Health Information System and Disease Surveillance
Situation Analysis and Model Proposal in Umbadda
Province Khartoum State (2000)

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Dedication

To all health and medical personnel in our lovely country
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Abbreviations

HIS  : Health Information System
HAS  : Health Area System
FMOH : Federal Ministry of Health
SMOH : State Ministry of Health
DGHS : Director General for Health Services
PHC  : Primary Health Care
SMA  : Service Medical Administration
D.S. : Disease Surveillance
M.I. : Medical Informatics
WHO : World Health Organization
Sur.S. : Surveillance System
CDC  : Centre for Disease Control
HMIS : Health Management Information System

MOH : Ministry of Health
DHIS : District Health Information System
H.Ws. : Health Workers
HFA : Health For All
DSS : Disease Surveillance System
E.D. : Epidemiology Department
H.C. : Health Centre
Abstract

A cross-sectional descriptive study was conducted in Umbadda province, Khartoum State during the year 2000. The main objective of the study was to evaluate the present Health Information System (HIS) and Disease Surveillance (D.S.) with the view of proposing a comprehensive model. The study mainly focused on analyzing the HIS and D.S. in the study area so as to draw lessons for improving the system. Qualitative as well as quantitative data were collected using pre-tested, pre-coded questionnaire, check-list and key informants depth interviews. The study revealed that the indicators used in HIS and D.S. are institutional and facility based. The system had no community indicators and had no information about those who have no access to the system or its workers. The private sector was not included in the system. The standardized registration books and forms cover only the governmental health facilities (31%) while the non-governmental (69%) were not covered. A lot of data were collected and reports were send to the high level on regular basis but analysis and use of data at the local level was not practiced at all. The training of health personnel in registration, reporting and simple statistical methods was poor. Feed-back process was weak and only 22.5 % of the health centres stated that it is practiced. The file keeping system was poor and 75 % of the health facilities had no places to keep the records. Lack of
communication, only 2.5% of the health centres had communication means. As regard the surveillance system, there was no standardized case-definition for the communicable diseases under surveillance. The system depends on (10) selected sentinel centres and no active surveillance is practiced. The number of population and maps for the catchment areas were not available except in 4 centres (5%) in which health area was tried. Registration of vital events was poor, birth certificate can be issued in 13.7% of the health facilities while death certificate was present only in 5% of the centres. Umbadda Province has no hospital to act as first referral level and to be supportive for PHC activities and training of heath cadre. Some of the health personnel had low awareness and weak commitment towards the HIS system. Duplication and waste existed because the system had many subsystems and vertical programmes send separate reports. The study recommended a set of recommendations at the provincial, state and federal levels to strengthen the system and to bridge the gaps as regards availability of standardized registration books, training of the health personnel in registration, reporting and simple statistical methods, training in registration of vital events, training in analysis and use of data at the local level. Inclusion of the private sector in the system, strengthening feedback process, increase awareness and commitment of the health personnel towards the system need to be added, and also increase the capacity
building of the system as regards to the communication, transportation means. Availability of suitable places for keeping the records and availability of qualified statistical staff in all centres should be considered.

Management Information Support Model for District Health System Based on Primary Health Care is recommended to be implemented by the health authorities all over the country.
يرجى التأكد من طريقة قراءة النص، فهذا النص كتب باللغة العربية.
لا يوجد نص قابلاً لقراءته بشكل طبيعي من الصورة المقدمة.
للبند اتخاذ مبادئ مساندة للمؤسسات الرقابية. يتطلب ذلك القيام بعدد من الخطوات الأساسيات، مثل:

- توفير المعلومات اللازمة للاستخدام.
- زيادة الوعي بشأن الأوقاف الموحدة.
- تسجيل النشاطات والأنشطة المختلفة.
- جمع البيانات والعمليات والقرارات.
- زيادة الوعي والإشراف على الأوقاف الموحدة.
- زيادة الأدوات المساندة.
- زيادة الوعي والإشراف على الأوقاف الموحدة.

الإشراف على الأوقاف الموحدة يمكن أن يؤدي إلى نوع من الأوقاف الموحدة. يمكن استخدام هذه الأوقاف الموحدة في الشمول في مجالات مختلفة، مثل:

- زيادة الوعي والإشراف على الأوقاف الموحدة.
- زيادة الوعي والإشراف على الأوقاف الموحدة.
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- زيادة الوعي والإشراف على الأوقاف الموحدة.
Chapter One

Introduction,

Literature Review

&

Objectives.
1.1 Introduction

The health Information System (HIS) is the process of collecting, analyzing, reporting, disseminating and using health information. The main purpose of (HIS) is the use of information for decision making and action taking for the enhancement of health care and the well being of the population \(^{(1)}\). The (HIS) in Sudan is designed according to the health care delivery and administration system. The organization of the health system and its infrastructure from the most peripheral (Community) level to the intermediate (district, provincial state) levels to the central (federal) level has undergone several changes in the last decade with changes in the political and administrative system in the Sudan. Since the adoption of the health area system (HAS) in 1988 and the federal system of government, the national health care system is as follows (Annex I): at the central level there is the Federal Ministry of Health (FMOH) in Khartoum. The FMOH is responsible for the formulation of national policies, strategies and programs, setting national standards, national training, supervision monitoring and evaluation and international health relations. In the states there is a state ministry responsible for running and administrating health services in accordance with national policies and plans. It is headed by a minister and a Director General for Health Services (DGHS). All health workers in the state are responsible to the (DGHS) and he in turn can delegate any of his powers to his assistants in the provinces and districts and rural medical inspectors or officers in health areas. The health area system is a new health management system developed to reform the health services at the rural and peripheral level by providing effective supervision, integration, coordination, collaboration, and professional management of these services. One of the main purposes and objectives of the health area system is to strengthen the health statistics registration/reporting system \(^{(1)}\) The (HIS) in Sudan includes:

- The (HIS) for Primary Health Care (PHC).
- The reporting system for hospitals.
• Reporting by regional health authorities.
• Reporting by the national authority.
• Reporting of notifiable diseases\(^{(1)}\).

Disease Surveillance (DS) as one source of data in (HIS) is defined as the ongoing systematic collection, analysis and interpretation of data on specific health events for use in planning, implementation and evaluation of public health programmes. Raska, 1965 defined (DS) much more broadly, including in his definition “the epidemiological study of disease as a dynamic process”. Surveillance has three basic elements, systemic collection of data, analysis and dissemination of these data to those who need to know. A (HIS) should provide information support for all decision making at all levels of health services, and should therefore fit into the overall management structure of the health services system\(^{(2)}\). It should provide reliable, relevant, up-to-date adequate, timely and reasonable complete information for health managers at all levels \(^{(3)}\). The (HIS) should inform the public, its political representatives, policy makers, administrators and providers about the nature and extent of the people’s health problems, and about the impact of a wide variety of influence, and services on those problems\(^{(2)}\). Management information systems need to be simplified and streamlined to meet local health management needs.

### 1.2 Justification

There are many reasons that justify the selection of this topic (HIS) and (DS) for research:
- It is an important area for research and the researches in (HIS) and (DS) in the Sudan are deficient.
- The development of effective (HIS) supporting the needs of health services at national, provincial and community level, contributes to the overall improvement of health services management, and can be a major tool for strategic planning.
- There is commitment by the Sudan government to the social goal of attainment by the people by the year 2000 A.D. of an acceptable level of health that will enable them to lead a socially and economically a productive life. The strategy for Health for All (HFA) is based on PHC and there is a growing recognition of the importance of high quality and well selected information for more efficient management decision making. Many, if not most, PHC projects have experienced difficulty in conceptualizing, planning, establishing and using management information systems effectively. Improved management tools and methods are needed. The evaluation of programmes related to health in different areas needs measurements based on statistical information.
- The limited scarce resources and the constantly changing status of these resources so we need accurate, reliable timely information for selection of priorities and how these resources be allocated best to do more for more with less. HISs are cost effective and most efficient means to improve health services and quality of care.
- All efforts which will be undertaken to implement the health area policy in Sudan are expected to fail without an effective HIS.
- Community mobilization and involvement needs information so as to respond and participate in the different health programs and activities.
Globally the eradication of polio-myilitis, neonatal tetanus and guina-worm diseases needs accurate information to achieve these goals.

Internationally, in 1973, the World Health Assembly stressed the need for the complete reconstruction of the (HIS systems).

A 1987 (WHO) report on “Evaluation of the strategy for (HFA) by the year 2000, Vol. 1, Global Review, emphasized that: "The main constraint reported by practically all countries is inadequate information for the managerial process to provide systematic and analytical information for continuous assessment of the situation, determination of priorities, improvement of management and evaluation. The information generated by the traditional health system is in most countries quite insufficient.”

Surveillance referred to as the cement that hold in place the corner stone of public health and it is viewed as an important tool for setting health priorities and specific objectives. The system in the Sudan, unfortunately is weak and not functioning well and effectively and need to be reviewed. It is hoped that by analyzing the HIS in Umbadda province, some important lessons may be drawn. These lessons may be of use in implementing better HIS and better health services in this province and in other areas in the country.
1.3 Literature Review
1.3.1 Health Information System (HIS)

1.3.1.1 Definition
The HIS is the process of collecting, analyzing, reporting, disseminating and using health information \(^{(1)}\). Two typical and influential definitions of medical informatics one reflects European perspectives while the other demonstrates the American viewpoint. Both emphasise the technology and methodology and refer to disciplines and practice areas \(^{(2)}\). The European definition says “Medical Informatics (M.I.) is an umbrella term referring to the application of methodologies and techniques of information science, computing, networking and communication to support health and health related disciplines such as medicine. The definition “M.I. is the field concerned with the cognitive, information processing and communication tasks of medical practice, education and research including the information science and technology to support those tasks. The methodologies for processing and communication of information may be viewed as both a science and technology \(^{(2)}\). M. Power said “I find these technology-oriented definitions of M.I. unsatisfactory. I prefer a definition that is more clients and purpose-centred such as the definition developed by the Medical Informatics Group at the University of Manchester. “M.I. is the responsible use of information in support of health care”. However, this statement needs to be augment with explicit descriptions of: the stakeholders: they are the customers and clients for whom services are provided.

“The mean”: how these services are provided.
“The ends”: the ultimate aims and objectives in terms of - health and health care for individuals and communities - the tasks of managing health care facilities and services - the ethical use of personal information \(^{(2)}\).

1.3.1.2 Objectives and Purposes
The main purpose of (HIS) is the use of information for decision-making and action taking for the enhancement of health care and the well-being of the population\(^{(1)}\).

The objectives of (HIS) as stated by its director:-

- To find out the necessary health indicators to manage the health services and to plan for future.
- To provide reliable, relevant, up to date, adequate, timely and reasonably complete information for health managers at all levels.
- To evaluate the health status of the population.
- To prevent and control epidemics.
- To promote registration for vital events (births and deaths).
- To keep medical records in different health institutions.
- To raise the awareness of the health personnel to provide and use of health information.
- To train health cadre in registration and reporting.

