Introducing regular behavioural surveillance into the health system in India: Its feasibility and validity

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ABSTRACT

Background. Illness is affected by human behaviour. However, in most developing countries the risk behaviour of the general population is not assessed. We developed a surveillance system to assess the 'risk factors' at the community level using the routine healthcare system.

Methods. The Comprehensive Rural Health Services Project at Ballabgarh, Haryana, provides healthcare to a population of 82 933 through 2 primary health centres and 24 health workers. Information on behavioural risk factors for communicable and non-communicable diseases was collected by health workers during the annual health census from December 2003 to February 2004. The information collected pertained to maternal and child health, and household and individual behaviour. We compared the data related to individual behaviour with that of a survey of non-communicable diseases risk factors done in the same area.

Results. Data were collected from (i) mothers who had delivered during the preceding year (n=1625), (ii) a random sample of individuals (n=2865), (iii) and all households (n=7488). The response rate was 85% for mothers, 91% for households and 95% for individuals. Approximately 80% of the households had access to drinking water, 32% to sanitary latrines, 28% of women increased their dietary intake during pregnancy, and 50% of adult men used tobacco. Comparing these results with those from the survey of risk factors for non-communicable diseases revealed no significant differences.

Conclusion. It is feasible for health workers to do behavioural surveillance by using the routine healthcare system.

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INTRODUCTION

Surveillance is defined as 'ongoing, systematic collection and analysis of data, timely dissemination of these data to those responsible for prevention and control so that action can be taken'.[1] Surveillance generally focuses on disease and deaths, but there is increasing awareness that behavioural risk factors and social determinants of health also require continuous surveillance. These factors also serve as effective intervention measures and are therefore useful for evaluating prevention programmes. Although behavioural risk factors have been in focus in evaluating non-communicable diseases (NCDs), they are equally important in communicable diseases and maternal and child health (MCH), both of which are priority areas for programme managers in developing countries.

Developed countries conduct surveys of the general population and also have special databases, which provide information about population-level risk factors. An excellent example is the Behavioral Risk Factor Surveillance System in the USA,[2] which is the world's largest on-going telephone health survey system that has been tracking health conditions and risk behaviours annually in the USA since 1984. In developing countries surveillance systems are weak, are not well linked to users of the information, and are often unidirectional. India lacks a behavioural surveillance system for the general population. We introduced a behavioural surveillance system for measuring risk factors at the community level through the regular healthcare system.

METHODS

Study area

The Comprehensive Rural Health Services Project (CRHSP) was started in 1965 by the All India Institute of Medical Sciences, New Delhi, in collaboration with the Government of Haryana. It is situated in Ballabgarh, Haryana. The objective of the CRHSP is to demonstrate a model healthcare delivery system, and to train undergraduate and postgraduate medical students and nursing students. The Intensive Field Practice Area (IFPA) of the project comprises 28 villages whose population was 82 933 in 2006. The healthcare in these villages is provided through 2 primary healthcare centres (PHCs) catering to a population of about 41 000 each. Each person living in the project area has been assigned a unique identification number, which has been stored electronically since 1991.[3] The computerized Health Management Information System (HMIS) is updated and revised to accommodate the needs of the users and to introduce new national programmes. A medical officer is in charge of the PHC and has multipurpose workers and health assistants as field staff. All activities related to important national health programmes are implemented through the PHC.

Each household is visited by health workers once a fortnight to provide health services. The births and deaths are registered by male workers during their domiciliary visit and this information is updated in the database every month. Besides routine, continuous collection of demographic information, a yearly census is done in December by male workers. Information from approximately 20% of the households is cross-checked by the health assistant, and in another 5% of households by the medical officer incharge, for completeness and accuracy.

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The infant mortality rate (IMR) of the study area was 80 per 1000 live births in 1981, and although it has gradually decreased, it has remained at 45–50 per 1000 since 1998 until the present time. Even though the IMR of this area is lower than the national average (57 per 1000 live births in 2005–06), stagnation of the IMR is a cause for concern. It seems that the CRHSP has reached its limit of achievement through health system intervention. We believe that introducing behavioural changes might help in reducing the mortality rates further.[4,5] To plan appropriate interventions and monitor the change, we introduced Surveillance for Demographic, Environment and Health Information (SUDEHI)—a community-based behavioural surveillance system.

