Development of Institutional Repository Using DSpace at ICMR-National Institute of Epidemiology, Chennai, Tamil Nadu: An Overview

S. Satish
Senior Technical Officer, ICMR-National Institute of Epidemiology
Tamil Nadu Housing Board, Ayapakkam, Chennai, Tamil Nadu, India
E-Mail: yessatish@gmail.com

Abstract - **Institutional repositories is converting the intellectual output of an institution to digital form. It contains collecting, archiving, preserving of Institute intellectual output in the digital form, as the archives are thesis, publications, reports, dissertation, teaching materials, presentations, video, images, photographs, printed material, newspaper clippings. ICMR-NIE has started its digital library service from 2015. This paper discusses the setup of a digital institute repository at ICMR-NIE using the open source software D-Space for the long-term preservation of the institutional materials. It benefits the institute by raising the institute's profile for a broader dissemination, increased use, and enhances the Institute research materials to the staff, scholars, students and faculty members**
Keywords: **Institute Repository, DSpace, Epidemiology, Digital Archive**

I. INTRODUCTION

Libraries play important role in information dissemination to academic and research Institutes. An institutional repository (IR) is the collection of intellectual output of an institution. IR is the long term preservation and structure of the materials of the institute in the form of academic community etc. in form of thesis, publications, reports, dissertation, video, images book chapters, patents, lectures, project reports etc. for wider accessibility to its community. It contains collecting, disseminating, capture, store and preserving of Institute output in digital form [1]. An institutional repository is a digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible to end users both within and outside of the institution [2].

For archiving of materials, many open source software are available. The commonly used software are Dspace, Eprints & Fedora. Dspace is an open source free repository software (https://duraspace.org/dspace) package typically used for creating open access repositories for scholarly and or published digital content. DSpace is completely customizable and fits the needs of any organization and is currently used by more than 1000+ organizations and institutions worldwide [3]. The first public version of DSpace was released in November 2002, as a joint effort between developers from Massachusetts Institute of Technology (MIT) in Cambridge and Hewlett Packard Laboratories. In March 2004, a group of institutions formed the DSpace Federation, which determined the governance of

future software development by adopting the Apache Foundation's community development model. In July 2007, as the DSpace user community grew larger, HP and MIT jointly formed the DSpace Foundation, a not-for-profit organization that provided leadership and support [4].

EPrints (http://www.eprints.org) is generic archive software under development by the University of Southampton. Eprints is the Open Archives Initiative (OAI) Complaint repository software. It typically supports collections of pre-prints and technical reports often subject based in scope. Recently this software is being used to manage multidisciplinary institutional archives [5].

Fedora (Flexible Extensible Digital Object and Repository Architecture) is a digital repository system developed jointly in 1977 by Cornell University Information Science and University of Virginia Library as project. Fedora is an architecture for storing, managing and accessing digital content in the form of digital object [6] Fedora is one of a number of repository architectures that have been proposed over recent years for use in digital libraries [7].

From the three open source softwares mentioned for building Institute Repository, Dspace was considered and found suitable for building up the digital repository as the ICMR-NIE materials were scattered in many places and access to the materials by the researchers, scholars, and staffs were difficult. This repository stores, process the information of the research output materials at one place for future perspectives. Thus this initiative is meant to have increased visibility of the research outcomes of the Institute.

A. About ICMR - National Institute of Epidemiology

The Indian Council of Medical Research (ICMR), New Delhi, Department of Health Research, Government of India is an apex body in India for the formulation, coordination and promotion of health research. It is one of the oldest medical research bodies in the world. The ICMR-National Institute of Epidemiology (NIE), Chennai is one of the permanent institutes of the ICMR, Department of Health Research (DHR) of Govt. of India. ICMR - NIE is situated at Chennai in Tamil Nadu, India. ICMR-NIE was established on July 2, 1999 by merging the field unit of Central JALMA Institute for Leprosy, Avadi with the

Institute for Research in Medical Statistics (IRMS), Chennai.