The main purpose of a health care information system should be to foster the well being of the population it serves, not to maintain bureaucratic or organizational power \(^{(4)}\). Decision making by providers of health care should be supported by information that is timely, relevant and complete, allowing services to be run efficiently and cost effectively and contributing to the achievement of policy and planning objectives. Such information also makes it possible to evaluate services, anticipate the needs of communities and assess improvements in health which are attribute to interventions \(^{(5)}\). One of the most critical factors in improving management is the availability of information to support rational and effective decision making. Health and management information system design and implementation are therefore seen as an important technical and financial investment to support all levels of the health system \(^{(6)}\). In recent years, considerable interest has been focused on the need to reform information systems as a way of improving health care delivery. The impetus for the development of improved information systems for health has come simultaneously from several directions \(^{(7)}\). It should be born in mind that the collection, compilation and analysis of data are not ends in themselves \(^{(4, 8)}\).
1.3.1.3 Principles and Requirements of HIS
The principal requirement for monitoring and evaluation of health development is national capability to produce adequate information support to the managerial processes of such development. The efficient collection, processing and dissemination of the most relevant information at all levels of the health system are essential. Even more critical, however, is the utilization of these data for management decision making purposes \(^{(9)}\). It is evident that the definition of information needs and indicators requires consensus-building among all the actors involved in collecting data and using them. It is necessary to take into account the concerns of both the users and the providers of services information that is gathered should be user-oriented and designed to meet the needs of service management, planning, policy formulation and medical audit. It should be periodically reviewed so that the evolving requirements of administrators and planners can be met \(^{(10)}\). There is no doubt that health information and its use are vital to health services. This has to be appreciated by all health workers and the communities they serve if PHC is to function effectively. PHC demands a partnership between its providers and recipients which can grow and become meaningful only if based on accurate information understood by both partners \(^{(11)}\). It has been argued that health information systems are peculiar to the countries that develop them and that no models can be universally applied \(^{(11)}\). It is possible to give some basic principles that could guide the acquisition of data for the system \(^{(12)}\):
- The data should be person-specific i.e., able to describe health problems, attributes, events, activities, services and outcomes in terms of numbers of individuals possessing them.
- The data should be population based. The system must have the capacity to make comparisons within and across geopolitical
boundaries. For the equitable distribution of resources on
the basis of need, politicians and planners require such
comparisons, and information expressed as numbers of
persons,
rather than rates, is generally most useful \(^{(12)}\).
- The data should be problem-oriented. The system must start
  with the identification, labeling, classification and
  counting of the people’s perceived problems.
- The data should be provider-specific. The system must have
  the capacity to identify where and by whom a service was
  provided. The effective deployment of resources implies a
  requirement that they be related to the distribution of the
  people’s problems over space and time \(^{(12)}\).
- The data should be procedure-or process-specific. The
  system
  must have the capacity to identify the forms of
  interventions
  used, in order to enable monitoring of the distribution,
  quality and appropriateness of care.
- The data should be period specific, that is, the system must
  have the capacity to relate persons and places to periods of
  time.
- The data should be practical, as easy to acquire as possible
  and able to serve multiple purposes. The system should not
  collect data that there is not a clear need. A sound rule
  is:
  when in doubt, leave it out!
- Standardization of data systems is very important if they are
  to operate to best effect \(^{(12)}\). National health information
  system should be integrated, with full recognition of the
  nature of the subsystems or components \(^{(13)}\).
- The system should employ functional and operational terms and the system should express information briefly and imaginatively e.g. tables, charts, percentages.
- The system should make provision for the feedback of data\(^{(3)}\).

**1.3.1.4 Component of a HIS**
The (HIS) is composed of several related subsystems. A comprehensive (HIS) requires information and indicators on the following:

1. Demography and vital events.
2. Environmental health statistics and occupational health.
4. Health resources: facilities, beds, and manpower.
5. Utilization and non-utilization of health services.
7. Financial statistics e.g. cost, expenditure related to the particular objective \(^{(3)}\).

**1.3.2 The National Health Information Centre Khartoum-Sudan**
It is found in the FMOH. It is the national authority responsible for the design of the (HIS), standardizing health information forms, registers and procedures, training and general supervision of health information and vital statistics activities. The data received by the department are compiled, sorted, analyzed and documented in forms that can indicate the state of health and well being of the citizens and can be used for decision making, action taking and research. The department publishes an annual report of vital statistics which is an important document \(^{(1)}\).

**1.3.2.1 Historical Background**
The committee of the national strategy for health development stated in its objectives the generalization and modernization of HIS. As information is the basion which planning for health
is built and information is also the base for indicators used for different activities in the prevention and control of different diseases. The (HIS) in the Sudan had passed through different stages:

1 In the period from 1921 to 1957: At that period collection of data from different departments and sent for the head office of medical services which prepare the annual report.

2 In the period from 1957 to 1965: The department at that period was called the heath statistics and international health. It started after the independence of the Sudan with the support of WHO. The main activity of this department at that time was the notification of communicable diseases and especially the outbreaks and the preparation of the annual report.

3 In the period from 1965 to 1975: In the year 1965 the department of health statistics separated from the international health and called the directorate of vital health statistics. The work started by collection of data for the monthly report, weekly report and the annual report. In this period there was great attention for the vital statistics (births and deaths) and analysis of data to study the magnitude of morbidity and mortality of different diseases. There was also the attention for the financial and manpower resources and its relation with the population. That period witnessed the development of manpower and training of the health cadre and the coverage of all health facilities with statistical services. This directorate at that time belongs to the social and preventive medicine department.
In the period from 1975 to 1992: At that time the name of the department was changed to health statistics and research directorate due to the following causes:
- The expansion of work and training of health personnel in registration and statistics.
- The directorate started to calculate mortality rates from different diseases.
- The development of skills in research to find explanations for these morbidities and mortalities.

The department provided the information on which based the different plans and programs at that time. The directorate did many health surveys separately and jointly with other department e.g. epidemiology department.

1.3.2.2 The national health information centre (1992)
The different committees of the comprehensive national strategy stated that the strategy for health development depends on information and statistical indicators:
- The interrelation between health, economic and social activities in the country.
- The different new programs implemented for achievement of health for all by the year 2000 through PHC.
- The new direction of the country by implementing the federal type of authority.
- The direct effect of the information system in measuring the achievement of the objectives of the health development.
- The committee touched the absence of the concept of health statistics in the health cadre and the poor awareness by its importance and uses. Add to this the limited resources as regard the financial and manpower in the directorate of health statistics which is not going with the objectives of the country in the comprehensive national strategy. Due to the above mentioned points the committee of the health development
strategy decided the change of the health statistics and research directorate to the national health information centre with federation authority and as one of the different departments and directorates in the FMOH under the authority and support of the first under secretary. The following program was suggested by the committee of the health development strategy.

1. Construction of the national health information centre and the national bank of health information.

2. The support for health statistics training centre for training of the workers and giving the chance for the training of university graduates for high studies in health statistics.

3. Generalization of the health statistics services in all health facilities at all levels.

4. Provision of trained cadre in the short and long run.

5. Continuous and accurate estimation for the financial and manpower resources in the health fields and production of indicators for equal distribution of these resources.

6. Provision of essential information about attitudes and directions of population towards health.

7. Provision of comprehensive map about endemic and epidemic diseases to study changes and trends of these diseases in general and those due to industrial and agricultural expansion in particular.

8. Attention for health economics and the study of economic impact of the important diseases and the sickness absentee for different diseases.

9. Attention for registration of births and deaths and generalization of this registration in urban-rural areas to increase the coverage from 25% to 100%.
Availability of death statistics by its cause so as to measure the fatality rate of different diseases and to measures the efficiency and effectiveness of different preventive programs e.g. immunization programs.

1.3.3 Sources of Health Information
The lifeblood of HIS is the routine health statistics. Information requirements will vary according to the administrative level at which planning is envisaged. The different contexts require different sources of information.

1.4.3.1 The Census
It is important source of HIS. It is taken in most countries of the world at regular intervals, usually of ten years. United Nations defines a census as “The process of collecting, compiling and publishing demographic, economic and social data pertaining at a specific time or times, to all persons in a country or delimited territory (3). It provides a frame of reference and base line for planning, action and research in different fields. Without census data, it is not possible to obtain quantified health, demographic and socio-economic indicators.

- The Registration of Vital Events:
It keeps a continuous check on demographic changes. If registration of vital events (births, deaths) is complete and accurate, it can serve as a reliable source of health information. Much importance is therefore given to the registration of vital events in all countries. It is the precursor of health statistics. Over the years, it has dominated the HIS (3). The United Nations defines a vital events registration system as including “Legal registration, statistical recording and reporting of the occurrence of, and the collection, compilation, presentation, analysis and distribution of statistics pertaining to vital events i.e. live births-deaths, foetal death, marriages, divorces” (3).

1.3.3.2 Notification of Diseases
Historically notification of infectious diseases was the first HI subsystem to be established. The primary purpose of notification is to effect prevention and/or control of the disease. Notification is also a valuable source of morbidity data i.e., the incidence and distribution of certain specified diseases which are notifiable. Although notification is an important source of HIS, it is common knowledge that it suffers from many limitations:

- Notification covers only a small part of the total sickness in the community.
- The system always suffers from under-reporting.
- Many cases especially a typical and sub-clinical cases escape notification.
- The accuracy of diagnosis and thereby of notification depends upon the availability of facilities.

In spite of these limitations, notification provides valuable information about fluctuations in disease frequency. It also provides early warning about outbreaks of diseases. The concept of notification has been extended to many non-communicable diseases (3).

1.3.3.3 Hospitals and Health Facilities Records

Hospital data constitute a basic and primary source of information about diseases prevalence in the community. The eighth report of the WHO Expert Committee on Statistics (3) recommended that hospital statistics be regarded in all countries as an integral and basic part of the national statistical programme. The main drawbacks of hospital data are:

- They provide information on only those patients who seek medical care, but not on a representative sample of the population.
The admission policy may vary from hospital to hospital, the hospital statistics tend to be highly selective.

The population served by the hospital is difficult to be defined. Therefore, hospital statistics are considered a poor guide to the estimation of disease frequency in a community. In spite of these limitations a lot of useful information about health care activities and utilization can be derived from hospital records and this information may be of great value in the planning of health care \(^{(3)}\). For the development of hospital statistics, the importance of establishing a medical record department in each hospital cannot be over emphasized. Hence, computerization of medical records will enable medical care to be more effectively rendered, better planned, and better evaluated.

1.3.3.4 Disease Register
A register requires that a permanent record be established, that the cases be followed up and that basic statistical tabulations be prepared both on frequency and on survival. Morbidity registers exist only for certain diseases e.g. Malaria, tuberculosis, leprosy. Even in the absence of a defined population base, useful information may be obtained from registers on the natural course of the disease \(^{(3)}\). If the reporting system is effective and the coverage is on a national or representative basis the register can provide useful data on morbidity from particular diseases, treatment given and disease specific mortality.

1.3.3.5 Epidemiological Surveillance
Where particular diseases are endemic, special control/eradication programmes, surveillance systems are often set up to report on the occurrence of new cases and the efforts to control.

1.3.3.6 Environment Health Data
Environmental data can be helpful in the identification and quantification of factors causative of disease. Collection of environmental data remains a major problem for the future \(^3\).

