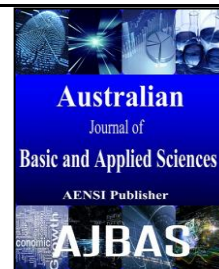




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Effective Approaches of Information Technology in Morbidity Management of Human Lymphatic Filariasis in Tamilnadu, India

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ABSTRACT

Background: India is a signatory to the 1997 World Health Assembly resolution for Global Elimination of Lymphatic Filariasis. The target for global elimination of human lymphatic filariasis is by 2020. The Indian National Health Policy (2002) aims at the elimination of LF by year 2015. The Global Programme for Elimination of Lymphatic Filariasis (GPELF) has two main components viz. interrupting transmission of lymphatic filariasis through mass drug administration and managing morbidity and preventing disability due to filariasis. Consorted efforts by the Public Health Department in Tamilnadu for elimination of lymphatic filariasis was launched in the year 1997 concentrating on both the components of the global programme. The data on the prevalence of filarial morbidity and its entire management is at present based on manual reports and registers generated by the field functionaries in the public health departments. Field surveys during the study indicated that interpretation and evaluation of morbidity management of filariasis was based on manual formats compiled as non analytical reports and stored in computers. **Objective:** To overcome the constraints in the manual reporting system, a web enabled user friendly format was evolved using the PHP server facilities and MySQL database management system that is capable of data entry, analysis and retrieval at the Health Sub Centre Level itself. **Result and Conclusion:** Feed back from field functionaries was encouraging and supported the implementation of such web based reporting system to achieve the goals of morbidity management of filarial lymphodema and prevent disability.

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INTRODUCTION

About 1.5 million people globally are affected by lymphatic filariasis related lymphodema that includes progressive swelling of the limbs genitals and breasts. Almost 25 million men are affected by filarial scrotal lymphodema (Michael E *et al.*, 1996). Although these clinical manifestations are not fatal, they categorize lymphatic filariasis as worlds leading cause of permanent and long term disability (WHO, 1995). In 1997, the World Health Organization (WHO) resolved to eliminate lymphatic filariasis as a public health problem (WHO, 1997). The World Health Organization subsequently launched the Global Programme for Elimination of Lymphatic Filariasis (GPELF) and proposed a comprehensive strategy based on two components viz. (i) Interrupting transmission of lymphatic filariasis through mass drug administration and (ii) managing morbidity and thereby preventing disability.

The Global Programme to Eliminate Lymphatic

Filariasis (GPELF) was launched by the World Health Organisation in the year 2000. India is a signatory to the 1997 World Health Organization resolution for elimination of lymphatic filariasis. The target for the global elimination of the disease is by the year 2020. The Indian National Health Policy (2002) however resolved to eliminate lymphatic filariasis by the year 2015 which aims at cessation of lymphatic filariasis as a public health problem when the number of microfilaria carriers in the community is less than 1% and children born after initiation of the elimination programme are free from circulating antigenaemia ie. presence of the adult filarial worm in the human body.

In April 2002, lymphatic filariasis was endemic in 73 countries and territories, an estimated 1.39 billion people were at risk of infection, and approximately 120 million were already infected (WHO, 2013). More than 40 million people were incapacitated and disfigured by lymphatic filariasis related disease, predominant lymphodema and its

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advanced form; elephantiasis and hydrocele. In India, the programme to eliminate lymphatic filariasis was universally launched in the year 2004 covering 220 endemic districts in 20 States/Union Territories and subsequently scaled up to cover all the 250 (now 255) endemic districts targeting a population of about 600 million.

Health being a state subject, the Government of Tamilnadu Public Health Department launched the National Filaria Day (NFD) programme in 10 revenue districts covering 15 Health Unit Districts in 1997 itself. Annual Mass drug administration with tablets Diethylcarbamazine Citrate (DEC) alone was taken up till the year 2000. From the year 2001 Tablet DEC was coadministered with tablet *albendazole* for the annual mass drug administration (ICMR, 2002). Along with the mass drug administration extensive morbidity management of filarial lymphodema cases was taken up through different institutions under the public health department.

