available but cannot be afforded
    3. Information is not convincing
    4. Other( specify)

**Treatment of Kala-azar**
11. Did you read the following paper
Khalil, E. A. G., ElHassan, A., M., Zijlstra E.E. et al 1998 The treatment of visceral leishmaniasis by stibogluconate in the Sudan : management of those who do not respond . Annals of Tropical Medicine and Parasitology, 92, 151-158. The main findings are:
Pentostam should be given at at a dose of 20mg/kg/d for 30 days. The full dose should be given from the start i.e. not to start with a test dose and gradually increase to the full dose.
    1. Yes                2. No

12.( If no) Why didn't you read it
     1. Journal not available
     2. Journal available but I did not read it
     3.Other( specify)
13.    (If    yes)    did    you    accept    the    findings**:**
   1. Yes     2. No
  14. Do you have similar information from other sources?
      1. Yes     2. No
      -Ministry of health
      -Conference
      -Other( specify)
15. If the answer for Q13 or Q14 was yes , do you use the recommendations?
      1. Yes     2. No
16. If no, why?………………………………
      1.Information is not convenient
      2. At the recommended dose the drug is not available
      3. Other (specify)

Questionnaire 2
**Utilization of Materials Published about Visceral Leishmaniasis**
**(For Graduates of Medical Laboratory colleges)**
**The use of Direct Agglutination Test (DAT) in the diagnosis of visceral leishmaniasis.**

1. Serial NO………
2. Present position
      1. Employed      2. Unemployed
3. If employed you are employed as:
     1. yes    2.no
    1. Technician public sector
    2. Private sector
    3. Both sectors
    4. Teaching assistant
    5. Teaching assistant and private practice
    6. Other
4. Place of graduation( university)
    1. University of Khartoum
    2. Gezira
    3. Juba
    4. Sudan University
    5. Elnailain
    6. Islamic University
    7. Elazhry
    8. Sharg Elneil
    9. Tghana( Omdurman)
    10. Abroad
    11. Other
5. Years after graduation
    1. 1 to 5 years
    2. 6 to 10
    3. more than 10
6. Degree:
    1. Diploma
    2. Bsc honours
    3. Bsc general
    4. Msc
7. Were you taught in your undergraduate curriculum about the use and limitations of DATin the diagnosis of visceral leishmaniasis?

    1. Yes    2. No

8. If yes, was the subject taught:

   1. Theoretically

   2. Practically

9. If practically, was the test

   1. Demonstration

   2. The students performed the test

10. Did you learn about DAT after graduation as part of on the job training?

    1. Yes    2. No

11. If the for 8 and 11 was yes did you perform the test in your laboratory after graduation?

    1. Yes    2. No

12. If no, why?

    1. The reagent and equipment are not available

    2. There was no request from the clinicians

## Questionnaire 3

## Utilization of Materials Published About Treatment of Mycetoma in the Sudan

## (for practitioners)

Serial No…………..

1. Occupation:

      1. Consultant    2. Registrar    3. Medical officer

      4. House physician    5. Medical assistant

2. State……………..

3. City……………….

4. Health facility

      1. Hospital    2. Health centre    3. Other( specify)…..

Treatment of Mycetoma (maduromycosis)

5. Did you read the article on the treatment of Mycetoma: Mahgoub E S(1994) Medical treatment of Mycetoma. Sudan Medical Journal, 32, 88-97?

The article states that the treatment of Mycetoma is a combination of medical and surgical approach. This reduces the duration and cost of treatment. The medical treatment for actinomycetoma is a combination of strepromycin and cotrimoxazole. If there is no response a combination of streptomycin with one of the folllowing drugs is given : dapsone, sulphadoxine-pyrimethamine, fansidar or rifampicine.

    For euomycetoma due to Madurella mycetomatis, the commonest in the Sudan, the drug of choice is Ketoconazole.