ICMR-NIE is ICMR's flagship organization that focuses on training and research in epidemiology and public health. ICMR-NIE has the principal mandate to develop the science of epidemiology and support capacity building in this area under the auspices of ICMR School of Public Health at ICMR-NIE. The Institute has the distinction of being the WHO Collaborating Centre for Leprosy Research and Epidemiology. The Institute carries out a variety of research activities which include areas such as cohort studies, interventional studies, health systems research, evaluation of health schemes and disease control programmes, issues concerning statistical methodology, epidemiological investigations, studies and clinical trials of traditional remedies. The Institute is recognized by the University of Madras for research leading to Ph. D degree in bio-statistics and by the Tamil Nadu Dr. MGR Medical University for Ph.D in Epidemiology.

II. RESEARCH ACTIVITIES OF NIE

NIE is involved in the following research activities

1. India hypertension control initiative – to strengthen the hypertension treatment component of National program for prevention and control of cancer, diabetes, Cardiovascular Disease and Stroke (NPCDCS).
2. HIV sentinel surveillance in Southern India
3. Strengthening tuberculosis and HIV detection and management
4. Hospital-based sentinel surveillance of pneumonia and invasive bacterial diseases
5. Congenital rubella syndrome surveillance in India
6. Integrated road traffic injury surveillance system, Chennai, Tamil Nadu
7. Integrated management of neonatal and childhood illness
8. Status of labeling drug information and branding in marketed anti-diabetic siddha formulations, Surveillance platform for influenza and other respiratory viruses,
9. Rotavirus vaccine
10. Surveillance of acute febrile illness, acute respiratory illness at district and sub-district hospital
11. Impact of measles and rubella vaccination campaign on population immunity
12. Dengue virus infection in India
13. Elimination of mother to child transmission of HIV and syphilis in India
14. Assessment of Acute viral hepatitis and chronic liver disease in Northeast India
15. Coverage of doxycycline for prevention of leptospirosis
16. Sero-prevalence of antibodies against NIPAH
17. Health system preparedness and deaths due to non-communicable diseases among the tribal population in India
18. ICMR virus research and diagnostic laboratories network
19. Model district for public health preparedness, surveillance and response.
20. Demographic and health surveillance
21. Evaluation of Human Papilloma Virus vaccine program
22. Risk factors of scrub typhus among children and progression to AES in Gorakhpur, Uttar Pradesh

III. ACADEMIC ACTIVITIES OF NIE

The Institute has been conducting two-year Masters's level programme in public health (MPH) since 2001. ICMR-NIE has been conducting two-year field epidemiology training program (FETP) leading to Master's degree in public health [2001-2010:Master of Applied Epidemiology (MAE); 2008-2010: MPH in Health Services Development and Research; 2011 onwards: MPH in Epidemiology and Health Systems] awarded by the Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), an Institute of National importance based in Thiruvananthapuram. The programme is affiliated to global network of such field-based epidemiology training programmes (called 'Training in Epidemiology and Public Health Interventions Network' - TEPHINET). This initiative of ICMR-NIE receives top priority from ICMR leadership and the required support from the Indian Ministry of Health and Family Welfare. The programme is aimed at strengthening health services through training of 'in-service' middle level health managers with a 'learning-by-doing' approach. MPH field projects include analyzing the surveillance data, investigating outbreaks, evaluating health programmes/ surveillance system and conducting epidemiological investigation.

Beginning 2016, ICMR-NIE started offering two-year M.Sc. in Biostatistics affiliated to Periyar University, Tamil Nadu. Further, ICMR-NIE offers Ph.D., programmes in Epidemiology, Bio-statistics and Microbiology.

ICMR-NIE offers online course on health research fundamentals. ICMR-NIE has initiated a two year Non-communicable disease epidemiology fellowship program.

ICMR-NIE in collaboration with United States Centers for Disease Control and Prevention (CDC) is conducting a 2 year, India Epidemic Intelligence Service Training Programme.

