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Internet based Human Health Risk Assessment and Management in India: An *In-Silico* Approach

L.K. Dwivedi[1*], Rambir Singh[1] and A.B. Pant[2]

[1]Institute of Biomedical Sciences,
Bundelkhand University, Jhansi-284128, Uttar Pradesh, India
[2]Indian Institute of Toxicology Research
(Council of Scientific & Industrial Research), Lucknow, India
**Corresponding Author E-mail: lavkush_dwivedi2002@yahoo.co.in*

Abstract

Human Health Risk Assessment & Management (HHRAM) is a systemic process to identify and characterize the nature and concentration of human health risks and possible restoration of health by scientific and technological methods. Such approaches are developed and communicated through internet in western countries to predict and manage the health risks of their own population. But due to entirely different circumstances they are found unfit for the country like India where diversity is an emblem. Since, Internet penetration is at pace and being developing nation growing health risks may not be an exception in India also. Therefore a HHRAM approach addressing to Indian population was attempted to design and develop in the present investigation which could predict and manage the health risks online.

Study completed in three phases (1) Preparation of online health risk assessment questionnaire (HRAQ) containing variables of our interest related to personal history, occupational health status, environmental and socio-economical status (2) Development of Database Management System (DBMS) to logically collect, retrieve and evaluate the collected data in computerized format (3) Designing and development of website (www.healthrisk.co.in) holding all the developed tools and other health related information for online survey and HHRAM. The health status inferences in addition to affordable mitigations are programmed to figure as risk report and produced to every end user at every assessment. MySQL, Microsoft office 2007, Hypertext Preprocessor (PHP) and Cascading Style Sheets (CSS) languages and application software were used for its development. More than 2000 individuals' consented data have been collected and evaluated so far.

Keywords: Human health risk assessment and management, Health Risk Assessment Questionnaire, Database Management System, www.healthrisk.co.in.

Introduction

Today, with technological advancement and strong scientific background at each level, one can achieve comfortable life but may also experience ill health behaviors due to simultaneous exposure of low, moderate to severe health hazards. Moreover, diversity in occupational, social and environment status has deepen the pain and taken the dilemma into threatening dimension in all over the world. Every day numbers of people surrendering their long-term health due to lifestyle they lead today. Behaviors such as lack of exercise, smoking, poor diet, non-prescribed medication, extended working hours and health negligence are increasing a person's risk of getting sick or dying prematurely [1,2]. However, considering the severities of jeopardy the efforts are made and have been rewarding in the shape of human health risk assessment and management (HHRAM) in western countries. Internet, which is now increasingly being used by citizens as a source of health information [1,2,3] and also considered to be a significant factor in maintaining users' satisfaction and empowerment [5] is used to communicate the HHRAM approaches among targeted population and rest of the world.

Human Health Risk Assessment and Management (HHRAM)

HHRAM is a combined approach of human health risk assessment (HHRA) and management (HHRM). The HHRA is an organized process of describing and estimating the likelihood of adverse health outcomes from environmental hazards' exposures to human beings [6]. It consists of four steps (I) hazard identification (II) exposure assessment (III) dose-response assessment and (IV) risk characterization [7]. The risk management is possible restoration of health by utilizing scientific and technical knowledge.

Interestingly, most of the HHRAM approaches employed in western countries may not be perfectly suitable for the country like India where diversity is an emblem while such approaches addressing to Indian population are almost none. At the same time, being developing nation growing health risks may not be denied in India also. In fact, many emerging occupational health troubles are to be tackled along with existing socio-economical and environmental public health problems [8]. Around 924,700 to 1,902,300 incidences of occupational diseases and 121,000 annual deaths have already been estimated in 90s [9]. In agriculture alone, 17 million injuries and 53000 annual deaths were reported in North India [10].

So considering the jeopardy, attempts were made in the present investigation to design and develop a HHRAM tool which could predict and manage the health risks associated with any possible health hazard in India. The internet was selected to communicate the approach because its penetration in India is on rise. With 1,520.0% growth between years 2000-2009, India is fourth ranked among world's top 20 internet user countries [11].