      1. Yes    2. No

6. ( If no) Why didn't you read it

    1. Journal not available

    2. Journal available but I did not read it

    3.Other( specify)

7.    (If    yes)    Did    you    accept    the    findings:

    1. Yes    2. No

 8. Do you have similar information from other sources?

      1. Yes    2. No

    -Ministry of health

    -Conference

    -Other( specify)

9. If the answer for Q7 or Q8 was yes , do you use the recommendations?

      1. Yes    2. No

10. If no, why?………………………………

**Utilization of Results of Materials Published About Treatment of Iodine Endemic Deficiency**

**(for practitioners)**


1.  Did you read the paper about the effectiveness of Oral Iodized Oil in the Treatment and prophylaxis of Endemic Goiter: M. ELTOM, F.A. KARLSSON, A. M. KAMAL, H. BOSTROM and P-A DAHLBERG, Journal of Clinical Endocrinology and Metabolism(1985) The topic concluded that a single oral dose of iodized oil is effective in the correction of iodine deficiency, reducing the goitre size and preventing the recurrences of goitre for at least 2 years.


    1. Yes   2. No
2. (If no) Why didn't you read it
  1. Journal not available
  2. Journal available but I did not read it
  3. Other( specify)
3.  (If  yes)  Did  you  accept  the  findings:
  1. Yes   2. No


4. Do you have similar information from other sources?
   1. Yes   2. No
-Ministry of health
-Conference
-Other (specify)


**Utilization of Materials Published About The Diagnosis of Tuberculosis Patients in Routine Practice in Sudan**

1.Did you read the paper  entitled The Relation of Grading of Sputum smears with Clinical Features of Tuberculosis Patients in Routine Practice in Sudan: A.Elsony, D. Enarson, A. Khamis, O Baraka, G. Bjune-

The paper demonstrates a relation between the grade of smear positivity and the clinical features of tuberculosis patients. Multiple chest symptoms are positively and duration of symptoms negatively associated with grade of positivity. A high smear positive and longest duration of symptoms of less than one year were significant predictors of thr presence of a sick household member.


    1. Yes   2. No
2. (If no) Why didn't you read it
  1. Journal not available
  2. Journal available but I did not read it
  3. Other( specify)
3.  (If  yes)  Did  you  accept  the  findings:
  1. Yes   2. No

4. Do you have similar information from other sources?

        1. Yes        2. No

-Ministry of health

-Conference

-Other (specify)


## Utilization of Results of Materials Published About The Diagnosis of The Treatment of Malaria in Sudan


1. Did you read the paper entitled: Assessment of Chloroquine Resistance of Plasmodium Falciparum in Children of Wad Medeni(Central Sudan): Adil M. Ibrahim, Mohi Eldin M. Ali. Journal of Clinical Pediatrics, vol38. August 1992

The paper reports on chlorquine resistance of plasmodium falciparum among Sudanese children(6 months to 16 years) living at Wad Medeni, central Sudan. All R1 to 3 levels of resistant response were confirmed while in vitro sensitivity test indicated that 25 percent of p. Falciparum isolates examined had exhibited maturation of schizonts at CQ level > 1.6pmol/μl blood. Patients were successfully treated by an age –measured dose of parenteral quinine(10mg/kg)

      1. Yes        2. No

2. ( If no) Why didn't you read it

   1. Journal not available

   2. Journal available but I did not read it

   3. Other (specify)

3. (If yes) did you accept the findings:

    1. Yes       2. No

4. If no, do you have similar information from other sources?

       1. Yes        2. No

-Ministry of health

-Conference

-Other (specify)

## Annex 5

## Situation Analysis of Health Research in Sudan

## Covered Research Institutes

| Research institute | Affiliation | Contact | Year of establishment |
|---|---|---|---|
| Blue Nile Research and Training Institute | Federal Ministry of Health | Tel +249(511) 46183<br>Email osman_saeed@hotmail.com | |
| National Health Laboratory | Federal ministry of Health | Tel +249(11) 772521<br>+249(11) 778370 | 1903 |
| Institute of Endemic Disease | University of Khartoum | Tel +249(11)779712<br>Email mmukhtar@iend.org | 1993 |
| Institute of Tropical Medicine | National Research Centre | Tel +249(11)781845 | 1971 |
| Mycetoma research Centre | Khartoum University | Email: alfahal@hotmail.com | 1991 |
| Nuclear Medicine Centre | Federal Ministry of Health | Tel +249(11)799296 | 1976 |
| Microbiology Research Laboratory | Ahfad University | Tel +249(15)554870 | 1998 |
| Diabetes and Endocrinology Research Centre | Private sector | Tel +249(15)552000 | 1988 |
| Khartoum University Renal Centre | Khartoum university | Tel +249(11)798140<br>Email: sudankidney@hotmail.com | 1985 |
| Nutrition Training and Research Centre | Alahfad University | Tel +24912384189<br>NRTC@sudanham | 2002 |
| Nutrition Research Centre | Ministry of Science and Technology | Tel +249(13)311294<br>Email: frc@sudanmail.net | 1965 |

