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Household economic impact of an emerging disease in terms of catastrophic out-of-pocket health care expenditure and loss of productivity: investigation of an outbreak of chikungunya in Orissa, India

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Abstract

Background & objectives: To examine the household economic impact of an outbreak of chikungunya in terms of out-of-pocket health care expenditure and income foregone due to loss of productive time in Orissa, India.

Methods: Structured interviews were conducted on 150 respondents, bread winners from the affected households of a village with maximum number of reported cases in the state, during August 2007. We looked at the economic profile, treatment history, and patient-side cost of care, loss of productivity and consequent income loss.

Results: The median out-of-pocket health care expenditure was US$ 84, of which the proportion of cost of diagnosis was the highest (US$ 77). One hundred and forty nine respondents incurred cost of care more than 10% of their monthly household income (catastrophic health expenditure). The median catastrophic health care expenditure was 37%. The respondents depended more on private health care providers (49%) and 31% of them accessed care from both public and private health care providers. The median work days lost was 35 with a consequent loss of income of US$ 75.

Interpretation & conclusion: Outbreak of an emerging disease creates unforeseen catastrophic health care expenditure and reinforcing the poverty ill-health nexus. The priorities of tackling emerging diseases should include; discretionary public health spending, financial protection against the cost of illness and productivity with special emphasis on people living on daily wages with less financial reserves, and further research on therapeutic measures to reduce the duration of suffering and consequent economic loss.

Key words Chikungunya – economic impact – health care – India – Orissa

Introduction

Chikungunya is a vector-borne disease usually characterized by fever, headache, fatigue, nausea, vomiting, muscle pain, rash, and joint pain[1]. The regions of Africa and Asia have been widely affected by the disease. Recently, the islands in the Indian Ocean witnessed the outbreak of chikungunya followed by larger parts of India[2].

Chikungunya is a neglected tropical disease as there is little evidence of social, medical and economic determinants as well as their impact. Even though, the disease is rarely life-threatening, the widespread occurrence of disease causes substantial morbidity and economic loss[3]. After a decade, the disease re-emerged for the first time in the southern parts of India, with a series of outbreaks in the rest of the country. As per the data from the National Vector Borne Disease Control Programme (NVBDCP)[4], about 1.4 million suspected and 1985 confirmed chikungunya cases were reported during the years

2006 from 15 states and union territories. The health system of the country faced challenges in ensuring timely and rapid availability of standardized drugs, vaccines and diagnostic measures[5].

This unavailability of prompt health care imposed further economic burden on the health system as well as households due to delay in treatment or mismanagement of treatment processes. The economic burden of disease varied from state-to-state depending upon the status of physical and financial access to health care.

Orissa, an East coast state of India contributed around 0.5% of suspected chikungunya cases and 1.7% confirmed cases to the national disease burden during 2006–07[4]. Since the disease emerged for the first time in the recent years, the health system had to confront more challenges in prevention and management of the outbreak. The households were also facing an unforeseen and new disease outbreak, imposing additional financial burden to the household economy. Since the disease emerged for the first time in Orissa, the outbreak of the disease challenged the health system of the state. Various dimensions of economic burden (patient-side treatment costs, productivity loss, government-side costs for prevention, control and management, etc.) of vector-borne diseases such as malaria[6], dengue[7], kala-azar[8,9] have been explored in the context of different countries, including India.

The study looked at the household level economic impact of the outbreak of chikungunya in terms of out-of-pocket health care expenditure and loss of income due to productivity loss in Orissa state, India.

Methods

We conducted a community-based cross-sectional survey in Kural village in Nayagarh district of Orissa state. Kural has a total population of about 9000. Daily wage earners and farmers are the main inhabitants. There is one primary health centre (PHC) and one subcentre. The PHC has one doctor, one pharmacist and one female multipurpose health worker. The village had witnessed the outbreak of the disease from May to August 2007. Out of the 3898 reported cases in the state from 11 districts, Nayagarh district reported 900 cases. We selected Kural village, since the report of the Department of Health and Family Welfare, Orissa enlisted the village with the maximum number of reported cases (495), out of a single village in the state. Out of all cases, we used two criteria to select the respondents. Since the study was looking largely into loss of economic productivity, we selected the bread winners of the households. Similarly, to explore completely the patient-side treatment costs, we have excluded all those bread winners who were undergoing treatment at the time of data collection. We defined bread winner as the person who earns all or most of the income of the household. Thus, the respondents were bread winners who had developed sudden onset of fever and body ache during the outbreak of the disease and who had already completed the treatment. We conducted the study during August 2007 and collected information from the respondents pertaining to the period from May 2007 (onset of outbreak) to July 2007.