Materials & Methods

The study was completed in three phases (1) Designing and development of online health risk assessment questionnaire containing variables of our interests for online health survey (2) Development of *in-silico* tool containing bio-calculators and various other databases to analyse, store, process and retrieve the data as per need of respondent (3) Designing and development of website uploaded with all developed tools and other scientific information on health risks for wider reach among targeted population.

The questionnaire was designed in PHP with SQL support containing 58 variables on Personal history, Environmental status, occupational health status (clinical history, disease history) and Socio-economical status. The DBMS and bio-calculators were developed on a Pentium ®-4CPU, 3.20 GHz personal computer with 80 GB of memory. The system was supported with Intel 4 processor having windows XP professional service pack-2, version- 2002. The application software used for system development were Microsoft DOT NET version 3.5 and SQL. Modular programming (MP) of DBMS was done for increasing the flexibility in data processing. The Macromedia Dreamweaver and Flash player were mainly used for website designing.

Online survey

This had included both closed and open-ended 58 questions about health behavior of volunteers. The volunteers were asked about what type of, if any, health illness they held and how much or little health benefits they had with the existing health focused plans and resources. The participants were also encouraged to submit additional information on health allergy mediators and possible known health hazard exposure, if any, at the end of the survey. The survey was started in November, 2009 and is still continued from then onwards. Total 2000 individuals' data have been collected so far.

Risks and Limitations of online survey

Undoubtedly the online survey research is inexpensive, quick, and automates much of the data processing but is restricted to individuals with access to relevant technologies (e.g. the Internet) [12] and where online technology penetration is limited, survey samples are unlikely to represent the general population [13, 14, 15, 16]. Though internet access range is rising in India with the estimate of about 6,845,609,960 users in 2010 i.e. 28.7% penetration on world population with tremendous 444.8% growth during 2000-2010 [12]. But still very significant populations do not have consistent access of internet. To counteract these limitation the existence of survey was publicized through various measures like conference presentations, public speaking engagements, and print media (Hindi and English daily news papers) etc. Though, it does not directly address the internet access problem but we hope that a variety of stakeholders got known about assessment and could seek out the survey easily if they wish.

Results

The website named http://www.healthrisk.co.in hooked with all developed tools like

HHRA questionnaire with DBMS and bio-calculators (related to oxidative stress, statistics and xenobiotic markers) was prepared and launched in October, 2009for mass communication (Figure-1). The risk report produced by DBMS (Figure-2) after every assessment was major result obtained. It contains assessment detail of volunteer in a clear and logical manner and presented to end user as a conclusion of risk analysis. The elements of a report are mainly inspired by data input by respective volunteer. Little but essential and affordable tips are also proposed for managing the risks in advance. Moreover, experimental protocols, over 2500 scientific journals and list of Indian scientific institutions with their detailed information and current science updates were also made available on said website (Figure-3). Finally one can take health survey, know his/her health status and take free health risk assessment and management advices.

Based on web statistics, exponential growth in users count is reported with highest 651 in recently passed three months (July-Sep, 2010) (Figure-4). It was tracked above 1700 users in just one year after its launch in October, 2009 without any added advertising efforts.