We planned and implemented SUDEHI through the routine healthcare system using existing health workers and assessed its feasibility. We also compared the results obtained with those obtained from the Non-communicable diseases risk factors (NCDRF) survey using the WHO STEPS approach.[6,7]

Development of the interview schedule

This was done in the following stages:

Identification of domains. Initially, the various domains were listed (Table I) and classified into 3 broad sections: (i) MCH, (ii) household and (iii) individual. These cover behaviours related to health, sanitation, lifestyle and health-seeking. However, questions on knowledge and attitude were not included.

Framing of questions. Questions were designed for each domain. The main criteria for inclusion of questions were: (i) they should focus on modifiable risk factors, (ii) should be measurable, and (iii) were not available in the existing HMIS. These questions were translated into the local language, pre-tested and finalized. Wherever possible we used and adapted available tools such as WHO STEPs for non-communicable diseases risk factors (NCDRF)[8] and the standard of living index (SLI) according to the National Family Health Survey-2 (NFHS-2).[9]

Sample size

The sample size for the MCH section was approximately 1900 as this is the usual number of births every year in the study area. For the household section, all houses in the area were included. However, for the individual section the sample size was calculated on the basis of identified key variables (Table I). The prevalence of these key variables in the project area was ascertained from studies done previously in the area, or from the NFHS data for rural population. The prevalence ranged from 10% to 75%. We planned to introduce intervention activities for changing specific risk behaviours in the community. As behavioural change takes time and depends on the type of behaviour, we decided to detect a change of 5% (absolute precision) by the time of the next survey, possibly after 3–5 years. The sample size calculated ranged from 686 to 1566. Hence, we decided that a sample size of 1500 each would be adequate for men and women in the individual section.

Study groups

In the MCH section, the target group were women who were pregnant between 1 April 2002 and 31 March 2003 and the questions were restricted to the present pregnancy to minimize recall bias. For the individual section people aged ≥15 years were included and they were selected by simple random sampling from the available computerized database. These were stratified as 150 men and 150 women for each sub-centre. As the questions in the household section were related to cooking practices and household facilities and possessions, the interview schedule was administered to women of the households. The eldest woman present in the household was interviewed if more than one woman was present.

TABLE I. Components and key variables of SUDEHI (Surveillance for Demographic, Environment and Health Information)

Section	Component	Domains	Items included	Key variable(s)	Sample size
Maternal and child health (MCH)	Antenatal	Antenatal care, nutrition, intranatal care	Abdominal examination, blood pressure, intake of iron/folic acid	90-day intake of iron/folic acid during pregnancy	1566
	Child health	Newborn care, child nutrition, childhood illnesses	Age at weaning, use of feeding bottles, measurement of mid-arm circumference	Breastfeeding initiation within 1 hour reported as 10%	686
	Reproductive health	Reproductive tract infection, family planning	Menstrual hygiene, contraceptive use	Use of family planning methods	1471
	Healthcare-seeking for childhood illness	Childhood illnesses	Treatment sought first in case of illness in the past 3 months	Preferred health facility for treatment	Not applicable
Individual behaviour	Non-communicable diseases (NCDs)	Risk factors for NCDs	Tobacco and alcohol use, Consumption of fat/junk food, leisure time physical activity	Use of tobacco, alcohol, diet	1252
	Hygiene and sanitation	Personal hygiene	Hand-washing practice, brushing teeth, use of footwear, use of sanitary latrines	Hand-washing practices	No information available
	Personal protection	HIV/malaria/ road accidents	Use of helmets, mosquito repellents, condoms	Sexual activity with non-regular partner and use of condoms	No information available
Household	Socioeconomic status	Household possessions and facilities	Items included under the standard of living index (SLI)	Socioeconomic status	Include all households
	Others	Household features	Types of salt, oil, availability of safe drinking water, etc.	Oil, iodized salt intake	

* Sample size calculation assumes an alpha error of 5%, beta error of 80% and expects a change of 5% in the variable during the next survey to be done after 3–5 years

Training of interviewers

Pre-testing of health workers was followed by a full day of training in using the interview schedule. A manual was prepared for using the interview schedule to ensure standardization of data collection. The manual provided detailed instructions for each question and was translated into the local language. The health workers field-tested the interview schedule in the community before starting the actual data collection.

Data collection

Since the whole population of the study area is covered during the annual census done by men workers, and our study required collection of information from all households, we combined the surveillance with the regular annual census. Thus, men workers filled the individual men forms and all household forms along with the census. The women workers filled the individual women forms and MCH forms. We had anticipated that 45–60 days would be required to complete the interviews. The data collection started on 15 December 2003 and was completed by 15 February 2004. Because of SUDEHI, the process of conducting the census took 15 additional days.