'NIE-ICMR e-Certificate' courses called as NIeCer courses are being conducted with the aim to strengthen the research capacity in India. The first in the NIeCer series, Health Research Fundamentals (NIeCer 101) –is a basic level course in health research methods was launched in 2016. The course is designed and conducted by faculty members from ICMR School of Public Health at ICMR-NIE. It explains the fundamental concepts in epidemiology and bio-statistics related to research methods. This course will provide an overview of steps and principles for designing

bio-medical and health research studies among human participants. The course is targeted for any current or potential health researchers including students, clinical/ public health/ laboratory researchers, physicians, research associates, allied health professionals, scientists, statisticians, ethics committee members and project managers. The course is open to undergraduate students in Medical/Dental/AYUSH disciplines or graduates in any other discipline as well. Additionally, ICMR- NIE conducts various short term courses like Basic course in statistics for medical doctors, Advance course in statistics using SPSS, Clinical trials, Geographic Information System for public health practitioners and internships training for research scholars for post graduate and under graduate students and laboratory training.

IV. NATIONAL AND INTERNATIONAL COLLABORATIONS OF ICMR-NIE

ICMR-NIE has developed meaningful collaborations with several national and international institutes. National collaboration for UNDP meningitis / pneumonia sites: Government Medical College and Hospital (GMC) Jammu, Jammu & Kashmir; Dr. Rajendra Prasad Government Medical College Kangra Tanda, Himachal Pradesh; All India Institute of Medical Sciences (AIIMS) Jodhpur, Rajasthan, Bhopal, Madhya Pradesh; Mahatma Gandhi Memorial Medical College (MGMMC), Indore, Madhya Pradesh; Lokmanya Tilak Municipal General Hospital (LTMGH), Sion, Mumbai, Maharashtra; Indira Gandhi Institute of Child Health (IGICH), Bengaluru, Karnataka; Trivandrum Medical College (TMC), Thiruvananthapuram, Kerala; Institute of Child Health (ICH), Chennai, Tamil Nadu; Kanchi Kamakoti Childs Trust Hospital (KKCTH), Chennai, Tamil Nadu. Congenital rubella syndrome (CRS) surveillance: AIIMS, Jodhpur, Bhopal, bhubaneshwar; CMC Vellore; IGICH Bengaluru; KEM Pune; PGIMER Chandigarh; ICH Kolkata; Niloufer Hospital, Hyderabad; MGIMS Sevagram, GMC, Gauhati, KGMU Lucknow; GMC Trivandrum. Further, in Tamil Nadu, the institute has

been working closely with the State health services and institutes such as Indian Institute of Technology (IIT)-Madras, Sri Ramachandra University, Chennai. Central University of Tamil Nadu, Tiruvarur; The TamilNadu MGR medical University, Guindy; King Institute, Chennai; Directorate of Public Health and Preventive Medicine, Chennai. Model rural health research unit at kalloor.

The Institute has Memorandum of Understanding (MoU) in the areas of research and training with Swiss Tropical Institute & Public Health Institute (Swiss TPH), Basel, under the Indo-Swiss bi-lateral funding, the institute is engaged with STI on several projects ranging from disease-specific research projects to public health training.

NIE has partnerships and Academic support (MoU) with Sree Chitra Tirunal Institute for Medical Sciences and Technology; University of Madras; Sri Ramachandra University; National Institute of Siddha; Central council for Research in Siddha and Loyola college; Chennai.