The Global Programme for elimination of Lymphatic Filariasis has two main components viz.

- (i) Interrupting transmission of lymphatic filariasis through mass drug administration.
- (ii) Managing morbidity and preventing disability.

The entire data on the beneficiaries, implementation of drug distribution and compliance is generated manually in the formats communicated to the concerned Primary Health Centres and other health care units. Statistical analysis is performed manually and stored in computers. Likewise the entire line-listing of Lymphodema cases is manually generated and stored in computers. Every year the list is updated by door to door surveys by the field functionaries. Since filariasis (manifested with lymphoedema & hydrocele) is a chronic disease without epidemic potential or mortality, periodical collection of number of cases is unrealistic (NVBDCP, Delhi). In such instances, the data on the prevalence of filarial morbidity and its entire management based on manual reports and registers is most likely to face constraints such as:

- Time Constraint and Labour Intensive.
- Un-traceable duplication of data.
- Difficulty in retrieval of specific patient data over a period of time.
- Inconsistent Data (often without future use).
- Unreliable for record of Ex gratia Programmes and special incentives of Government and
- Difficulties for use in Rehabilitation.

The overall objective of the Global Programme for Elimination of Lymphatic Filariasis is possible only with a reliable and précised reporting system that is capable of subduing the above deficiencies.

In order to subdue the above deficiency in the manual reporting system, effective use of Information Technology was made for developing a user friendly web based online reporting system from the Health Sub Centre Level to the State Level for

the control and management of morbidity among patients with lymphoedema. PHP server side scripting language was used for this and datamining procedures were in line with MySQL facilities. The components in the new online reporting system are:

- Lymphoedema cases registration
- Particulars of interventions and cure in patients with filarial lymphoedema
- Format for incorporating details of ex-gratia for IV grade lymphoedema patients and other incentives sanctioned by government from time to time.
- Format for incorporating details of surgical interventions such as hydrocelectomy nodo-venal shunts etc.
- Line list of all grades and types of lymphoedema.
- Format for incorporating details of death of lymphoedema patients and registration of new cases (deletions and additions).

MATERIAL AND METHODS

The study was conducted between 2011 and 2014 in Districts of Vellore and Tiruvannamalai in the state of Tamilnadu in India.

Pre- tested questionnaires were used for the concerned staff of the Public Health Department in these Districts.

The details for the study was collected through questionnaires from Health Inspectors of the Health Sub Centers (HSC), Staff involved in data entry at the Primary Health Centre (PHC), Data Managers at the Health Unit District (HUD) and State Data Manager at the State Directorate.

Based on the replies to the questionnaires, the entire data was compiled for analysis and interpretation to strengthen effective use of Information Technology for the online reporting system. Line list of lymphodema cases manually generated in the district was maintained as reference in the online reporting system.

The user friendly online analytical formats were designed using PHP server-side scripting language with MySQL database. The utility of the database generated was enhanced using relational database management system (RDBMS) (Ramaiah KD *et al*, 2000) with Multiple User Facility through (LAN). Data validation and testing procedures were done as a routine using javascript facilities in the software.

Patient ID is provided and sequenced as 17 digit code comprising of two characters each for the State, District, HUD, Taluk, Block, PHC, HSC and 3 characters for serial number of the lymphodema patient. This ID facilitates retrieval of patient history for editing and also for advanced search. Analysis in terms of district wise, block wise HSC wise details of lymphodema cases is facilitated in the software.