Ethical issues

The survey was implemented by the programme managers to evaluate the programmes and plan better services, and not merely as part of a research activity. Information on births, deaths and reproductive health issues is collected routinely as part of the national programme. All participants were explained the purpose of the questions and their verbal consent was taken. In the individual section, the information of each individual was kept anonymous by removing the unique number during data entry. This ensured confidentiality and the dataset was not linked with the HMIS.

Quality control

Supervisors and medical officers conducted the supervision concurrently. Simultaneously, independent data collection of 20% of the sample by supervisors and 5% by medical officers was done in all three sections. If there was a discrepancy of 10% in any village/sub-centre, we had planned to repeat the data collection. However, the verification procedure did not detect any major discrepancies.

Analysis

Data were entered in Microsoft Excel and analysed by SPSS version 10. The SLI was calculated according to the scoring used in NFHS-2.[9]

RESULTS

A total of 1625 women of the planned 1900 were interviewed in the MCH section (response rate 85%). The total number of forms filled up in the individual section was 1431 for men and 1434 for women. Thus, we had a 95% response rate among individuals (2866/3000). Of the 8145 households in the project area, data for the household section could be collected from 7488 households (response rate 91%).

Maternal and child health section

Only 28% of women increased their dietary intake during pregnancy and 45% took iron and folic acid supplementation during their last pregnancy. Initiation of breastfeeding within 4 hours of delivery was reported by 49% of women, and approximately 74% of infants received pre-lacteal feeds (Table II).

Household section

Two-thirds (66.8%) of the households belonged to the high SLI group; 80% of households had access to drinking water, and 38% to sanitary latrines. Only 3% of households used unsaturated oil for cooking and more than half (58%) the households used iodized salt (Table II).

Individual section

Fifty-two per cent of men reported using tobacco, whereas 16% of women used tobacco. The average consumption of fruits for both men and women was approximately 2 days per week. The mean waist circumference was 76.7 cm in men and 74.1 cm in women.

Fifty-six men (4%) reported having had sex with a non-regular partner in the past one year; of these only 7 used condoms. Only 2 (0.1%) women reported having had sex with a non-regular partner.

Validity

The results obtained from this survey were compared with those from the NCDRF survey done in rural Ballabgarh during 2003–04, which used the WHO STEPS approach. Table III shows that there was no statistically significant difference in the estimates. Thus, it is reasonable to conclude that the SUDEHI survey using health workers generated valid results.

We could not obtain information on the MCH or household section from any other source. However, given that the NCD risk factors collected by the same process were reasonably accurate, it is likely that the data gathered in the MCH and household sections were also valid.

DISCUSSION

We attempted to develop a model for behavioural surveillance that was best suited to developing countries. The information was collected by health workers during their domiciliary visits while carrying out the annual census and was accommodated within the existing work pattern with ease. We found the model to be feasible and provide valid results. Whereas the results from this study pertain to the study area investigated, several of the issues studied are common to any developing country.

TABLE II. Selected indicators from SUDEHI (Surveillance for Demographic, Environment and Health Information)

Section	Indicators	Estimate % (95% CI)
Mother and child health	Took iron and folic acid during pregnancy	45 (42–48)
	Infants given pre-lacteal feed	74 (71.6–76.4)
	Breastfeeding initiated within 4 hours	49 (45.9–52.1)
	Children bottle-fed	27 (23.9–30.1)
	Weaning at 6 months	72 (69.5–74.5)
Household	Access to water within and near the house	80.6 (80.2–81)
	No sanitary latrines	62.1 (61.5–62.7)
	Consumption of iodized salt	58 (57.4–58.6)
Individual	Sex with non-regular partner (men)	3.9 (2.9–4.9)
	Sex with non-regular partner (women)	0.1 (0.04–0.5)
	Current use of tobacco (men)	52 (48.5–55.5)
	Current use of tobacco (women)	16 (14.1–17.9)
	Mean waist circumference in cm (men)	76.7 (76.2–77.2)
	Mean waist circumference in cm (women)	74.1 (73.6–74.6)

TABLE III. Comparison of indicators from the individual section of SUDEHI (Surveillance for Demographic, Environment and Health Information) and Non-communicable diseases risk factors (NCDRF) survey in rural Haryana