For improving the quality of public health training in the country, ICMR has developed ICMR Partnership for Schools of Public Health (IPSPH) in the country with its secretariat at NIE. Institutes joining this partnership include (I) The institutes of National Importance viz. the All India Institute of Medical Sciences (AIIMS), New Delhi, Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh and SCTIMST, Thiruvananthapuram (II) Premier public health training institutes in the country viz. All Indian Institute of Hygiene and Public Health (AIIHPH, Kolkata), National Institute of Health and Family Welfare (NIHFW), New Delhi (III) Armed Forces Medical College (AFMC), Pune, (IV) National Centre for Disease Control (NCDC), Delhi and (V) Institutes of eminence in medical field e.g. Christian Medical College (CMC), Vellore. The institute has partnership at the international level with WHO, Center for Disease Control and Prevention (CDC), Atlanta, UNICEF, UNDP, JHU, OUCRU and NIH etc. (Fig.1).

Fig.1 National and International Collaborations of ICMR-NIE

ICMR- NIE library a cornerstone to excellence in research and education has been upgraded to meet the requirements of expanding training, teaching and research activities. The library caters to varied segments of users viz. Scholars of the ICMR School of Public Health pursuing Masters in Public Health (MPH), Masters in Applied Epidemiology (MAE), National and International trainees and visitors, Ph.D fellows, ICMR institutes and educational Institutes in and around Chennai, 200 in house scientists, ICMR-NIE faculty members who are designated guides for Ph.D in epidemiology, biostatistics and microbiology affiliated to University of Madras, The Tamil Nadu MGR Medical University, The Sree Chitra Tirunal Institute for Medical Sciences & Technology, Thiruvananthapuram.

As ICMR-NIE is involved in several nationally important short-term training activities. The participants in these training activities utilize the library resources for the various academic exercises. ICMR-NIE also caters to the need of many medical colleges, research institutes, government and non-governmental agencies and independent researchers in the city of Chennai. Further, it is being used by institutes which have a MOU with the ICMR-NIE and enjoys popularity among ICMR institutes spread all over India. The library is the hub for information needs of scholars of academic programmes conducted at ICMR-NIE.

V. INSTITUTE REPOSITORY AT ICMR- NATIONAL INSTITUTE OF EPIDEMIOLOGY

The research materials of ICMR-NIE were difficult to preserve for future use. Keeping Institutes mandate and preserving the materials, the research outputs like publications, reports, lectures presentations, newspaper clippings, thesis and dissertations etc. which were not readily accessible and scattered in hard copy were converted to Digital form for long-term preservation. Institute Repository ICMR-NIE created using the Dspace open access software.

VI. MATERIALS IN THE REPOSITORY

ICMR-NIE research materials were divided by publications, reports, thesis and dissertations, lecture presentation, question bank (previous years), newspaper archives and conference videos. The research materials were customized as per the requirements of the scientists, staff, scholar and students.

The following Table I shows the number of records available in ICMR-NIE Dspace repository.

TABLE 1 ICMR-NIE IR DOCUMENT TYPE IN COMMUNITIES

Type of documents	Number of Records
Publications	260
Reports	45
Thesis and Dissertations	145

A. DSpace Production Needs the Following System Requirement

1. Hardware requirement

a. Any mother board and processor that can run Linux / Unix / Windows
b. 4 GB of Random Access Memory (RAM)

1) 2GB for Tomcat
2) 2GB for Database
3) Operating System also needs some memory to function. So, while a mid-range DSpace may only need ~4GB of memory, should ensure the computer itself has at least 5-6GB of RAM available overall.

c. 300 GB for storing of files.
d. Size of hard-disk depends on the volume of documents to upload. A minimum of 500 GB hard-disk is recommended.

2. Software

a. Operating System: UNIX-like OS (Linux, HP/UX, Mac OSX, etc.), Microsoft Windows
b. Java JDK: Java JDK 7 or 8 (Open JDK or Oracle JDK)
c. Java build tool: Apache Maven 3.0.5 or above & Apache Ant 1.8 or above
d. Database Server: PostgreSQL 9.4 or higher (with pgcrypto installed) /Oracle 10g or later
e. Servlet Engine: Apache Tomcat 7 or higher
f. Dspace open source software from:http://www.dspace.org

VII. ICMR-NIE DSPACE SEARCH METHOD

ICMR-NIE holds publications by ICMR-NIE scientists, outbreak publications, Annual report since 1979, Research project reports, Thesis and dissertations of Master of Applied Epidemiology (MAE), Master of Public Health (MPH), PhD of staff, Lecture presentations of faculty, Previous year question bank of MAE, MPH, Newspaper archive and Conference videos which covers the research areas involved at ICMR-NIE.