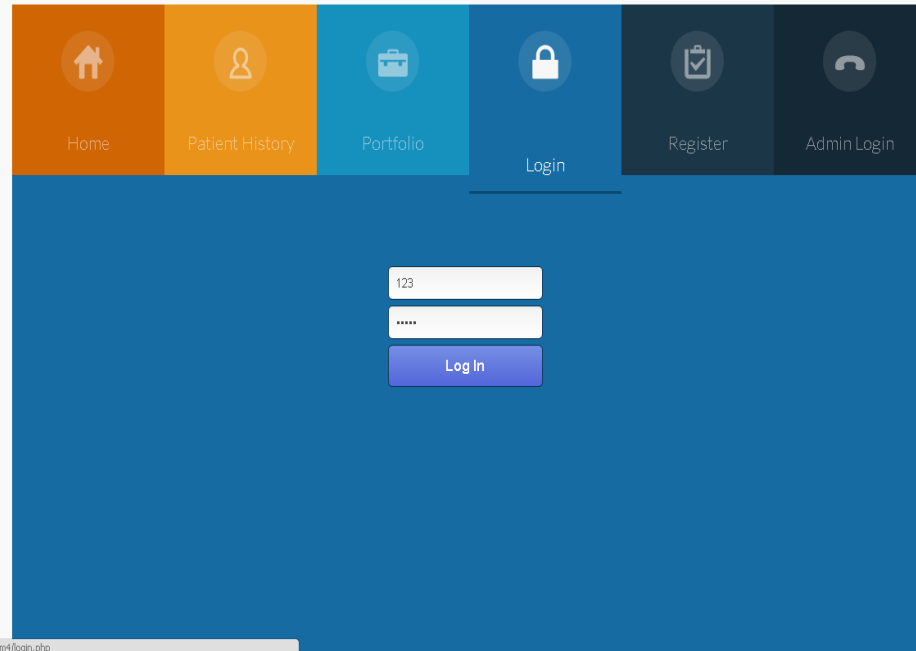
The information based on the replies to the questionnaires were compiled for analysis and the interpretation was done using SPSS tool.

Result:

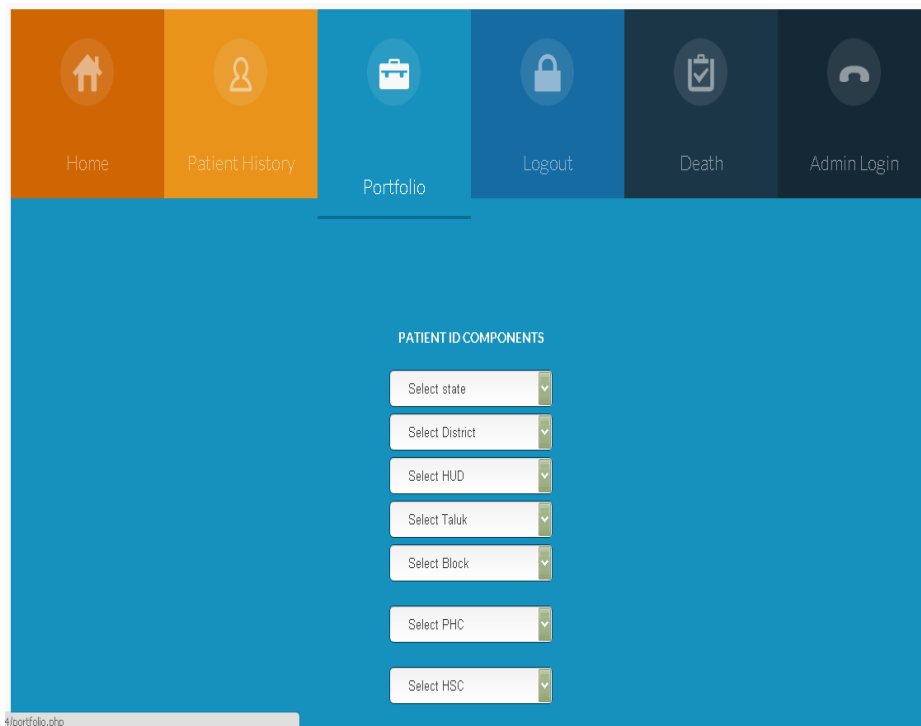
The analysis of the responses in the questionnaire revealed that universally in the districts, the reports were collected, compiled and analyzed manually ($p < 0.005$) and that an online reporting system is required for reliable data.