**1.3.3.7 Population-Surveys**

A HIS should be population-based \(^{12}\). The routine collected data do not provide all the information about health and disease in the community. This calls for population surveys to supplement the routinely collected statistics.
1.3.4 Disease Surveillance (DS)
1.3.4.1 Definition:
The term DS is used in two rather different ways, first it can mean the continuous scrutiny of the factors that determine the occurrence and distribution of disease and other conditions of ill health. It is thought to be essential for effective control and prevention and includes the collection, analysis, interpretation, and distribution of relevant data\(^{(14)}\). Such a broad definition almost equates D.S. with routine HIS and the two can therefore considered together. The centre for Disease Control and Prevention in Atlanta, Georgia in the United States (CDC), defines epidemiological surveillance as the ongoing and systematic collection, analysis and interpretation of health data in the process of describing and monitoring a health event. Langumir, 1963 described the scope of D.S. of the collection, analysis and dissemination of data which did not encompass direct responsibility for control activities\(^{(15)}\). Raska, (1965) defined as much more broadly than Langmuir had, including in his definition “the epidemiological study of disease as a dynamic process”. Thacker and Berkel, 1983 explained that the word “Surveillance” which refers to the activity of watching over (a person or area), presumably for the purpose of direction, supervision or control\(^{(16)}\). The word surveillance refers to the systematic collection and use of epidemiological information for the planning, implementation and assessment of disease control; surveillance therefore implies ‘information for action’\(^{(17)}\). D.S. is essential for public health and it is said that “one should not practice public health without a surveillance system (Sur.S.) Shira, 1992\(^{(18)}\) so there are three basic elements of (Sur.S.), systematic collection of data, consolidation and evaluation of these data to those who need to know. The ultimate aim of (Sur.S.) is to support sound decision-making at the different
levels. The overall effectiveness of D.S. is measured by the outcome.

1.3.4.2 Purposes and Uses of Surveillance

The uses of Surveillance Data are quoted from Stephen as follows (19)

- To detect epidemics and out breaks and to ensure that effective action to control the disease is being taken (16).
- To document the distribution of health events.
- To test hypothesis on timely basis and to facilitate epidemiological and laboratory research.
- To monitor a risk factor and to identify high risk groups.
- To evaluate control measures.
- To facilitate planning.
- To monitor disease trends so as to adjust plans to meet current needs.
- Assessment of whether targets have been reached (19).
- Monitor disease trends so that planning can be adjusted to meet new situations (14).

1.3.4.3 Principles of Surveillance

According to CDC guidelines an effective (Surveillance System):

- Addresses health events which are of considerable public importance.
- Identifies and correctly classifies a large proportion of target health events.
- Correctly reflects the distribution of events overtime place and persons.
- Consists of components which include clear definitions of health events under surveillance, clear and logical path for
data flow, adequate knowledge of the population under surveillance and defined and appropriate methods for collection, analysis interpretation and feedback of information.

- Gives rise to meaningful and effective public health action based on the data processed in the system.
- Is uncomplicated.
- Is adaptable and responsive to new demands.
- Engenders a high level of participation.
- Provides information rapidly enough to allow effective action to be taken.
- Requires minimal appropriate resources\(^{(14)}\).
- Flexibility: does the system have the ability to change to collect new or different information if the need arises.
- Acceptability: is the system well accepted by the people who collect and utilize the data.
- Sensitivity: does the system pick up a high percentage or at least a consistent percentage of the cases.
- Predictive value positive (of the persons identified by the surveillance system as having the disease, how many actually have the disease.
- Representatives are the findings from the system representative of the population covered by the system.
- Uniqueness: does the system unnecessarily duplicate other data collection efforts\(^{(20)}\).

1.3.4.4 Surveillance Methods
1. Routine reporting systems.
2. Sentinel reporting systems.
3. Surveys and special studies.
5. Vital registration systems.

1.3.4.5 Surveillance Procedures\(^{(14)}\)
This describes how to design and operate a Surveillance System using one or more of the methods above:

1. Specify the objectives of the system.
2. Define the Surveillance data to collect.
3. Select the Surveillance methods.
4. Develop the data collection procedures.
5. Collect and tabulate the data.
6. Analyze the data.
7. Take action.
8. Prepare and present reports.

1.3.4.6 Limitations of Surveillance

Surveillance is a labour intensive. It requires many efforts to collect the needed data. Tabulation and analysis is also time consuming. Also it can take several years of data collection before trends can be identified. It is difficult to assess the impact if the target population is small. Large population is needed to compute rates especially mortality rates. Reporting of surveillance data is often incomplete especially from remote area (14). Surveillance generally does not include all the cases of a disease or event, additionally the cases coming to the attention of a Surveillance System are usually somewhat biased since they are based on people who voluntarily seek health care. Because of these problems, caution is required in the interpretation of data, and Surveillance data alone should generally not be used to make broad conclusions (20).

1.3.4.7 The Disease Surveillance System in the Sudan

The Disease Surveillance System (DSS) belongs to the Epidemiology Department (ED) in SMOH all over the Sudan. Every state sends weekly report to E.D. in the FMOH in Khartoum about the diseases under surveillance. The list of the diseases under surveillance includes:

- Laboratory malaria.
- Clinical malaria.
- Typhoid.
- Measles.
- Hepatitis (Jaundice).
- Whooping cough.
- Meningitis.
- Adult tetanus.
- Neonatal tetanus.
- Flaccid poliomyelitis.
- Diphtheria.
- Cutaneous leishmaniasis.
- Abdominal Leishmaniasis.
- Mumps.
- Chicken pox.
- Rabies.
- Pulmonary tuberculosis.
- Watery diarrhea.
- Bloody diarrhea.

The weekly report about these usually comes from the northern states while the southern states they do not send any reports and this due to the circumstances of the war. As regard the northern states, Kordofan and Darfour States usually they are not regular in sending the reports.

These information in the weekly report are usually hospital and health facilities based (passive surveillance). The ED in FMOH prepare weekly report from the reports of the states with simple analysis and comparison between different weeks in the different states and the different weeks in one state and general comparison with the same week of the last year. The FMOH distribute the weekly report about communicable disease under surveillance to the different health facilities and to the different schools of medicine and other concerned sectors.

1.3.5 Historical background of HIS and DS in the World
The roots of analysis of surveillance data can be traced to the 17th century. Libnitz, 1980 called for the establishment of a health council and the application of a numerical analysis in mortality statistics to health planning \(^{(21)}\). Graunt in his book “Natural and political observations made upon the Bills of Mortality”, he attempted to define the basic laws of natality and mortality. He developed some fundamental
principles of public health surveillance including disease, specific death cause, death rates and the concept of disease patterns \(^{(21)}\). Achenwall introduced the term statistics which over the next decades vital statistics became more widespread in Europe. Two prominent names in the development of the concept of public health surveillance are Lemuel Shattuck and William Farr. Shattuck recommended a standardization of causes of diseases and deaths and collection of health data by age, sex, occupation … etc. He introduced these concepts into the teaching of preventive medicine \(^{(21)}\). William Farr, 1807-1883 was recognized as one of the founders of modern concepts of surveillance. In 1897, William Farr used routinely collected mortality data to describe the impact of epidemic influence in England and Wales \(^{(22)}\). Alexander Langmuir developed the concept of surveillance as the routine process of collection analysis and dissemination of health data \(^{(15)}\). The concept of epidemiological surveillance has expanded to include broader issues in public health and the application of new methodologies \(^{(16,23)}\). Farr concentrated his efforts on collecting vital statistics, on assembling and evaluating those data and on reporting to responsible health authorities. In Europe compulsory reporting of infectious diseases began in Italy in 1881 and in Great Britain in 1890. In the United States a law was enacted in 1839 to provide for the collection of information each week from states and municipal authorities through the country \(^{(21)}\).

1.3.6 The Situation of HIS and DS in different countries
Frank 1966 advocated a more comprehensive form of public health surveillance and delineated governmental measures to protect the public health \(^{(21)}\). World health assembly 1968 focused on national and global surveillance of communicable disease, applying the term to monitoring targeted disease rather than monitoring the individuals whom had those diseases. Langomuir 1976 indicated that the CDC in Atlanta
since its creation in 1940 began contributing to the developing science of surveillance, analysis of mortality and morbidity \(^{(22)}\). In the middle ages governments in Western Europe assumed responsibility for both health protection and health care of the population \(^{(24)}\). In Peru in Western South America, infectious diseases continue to be the principal health problem. In 1980, the general director of epidemiology was in charge of a number of disease specific programs. The routine data collection system of the ministry of health was centralized and complicated. Information was processed and analyzed extremely slow and was not available on timely basis. Newspapers and rumors were the principle source of notification of out-breaks. After six years, in 1987 a new surveillance system was organized by members of the office of active epidemiologic surveillance and health officers from the different health regions. The objective of this system can be summarized in three words “Information for Action”. The most important step in creating this Surveillance system was the decision to begin \(^{(25)}\). Akey conclusion is that a simple well communicated surveillance system in place will facilitate the prevention, control and treatment efforts \(^{(25)}\). In Zimbabwe, initial surveillance efforts were built around notification of communicable diseases and gradually broadened to include health service, coverage and utilization and also health resources and non-communicable disease \(^{(18)}\). The disease surveillance system in the city of Bulawayo, Zimbabwe is complex. It reports on 94 health events, of which only six have standard case definitions. The system has no plans on how data should be analyzed, used and disseminated. The system is potentially useful in detecting trends of diseases, however the long delay between data collection and data analysis does not allow for early detection of epidemics and clusters of diseases may be missed. A simpler and less time consuming surveillance system should be started to improve the systems
attributes particularly timeliness of reporting and acceptability of the system to those who have or need to participate (26).

Epidemiological surveillance is the systematic collection, analysis, interpretation and evaluation of public health programs. The application of these data to disease prevention and health promotion programs completes a surveillance cycle in public health (15). Established Surveillance systems should be periodically reviewed on the basis of their quality as well as their usefulness and cost, they may then be modified accordingly (27). Most published evaluations of surveillance systems have been limited to infectious diseases, (16,28,29) although there have been some efforts to assess the appropriateness of various data sources for the surveillance of other kinds of health problems (30,31,32). A surveillance system is useful if it generates a public health response leading to the control and prevention of adverse health events. An addition on consideration is the extent to which the knowledge obtained from surveillance data about the epidemiology of a health event leads to a better understanding of a health problem (e.g. the identification of foreign travel as a risk factor in disease transmission (33,34,35,36)). The simplest way to assess usefulness is to ask those involved in public health practices. Surveys of public health officials at the state and local level e.g. have indicated the routine notification disease reports for viral hepatitis and measles are useful for disease prevention and control (37,38). Among rigorous approach to define usefulness is through assessment of the impact of surveillance data on polices and interventions, and ultimately their impact on the occurrence of a health event. While policy analyses have been conducted elsewhere in health, there are no such studies in surveillance system (39). In general, surveillance should only be established
if the information obtained may be expected to be used for control measures \(^{(40)}\).

The surveillance system should be designed in such away it reaches those who need to take action in time. Whatever options are chosen, no single system is likely to provide all the required information, or to provide perfect information. Since no one source is usually adequate, good public health decision-making requires the synthesis of data of varying quality from a wide range of sources as well as the critical interpretation of findings \(^{(41)}\). Valleron and Garnrin, 1992, explained that the French Communicable Disease Network (FCDN) was conceived in 1983 as a national communicable disease information system with a sucomponent. The basic idea was to use computer networking to link all health system partners who were responsible for recording surveillance data on communicable diseases \(^{(42)}\).

Surveillance for communicable diseases is the main public health activity in China. In 1959, a system for reporting infectious diseases was established, in 1989, a National Antiepidemic Computer Telecommunication Network (NACTN) was established as an official information system for the Chinese national disease reporting system. The ministry of health and provincial centres of health support this network which has been effective in monitoring disease epidemics at various levels. As technical facilities of the network improve, the use of the NACTN will expand into all aspects of public health surveillance. Disease surveillance points are surveyed annually to estimate under reporting of births, deaths and morbidity due to infectious diseases, Chen, 1992 \(^{(22)}\).