Indicators	SUDEHI (95% CI)	NCDRF survey estimate (95% CI)	p value
Current use of tobacco (%)			
Men	52 (48.5–55.5)	50 (46.2–53.8)	0.77
Women	16 (14.1–17.9)	18 (15.1–20.9)	0.14
Mean number of days of consumption of fruits			
Men	1.5 (1.4–1.6)	2.1 (1.9–2.1)	0.75
Women	1.3 (1.2–1.4)	1.4 (1.3–1.5)	0.90
Mean waist circumference (in cm)			
Men	76.7 (76.2–77.2)	77.4 (76.9–77.9)	0.84
Women	74.1 (73.6–74.6)	74.3 (73.7–74.9)	0.86
Measurement of blood sugar within 1 year (%)			
Men	6.9 (6.0–7.8)	4.3 (2.8–5.8)	0.63
Women	4.1 (3.6–4.6)	3.2 (1.9–4.5)	0.11

The indicators were chosen to reflect the needs of the study area, but they are also likely to be relevant to other parts of India. The indicators chosen for the antenatal period are important as they have a direct impact on birth weight and anaemia in the mother—the two most common causes of infant and maternal mortality, respectively. The child nutrition indicators reflect the cultural influence on child rearing and nutritional status, e.g. pre-lacteal feeds, the late initiation of breastfeeding, etc. As these are part of the cultural norm, these are not considered harmful and could be potential areas for behavioural intervention. An intervention on nutrition education for women and children is planned. If data are collected regularly in a standardized manner, such surveys would help in comparisons between PHCs for the same year and also show a trend over the years.

When we decided to adopt a surveillance mode, it was assumed that a minimal amount of information could be collected. This called for a judicious selection of indicators. For example, whereas the ideal choice of indicator for measuring obesity is body–mass index, the routine use of weight and height scales can be difficult. Therefore, we used waist circumference as a measure of obesity.

We administered all 3 interview schedules simultaneously during the first round. However, it was apparent that this would not be necessary each time the survey was conducted. The frequency with which these sections need to be administered depends upon the expected change and load that the system can handle at any given time. Some of the indicators, such as the NCD-related behaviours, could be collected every 3–5 years, as they are not expected to change rapidly. Information on MCH could be collected annually or biannually.

As CRHSP maintains a database of the population, there is the possibility of linking this information to the database. Since this was a surveillance activity, it was decided that we would not link the individual data to the database (written consent was also not taken). However, a need might arise in the future to identify individuals at risk of certain diseases, such as NCDs and HIV/AIDS, for initiating timely interventions. Linking to the database provides the additional advantage of being able to study and address issues of equity. We plan to link the household information on SLI to the HMIS so that programme delivery indicators (not behaviours) can be monitored by socioeconomic status and address the issue of equitable coverage.

Our model integrates different behaviours (related to salient characteristics of communicable and non-communicable diseases), performs both demographic and behavioural surveillance simultaneously, and uses local health workers. While other models for behavioural surveillance are available, the Behavioral Risk Factor Surveillance System uses a telephone interview schedule. As the telephone density in India is variable and has a socially differential distribution, this model would be unsuitable for our scenario. Also, during such surveys, reported height and weight are used. While this may be acceptable in developed countries, it would not be feasible in developing countries.

The National AIDS Control Programme in India does nationwide sentinel surveillance for behavioural risk factors for HIV/AIDS.[10] In addition, some information on health behaviour is generated for research through the NFHS. The advantage of carrying out these surveys in a research mode is that it is more focused and usually an external evaluation is done, thus making it more likely for the surveys to be unbiased. However, such vertical activities are expensive and cost would limit the frequency with which these can be carried out. Using existing health workers has the advantage of better response rates, as they are well known to the community. We have shown that both these components (MCH-related behaviours and HIV risk factors) included in SUDEHI can be integrated into population-based surveillance.

While we have demonstrated the feasibility of our model of surveillance at a local level, its implementation at the national level may be questioned. Because our model is integrated into the routine health system, it has distinct advantages in terms of cost, local usability, better ownership, and a close link between the generation and utilization of information. Although not all PHCs in the country may have this kind of infrastructure, manpower and facilities, it is feasible to build capacity at the grassroots level, upgrade PHCs, strengthen the workforce, etc. under the National Rural Health Mission (NRHM). Therefore, we propose that rural practice areas of medical colleges, demographic surveillance sites and non-governmental organizations could start using this approach.

That developing countries will have to move towards introducing behavioural surveillance is indisputable. Our model provides a feasible and valid alternative for conducting such surveillance in a more sustainable system, rather than in the research mode.

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