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Results and Discussion
The present research which investigates NNDSS of India and aims at proposing an appropriate model for India was carried out in 2008. In line with the objective of the research and to identify the parameters of NNDSS of India, library sources and Internet was used and specialists and experts of India were consulted through e-mail and face-to-face interview.

Considering the advantages and shortcomings of each parameter, and taking into consideration socio-economic, geographical and cultural conditions of India, a model was proposed for NNDSS of this country. The model was tested in three stages by means of Delphi method. A model was finally proposed for NNDSS in India.

This chapter presents a summary of the findings and discusses the objectives of the research and states the final conclusion. Researcher’s proposal with regard to the results is presented at the end.

**A summary of the findings of the research:**

A summary of the findings about the nine parameters are given below:

The first parameter of NNDSS was “The structure of NNDSS” According to the research findings, NICD was determined as the organization in charge at national level. It was suggested that a secretary for management of health information in NICD center be established as a subset monitoring organization involved in policy making. PHC, CHC, state and NICD were approved as NNDSS.

The 2\textsuperscript{nd} parameter was “Data types in NNDSS”, The registration of demographic, clinical, laboratory and epidemiological, diagnostic, vaccination records, and risk factors.
data were approved by most specialists in order to use some of these data in terms of the disease.

Doctor’s clinic, private and government hospitals, rural and urban health centers, army, Blood Transfusion Organization, Blood Bank, government laboratory, private clinics, nursing home, prisons, and vets were considered as essential sources for notifying the diseases.

The 3rd parameter “Criteria for patient’s acceptance for registration in NNDSS”. Suspected case probable case, definite case, clinical compatibility, epidemiological relevant and laboratory confirmation were proposed as criteria for accepting patients for registration in NNDSS according to disease type. To describe the variables, the completion of standard definitions of all notifiable diseases were suggested. To make a framework for disease definitions, clinical description and laboratory criteria were agreed on for diagnosis and classification of disease for the purpose of notification.

Fourth parameter was “The process of data collection in NNDSS” To collect data, depending on disease type, active and passive methods were considered as being necessary. Data collection process starts from first sources local (PHC), State (CHC), and ends with national (NICD).

Different time limits were set for data transfer according to disease type and there was consensus among experts in this regard. For urgent cases telephone, e-mail, and letter-on daily basis, and weekly 5 days after diagnosis, and monthly and annual reporting were suggested. Further, to transfer data, web, telephone, e-mail and letter were considered as priorities in the order mentioned respectively.
The fifth parameter was “Data analysis method in NNDSS”. The use of diagram, table and disease chart were suggested as appropriate methods to present data and to analyze data such as cases, deaths, incidence rate, incidence rate of diseases, case fatality rate and general awareness of risk were suggested. On the use of an appropriate software for data analysis, it was suggested that existing software for this purpose be examined and appropriate software such as INFO-EPS-MS-EXCEL be selected.

Sixth parameter was “Methods for information dissemination in NNDSS”. To disseminate information, electronic, press, audio-visual and oral mode were suggested. And weekly report on mortality, mass media, and notification through web, newspapers, meeting, handouts, books, postal letters, press interview, bulletin, reports and weekly review were considered as most appropriate ways for information dissemination.

Seventh parameter was “The application of International classification of diseases in NNDSS”. Considering the use of International classification system of diseases at national level and its importance from experts’ viewpoints, the use of ICD-10 for all health levels was considered as being necessary.

The eight parameter was “Data quality control methods in NNDSS”. The preparation of written guidelines for data quality control in NNDSS, consensus on national standards of notification, complication of standard definitions of disease, the determination of the minimum data for notification at national level, publishing manual /guide for users, time period set for notification, regular training of staff, safeguarding
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confidentiality, using appropriate statistical methods for data quality control were approved by specialists.

The indexes of completeness, timeliness, validity accuracy, clarity, controlling recurrent cases, and usefulness of data were approved as main indexes of quality control by experts. The use of appropriate software package, capable of automatic identification or recurrent cases on the basis of some specific fields for prevention from recording recurrent cases was recommended. IDSP is data quality control monitor organization.

Ninth parameter was "guidelines and data privacy policies in NNDSS". MOHFW was agreed as the organization in charge of developing guidelines and policies for confidentiality of data and patients' privacy. Making governmental rules concerning invading patients' privacy as a result of disclosure of their confidential information was considered as being important. Emphasis was laid on unified identity number to keep track of the patients instead of sending data related to patients' identity and defining different levels of management allowed to have access to computer and identity details of patients.

Results and Discussion

In response to the objective Number 1 "the investigation of NNDSS structure in India", NNDSS of the United States, Australia, Canada and England involves the participation of groups and organizations that operate in spheres of recording, reporting, diagnosis, treatment and information transfer of notifiable infectious diseases in NNDSS. Major limitation of NNDSS of the United States is the optional notification from state level to national level. The organization in charge of this
system at national level in the US is Centers for Diseases Control in Australia is Health and Old-age care Department-Division for people’s Health, and England is. In the United States regional and State Association of Epidemiologists in cooperation with Centers for Diseases Control (CDC) and in Australia Federal government in cooperation with National Association of Medical and Health Research, Regional and State Health Department are organizations for monitoring and policy-making of the System.