In India, a computer-based national HMIS is being implemented by linking more than 450 districts on a network. This and other actions in the field of informatics technology could
significantly raise the efficiency of the country’s health sector by making decisions more logical, speeding them up and monitoring their impact, and could help to improve the utilization of scarce resources \(^{(43)}\). In Singapore there is a well-developed HMIS built on the routine reporting of utilization and activity statistics from public and private sector. In addition, there is a computerized national surveillance system for disease monitoring. This forms the basis for the Computerized National Health System known as “Medint” which greatly facilitate medical audit in Singapore\(^{(5)}\).

The subsequent development and use of computer-linked telecommunication networks has decreased the time of data turn around and enabled more complete analysis of reports \(^{(27)}\). Experience shows that the international transfer of technology in general and health care technology in particular plays a crucial role in the process of socio-economic development in the third world \(^{(44)}\). In Togo, West Africa since 1988, the MOH with technical assistance from CDC, has systematically adapted and strengthened its (HIS) to enable improved monitoring of trends in diseases. The previous system had been hampered by complicated, lengthy, reporting forms, incomplete and delayed receipt of reports, absence of mortality, reporting, slow cumbersome manual compilation and analysis methods and lack of standard case definition. To simplify the adaptation process, the system was divided into three main activities: data collection, data complication and analysis and dissemination of reports and follow up action. Public health authorities in Togo have built on existing strengths and successfully adapted the (HIS) to focus on national morbidity and mortality prevention priorities \(^{(26)}\).

In Ghana between 1990 and 1993, a series of steps were undertaken to review the existing vertical reporting
procedures and to develop an integrated Health Management Information System (HMIS) for (PHC). These steps include a situation analysis of the existing reporting systems, participatory design of tools for planning, data collection, feedback and reporting, training of staff at all levels, development of tools for self assessment and stimulation of routine feedback to lower levels and reporting of analyzed indicators to higher levels. There were some notable achievements which included promotion of self-reliance, improved data relevance and accuracy as well as strengthened supervision and support. However reporting was still given a greater priority than analysis and use of data, systems for collection and use were still cumbersome and time consuming. It is also difficult to prove that having better information really improves decision making or even coverage and quality of PHC service delivery (6).

In South Africa, an outline is given of the development of health information standards framework, the main emphasis has been in the development of data standards (45). The creations of health districts to implement and manage PHC are control to the reconstruction of the health system in South Africa. One of the key mechanisms identified for driving this process is the development of a locally useful (HMIS). The Health System (HS) was fragmented and centralized, and the priority of the new government is to establish an integrated and decentralized district health system of which a key element is the development of district HMIS. Much time is used on data collection, but information is not used at local level. A prerequisites for a successful district HMIS include local ownership and motivation, a process based a round existing local management structures and the involvement of the community (46).
In Papua – New – Guinea, information on the number and causes of deaths are usually derived from death certificates and health facility discharge summaries. There are usually several causes of errors in the routine collection of this information. A criteria audit of death certificates is presented to assess these sources of errors. This procedure involved the systematic and critical analysis of hospital mortality as reported in death certificates. The audit is simple, cheap and useful for monitoring the quality of information which will be used in health planning and management (47). In Papua – New – Guinea over the past few years, the department of health recognized a number of weaknesses. The government committed itself to a policy of decentralization, and they recognized the importance of strengthening the management capacity of district offices. District Health Information System (DHIS) was started a health information policy to guide the work and included in the national health development plan. The main output of (DHIS) was the summarized data on a number of health services indicators for district level health managers. Training on how to use the reports was done. The system extended to other districts; however some problems remain to be solved:

- Outputs of the system are not sufficiently used by managers for monitoring, or for providing improved supervision and feedback to health providers.
- (DHIS) does not include district hospital data. Indonesia’s past experiences when the HIS was organized vertically to support the needs of special programs. The intermediate levels were left out of the process of data analysis and therefore were slow to respond to decision taken at central level. The present policy of decentralization is designed to address this problem but to be really effective will need the development of (DHIS) to support managerial decision-making. Training of
the staff in using the locally available information must be an integral part of the development of such a system \(^{(48)}\).

- The overall HIS in Indonesia comprises numerous components which require more adequate means of integration. Formerly, data passed from the periphery of the system to the center with little analysis at district level, at present data sent to the districts from the periphery and distributed to respective program managers at district level to process, analysis and utilize. There have been many innovations to encourage local use of information\(^{(48)}\).

- In Nepal at present data processing for the reporting and collecting system is carried out at the national level, but a new information policy aims to strengthen the districts to coordinate the HIS. The HIS needs to become a tool for investigating problems and to initiate appropriate action to overcome them. Mid level health managers in a developing country were studied to examine the extent to which they are able to use and analyze data they receive. Among 168 filling a self-administered questionnaire, 52% could compute a simple cost effectiveness ratio and 27% were able to calculate proportions. Only 43% were able to construct a cumulative graph similar to the one recommended by WHO. The results of this study suggest:

  - Training managers in depth analysis and user is critical if HISs are actually needed to improve health care delivery.
  - Data needed to be presented in a simple way.
  - Efforts ensure the use of data \(^{(49)}\).
Many HISs provide data of doubtful value which often remained unused. HWs in Zambia are often faced with a situation in which the information to hand is not needed. The data that are available are often unreliable or arrive too late to be of use (50). Any HIS should not collect data for which there is not a clear need. Every health care administrator and statistician should be given a copy of Finagles Laws of information, which run thus. The information you have is not the information you want! The information you want is not the information you need! The information you need is not what you can get! The information you can get costs more than you want to pay (12,51).

The presents HISs have been organized on a top down basis to satisfy the needs of central government and that had led to a situation in which front-line HWs have become alienated from these systems. Professor Opit is right when he makes the point that we must attempt to get the data we need and that we should not accept Finagles Law as unavoidable. We live in a time when information is becoming more important than actions; the collection, compilation and analysis of data are becoming ends in themselves. Has the increased collection and analysis of data improved people’s welfare? (51,52).

The collection of data nationally, it is of the top-down kind, those at the top ask questions while those at the bottom are persuaded to given answers. Along time usually elapses between the collection of answers and the first availability of analyzed results to those at the top. Again the provider of the primary information is functionally and physically remote from those who carry out the analysis. Health information managers are often reluctant to explain that the aim is to identify problems, facilitate the administrative works and improve health conditions. The situation is made worse by the multiplicity of records used in information gathering. There is a tendency to concentrate on the use of complex and costly
and technologies without considering whether adequate manpower and financial resources are available\(^{(4,51)}\).

There is lack of cooperation between different services in the health sector and between it and the different related sectors with regard to the utilization of data collected and indicators calculated. Decisions are often taken without reference to indicators, either because expertise is lacking or because of an absence of confidence in the information available. HWs in most countries are in undated with forms that they are expected to fill in even though their purpose may be far from clear. The workers are allocated little or no time to collect, collate and analyze data and interpret them for the local communities and this due to training is inadequate and thus newly qualified HW is ill prepared. Supervisors also have inadequate training and are unable to provide support. No one appears interested in the problems faced by HWs who are rarely visited or supervised, their reports are rarely commented on and they have to guess at what will satisfy the form-users. It was recognized that if PHC was to be successfully implemented, the basic training of nurses would have to change\(^{(4,10)}\).

Inefficient communication may make it impossible to provide the right person with the right information at the right time\(^{(4)}\). The same and similar problems appear to exist in many countries, a review of the HIS in Zambia yielded the following list of major factors that hinder effective reporting, collection and interpretation of data: \(^{(4)}\)

- There are too many forms are now in use, and they are too complicated and result incorrect reporting.
- There is frequently a lapse of 4-5 years between data collection at the centre and the compilation and publication of results.
Data summaries which would be useful to local health centres staff are not sent.

Present recording methods on monthly report forms do not provide the epidemiologist with sufficient data.

There is a shortage of stationary and forms. Lack of transportation and communication means.

Shortage of personnel to compile statistics and few qualified are available.

Data are least reliable at health centres, H.C. staff do not appreciate the purpose of the data collected, submit in fated figures in the mistaken belief that they are performance indicators rather than indicators of community health status. The problem is also related to the fact that the process of data collection is not seen as being immediately relevant to service delivery. It is clearly vital that H.C. staff should learn to appreciate the importance of statistics by being trained in simple data analysis and interpretation. One of the first steps in this process is to involve them more directly in data collection at the community level (50).

In Fiji there was a manual routine reporting system for its health activities, but this has proved cumbersome with excessive data collection and reporting. As a result little use has been made of it at any level for management or planning. The lack of relevant information has made it difficult to argue effectively for reallocation of resources from curative care to preventive care. The system has been revised as part of a wide process of decentralization of the health services (48).

In Spain, although epidemiological surveillance includes originally a strategic function, beyond epidemic control, the communicable disease control system has the only surveillance scheme. This system suffers a severe crisis, probably due to
the scarce uses of the information. In the last few years information sources and procedures have been developed out of the official surveillance. Moreover national and regional health plans which signify special health objectives entail information tools with ability to rank and evaluate the interventions. The conclusion is that the expression public health surveillance defines much better the functions of:

- Monitoring and evaluation of the health policy.
- Detection and research of epidemics \(^{53}\). In Australia national health care system is facing major administrative dilemmas which are the need to reform practices associated with massive data – information over load. The current system is burdened with paper – based administrative forms, patient's records, files referral notes and other manual methods of data organization. An integrated computer-based information system may be perceived as an attractive solution to such burdens. The Health Workers (HWs) have to adopt and develop more efficient information management practices, health indicators and better practice care methods \(^{54}\). In Seoul, Korea, the (HMIS) increased the productivity and satisfaction of staff but did not increase decision level, and that it succeeded in increasing the satisfaction with the services for the visitors. 1980 the MOH decided to develop a medical care IS in order to support PHC and to increase the public health sector’s role in health care. In reviewing the situation the users have many problem:

- Poor communication between developers and users.
- Lack of understanding of computer operations.
- Inconsistency in paper forms and formats.
- Lack of determination to improve work improvement and other problems concerning the developers:
- Limitation in manpower resources.
- Insufficient time for system development.
- No previous work experience in health sector.

The system mainly produces administrative reports and does not yield information to monitor performance with regard to target achievement. Targets are centrally set and pass down to the local level \(^{(48)}\). Many examples illustrate clearly how the Philippine health department has used surveillance as a tool to guide policy, resource allocation and program management \(^{(21)}\). Priority was given in Philippine to reduce the burden of the most peripheral HW in data handling, through consultation and negotiation a consensus was reached with regard to data items and the channels for reporting. Emphasis was placed upon initial training of HWs in the use of data collection forms, and further training will develop skills in information use\(^{(48)}\). Sharma in India proposed a mof HMIS with reference to malaria 1992. The objective of this model is to reduce the workload of HWs at all levels. Forms in used had been updated and reduced. The model is expected to save the working time of HWs and supervisors at PHC level, district, state and national level. The data are expected to be of high quality and accuracy\(^{(55)}\). In Thailand there is a routine administrative HIS similar to those of other countries but has given priority to a national wide rural development information system since 1985.