We also collected information regarding socioeconomic and demographic details, treatment history, and out-of-pocket health care expenditure, loss of productive time and subsequent loss of income. We explained the respondents in detail about the objectives of the study and the utilization of the information they would be giving. We obtained written informed consent from each respondent before the interview. We cross-checked the information given by the respondents on treatment history and the patient-side costs of treatment from the consultation cards and bill receipts. All the data were coded and entered into Microsoft Excel spread sheet and identities of the individuals were kept completely confidential. Analyses were carried out by using SPSS version 14.0 for Windows.

Out-of-pocket health expenditure (patient-side cost of treatment): We calculated the out-of-pocket health care expenditure by considering the patient-side cost

of treatment for diagnosis, consultation, drugs, transportation, hospital stay and food, and escort. We recorded the expenditures in Indian Rupees (INR) and later converted to approximate value in US Dollars as per the exchange rates during the study period (1 INR = US$ 0.024)[10]. The expenses of consultation and drugs were combined together during the analysis of the study results since there was no consultation fee in the public health care facilities and the consultation fee and cost of drugs were combined as treatment fee for private health care providers in the study area.

Catastrophic health expenditure: We considered the individual out-of-pocket health care expenditure as catastrophic if the per capita patient-side cost of care for the disease was more than 10% of the total monthly household income. The justification was based on the socioeconomic profile of the sample and the available literature[11–13].

Loss of productivity: We calculated the loss of productivity in terms of time (work hours and days) and consequent loss of income. There was considerable loss of productive time even after the respondents commenced the work. This loss of working time was after the acute phase of the illness—after the fever subsided. In the study, the loss of work time after the acute phase was less than a full working day (only some hours) for the respondents. Thus, we looked at the loss of productivity as follows:

(i) Acute phase of the illness; by calculating the loss of work days and consequent loss of income; and
(ii) After the acute phase of the illness; by calculating the loss of work hours and consequent income loss.

This classification of the disease into acute phase and after the acute phase was made exclusively on the basis of the behavioural responses of the respondents to it.

Results

Out of total 150 respondents, 124 (82.6%) were males and 26 (17.3%) were females. The median age was 45 years (Range 20–70) and the median years of schooling was 7 (Range 0–17). The number of respondents without schooling was three. Out of 150 respondents, 110 were daily wage labourers and the rest 40 were farmers. The percentage of scheduled caste and other backward communities was 35 each. The rest 30% belonged to general category.

The median monthly household income was US$ 59 (Range US$ 32.05–128.2). The respondents' median individual monthly income was US$ 48 (Range US$ 30–78.5). The median family size was 6 (Range 4–8). The median affected members in each family were 4 (Range 2–6). The median days of illness were 30 (Range 4–120). In all 60% were ill for 30–60 days.

Patients consulted a median of six different health care providers (Range 2–8) and incurred a median of eight visits (Range 2–10). The broad category of providers was public and private (Fig. 1). About half of the respondents received care exclusively from various categories of private providers, whereas 20% depended on public health care facilities for care. The remaining 31% approached both public and private providers for diagnosis and drugs. The major portion of private providers included allopath doctors, doctors from Indian systems of medicine (ayurveda and homoeopathy), nurses, pharmacists, traditional healers and informal service providers (quacks).

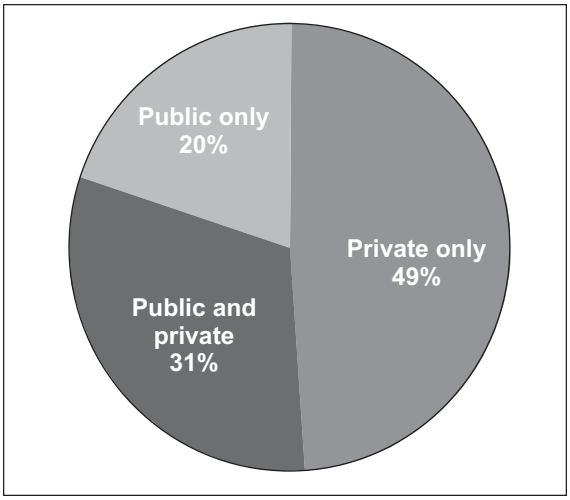

Fig. 1: Type of health care providers in study village

Table 1. Out of pocket health care expenditure (Patient side cost of treatment) in Orissa during 2007

Type of expenditure	Median (Range) in US$
Diagnosis	32.1 (12–50)
Drugs and consultation	30 (15–50)
Transport	7.1 (3–13)
Stay and food	6.8 (0–15)
Escort	7.1 (0–13)
Total	83.1 (30–141)

Majority (62%) paid US$ 12–50 for diagnosis. About 66% of the respondents paid US$ 15–50 for drugs and consultation (Table 1). The cost of transportation was in the range of US$ 3–13 for 64% of the respondents. About 77% did not incur any cost for hospitalization and escort. The average total cost of treatment was in the range of US$ 30–141 for 65% of the respondents. The rest 35% paid an average of US$ 10–24.5 as total cost of treatment.