Figure 1: *Screen shot of www.healthrisk.co.in home page.*

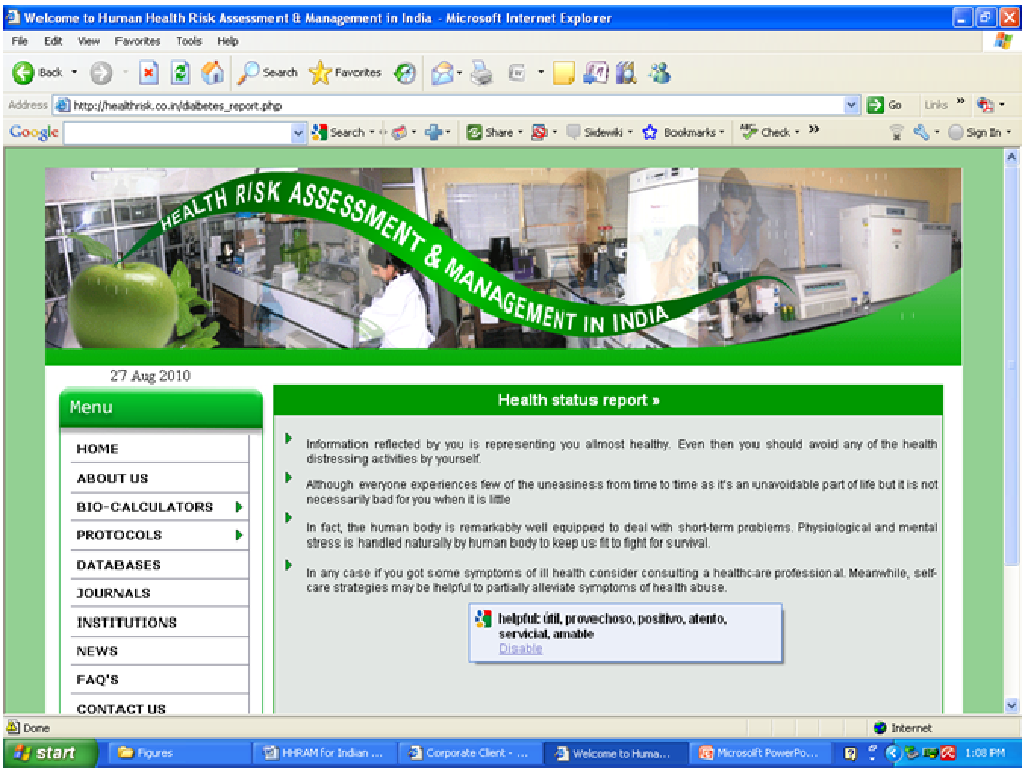

Figure 2: *Screen shot of www.healthrisk.co.in home page.*

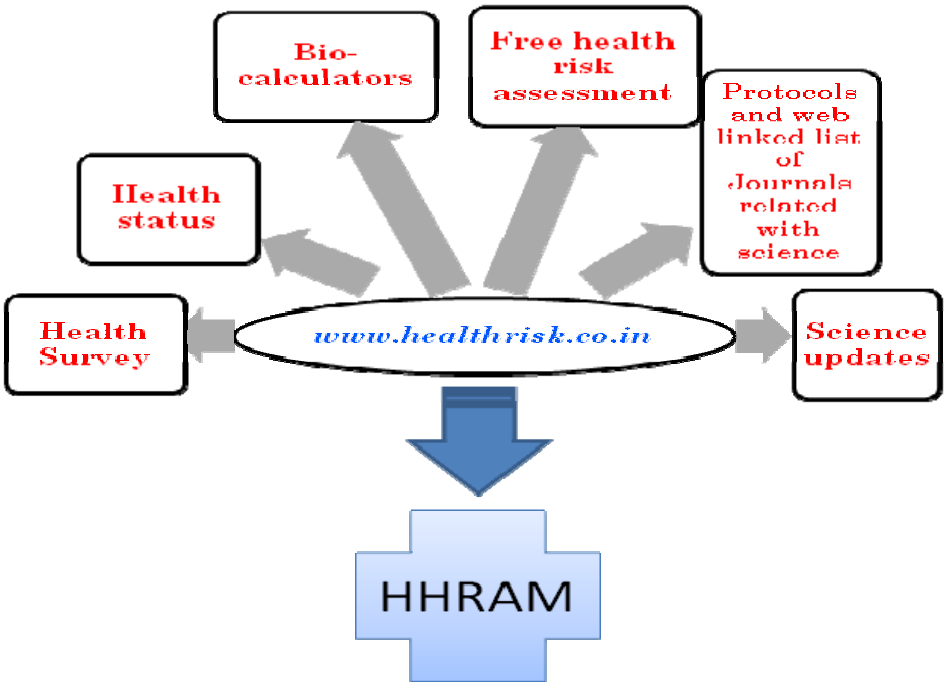

Figure 3: Showing information heads hooked on developed website.

