RESEARCH BRIEF

Direct and Indirect Costs of Pediatric Gastroenteritis in Vellore, India

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Objective: To determine costs of pediatric gastroenteritis in out-patient and in-patient facilities.

Methods: Cross-sectional survey of children with acute gastroenteritis attending out-patient clinic (*n*=30) or admitted in the ward (*n*=30) for management in the Christian Medical College, Vellore, India from July-September 2014 to estimate direct (drugs, tests, consultation/ hospitalization) and indirect (travel, food, lost wages) costs associated with the episode.

Results: Median direct and indirect costs were Rs 590 and Rs 190 for out-patient management and Rs 7258 and Rs. 610 for hospitalization, constituting 1.1% and 11% of median annual household income, respectively.

Conclusions: Escalating healthcare costs need tracking for evaluation of interventions.

Key words: *Diarrhea, Epidemiology, Healthcare expenditure.*

Rotavirus disease results in a medical and economic burden on the affected household, and on the healthcare system. Vaccines are estimated to reduce rotavirus-associated hospitalization by 49% to 92%, and all cause diarrhea by 17% to 55% [1-4]. For governments to incorporate a rotavirus vaccine into national immunization programs and to estimate costs averted, it is essential to measure the economic burden of the disease. A previous study in Vellore in 2005-2006 reported a cost of Rs. 3278 on one hospitalization of a child with diarrhea, which was 5.8% of the annual household income [5]. Another study estimated that 2-3.4 billion rupees are spent annually treating rotavirus disease in children under the age of 5 years in India [6]. However, because healthcare expenditure can escalate rapidly, it is essential to periodically monitor these costs.

METHODS

This study was conducted between July 2014 to September 2014 at the Christian Medical College (CMC), Vellore, where patients pay for all direct costs incurred, including admission, diagnostic tests and drugs. These are calculated for the general ward/out-patient department (OPD) on a no-profit, no-loss basis. All pediatric units follow a standardized protocol for management of acute gastroenteritis, which includes rehydration per Integrated Management of Neonatal and Childhood Illness guidelines, and includes use of oral zinc preparation for two weeks [7].

Children aged 5 years or below, diagnosed with acute gastroenteritis of less than 5 days' duration, presenting to the OPD (*n*=30) or admitted to the pediatric general ward (*n*=30) were included. For patients admitted to the ward, only patients with a single admission diagnosis of acute gastroenteritis were recruited, and patients with dysentery or any other additional diagnosis such as sepsis were excluded.

Data collection forms were based on the World Health Organization (WHO) generic protocol for estimating the economic burden of diarrheal disease [9]. The forms were completed by interview of parents or caregivers at or close to discharge. The questionnaires assessed direct medical costs, non-medical indirect costs and lost wages (indirect costs), which were calculated for pre-visit, OPD costs and inpatient costs as appropriate. One week after the visit/discharge, parents of children were re-contacted to assess the current status of the child, and collect data on follow up visit costs, if any. The data were entered using Epidata.

The data are presented stratified as out-patients and in-patients. Costs are presented as mean and median with ranges.

RESULTS

The questionnaires were completed for 30 out-patients

and 30 in-patients during their visit/stay in the hospital between July and August 2014, with a one-week follow up for all participants being completed by September 2014.

Overall, the median (IQR) costs, including pre-hospital, hospital and follow-up direct medical costs and indirect costs were Rs 780 (33e2, 1011) for gastroenteritis managed in the OPD and Rs. 7868 (4497-9983) for the hospitalized children (***Table* I**). The major cost component for the OPD was the drugs. The main costs of drugs for out-patients were for rehydration and antibiotics in 33% (10/30) of children. For the hospitalized children, the major cost components were drugs. For indirect costs, travel constituted the major component for both out-patients and in-patients. No family reported costs for accommodation since mothers stayed with hospitalized children. No families reported lost wages as a result of the hospital visit/stay. Overall, the reported median (IQR) household annual income was Rs. 72,500 (44,000, 1,80,000) and costs for outpatient or in-patient management constituted 1.1% and 11% of median household income, respectively.

DISCUSSION

Comparing this data to that collected in a similar study conducted in 2005-2006 [5] with no change in the management protocol, the costs have escalated by 2.4 times for inpatients, and by 4.7 times for outpatients. The greater increase in out-patient costs was contributed to by an approximate doubling of consultation and drug costs, but an almost 10-fold increase in indirect costs, mainly transportation and food.

It is important to monitor healthcare costs when preventive strategies such as vaccination are to be implemented. Diarrheal disease has high incidence in children, particularly in low-resource countries. Even though most cases may be mild, a proportion of children require clinic visits and a small percentage require hospitalization [9]. Mild to moderate dehydration can be managed via oral rehydration but in the case of severe infections, specialized care is required that may not be available everywhere.

This study has the limitations of small numbers of patients, and being conducted in a single site and type of facility. However, in India, assessment of real costs to manage or treat a specific clinical condition in government facilities is difficult because cost heads are difficult to evaluate, as has previously been shown [10]. Private, not-for-profit hospitals such as CMC, which use cost accounting to determine charges for consultations, admissions, diagnostic tests or investigation, and provide

TABLE I DIRECT AND INDIRECT COSTS FOR CHILDREN (AGE<5Y) WITH ACUTE GASTROENTERITIS AT THE CHRISTIAN MEDICAL COLLEGE, VELLORE, INDIA

	Direct costs							*Indirect costs*			*Total costs*
	Pre-hospital direct costs	*Drugs*	*Tests*	*Consult*	*Other*	*Follow up*	*Total direct*	*Trans-port costs*	*Food*	*Total indirect costs*	*for episode*
Out-patient costs (to the nearest rupee)											
Mean	118	353	160	165	0	181	977	288	73	362	1338
Median (Min., Max.)	34	274	28	210	0	45	591	135	55	190	780
	(0, 1000)	(21, 1916)	(0, 1815)	(0, 275)	(0, 125)	(0, 1820)	(94, 4006)	(0, 1200)	(0, 400)	(30, 2200)	(325, 6502)
In-patient costs (to the nearest rupee)											
Mean	555	5195	2133	1071	2588	225	11,767	516	732	1248	13014
Median (Min., Max.)	229	3375	2180	605	805	65	7259	135	475	610	7868
	(0, 6000)	(1098, 3066)	(0, 6903)	(210, 1288)	(610, 1211)	(0, 1500)	(2455, 47663*)	(0, 3160)	(0, 540)	(11, 6500)	(2637, 49498)

** The child with the highest hospital bill was admitted with gastroenteritis but was found to have a congenital cardiac defect which required investigation.*

drugs at or below the retail price thus offer a means of estimating the real cost of management of an illness. Therefore, although the operation of the facility on a no-profit, no-loss basis permits cost accounted data to determine medical direct costs, indirect costs such as transportation or loss of wages could differ greatly across locations.

The results of this study suggest that the cost for both out-patient and in-patient treatment of gastroenteritis has increased markedly. However, costing studies that use multiple types of facilities and stratify cases based on etiology, by severity of disease and by presence or absence of concomitant conditions and complications will be required for a better estimate of the true costs of management of diarrheal illness in India.

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