| Research institute | Affiliation | Contact | Year of establishment |
|---|---|---|---|
| Khartoum Fertility Centre | Private sector | Tel +249(11)482216<br>Email: rfcsudan@hotmail.com | 2000 |
| Oral Surgery and cancer Research Centre | Federal Ministry of Health | Tel +249(11)77254 | 1995 |
| Institute of Nuclear Medicine, Molecular Biology and | University of Gezira | Tel +249(511) 43232 | 1994 |
| National Centre of Chemotherapy and Nuclear Medicine | Federal Ministry of health | Tel +249(11) 776905<br>Email: profhussein@hotmail.com | 1967 |
| Sudan Molecular Agency | Ministry of science and technology | Tel +249(11) 771993<br>Email saec@sudanmail.net | 1973 |
| Tobacco Research Centre | Sudan Medical Association | Tel +249(11) 785381<br>Email: TSRC@sudanmail.net | 1994 |
| Medicinal and Aromatic Plants Research Centre | National Research Centre | Tel +249(11) 784882 | 1972 |
| Veterinary Laboratories and Research Centre | Animal Resources Research Corporation | Tel +249(11) 830012 | 1910 |
| Biotechnology Corporation | Ministry of Science and Technology | Tel +249(11) 770701<br>elgaali@hotmail.com | 1994 |
| Sudan Postgraduates Medical Council | University of Khartoum | Tel +249(11) 778169 | 1973 |
| Sudan National Specialization Board | Ministers Council | Tel +249(11) 785207 | 1995 |

| Research institute | Affiliation | Contact | Year of establishment |
|---|---|---|---|
| Population Studies Centre | University of Gezira | Tel +249(115) 45024<br>Email: Alnoury_pop@hotmail.com | 1981 |
| Health Economics Centre | | Tel +249(11) 790337 | 1999 |
| Institute of Socioeconomic Studies | Ministry of Science and Technology | Tel +249(11)778805 | 1992 |
| Agricultural Research Corporation | Ministry of Science and Technology | Tel +249(115) 43890<br>Email: Elahmedi41@yahoo.com | 1902 |
| Animal products Research Centre | Animal Resources Research Corporation | Tel +249(11) 835269<br>Email: Elkhidir2002@yahoo.co.uk | 1962 |
| Iman Research Centre | | Tel +249(11) 472088<br>Email: info@imanonlinesd.net | 1990 |

**Annex 6**

**Situation Analysis of Health Research in Sudan 2002**

**Visited Universities**

1. University of Khartoum
2. University of Al Gazira
3. University of Juba
4. University of Sudan
5. Al Nailain University
6. Omdurman Islamic University
7. Alazhary University
8. Khartoum Academy of Medical Sciences
9. Khartoum College of Medical Sciences
10. Alahfad University
11. Ahlia University
12. Uper Nile University
13. College of Sciences and Technology

**Annex 7**

**Situation Analysis of Health Research in Sudan 2002**

**Covered Ministry of Health Directorates and Programmes**

1. Directorate General of Planning

2. Directorate General of Primary Health Care

3. Directorate General of Pharmacy

4. Directorate General of International Health

5. Directorate General of Human Resource Development

6. Directorate General of Curative Medicine

7. Directorate General of Preventive Medicine

8. Epidemiology Directorate

9. Research Directorate

10. Reproductive Health Directorate

11. Integrated Primery Health Care Directorate

12. National HIV/AIDS control programme

13. National Malaria, Leishmania and Scistosoma control programme

14. National Tuberculosis and Leprosy control programme

15. National EPI  programme