Initially 450 records of the research outputs of the Institute were scanned and converted to pdf and added in the Dspace in-house IR. The Institute repository can be searched by basic and advance search interface. Users can search browse and access fulltext of these publications reports byTitle, Author, Subject wise andDocument type from the collections.

The repository is accessible on-campus via intranet facilities and is in accordance with the copyright regulations. Fig. 2Shows the Screen shot of the home page of NIE digital repository, Fig. 3 shows the browsing of author search.
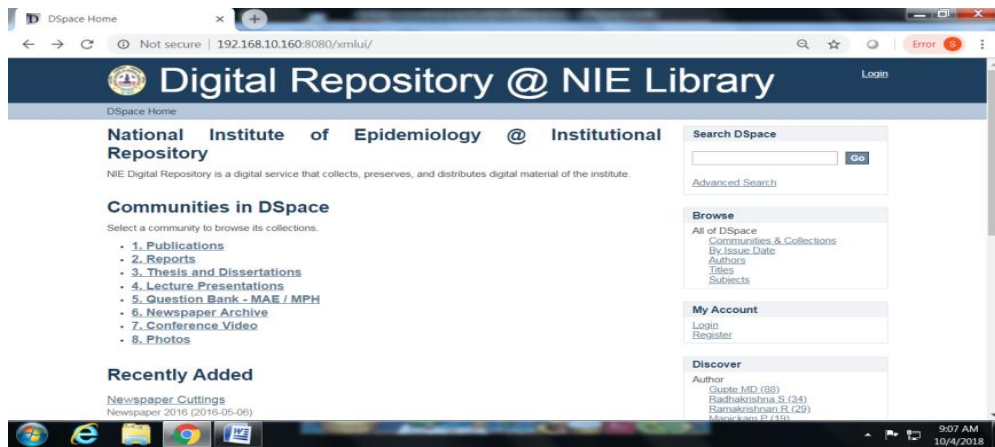
Fig. 2 Screenshot - Home page of National Institute of Epidemiology Dspace
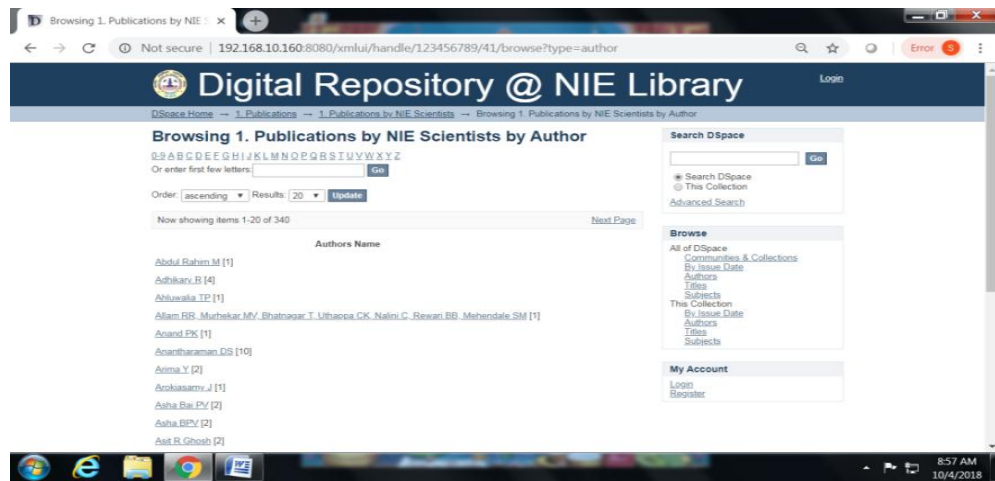Institutional repository

Fig. 3 Screenshot - Browse by Author

The Dspace software supports the search by advance and simple search. The advance search can be done by limiting the search by author, title, fulltext etc. Screen shot of advance search (Fig. 4).The search result of publication by NIE scientists by title. Screen shot (Fig 5) the details of the title, author, journal and issue etc. as per the Dspace display policy.