In 1987 the system has been integrated with community development information system based on the basal minimum needs approach. A common feature is the integration of data collection from different sectors, facilitating abroad based approach to development including PHC. The success of Thailand in this approach is partly due to the fact that while there is emphasis on community involvement the basal minimum needs/national rural development systems are strongly promoted and controlled from the centre level \(^{(48)}\).
HIS should be ‘action-led’ rather than ‘data-led’, the latter approach sees data as the end in itself. The action-led in contrast, regards information as needs to interventions with a focus on how information will influence decisions. What are needed are not necessarily more information but more use of information \(^{(56)}\). The major obstacles facing the health sector in developing countries can be divided into four interrelated sets of factors:

- Lack of appropriate national policy formulation and organizational style.
- Inadequacies in infrastructure and ineffective health care technical services.
- Shortage of capable human resources, inadequate experts and ineffective training system.
- Insufficient information support and the lack of effective information systems \(^{(51)}\).

An enormous amount of information never serves a useful purpose because there is no system to make it available to the right people at the right time and in a form that is easy to understand. In order to develop (DHIS) it is necessary to start with a small trained staff committed to an agreed conceptual framework and to a set of organizing principles. To focus on common health problems and to express findings in graphic formats. It is better to employ limited sets of basic uniform terms, definitions. In general HIS should be developed from the bottom up rather than from the top-down. Although the leadership and even the overall design of the system may originate at the national level, it should never be forgotten that the sole objective of the system is to serve the needs of all the people \(^{(12)}\).

One major problem with the concept and design of the NHIS is that countries tend to have different concepts of NHIS and it’s objectives. The majorities accept the wider concept
embracing both statistical HI and documentary HI, but such acceptance is not universal. This mix up or lack of clarity might be due to:

- Absence of a conceptual design for the NHIS.
- Lack of relevance of statistical services due to under reporting, lack of training and lack of comparability due to lack of standards.
- Shortcomings of health literature services \(^{(13)}\). In developing countries, information requirements have frequently been defined against background of:
  - Attempts to conform to information systems applied in other countries, without due regard to technical and practical appropriateness.
  - Decisions imposed by administrators who do not take technical issues into account and do not allow specialists to design and operate the systems.
  - Inability to determine the type of information required, leading to confusing the good with the bad or even to a total absence of information \(^{(4)}\).

There are defects and weakness in many HIS systems. The data collected may not be relevant or appropriate. There may be considerable delays in collecting or analyzing data, some data, may remain unprocessed. Delay leads to taking decisions on the basis of outdated information, while unused data represent a waste of valuable resources \(^{(57)}\). There are several harmful consequences of the top-down approach, those who want to use information can seldom specify the data they wish to have. It is very difficult and expensive to validate the information, and consequently errors easily creep in. There is, once more, a long time lag between clinical events and their analysis in an epidemiologically or statistically useful way \(^{(51)}\).
Clearly, all these HISs provider data about users of the health system but often fail to give information about illness in those who do not have access to such systems or their workers. Very scant regard is given to what local decision-makers need to know or how information can be used locally to improve health care. Collecting and using large bodies of information centrally in health care system is very expensive in top down systems and the question arises as to whether the costs are justified by what is achieved for those who directly or indirectly, have to foot the bill (51). In the bottom up approach, if timely and relevant information is collected it should be used locally. It will almost certainly be necessary to adopt a bottom up approach to examine why information is needed and how it is generated and used. This implies political and administrative willingness to develop power and resources to the grass roots (51). PHC is a top - down activity separate from established health systems. It even has a special information system as if health and health services were easily separable. Worse still, the components of PHC have become independent entities, each with its own information systems. Worse of all, sub components have also gained independence, becoming top - down activities collecting their own information separately (4).

In Sudan there separate information systems for selected components of PHC programs, the data collected using separate registration and reporting forms for each program (58). The reports sent from the different states of Sudan to FMOH were quite irregular and feedback if practiced was to the state level only. Observations of the registers in health facilities revealed poor quality. Sending monthly reports is not regular and carbon copies of the reports were not available (58).

A model approach in Sudan divided the country into health areas. The H.A. is responsible for the implementation of all
health activities and programs, as stipulated in the general national health policy, and in accordance with defined priorities for the area. It is fashionable to press for greater decentralization or delegation of authority. The assumption is that the periphery does not possess enough power to make decisions and many managers at the periphery are not fully exercising it. Decentralization should be planned and carried out within the local context to avoid chaos in the system and should be accompanied by a willingness and ability to manage better \(^{(4,57)}\).

Doctors and other health professionals in developing countries are missing out on relevant information about health. A lot of the information they need is available in the developed countries, and those who have it are happy to share it with them. But transporting information is not an easy task nor is it the complete answer to the information drought. Because of the gross inequalities in access to information world wide, the developed world must find ways of making useful, reliable appropriate information available to the developing world. People in the developing world should be given the chance to say what they want rather than simple is sent information\(^{(59,60)}\).

Information systems should be geared primarily to indicating where bottlenecks are occurring and monitoring attempts to clear them. It is essential for each country to develop its own indicators. Clearly, each country has to develop or restructure its own HIS in accordance with national socio-economic, political and administrative condition. The flow of information should be not only north-south but also south-south and south-north international organizations such as WHO help with information flow, but they should try to develop plans that are more strategic and less tactic. Exchange of information (not just data) requires the communication channel, an exchange protocol, and common language. Computers
and communication systems improve the sharing of health care information by overcoming the limitations imposed by the dimension of time and location \(^{(10,59,60)}\).
1.4 Objectives

1.4.1 General objective
To evaluate the present health information system and disease surveillance in Umbadda Province - Khartoum State in year 2000 with view of proposing a comprehensive model.

1.4.2 Specific Objectives:

1.4.2.1 To assess the present HIS in terms of:

- Types of indicators.
- Availability of standardized registration books and forms, data registration including vital events and file keeping.
- Analysis and use of data at local level and reporting.
- Training of health personnel in registration and reporting system.
- Feed-back.

1.4.2.2. To assess the infrastructure i.e. communications means, transportation means and computer units.

1.4.2.3. To assess the surveillance system regarding diseases under surveillance, surveillance methods, standardized case-definition for the disease under surveillance and reports of surveillance system.

1.4.2.4. To design and recommend a model for HIS concerned with both outcome and services.
Chapter Two

Materials and Methods
2. Materials and Methods

2.1 General Description
This is a descriptive, facility based study, to achieve the study objectives, both quantitative and qualitative approaches were employed.

2.2 Study Design
This is a descriptive-cross sectional institutional based study collected based line data about HIS and DS.

2.3 Study Area
This study was conducted in Umbada province which is one of the seven provinces in Khartoum state. It lies about ten kilometers from central Omdurman. The total area of the province mounts to about 80,000 Feddan (1 Feddan = 4200 m²). The province is composed of about 45 residential compounds and surrounded by several agricultural schemes. The province is subdivided into 4 local councils: ElAmeer, ElBouga, Dar ElSalam, and Western Rural Council. Each council is subdivided into a number of compounds and each one is composed of 1500-2000 households. Most of the houses are built of mud, sand and red bricks with roofs made of zinc or wood plates. The area of each house range between 300-400 m² and the number of rooms is 2-3. The water supply from the national network is covering about 50% of the residential compounds. Those who are not covered by the national network obtain water from wells by using water carts. The water is usually stored in barrels inside the houses for domestic and personal use. Most of the houses have their own conventional pit latrines which carry potential health hazards as they are suitable places for breeding of house files and to a less extent mosquito breeding. The electric supply covers less than 50% of the province (Map of the study area Annex II).
2.3.1 Population in the Province
The total population in Umbada Province is about (914650) (State Ministry of Health) 1999. The population is composed of a mixture of the different Sudanese tribes partly from the original population of old Omdurman City and the vast majority from different rural areas who had been settled there during the last 25 years. The vast majority of the populations are labourers, employees, teachers and private workers. The population is distributed in the four localities as follows (SMOH, 1999):

- ElAmeer Council: 144013
- ElBouga Council: 328616
- Dar ElSalam Council: 194960
- Western Rural Council: 47168

2.3.2 Health Facilities in the study area
In the province there are 7 main health centres and 11 small health centres and 7 dispensaries and about 55 centres belongs to different organizations. There is no teaching or specialized hospitals. There are only 8 medical officers giving a ratio of 1: more than 100,000 people, 32 medical assistants, 36 nurses, 13 nutritionist, 44 immunization officers, 27 health visitors, 24 trained midwives and 89 trained Traditional Birth Attendants (TBAs) - Omdurman Teaching Hospitals (the main hospital, maternity, pediatrics) are the main referral hospitals for the province. All these hospitals are very busy serving all great Omdurman area, for these reason the government has planned a tertiary referral hospital to serve umbadda province and this is called the friendship hospital which is functioning since 1995. Umbadda province is planned to be one of the health areas of the Sudan with the friendship hospital serving as the nucleus for the peripheral health units. In 1997 ElManara health centre in ElBouga Locality was selected to implement Health area policy (District Health System). In 1998 other three centres were selected also to implement health area policy, ElRaka, Garib
ELGoose and ElGemeab, the three centres are in ElAmeer Locality. The four centres started by knowing the number of population in the catchment areas and the yearly change in population number due to different causes. The province is suffering from the following major health problems:

- High prevalence and incidence of endemic diseases e.g. Malaria, T.B.
- Environmental health problems lack of safe water supply and in proper disposal of human excreta.
- Inefficiency of health care delivery system.

High infant and maternal mortality rates and lack of MCH services, 81/1000 L.B and 506/100,000 L.B respectively (Central Bureau of Statistics (CBS), 1998). Also under 5 mortality is high 146/1000 L.B (CBS, 1998. In this study total coverage of governmental and non-governmental organizations health centers and dispensaries were done (80 health facilities). Private sectors clinics were not included.

### 2.3.3 Justification of Selection of Study area
- The province is one of Khartoum State provinces with major health problems.
- Umbadda province is one of the health areas in the Sudan, with four (4) operational health areas functioning now.
- Umbadda province with a population of nearly one million is rapidly growing area and the availability of the different levels of health services has been one of the poorest.

### 2.4 Study population:
The study populations are:

1. Health facilities in Umbadda province:
Two types of tools for data collection were used in the health facilities.
- Questionnaires which were filled by the directors of the health facilities.
- Checklist used in the health facility by observation.
2. **Persons:**
Purposively selected key informants for in depth interview.
- The director of the national centre for (HIS) in (FMOH).
- The director of (HIS) in (SMOH).
- The director of epidemiology department in (FMOH).
- The director of the Medical Services Administration (MSA) in Umbadda province.
- The coordinator of disease surveillance in Umbadda province.

2.5 **Methods and Tools of data collection**
- Review of registration books, record forms, and previous reports.
- Standardized close-ended questionnaire.
- Checklist (Observation).
- In depth interviews with purposely selected persons.