In the United State, organizations of NNDSS are local Health Departments, Health Departments, State Health Departments, and Centers for Disease Control (CDC) and in Australia Local Public Health Units, Regional and State Health Departments and Health and Old-age Care Departments are in charge. In the current system of India, NICD as organization in charge at national level is the place of collection and analysis of data related to this system. This center is in IDSP and Health Ministry. In the present model the establishment of Undersecretary for Health information along with NICD has been suggested. World Health Organization has also suggested that units be created at national level for the purpose of coordinating different activities of NNDSS and an integrated system of care be established.

Organizations of NNDSS in India are Medical College PHC, CHC, NICD and in the proposed model it has been suggested to maintain the status quo.

In response to objective number 2 “The investigation of different types of NNDSS data in India”, data types and their sources have been investigated. Data types of NNDSS of the
United States, Australia, England and Canada\textsuperscript{89} were very comprehensive, and they meet all informational needs in this regard. These data have been designed on standard forms and are available online; therefore, easy access to them is possible through Internet\textsuperscript{90, 91, 92}. Investigating collected data types related to this system in India, the United States, Australia, England and other countries, in the proposed model, based on informational needs of different infectious diseases while taking into consideration specialists suggestions, the data of the United States were emphasized, and demographic, clinical, laboratory, final diagnosis, epidemiological, history of vaccination and risk factors data were determined as essential data of the system\textsuperscript{90, 91, 92, 93}. In the present system of India like other countries notification takes place through identical forms.

Essential sources of notification of data in NNDSS of the United States is complete\textsuperscript{90, 94, 95} and in the proposed model, considering the confirmation on the part of specialists and minor changes in the sources, doctors' clinics, private and government hospitals, rural and urban health centers, army, Blood Transfusion Organization, Blood Bank, nursing homes, private and government laboratories clinics, prisons, and vets have been determined as essential sources of notification.

In response to objective number 3 "The investigation of criteria for patients' admission for registration in NNDSS in India". The criteria for patients admission for registration in NNDSS of the United States, Australia, and England is diseases ranking in terms of their types\textsuperscript{96, 97}. This ranking has been described with further details in the United States\textsuperscript{98, 99}. In some
countries like Australia and England a similar ranking has been used\textsuperscript{100,101}.

The method for data description in the United States, Australia, and India is according to standard definition of diseases and in the proposed model it has been suggested to maintain status quo.

In response to objective number 4 “The investigation of the process of data collection in NNDSS of India”, The United States\textsuperscript{97}, Australia\textsuperscript{92}, England\textsuperscript{101}, Canada\textsuperscript{77} apply active and passive method for data collection according to diseases type.

In the proposed model the data are, first, transferred from data sources to rural centers, after that, to urban health centers and School of Medicine and then to CHC and State Health Centers and finally to NICD.

One of the most important aspects of this objective is time limit for data transfer. In the proposed model according to disease type, urgent notification through telephone, e-mail\textsuperscript{98,102,103,104}, daily, weekly, after five days\textsuperscript{58} of diagnosis, monthly and annual were confirmed for data transfer. The ultimate aspect of this objective is methods for data transfer. Considering technological advancements and the importance of prompt data transfer related to this system, in India and most countries Web and Electronic mail are used\textsuperscript{92,98,102}.

In the proposed model, based on these characteristics and specialists approval, and according to priorities, web-based, telephone, e-mail and letters are used to transfer data while taking into account disease type and facilities.

Picture 1 show data cycle route and NNDSS information according to final model.
In response to objective number 5 "The investigation of data analysis method in NNDSS of India the same method is used for data presentation in the United States, Australia, Canada, England, Iran and India, and it has been suggested to maintain the status quo in this model. Another aspect of this objective is measurement indexes. One of the other characteristics of this system in the United States and Australia is the calculation of indexes related to health condition of society. In the proposed model, considering the importance of this indexes and the use of measurement indexes suitable for data analysis such as cases, deaths, incidence rate, incidence rate of disease, case fatality rate and general understanding of risk has been suggested and approved. The final aspects of this objective are the use of modern electronic technology for data analysis. In developed countries such as the United States, Australia and England, different software is used. Some of this software has a very simple structure. Considering the fact that currently MS-Excel, and EPI-INFD package are mostly used in India to register and analyze data, in the proposed model, while taking into consideration the advantages and disadvantages of other software of relevance to this system, appropriate software was, finally, suggested for this purpose.