Clicking on the title of the article, will display the bibliographic details with abstract. Screen shot of article with abstract (Fig.6)

Clicking on download the PDF of the article will display the pdf version of the article. Screen Shotof pdf of the article (Fig. 7).
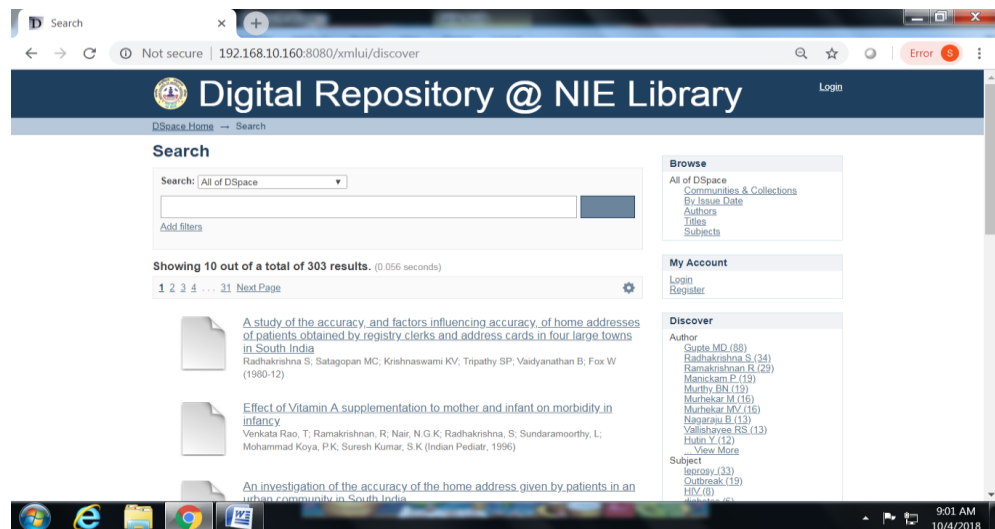

Fig. 4 Screen shot of Advance search

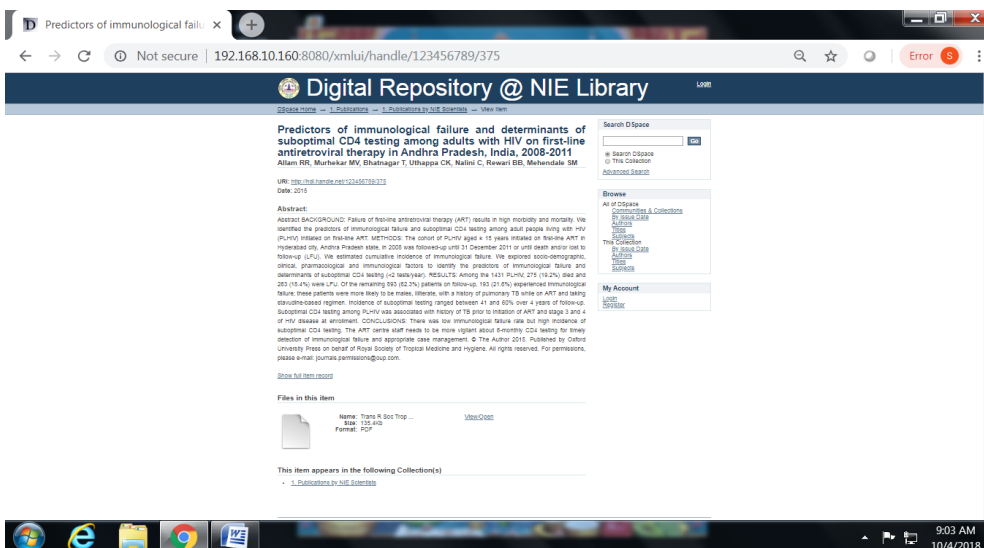Fig. 5 Screen shot: Display of publication by the NIE scientists by title