2.6 **Study Variables**
- Levels of the health facility classification.
- Ownership of the health facility.
- Profession of the respondent.
- Number of training courses in registration and reporting system attended by the respondent.
- Type of registration books.
- Source of registration books.
- Standardization of the registration books.
- Opinion about the responsibility of the diagnosis.
- Level of keeping the registration books.
- Problems faced by health personnel in registration.
- Nature of the problems faced.
- Presence of statistical unit.
- Presence of statistical staff doing the work.
- Sending of monthly report (Regularity).
- Sections in the health facilities included in the monthly report.
- Place where the monthly report is send.
- Discussion of the report before its send.
- Reasons for not discussing reports at the health facility level.
- Data analysis at the local level.
- Persons who do the analysis.
- Presentation of the data in the health facility.
- Use of information for action at the local level.
- Method of sending the report.
- Feedback mechanism presence.
- Description of the feedback.
- Presence of communication means.
- Presence of notifiable diseases list.
- Presence of surveillance system.
- Presence of standardized case definition.
- The number of population served by the health facility.
- Presence of map to the area which the health facility serve.
- Presence of registration book for referral cases.
- Presence of birth registration.
- Presence of death certificate registration.
- Suggestions of the health personnel to promote HIS and DS

2.7 Training of the Data Collectors:
Two days training was conducted for the interviewers to make sure that every question and its options is clear and understandable and to make sure that every point in the checklist is clear.

2.8 Pre-testing of data collection tools:
The questionnaire and checklist were pre-tested in Omdurman province, ten questionnaires and ten checklist were filled in ten different health centres. The questionnaire reviewed and revised and necessary corrections and omissions were performed.
2.9 Ethical Consideration:
Permission and clearance was obtained from the general director of (SMOH) to the directors of the health facilities in Umbadda province to help and facilitate the job of the interviewers.

2.10 Methods of data analysis and presentation:
1. Quantitative data from a master sheet (80 Health Centres) was entered in the computer using software (Epi-SPSS) and frequency tables were obtained. Master sheet for the checklist was entered and frequency tables obtained.
2. Qualitative data from in depth interviews were obtained by the investigator and these data was analyzed narratively. Simple descriptive statistical tables, graphs and charts were used as appropriate to present the results.
Chapter Three

RESULTS

3. RESULTS

3.1 Quantitative data

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These data were collected by questionnaires and check lists

3.1.1 Description of the health facilities

The number of the health facilities studied was 80 which was the total number of the health facilities in the study area at the time of the field work (Sep.-Dec. 2000). These health facilities were distributed in the 4 localities of the Province. There were 7 main health centers and 11 small health centers, 7 dispensaries and 55 health centers that belong to non-governmental organizations (69%). There was no teaching or specialized hospital in the study area (Figure I-II).

3.1.2 Health personnel and training

The medical assistants were the majority 73.8% in providing the health services in the study area. While the medical officers were only 11.3% (Table 1). Those who did not attend any course in registration, reporting and simple statistical methods were 25%; whereas, 1.2% attended 3 courses (Table 2). The health facilities in which there were statistical units were only 14% and those with statistical technicians were 11.2%. In almost 90% the work is done by other personnel (FIGURE V & Table 7).

3.1.3 Registration records

As regards the source of registration records 20% of the health facilities stated that the source is SMOH. The rest (80%) mentioned that it is locally prepared (Table 3). Table (5) showed that 96.3% of the health providers were responsible for the diagnosis; while 3.7% claimed that it is the responsibility of the statistical technician. Birth registration records were present in only 13.7% of the facilities and 5% could issue death certificates (Table 18-19). As regards the problems facing the process of registration 81.2% stated that there were no problems; while the rest stated problems such as lack of logistics and incentives and load of work (Table 6). For the file keeping system 75% of the facilities had no suitable places for keeping the records and only 25% claimed that the records were
well kept (Figure IV). Regarding referral system 31% of the centers had registration records for referred cases (Figure IX).

3.1.4 Infrastructure in the health facilities
Communication and transportation means were present only in 2.5% of the facilities. None of the health facilities in the study area had any computer unit. The reports in the all facilities were hand-delivered (Figure VIII & Tables 10-11).

3.1.5 The surveillance system
The surveillance system was present 12.5% of the centers; but there were no standardized case definitions for the diseases under surveillance. None of the facilities had a list of notifiable diseases (Tables 14, 15 and 16). Regarding the presence of a map for the catchment area it was present in only 5% of the health centers (Table 17).

3.1.6 Reporting system
Discussion of the reports before it is sent to the higher level was present in 31% of the centers. Those who stated that there was no discussion gave reasons such as: no body asked for it, unnecessary and some of respondents mentioned that they do not know the reason (Table 8). The analysis of collected data at the local level is not practiced at any health center (Table 9). Only 7.5% of the facilities provide presentations for their data in the center (Figure VI). Table 12-13 showed that the feed-back process was weak at all levels i.e. 77.5% of the centers no feed-back and the rest mentioned that it is there but with ill-defined mechanism. No use of the information for planning and decision making at the local level in all health centers (Figure VII).

3.2 Qualitative Data
3.2.1 Description of the sample
The key informants' interviews were conducted in the period from 10\textsuperscript{th} of January 2001 to the 30\textsuperscript{th} of March 2001. The key informants were selected from the federal, state and provincial levels. This selection included the coordinator of communicable diseases and surveillance, director of medical services administration and the statistical staff in the study area. As well as the inclusion of:

- Director of health information and statistics department in SMOH.
- Director of epidemiology department in FMOH.
- Director of the National Health Information System in FMOH.

3.2.1.1 The Coordinator of Communicable Diseases and Surveillance in Umbadda Province:

The following points were extracted:

- The surveillance system is special (reporting system which is set up for particularly important health problems or diseases, it includes collection, analysis, interpretation and use of these data to know the causes of diseases and predict and forecast for the epidemics to take the suitable, proper action to prevent their spread.
- The diseases under surveillance are about twenty (20) disease and they are selected according to their public importance and affect large numbers of the population and cause substantial morbidity and mortality. Also one of the criteria for selection is the potential to cause epidemic.
- The system use the sentinel sites and the criteria for selection of these sites are:
  - The geographical location (representative for the locality).
  - Accessible to all people in the locality.
  - Number of the population around the site is large.
  - Daily attendance of patients to the site.
- Data collection includes:
Number of cases for each selected disease by age, sex, residence, and occupation.

Number of deaths for each disease by age, sex, and residence.

The data is collected by statistical technician in the sentinel sites and by the medical directors in the centres which have no statistical technician.

The reports were sent weekly on regular basis (every Saturday) and the report should be sent daily in case of occurrence of an epidemic. Meeting are also held on regular basis, every week in the M.S.A., and every week in the State Ministry and monthly with the statistical technician.

As regards the accuracy of these data, it can be tested and reviewed with the previous data of the last week and with the data at the same time of the previous year and it can be also revised with the registration book of the outpatient and that of the service provider. Supervisory visits also help in checking the accuracy of these data.

As regards the feedback there is no feedback and it is not regular and till now there is no clear, regular form for the feedback and it is only activated in case of epidemics.

For the analysis of the data and use of it at the local level, he said the data are collected, compiled and graphs and diagrams are done and comparison is done between the different weeks to see if there is any change in the occurrence of different diseases e.g. Malaria, diarrhoeal diseases. No effective action is taken at the peripheral level.

As regards the communication means they are poor, there are some radio machines some are not functioning and there is telephone in the M.S.A. For the transportation there are no cars, some have motor cycles which are
difficult and not suitable especially in rainy seasons, winter and the roads are bad.

- **Problems and constraints:**
  - No means of transportation and the available communications means are not functioning.
  - No computer units for analysis.
  - No standardized case definitions for the different diseases under surveillance.
  - No interest among data collectors either due to ignorance of the importance of the information or due to financial problems (no incentives).
  - Limited resources.
  - No training courses for the health personnel at the local, peripheral level.
  - No health awareness in the community (they do not tell the information).
  - Delay in sending reports and no feedback.

- **The suggestions for improving and upgrading the surveillance system:**
  - Scheduled training courses for the health cadre in the disease surveillance.
  - Availability of transportation and communication means and provision of continuous maintenance.
  - Provision of computer units.
  - Continuous supervision and follow up.
  - Solutions for the administrative conflicts.
  - Standardized case definitions.
  - Increase the awareness of the health cadre and the community about the disease surveillance.
  - Strengthening the link between localities and provinces.
  - Presence of incentives for the staff.

3.2.1.2 The Director of the Medical Services Administration and the Statistical Staff in Umbadda Province:

The following points were extracted:
The total health facilities in the province are seven (7) dispensaries, 18 health centres and 55 health centres belonging to voluntary organizations.

The monthly report is send by all the health facilities on the 3rd day of the month to the office of the Medical Services Administration (MSA) of the province. There is the monthly meeting in (MSA) with the representatives of all health facilities in the province. Then three reports are prepared in (MSA) one for the dispensaries, one for the governmental health centres and one for the health centres of voluntary organizations and these three reports are send to the (SMOH). The analysis of data and preparation of the reports is done by computer in (MSA).

The monthly report of the health facilities includes all the sections except the pharmacy which sends its report to the directorate of the drug revolving fund in (SMOH). The sections like MCH, Immunization, nutrition that belong to PHC send separate reports to the directorate of PHC in (SMOH).

The registration books and forms are standardized and issued by (SMOH) to the governmental centres only. There is the daily register book of the out-patient in the reception in which all the personal data are registered, the service provider register in ordinary book and send the prescription to the clerk in the reception to write the diagnosis and treatment prescribed. The statistical unit prepares the monthly report from the daily register book of the outpatient. In the health facilities where there is no statistical staff the report is done by the service provider. Only three centres have medical officers and the others have only medical assistants. Some centres have no statistical staff.

The analysis and use of data at the local level is weak and depends on the interest of the working staff.
As regards the feedback they concentrate on the date of report delivery, signature of the director, completion of the report, accuracy and they have special forms for feedback.

As regard the training there is basic training course in registration and statistics done yearly in the FMOH, they select two health personnel from each province. Those who are selected for this course should have the high secondary certificate. There are some personnel working in the statistical unit and they did not attend this essential course. The training is deficient not scheduled.

The supervisory visits are done on regular basis and there are three types of visits:

- Long visit (the whole day) once per month for every centre.
- Two short-visits twice per month for every centre.
- Surprise or unscheduled visits.

The purpose of these supervisory visits is to see accuracy of data, registration books – performance, problems facing the workers and also has educational goals.

There are no maps for the area in the health centres except few centres and the population served by the centre services is known in very few centres. Only five (5) centres have books to issue birth certificate and death certificate. There are no any communications or transportation means only three centres have telephone.

No centre has special books for referral cases, just they mentioned the referral cases in the general registration book of the service provider. There is deficiency in the infrastructure in all centres, in some centres many sections are found in one room.
There is lack and shortage in all types of stationaries.

As regards the surveillance system, there are ten sentinel sites in the province four (4) governmental centres and six (6) centres for the voluntary organizations they make a weekly report about six immunizable diseases, malaria, pneumonia, watery diarrhea and bloody diarrhea. There is no standardized case-definition for these diseases and the diagnosis depends on the service provider. All the reports are hand delivered. The analysis of the data sent by the ten centres is done in MSA by computer and one report is done and sent to the directorate of epidemiology in SMOH. The reports in the ten sites are done by the statistical staff or the director of the centre. These sites selected for surveillance change yearly and the selection depends on the number of patients visiting the centre and the population density in the area.

- As regards the problems facing (HIS) and DS they mentioned:
  - Unqualified health cadre.
  - Training is not available on regular basis at the provincial level.
  - Infrastructure of all health facilities is deficient.
  - Financial resources are weak.
  - No transportation and communication means.
  - No computer units in the health facilities.