Screen Shot 1: Login ID:

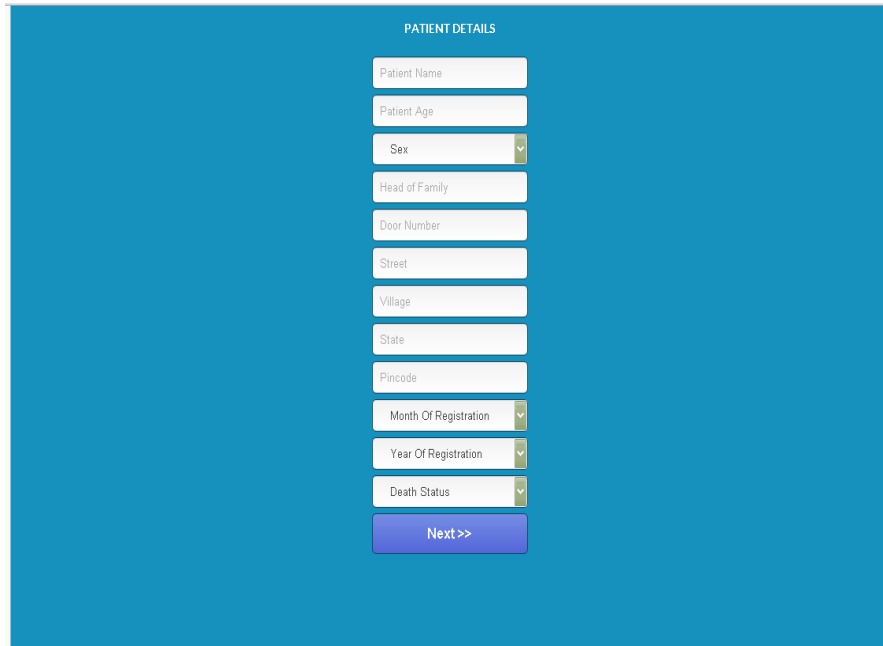
The data management staff needs to create login ID to access the reporting system.



The screenshot shows a web application interface with a navigation bar at the top. The navigation bar contains six items: Home (orange), Patient History (orange), Portfolio (blue), Login (blue), Register (dark blue), and Admin Login (dark blue). The main content area is blue and features a login form with two input fields: the first contains the number '123' and the second contains six dots. Below the input fields is a purple 'Log In' button. The browser's address bar shows 'http://login.php'.