In response to objective number 6 "The investigation of information dissemination in NNDSS of India". The use of electronic method for information dissemination in addition to routine methods are characteristics of this system in the United States, Australia and England and in the proposed model this was taken into consideration and the electronic, press, audio-visual, and oral methods were
recommended for dissemination of information. Specialists believed that website, mass media, weekly report of diseases and morality, etc, can play a major role in dissemination of information related to this system.

In response to objective number 7 "The investigation of classification system of diseases in NNDSS of India", it was found that the classification system used in the United States\textsuperscript{111}, Canada, England and Iran is version-10 of international classification systems with clinical modification (ICD-10CM) and in Australia version-10 of International classification of diseases with clinical modification (ICD10-AM 3\textsuperscript{rd} Edition) is used\textsuperscript{112,113,114}. Based on specialists views version-10 of International classification system (ICD-10) which is WHO’s publication was used for accurate reporting and comparison of information at national and International levels.

In response to objective number 8 "The investigation of data quality control in NNDSS of India". One of the most important advantages of NNDSS in the United States\textsuperscript{95,115}, Australia and Canada is the use and availability of written and compiled data quality control methods in these countries\textsuperscript{98,116}. In the proposed model the following suggestions have been made:

- Preparation of written guidelines for data quality control.
- Consensus on national notification standards.
- Providing standard definition for disease.
- The determination of minimal data for reporting at national level.
- Publishing guide for users.
- Determination of period for notification.
- Regular training of staff.
• Safe guarding confidentiality of data.

One of the most important aspects of this objective is quality control indexes of data. Therefore, the indexes of quality control were determined. For notification of data, emphasis was laid on completeness, validity, accuracy, the control of recurrent cases, and the usefulness of data as main indexes of quality control and prevention from recording repeated cases. Taking specialists views, software package capable of automatic detection of repeated cases according to some specific fields was recommended. On the last aspect of this objective, Data Quality Control Monitor Organization, in the U.S, Centers for Disease Control and Local/State Health Centers bear this responsibility at national and local levels, respectively. In Australia, Health Department is Data Quality Control Monitor Organization. In this model IDSP was determined as the organization in charge of drawing up guidelines and developing policies for data privacy. One of the other characteristics of NNDSS is the written guidelines and policies of how to safeguard safeguard patients' privacy. In United states, a unified identification number is used instead of their identity information or personal details for the purpose of tracking them94,95,117,118. In Australia the data are codified, and individuals permitted to have access to identify information of patients119,120.

In the proposal model making rules against disclosure of patients' identity and information and for safeguarding their privacy, unified identification number is used to keep track of patients. Different levels of management and individuals were permitted to have access to identity information.
In response to objective number 10 “Designing an appropriate pattern for NNDSS in India and testing it by Delphi method”, a model was suggested on the basis of finding of the research and socio-economic, cultural and geographical condition of India. Diagram 5-1 shows the first model. This model was tested in three stages by Delphi method and final model was offered for NNDSS of India. Diagram 5-2 shows the final model.

**Overall the characteristics of this model are.**

- The promotion of Community health and people’s access to a better life.
- The development of NNDSS of the country.
- Decrease in prevalence rate of Notifiable Infections Disease NID in the country.
- Timely treatment of patients infected by NID.
- Simplicity and practicality.
- Enhancement of effective use of health resources.
- The provision of timely, sensitive indicators and data for prevention from prevalence and occurrence of diseases.
- Accurate notification and comparability of obtained data at national and international levels.
- The increase of confidence co efficiency of data through compilation of guidelines for Data Quality Control, the determination of Quality Control Indexes and methods of prevention from recording repeated cases.
- Enhancing patients’ confidence in NNDSS and safeguarding their privacy and confidentiality of information related to their identity.
• Developing database at national level to save data for managers’ use in planning, treatment, training and research

**Summary of researcher's suggestions, with respect to the findings of research:**

- The revision of national list of NID in specific period.
- The provision of integrated information infrastructure for national surveillance network of NID.
- Compilation of guidelines for data quality control.
- Making governmental rules against disclosure of information and for safeguarding the confidentiality of data and identity of patients during notification.
- Regular training of the staff involved in NNDSS.
- Training with respect to SS for all University disciplines that have connection with the system.
- Enhancement of information technology in this regard.
- Enhancement of feedback system in this regard.
- Evaluation of NNDSS in specific period.
- Making infectious diseases specialists more engaged in NNDSS.
- Having an integrated look at NNDSS
- The establishment of undersecretary for health information management in NICD.
- Developing a website in NICD center.
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- The use of Version-10 of international classification system of diseases' for codifying diseases at national level.
- Updating reporting guidelines on specific period.
- Data analysis at national level.
- The compilation of dictionary for NNDSS

Suggestions for future research

- Comparative study of NNDSS with that of the United States and Australia.
- Comparative study of National Notifiable non-Infection diseases system.
- Analytical investigation of effectiveness of cost of NNDSS.
- Comparative study of National System of Laboratory Information Management.
- The investigation of national system of Medicine Information Management
- The investigation of National Surveillance System of notifiable occupational Diseases.