- Suggestions to upgrade the (HIS) and D.S.:
  - Training.
  - Availability of infrastructure and improvement of the working environment.
  - Availability of communication and transportation means.
  - Availability of computers at the local level.
  - Availability of manpower and financial resources.
3.2.1.3 The Director of Health Information and Statistics Department (SMOH).
The following facts and comments were obtained:

- As regards the flow of information, epidemiological reports (surveillance) are sent weekly to the medical services administration at the provinces (MSA). Routine reports are sent monthly to the (MSA) at the province and from these reports are send to the ministry head quarter. The report covers all the sections in the health facility. Some programmes send their report directly to the ministry like T.B. program, AIDS. About accuracy the reports are checked by the (MSA) and checked in (SMOH) and checked during the supervisory visits.

- Feed back is usually verbal when the reports are received and sometimes written feed back are send to peripheral units.

- Registration books, forms and cards are printed centrally and distributed by the MSA office to the peripheral units (health centers and dispensaries).

- Hospitals are supplied centrally (hospital department). As regard meetings there is regular meeting with the peripheral units monthly when they deliver their reports to the MSA and also there is a monthly meeting at the centre to discuss the reports.

- Training of health personnel in statistics, registration and reporting system:

- There is no regular basis or scheduled programmes for training. We send health cadre to the federal course for 4 months which is available twice a year with the total training of 20 persons per year which is very much less than the actual needs.

- As regard the equipment, calculators are not available in the heath facilities, some are available to persons (personal calculators).
Annual report is done on regular basis.

Co-operation between state and federal ministries of health is good.

For disease surveillance which is concern with diseases of epidemiological importance, diseases under surveillance are list A and list B but some diseases are excluded like typhus and plague. The system is based on sentinel sites which are chosen according to some criteria like being representative of the area (locality) and has a good attendance, easy to access. The data collected are; the number of cases of selected diseases seen during the last week and also persona data about the case like age, sex, occupation, residence. Reports are sent weekly to the provincial level and from there they are sent to the epidemiological department in the ministry. For the accuracy we compare the readings for several months and if there is clear deviation then we go and check the records and reports. There is feed-back sometimes verbal and sometimes written

Meetings are held on regular basis and messages then distributed to the peripheral units. Analysis is done by computer in the epidemiological department in SMOH and information are used centrally but some provinces used it locally.

Problems and Constraints in the health information system:

- Limited, scarce financial resources for printing forms and records.
- There is only one training centre in registration and reporting (federal).
- There is a problem in writing the diagnosis by the service provider.
- Poor communication and transportation means.

Problems and constraints in the surveillance system:
Some centres do not send reports at all and others do not send the reports in the proper time and this leads to under-reporting.

No incentives for the personnel working in the sentinel sites, so no motivation.

No active surveillance.

Private sector is not included in the surveillance process.

- **Recommendations to improve the system:**
  - Private sector should be included.
  - Activate the system in the federal hospitals.
  - Training for the health personnel to raise the awareness among them for better reporting.

### 3.2.1.4 The Director of Epidemiology Department (FMOH)

The following facts and results were obtained:

- The directorate receives weekly report about the communicable diseases (18 diseases) from the northern states of the Sudan. The states of the south do not send any reports due to circumstances of the civil war and no communications means. The states of Darfour and Kordofan are not regular in sending their reports. The reports from all the states except Khartoum and Red Sea states telling the situation about patients admitted to hospitals but in Khartoum and Red Sea about patients from all the health facilities and institutions. The directorates of epidemiology prepare one report for all the states weekly and distribute it to all hospitals and medical institutions.

- The report compares the more common communicable diseases prevailing in the week with the same week of the previous year. The report also analyzes the data mentioning the increase and decrease in the incidence of different diseases. The states analyze their data at state level and make use of it to improve the situation.
The data at FMOH is analyzed by computers and feedback to states is usually sent and the directorate helps the states in case of epidemics. This helps and supports in the form of supplies, drugs, cars and manpower.

As regards the training for the health personnel it is done at the state level but not on regular basis due to limited resources.

The problems facing the department of epidemiology:
- Limited financial resources.
- No scheduled training.
- Communication means between FMOH and other states are weak and sometimes not functioning.
- Some states do not report.
- Private sector is not included in the surveillance process.
- No active surveillance.

Suggestions to upgrade the surveillance system:
- Proper, regular training for health cadre.
- Availability of qualified, trained staff.
- Availability of financial resources.
- Availability of communication means.
- Inclusion of the private sector in the system.

3.2.1.5 The Director of the National HIS in the FMOH.

The following facts and comments were obtained:

The objectives of the H.I.S.:

1. To find out the necessary health indicators to manage the health services and also to plan for future.
2. Control of epidemics.
3. To evaluate the health status of the population.
4. To raise the awareness of the health personnel to provide and use health information.
5. To promote registration for vital events (births and deaths).
6. To keep medical records in different health institutions.
7. To train health cadre in registration and reporting.

- As regard the flow of information. The primary health care units and dispensaries and health centres send monthly report to the rural hospital in the health area. The medical services administration office in the health area send report every 3 months (quarterly), to the state ministry of health.

- The vertical programmes e.g. TB, leprosy EPI extra send quarterly report to their chief department and they send quarterly report to the FMOH.

- For the accuracy of the information revision of reports and comparison between different months.

- As regard the feedback, there is no feedback. The only feedback present is to the SMOH and it is in the form of comments. An important point mentioned by the director is that all the indicators are on institutional basis and not community basis except by surveys when conducted.

- The forms and registration books and for report for the health area were agreed upon in a workshop. The states can add to these forms for their own benefits. Some states do their forms and registration books alone at their states, like Medani and Kassala. There is shortage in forms and not all centres and institutions are covered.

- **As regards the training:**

  - The advance training abroad stopped for many years due to financial problems. There is a training centre belongs to the FMOH graduates statistical technicians who have high secondary school certificate. The duration of course is four (4) months, three- (3) months theory and one (1) month practical in the hospitals. This course is held twice per year and it qualifies forty (40) students from different states every cycle.

  - Seventeen (17) states were covered by computer system. One report about the situation in all states is sent
yearly from the SMOH to the FMOH the FMOH prepare an annual report and it is done on regular basis.

- As regard the evaluation of the HIS it is usually done by experts from WHO in the form of periodic visits to evaluate the situation and to identify the weak points in the system, the last evaluation visit were on 1999.

- **The major problems and constraints facing the HIS are:**
  - The commitment and awareness of the health cadre towards the information is poor and not to the standard.
  - Limited scarce resources especially the financing resources.
  - Lack of transportation and communication means (Not to the standard although the arrival of reports increased from 21% to 75% and Sodatel has the major role in this.
  - The commitment and awareness of the community towards information is poor especially in vital events, births and deaths.
  - Lack of utilization and use of information at the first level.

- **The Recommendations for improving the HIS:**
  - Availability of resources (manpower and equipment).
  - Strengthen the transportation and communication means.
  - Increase the commitment and awareness of the health personnel towards HIS.
  - Increase awareness of the population and community towards the system by giving the proper information when needed.
  - Utilization of data at different levels (first provider should be the first user).

### 3.3 Management Information Support Model for District Health Systems Based on Primary Health Care

#### 3.3.1 Definition of Model:
A simplified representation of real or hypothetical relationships, So this model will be presented in a simplified form in broad lines without details.

#### 3.3.2 General Aims
1. The improvement of information support for management of health care programmes to improve the efficiency and effectiveness of the health system
2. The development and strengthening of “district health systems based on primary health care”.

3.3.3 Major Sources of Information:
1. The traditional health facility-based record system.
2. Community based information system.
3. Special studies.

3.3.3.1 District Health Systems Based on PHC:
Definition: A more or less self-contained segment of the national health system with well defined population living within a clearly delineated administrative and geographical area. It includes all institutions and individuals providing health care in the district.

Principal features: Key features of PHC approach which have particular importance in moving towards district health systems based on PHC are:
- Equitable allocation of resources in relation to need.
- Accessibility and coverage for entire population.
- Emphasis on health promotion and disease prevention.
- Addresses inter-sectoral determinants of health as well as health services.
- Seeks to involve and empower communities and individuals to assume greater responsibility for their own health.
- Comprehensive and integrated approach for more efficient use of scarce resources.
- Coordinated action of all health and health related organizations and groups in district under leadership of district health team.

Relationship between District and National Health System:
The district health system functions as an integral part of a national health system and is closely related to provincial, regional or state levels responsible for direction, guidance
and support. It draws its policies and technical directions from higher levels, while having the responsibility to relate this central direction to the needs and resources of the district.

3.4 Decentralization: A prerequisite

To ensure that the district health system can play as a mediator between local needs and national policy, adequate decentralization of resource management and planning responsibility is a pre-condition.

Common Deficiencies in Current District Management Information System:

These common deficiencies in current systems should be avoided.

1. Important Information is missing:
   - Information about target populations
   - Information about outcome and impact.
   - Information about social and environmental determinants of health.
   - Information from all relevant institutions.

2. Available data is inappropriate in quantity and quality:
   - Information is collected but not used.
   - Available information is often late, incorrect, incomplete or missing.

3. Health staff have limited skills in information processing and use

4. Available information is not sufficiently used for local decision-making

District Decision-Making and use of Information:

A sound and workable district health management system requires not only a well-planned and organized administrative and program structure, but an efficient data management system as well.

The major levels of decision makers within the district health system who benefit from a stronger information base:
1. Communities, village health committees and community health workers.
2. Peripheral health workers: medical auxiliaries sanitarians, nurses, doctors .. etc.
3. These responsible for supervision and support of peripheral HWS.
4. District health management team
Each of these levels have certain information needs unique to their own functions.
The major concerns for district decision-making can be grouped into four categories:
1. Resource allocation and utilization.
2. Use of services, coverage and quality
3. Policy and strategy
4. Assessment of health needs and program effects and impacts.

3.4.1 Guidelines for improving district management information support:
1. Increasing the scope of available information:
One of the most critical constraints of many existing district health information systems is the lack of adequate epidemiological base concerning the size and characteristics of the district population and important subgroups within that population. Without such population-based information, it is impossible to do even the most basic types of monitoring of key primary health care indicators the district health management team should know at least a minimal set of demographic information for the district and to key rates such as births, deaths, infant mortality rate. And complete service delivery information for the district and some supplementary community-based information should permit at least a reasonable core of information with which to assess health progress in the district. Data from other sectors concerning important health determinants can be added to the core information. It is important to disaggregate district data to sub-district populations, as well as by age, sex and economic
status in order to recognize higher risk areas and groups. Information from non-governmental, private and community health services are very important to obtain more accurate and comprehensive information regarding key indicators for the district.

2. Clarifying district needs, resources, objectives, targets and indicators:

A key first step in district planning is the preparation of a district profile, containing information about health status, risk factors, health resources and activities within the district—particular attention should be paid to non-governmental and community resources, with a view to strengthening coordination and collaboration to improve health in the district. Specification of objectives, targets and indicators is a prerequisite to strengthening information and monitoring of progress.

3. **Streamlining procedures for data management:**

One important area for streamlining procedures is the elimination of the routine collection and processing of data not needed for decision-making. This means that serious efforts to improve the district information system in this direction will require leadership from the national level. Integration of information collection procedures and form is an important area for improvement.

4. Improving the skills of district staff in management and use of information.

There will be a need to improve the skills and capacity of staff in information collection, analysis, presentation and use. The reinforcement of information skills as part of supervision, in-service training, and information feedback activities between peripheral health workers and their supervisors.