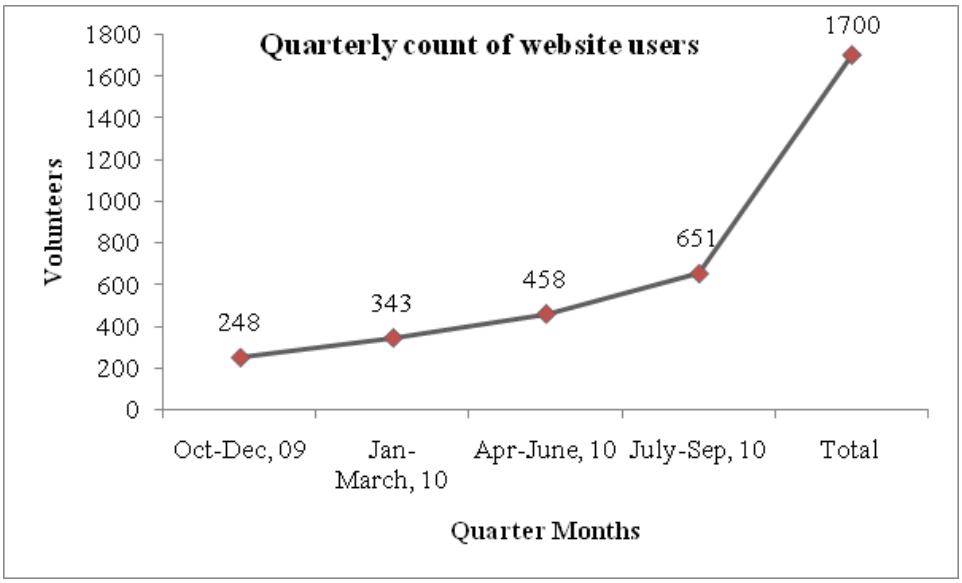

Figure 4: Number of website (www.healthrisk.co.in) users.

Discussion

Today in electronic age, growth of Internet and other digital media has opened up exciting opportunities for the provision of personal health care. Interestingly, the online surveys are producing quicker and richer open-ended response than offline surveys [14]. Therefore, an online health risk assessment can provide better sampling implications, response rates and quality of data. HHRAM through internet can nurse to variety of people living in different circumstances in India. It can be available for every Indian family who surf or on the verge of surfing internet for health care. Communicating approach through internet has produced variety and quality of data of users which increased the strength and range of data in DBMS. Our aim to forecast possible health risks and its sustainable management for every Indians may be accomplished up to certain limits by current approach. As a person seated even in farther state can directly participate in the survey and acquire the knowledge of nearly all possible health risks which further may help him to take necessary health decisions to maintain hale and hearty life.

The crafted risk reports and educational message may support into making the inference on health status of subject. Though they help to predict the health risks of volunteers but simultaneously they also support the importance of adherence to treatment plans and medications [2]. These are meaningful reports on 'well/at risk' population, allowing for better strategic planning and trend identification which may finally support the cost savings and better health outcomes. They may be valuable for targeting wellness programmes and incentive strategies too.

Furthermore, vast information of nearly all scientific journals with their active web link may become a very useful tool for a user of any branch of science looking to get updated with recent trends and also wants to communicate his/her research at

global level. Also, the detail of all Indian universities, colleges and research institutions at one site may provide an idea about their locality, study environment and type of research running there which may be very helpful to students and researchers into shaping their career. Largely, website was attempted to develop of a class where students to a retired person may get it as "one stop shop" for searching education and research in India and/or willing to know and manage their health risks in advance.

Conclusions

Risk is pervasive in the society which we can't stop enormously but can be reduced to acceptable level by common understanding of key elements and developing the approaches like Human Health Risk Assessment and Management. Moreover, communicating them through internet may widely nurse to inhabitants because it covers the mass of people of different locations.

Though, efforts are made in the present investigation to develop an umbrella approach for HRAM of Indian population but due to accidental nature of exposure, it changes considerably which is tough to cover in only one approach. Therefore, few more approaches are required to develop which can better and effectively evaluate and manage the health risks present in Indian scenario.

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