The total cost increased as the duration of illness extended (Table 2). Females incurred more costs compared to males. There was an inverse relation between cost of care incurred and the level of monthly income. Increased cost of care was associated with seeking treatment from private health care providers.

Catastrophic health care expenditure (CHE): Out of the total 150 respondents, 149 incurred catastrophic health expenditure as per our definition. The median health care expenditure as a proportion of monthly household income was 37.2% (Range 9.2–89%). Nearly 63% faced catastrophic health care expenditure of 53% (Range 30–87%). The remaining 37% met with a catastrophic health care expenditure of 14% (Range 12–25%). None of the respondents was part of any risk pooling and financial protection mechanism against the cost of illness.

During the acute phase a median of 35 days were lost and the consequent loss of income was US$ 75 (Range 14.1– 962). The median work hours lost during the acute phase of illness was 29.1 with a consequent loss of median income of US$ 5.02 (Range 0.05–9.3). After the acute phase 21 days were lost. Out of the total respondents, 42% lost 37 days (Range 31–60 days). About 29% of respondents lost 22 days (Range 16–30 days). The remaining 21% lost 68 days (Range 61–125 days). The median daily work hours before the illness was nine hours and it reduced to six hours due to illness. The variables considered for loss of productivity during the acute phase of the illness was the number of work days lost along with respective loss of earnings. We calculated the loss of productivity after the acute phase of the illness by considering the loss of work hours per day with sub-

Table 2. Total cost of care by sex, income level, duration of illness and type of health care provider in Orissa during 2007

Socioeconomic group		n	Median cost (Range) in US$
Sex	Male	124	73 (32.4–120)
	Female	26	76 (32.1–141)
Monthly household income	≤ US$ 65	55	73 (32.1–96)
	> US$65	95	75 (32.4–141)
Duration of illness	≤ 30 days	87	69.2 (32.4–95)
	> 30 days	63	76 (32.1–141)
Health care provider	Private	73	123.1 (74.9–141)
	Public	30	48.7 (32.4–71)
	Mixed	47	71.3 (53.8–93.6)

n = Number of non-missing values; $p < 0.05$ by Wilcoxon rank sum test.

Table 3. Total loss of work days and work hours by sex, income level, total cost of care and duration of illness in Orissa during 2007

Total loss of work days	n	Median loss of work days (Range)	Median loss of work hours (Range)
Male	124	33 (10–123)	286.5 (73–1233)
Female	26	36 (12–86)	347 (84–690)
Monthly household income ≤US$ 65	56	34.5 (13–103)	301 (101–1233)
Monthly household income > US$ 65	94	34.5 (10–123)	267 (73–969)
Total cost ≤ US $ 65	95	36 (10–123)	290 (84–1690)
Total cost > US $ 65	55	33 (11–96)	298 (73–1233)
Days of illness ≤ 30	87	25 (10–41)	213 (73–698)
Days of illness > 30	63	63 (37–123)	531 (211–1233)

n = Number of non-missing values; $p < 0.05$ by Wilcoxon rank sum test.

sequent loss of earnings.

Females lost relatively more work days compared to males (Table 3). The loss of work days did not vary with changes in the levels of monthly household income. As the total costs of care increased, the number of work days lost declined. With the extension of the duration of illness, the number of work days lost increased. Females had higher loss of work hours compared to males. Loss of work hours was higher for respondents with low level of income. The work hours lost increased with duration of illness. The respondents who incurred higher cost of care had higher loss of work hours.

Discussion

We looked at the extent of out-of-pocket catastrophic health expenditure incurred by the respondents, who were heads of the households. The prevalence of catastrophic health care expenditure would be more alarming, if the same method is applied to other affected members of the family. Out-of-pocket health care expenditure has been considered as an important cause of impoverishment[14]. The incurrence of out-of-pocket catastrophic health expenditure due to epidemic outbreaks would challenge the household economy and the concern of equity in health care. The higher the out-of-pocket health expenditure, the lesser would be household welfare in terms of health care and living standards[15–17]. The adverse impact would devastate people who are living on daily wages and have less economic securities, and reserves.