5. Broadening the use of information, particularly within district and communities.
One of the strongest motivations for ensuring the quality of information being collected is a personal interest in its local use. Improving the understanding and use of information by those who collect it, particularly in communities, at health facilities and among the district health management team, thus contributes not only to better management, but also to improving the quality of the information itself. The use of information should extend beyond the health services to community health initiatives, including community planning, management and information collection. There is a need for new and innovative approaches in adapting health information systems to the needs and capabilities of communities, accompanied by the necessary support from the health services.
Table (1) Distribution of the respondents according to their Profession

<table>
<thead>
<tr>
<th>JOB</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Officers</td>
<td>9</td>
<td>11.3%</td>
</tr>
<tr>
<td>Medical Assistants</td>
<td>59</td>
<td>73.8%</td>
</tr>
<tr>
<td>Midwifes</td>
<td>1</td>
<td>1.2%</td>
</tr>
<tr>
<td>Vaccinators</td>
<td>2</td>
<td>2.4%</td>
</tr>
<tr>
<td>Statistical technicians</td>
<td>9</td>
<td>11.3%</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table (2) Distribution of the health staff according to the number of training courses in registration and reporting system attended

<table>
<thead>
<tr>
<th>Number of Courses</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>One course</td>
<td>41</td>
<td>51.3%</td>
</tr>
<tr>
<td>Two courses</td>
<td>18</td>
<td>22.5%</td>
</tr>
<tr>
<td>Three courses</td>
<td>1</td>
<td>1.2%</td>
</tr>
<tr>
<td>No course</td>
<td>20</td>
<td>25%</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table (3) The source of registration books in the health facilities

<table>
<thead>
<tr>
<th>Source</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locally in the health facility</td>
<td>55</td>
<td>80%</td>
</tr>
<tr>
<td>State ministry of health</td>
<td>25</td>
<td>20%</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table (4) Standardization of the registration books in the studied health facilities

<table>
<thead>
<tr>
<th>Standardization</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>25</td>
<td>20%</td>
</tr>
<tr>
<td>No</td>
<td>55</td>
<td>80%</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table (5): Distribution of the health staff according to their opinion about the responsibility of the diagnosis

<table>
<thead>
<tr>
<th>Responsibility of the diagnosis</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>The service provider</td>
<td>77</td>
<td>96.3%</td>
</tr>
<tr>
<td>Statistical technician</td>
<td>3</td>
<td>3.7%</td>
</tr>
</tbody>
</table>
Table (6) Nature of the problems faced by health facilities as regard Registration

<table>
<thead>
<tr>
<th>Problems</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lack of logistics</td>
<td>10</td>
<td>12.4%</td>
</tr>
<tr>
<td>2. Plenty of work</td>
<td>3</td>
<td>3.8%</td>
</tr>
<tr>
<td>3. No incentives</td>
<td>1</td>
<td>1.3%</td>
</tr>
<tr>
<td>4. Lack of logistics &amp; incentives</td>
<td>1</td>
<td>1.3%</td>
</tr>
<tr>
<td>5. No problems</td>
<td>65</td>
<td>81.2%</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table (7) Type of health cadre responsible for statistical work

<table>
<thead>
<tr>
<th>Health cadre</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistical Technician</td>
<td>14</td>
<td>11.2%</td>
</tr>
<tr>
<td>Service Provider</td>
<td>66</td>
<td>88.8%</td>
</tr>
</tbody>
</table>
Table (8) Reasons for not discussing the report before it is sent

<table>
<thead>
<tr>
<th>Reason</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No body asked for discussion</td>
<td>20</td>
<td>25%</td>
</tr>
<tr>
<td>Not necessary to be discussed</td>
<td>20</td>
<td>25%</td>
</tr>
<tr>
<td>Do not know the reason</td>
<td>15</td>
<td>19%</td>
</tr>
<tr>
<td><strong>Discuss the report before its send</strong></td>
<td>25</td>
<td>31%</td>
</tr>
</tbody>
</table>
Table (9) Data analysis at the health facility level

<table>
<thead>
<tr>
<th>Data Analysis</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Zero</td>
<td>0%</td>
</tr>
<tr>
<td>No</td>
<td>80</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table (10) Presence of computer units in the health facilities

<table>
<thead>
<tr>
<th>Computer Units</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>Zero</td>
<td>0%</td>
</tr>
<tr>
<td>Not-present</td>
<td>80</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table (11) Method of communicating the report to the higher level

<table>
<thead>
<tr>
<th>Method</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>By health unit car</td>
<td>Zero</td>
<td>0%</td>
</tr>
<tr>
<td>Hand-delivered</td>
<td>80</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table (12) presence of feed-back:

<table>
<thead>
<tr>
<th>Feed back mechanism</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>18</td>
<td>22.5%</td>
</tr>
<tr>
<td>Not Present</td>
<td>62</td>
<td>77.5%</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table (13) Feed-back mechanism to the health facilities

<table>
<thead>
<tr>
<th>Description</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructions from supervisors</td>
<td>10</td>
<td>12.5%</td>
</tr>
<tr>
<td>Suitable solutions from supervisors</td>
<td>8</td>
<td>10%</td>
</tr>
</tbody>
</table>
Table (14) Presence of notifiable diseases list in the health facilities

<table>
<thead>
<tr>
<th>List of Notifiable diseases</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>Zero</td>
<td>0%</td>
</tr>
<tr>
<td>Not-Present</td>
<td>80</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table (15) Presence of surveillance system in the health facilities

<table>
<thead>
<tr>
<th>Surveillance System</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>10</td>
<td>12.5%</td>
</tr>
<tr>
<td>Not-Present</td>
<td>70</td>
<td>87.5%</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table (16) Presence of standardized case-definition for the disease surveillance

<table>
<thead>
<tr>
<th>Standardized case definition</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>Zero</td>
<td>0%</td>
</tr>
<tr>
<td>Not-Present</td>
<td>10</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table (17) Presence of a map for the catchment area in the health facilities

<table>
<thead>
<tr>
<th>Map</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td>Not-Present</td>
<td>76</td>
<td>95%</td>
</tr>
</tbody>
</table>

Total: 10 (100%)
Table (18) The presence of birth registration book in the health facility

<table>
<thead>
<tr>
<th>Birth registration book</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>11</td>
<td>13.7%</td>
</tr>
<tr>
<td>Not-Present</td>
<td>69</td>
<td>86.3%</td>
</tr>
</tbody>
</table>
Table (19) The presence of the death certificate in the health facilities

<table>
<thead>
<tr>
<th>Death Certificate</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td>Not-Present</td>
<td>76</td>
<td>95%</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table (20) Suggestions of health cadre to promote registration and reporting system

<table>
<thead>
<tr>
<th>Suggestions</th>
<th>No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available of resources</td>
<td>2</td>
<td>2.6%</td>
</tr>
<tr>
<td>Available of trained cadre</td>
<td>12</td>
<td>15%</td>
</tr>
<tr>
<td>Scheduled training</td>
<td>5</td>
<td>6.2%</td>
</tr>
<tr>
<td>Available of resources &amp; trained cadre</td>
<td>17</td>
<td>21.2%</td>
</tr>
<tr>
<td>Available of resources &amp; Scheduled training</td>
<td>1</td>
<td>1.3%</td>
</tr>
<tr>
<td>Available of trained cadre &amp; Scheduled training</td>
<td>2</td>
<td>2.5%</td>
</tr>
<tr>
<td>Available of resources, trained Scheduled training</td>
<td>41</td>
<td>51.2%</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100%</td>
</tr>
</tbody>
</table>
Figure (I) Level of the health facilities

- Health center: 91%
- Dispensary: 9%
FIGURE (II) OWNERSHIP OF HEALTH FACILITIES

- 69% Non-Governmental
- 31% Governmental
FIGURE (III) TYPE OF REGISTRATION RECORDS

- Specific Books
- Ordinary Books
FIGURE (IV) STANDARD OF KEEPING RECORDS

Any Where

Well kept
FIGURE (V) PRESENCE OF STATISTICAL UNIT

<table>
<thead>
<tr>
<th>Statistical unit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>14%</td>
</tr>
<tr>
<td>Not present</td>
<td>86%</td>
</tr>
</tbody>
</table>
FIGURE (VI) DATA PRESENTATION IN THE FACILITY

YES

NO
FIGURE (VII) INFORMATION USE FOR DECISION MAKING

- Yes: 100%
- No: 0%
FIGURE (VIII) COMMUNICATION MEANS IN THE CENTERS

- 97.50% Present
- 2.50% Not

☐ Present  ☐ Not
FIGURE (IX) REGISTRATION BOOK FOR REFERRAL
Conclusion

&

Recommendations
4.1 Conclusion
The study concluded that Umbadda Province which was selected as a health area and the experience was started in some centers has no hospital to act as first referral level and to be supportive for the PHC activities and training of health personnel. The majority of the health facilities was non-governmental functioning on private basis and was not fully enrolled in PHC activities. The private sector was not included in HIS or disease surveillance. The file-keeping system was poor and only the governmental health facilities were covered by standardized registration books and forms. There was lack and poor training of health cadre in registration, reporting and simple statistical methods. Some of the health personnel had low awareness and weak commitment towards the system. Registration and reporting were given greater priority than analysis and use of data at local level. Duplication and waste existed because the system had many sub-systems and vertical programs send separate reports. There was no standardized case-definition for the diseases under surveillance. There was no active surveillance and the system had some sentinel sites. Lack of communications, transportation means and computer units in the health facilities were observed. Feedback to the peripheral level on regular basis was lacking and it had no clear mechanism. The registrations of vital events like births and deaths were weak. The indicators
used in the HIS were facility and institutional based and there was no community indicators.
4.2 Recommendation

1. At the Provincial Level:
   1-1 Availability of standardized registration books and forms and registration books for birth certificate and death certificate for all health facilities in the province with the cooperation between the province and the SMOH.
   1-2 Training of the health personnel at the provincial level in:
       - Registration and reporting system.
       - Simple statistical methods.
       - Registration of vital events.
       - Analysis of data.
       - Use of data for action at the local level.
       - With well-planned and organized, courses the budgets for these courses should be provided from the local resources of the province and the support of (SMOH).
   1-3 The health authorities in the province should find a mechanism for the private sector o be included in the HIS and D.S.
   1-4 The health authorities in the province should strengthen the process of feed-back to the peripheral units on regular basis.
   1-5 The health authorities in the province should increase the awareness and commitment of the health personnel towards the HIS by continuos meetings, sessions & education.
2. At the State Level:

2-1 Infrastructure:

The state ministry of health with the collaboration of the provincial authorities should start plan of action for capacity building in the province as regard:

- Communication means.
- Transportation means.
- Suitable places for records keeping.
- Availability of standardized registration books and forms for all centres.
- Availability of qualified statistical staff in all centres by strengthening the training at the provincial & state levels.

2-2 Standardized case-definition for the communicable disease under surveillance should be prepared centrally by the experts in the department of epidemiology in SMOH with the collaboration of the epidemiology department in FMOH.

2-3 Strengthening & encouragement of feedback from state level to the provincial level.

3. At the Federal Level:

3-1 Increase the number of health workers participating in the course of registration, reporting and statistic from the different provinces.
3-2 Support the SMOH in preparing & printing the registration books and forms.

3-3 Strengthening the feedback process to the state level.

3-4 To implement the Management Information Support Model for District Health systems Based on primary Health care.
Appendices
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