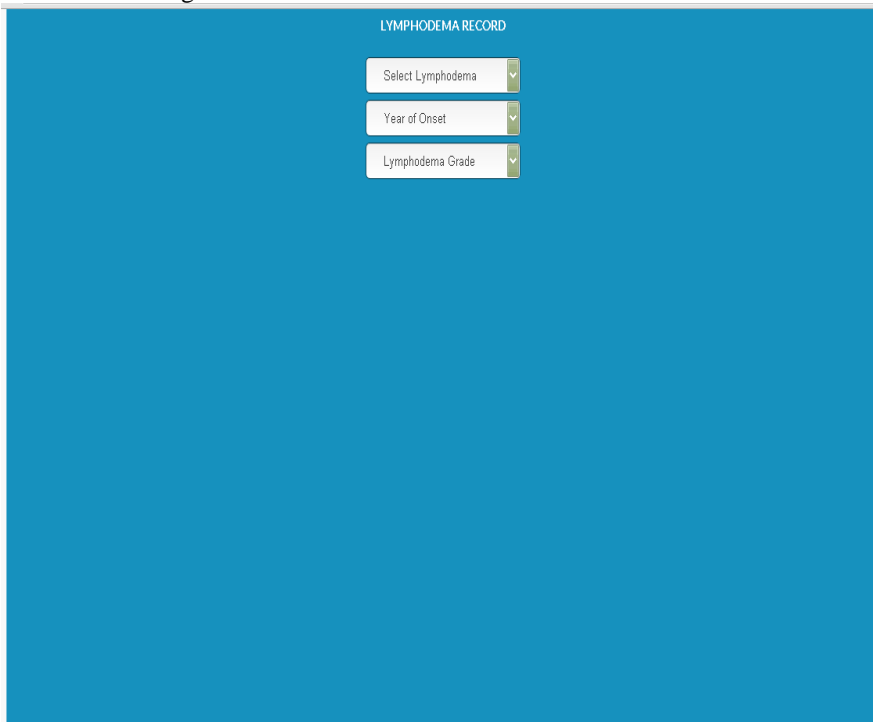
Screen Shot 2: Patient ID Components

The screenshot shows a web application interface with a navigation bar at the top. The navigation bar contains six items: Home (orange), Patient History (orange), Portfolio (blue), Logout (blue), Death (dark blue), and Admin Login (dark blue). The main content area is blue and features a form titled 'PATIENT ID COMPONENTS'. The form contains seven dropdown menus: 'Select state', 'Select District', 'Select HUD', 'Select Taluk', 'Select Block', 'Select PHC', and 'Select HSC'. The browser's address bar shows 'http://portfolio.php'.

Screen Shot 3: Patient Details

A screenshot of a web form titled "PATIENT DETAILS" on a blue background. The form contains several input fields and dropdown menus arranged vertically. At the bottom is a blue "Next >>" button.

PATIENT DETAILS	
Patient Name	<input type="text"/>
Patient Age	<input type="text"/>
Sex	<input type="text" value="v"/>
Head of Family	<input type="text"/>
Door Number	<input type="text"/>
Street	<input type="text"/>
Village	<input type="text"/>
State	<input type="text"/>
Pincode	<input type="text"/>
Month Of Registration	<input type="text" value="v"/>
Year Of Registration	<input type="text" value="v"/>
Death Status	<input type="text" value="v"/>
<input type="button" value="Next >>"/>	

Screen Shot 4: New Patient Registration

A screenshot of a web form titled "LYMPHODEMA RECORD" on a blue background. The form contains three dropdown menus arranged vertically.

LYMPHODEMA RECORD	
Select Lymphodema	<input type="text" value="v"/>
Year of Onset	<input type="text" value="v"/>
Lymphodema Grade	<input type="text" value="v"/>

Screen Shot5: Patient Lymphodema details

LYMPHODEMA RECORD

Select Lymphodema

- Select Lymphodema
- Right Hand
- Left Hand
- Both Hand
- Right Leg
- Left Leg
- Both Leg
- Scrotum
- Breast

Screen Shot 6: Patient Lymphodema Record details:

LYMPHODEMA RECORD

Right Hand

2010

2

Lymphodema Grade

- 1
- 2
- 3
- 4

Surgical Intervention

Nodovenal Shunts

Intervention Date-YYYY/MM/DD

Institution Name

Screen Shot 7: Lymphoedema Record on Grade and Ex gratia details.

LYMPHOEDEMA RECORD

Right Hand

2010

4

Date Paid-YYYY/MM/DD

Amount Paid

Surgical Intervention

Nodovenal Shunts

Intervention Date-YYYY/MM/DD

Institution Name

Select Expenses

G.O Number

Total Funds

Screen Shot 8: Patient History Retrieval

Home Patient History Portfolio Logout Death Admin Login

010101010101004

Advanced Search

Submit

Screen Shot 9: Patient History Output

Month of Registration	Year of Registration	Patient ID	PHCHCS	Village	Street	Door No	Name	Head of family	Age	Sex	Lymphodema Part							
											Right Hand	Left Hand	Both Hands	Right Leg	Left Leg	Both Legs	Scrotum	Breast
01	2013	01010101010101004	01	krishna nagar	ganapathy street	123	venkatesha shivan	34	M		✓							

Year of onset of lymphodema	Details of Grade of Lymphodema
2010	04

Death Status
 Alive

PATIENT ID:

State -> TamilNadu-01
 District -> Vellore-01
 HUD -> Katpadi-01
 Taluk -> Vellore-01
 Block -> Vellore-01
 PHC -> 01
 HCS -> 01
 S.No -> 004

Screen Shot 10: Listing Death with Action Taken Drop down Field

Home

Patient History

Portfolio

Logout

Death

admin

Month of Registration: 01	<input style="width: 90%;" type="text" value="2014/12/03"/>
Year of Registration: 2013	<input style="width: 90%;" type="text" value="78"/>
Patient ID: 01010101010101004	<input style="width: 90%;" type="text" value="Action Taken"/> <div style="border: 1px solid white; padding: 2px; margin-top: 2px;"> Action Taken 01-Deleted from Main list and sent to death bin 02-Retained in the Main list </div>

Screen Shot 11: Advanced Search Leading To Health Sub Center passing through State, District, Health Unit District, Taluk, Block and Primary Health Center

Discussion:

A significant proportion of the public health problem represented by lymphatic filariasis is due to impairment and disability related to lymphoedema (elephantiasis) and hydrocoele. Therefore, national programmes focus on managing morbidity and preventing disability. These activities will not only help lymphatic filariasis patients but can improve coverage with drugs during mass drug administration (Cantey PT *et al*, 2010). The success of any epidemiological investigation is influenced by the complexity in proper management of epidemiological data and corresponding database support (Suryanarana Murty Upadhyayulu *et al*, 2012). The present study offers a reliable database generated right from the peripheral units of the public health department and accessible at all levels of implementation and monitoring. Also all types of combinations of different parameters significant to filarial morbidity management is retrievable at all levels.

An estimated 40 million people globally have clinically significant manifestations of lymphatic filariasis; predominantly lymphoedema and hydrocoele accounting for 5.9 million DALYS (disability-adjusted life years (WHO, 1995), with a concomitant loss of productivity and social stigmatization.

As the goal of the GPELF is to eliminate the disease, managing morbidity and preventing disability is integral to elimination programmes (New England Journal of Medicine, 2012). Access to management of lymphoedema and surgery for

hydrocoele may increase community cooperation in mass drug administration (Cantey PT *et al*, 2010) and thereby contribute to interrupting transmission of the parasite and preventing new infections. A reliable database on such management is therefore very essential to evaluate and modulate the efforts for early elimination of the disease.

Filarial morbidity management should be part of the primary health care system to ensure sustainability (Michael E, 1996). All national programmes must manage morbidity and prevent disability in order to eliminate lymphatic filariasis, including care for those affected, even after interruption of transmission. Patients with clinical and social consequences have a right to health care, and this is the responsibility of national elimination programmes (WHO, 2011). Early hydrocoele changes can often be reduced by lymphatic drainage (Simonsen PE *et al*, 1996). Hydrocoele is effectively cured by surgery, and this has been shown to improve men's economic situation, community participation and quality of life. The online formats developed in the study, track such remedial measures catered to the filarial lymphoedema cases. Hydrocoelelectomy 'camps' have been useful in Africa (WHO), where a concerted effort can result in treatment of a large number of hydrocoele patients relatively quickly. An online reporting system instantaneously allows for data entry from the site of such camps itself.

Government of Tamilnadu in India, has sanctioned financial support for patients referred for hydrocoelelectomy. Also monthly ex-gratia payment for

filial patients with fourth grade lymphodema has been provided through the public health department. This ex-gratia payment enables patients to meet out expenses for foot care hygiene and to seek medical attention. The online reporting formats have provisions to incorporate details of patients availing such financial benefits and cure. This will eventually reduce human errors during compilation of manual reports and be even more reliable and accessible at all levels.

Validity of the Impact Indicators and Clinical Indicators in assessing the Geographical Coverage of Filial Morbidity Management Programmes would be even more expressive with a well-organized online reporting system as indicated in the present study. Innovative Vector Control Consortium has already identified that Information Technology and its tools helps to improve the vector control mechanisms and leads to reduce the burden of vector borne diseases (Hemingway J *et al*, 2006).

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