A major concern came out of the findings was that there was no financial protection and risk pooling mechanism for the respondents to face unforeseen health care needs such as disease outbreaks. One of the reasons for catastrophic health care expenditure for the respondents could be also the absence of such financial protections. An emerging disease was certainly an unforeseen event, therefore, the households would not have sufficient financial resources at their disposal. This could either lead to delay in treatment or no treatment. Both the situations lead to severities and complexities of the disease and demanded more financial resources. Due to complexity of the disease, the patient also had to forego earnings due to work days lost for longer period. Since there were multiple affected members in a family, the economic impact of the disease on the household could be 'catastrophic'.

Among all components of health care expenditure, diagnosis came out to be the major one. Since the disease appeared to be new to the setting, there was confusion among the health care providers and patients for the appropriate diagnostic tests. Many patients were advised to adopt multiple diagnostic tests.

The reliance on private facilities for diagnosis highlights the lack of properly standardized and widely available diagnostic devices for the disease. India faced acute inadequacy in blood testing facilities for the chikungunya virus, with only two government institutes in the whole country[5]. The study did not explore the possibility of exploitation and misleading of the poor patients by the private health care providers.

The findings revealed more dependence on private providers for health care. However, in the context of large number of people with less ability to pay for care and spread of the epidemic, the dependence on private providers was a major concern to ensure affordable and timely health care. Over reliance on private providers also gives an insight to inadequacy of infrastructure and human resources of the health system in rural and inaccessible areas.

The high cost of care incurred was irrespective of the level of income, thereby implying the severity of the disease and the compulsions of the people to seek care. The disease showed a prolonged nature resulted into large number of health care visits, profound health care cost and bulk loss of work time and earnings.While recovery from chikungunya is the expected outcome, convalescence can be stretched up to a year or more[18]. The report of the WHO-SEARO meeting on the priority areas for research in chikungunya and dengue highlighted the inevitability of developing guidelines for the case management of chikungunya, to alleviate the presence of long standing arthralgia and piloting to develop an early warning system[18,19]. The respondents with low income level, who incurred high cost of care, lost work hours largely after the acute phase of the illness. This phenomenon reflects the economic compulsions of the patients to earn before full recovery from the illness. Females incurred more health care expenditure; this could be due to longer duration of illness.

The method we adopted for estimation of CHE was very much specific to the context. Application of this method in another setting without any adjustment might be dealt with caution. The study did not probe into the ways/sources of meeting the out-of-pocket health care expenditure by the households. A study by Sharma *et al*[9], to explore the economic impact of another vector-borne disease, kala-azar in Bangladesh revealed that households employed multiple coping strategies to cover expenditures, most commonly sale or rental of assets and taking loans. A study by Durrheim *et al*[20] on vector-borne diseases pointed out that the elimination of parasite diseases would be a real health indicator of poverty alleviation and more equitable service provision. The study explored the out-of-pocket expenditure and productivity loss incurred by the bread winners of the households due to chikungunya outbreak. Since, there were multiple affected members in the family, the economic impact of the disease outbreak would be more severe. The study did not cover the bread winners of the households, who were undergoing treatment during the time of information collection. Therefore, virtually, the household economic impact could be more than what the study could explore.

The economic impact of the chikungunya would be overpowering for years, since majority of victims of such an outbreak were already poor or became impoverished in the due course of the outbreak. Since there was no fatality due to the disease, the economic loss was overlooked.

The study reiterates the need for ensuring timely, effective and affordable health care for emerging diseases. In this regard, we call for a number of suggestions to enhance the physical and financial access to health care for emerging diseases. The strengthening of the health system in terms of infrastructure and organization of finance would be the ideal strategy to handle an emerging disease. The proper geographical dispersion of public health care facilities, adequate supply of human resources and logistics support are the minimum essentials to enhance the existing physical access to care for an emerging disease in a setting like Orissa. When it comes to organization of finance, we suggest for changes in the public health spending as well as household mobili-

zation of financial resources for emerging diseases. We suggest for discretionary public health spending for emerging diseases. However, the enhancement of the public health spending should really address the equity concerns in terms of providing free care or subsidies to the real needy. For example, public health spending should pay more attention to people living on manual labour with less financial reserves. As far as the mobilization of domestic financial resources are concerned, we suggest to encourage innovative and other alternative sources of financing like micro-financing, community financing and medical savings to face the unforeseen catastrophic health expenditure brought out by emerging diseases. There should be also attempts to ensure financial protection and risk pooling for emerging diseases covering cost of care along with loss of productivity. Such attempts should be widespread and sustainable. The study also reiterates the need for ensuring effective care and we suggest for further research on therapeutic measures to reduce the duration of the disease and consequent economic loss.

We ask for a widespread and in-depth look into the extent of household level economic impact as well as the consequences of outbreaks of chikungunya to the rest of the affected geographical settings.

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