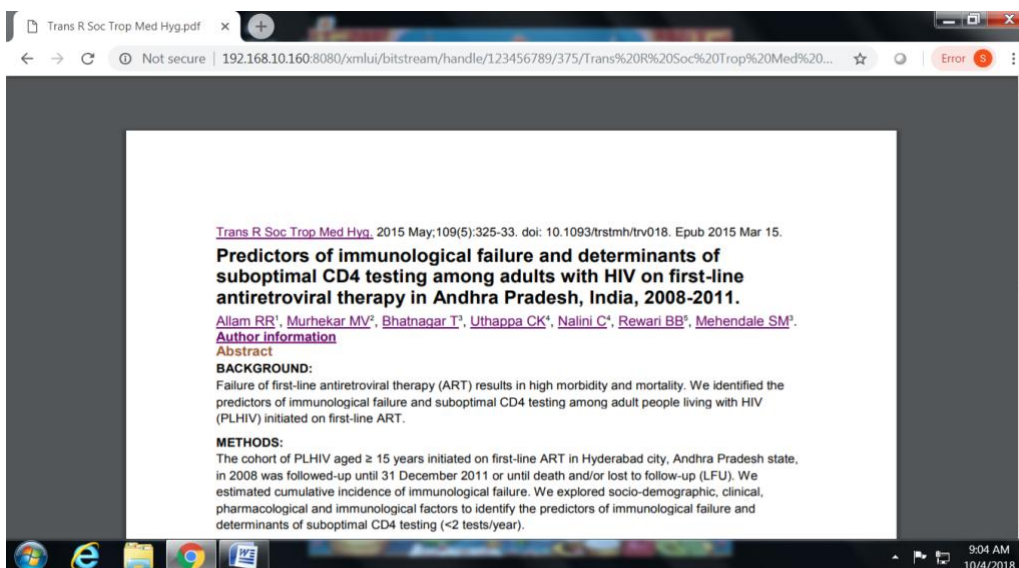Fig. 6 Screen shot: Bibliographic details with abstract

Fig. 7 Screen Shot of PDF of the article

VIII. COPYRIGHT INFORMATION

Research materials of National Institute of Epidemiology follow Sherpa / RoMEO copyright policy for research papers. SHERPA/RoMEO Programming Interface RoMEO is a database of publisher copyright policies on self-archiving, based on the publisher's copyright transfer agreement. It is maintained by SHERPA with support by Joint Information Systems Committee (JISC) and the Wellcome Trust. Individual journal titles, ISSNs or publishers can be searched, and each title is identified as green (can archive preprint and post-print), blue (can archive post-print (i.e. final draft post-refereeing), yellow (can archive pre-print, i.e. pre-refereeing), or white (archiving not formally supported) [8]. In-house scientist, staff and scholars can access the full-text of the articles available in ICMR-NIE Dspace repository and outside the affiliated institution with accordance of copyright regulations.

IX. CONCLUSION

ICMR-NIE has established IR of its publications, reports, thesis, dissertation, videos, education materials etc. and converted from print to digital form to preserved and access it for long-term in the digital form using Dspace open source software. IR provides access to the documents in different ways like title search, author, subject etc. Building IR for the institute is necessary for increasing the research visibility of the individuals and Institute. The access of IR is on-campus via intranet facilities (LAN only) and is in accordance with the copyright regulations. ICMR-NIE IR has been found useful for various stakeholders and also in research activities of the individual Institute. We plan to expand the Institute repository in future, make it more participatory and dynamic.

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