

Cost of Hospitalization for Foodborne Diarrhea: A Case Study from Vietnam

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Vietnam is undergoing a rapid social and economic developments resulting in speedy urbanization, changes in methods for animal production, food marketing systems, and food consumption habits. These changes will have major impacts on human exposures to food poisoning. The present case study aimed to estimate hospitalization costs of foodborne diarrhea cases in selected health facilities in Vietnam. This is a facility-based cost-of-illness study conducted in seven health facilities in Northern Vietnam. All suspect cases of foodborne diarrhea, as diagnosed by doctors, who admitted to the studied health facilities during June–August, 2013 were selected. Costs associated with hospitalization for foodborne diseases were estimated from societal perspective using retrospective approach. We included direct and indirect costs of hospitalization of foodborne diarrhea cases. During the study period, 87 foodborne diarrhea cases were included. On average, the costs per treatment episode and per hospitalization day for foodborne diarrhea case were US\$ 106.9 and US\$ 33.6 respectively. Indirect cost (costs of times to patient, their relatives due to the patient's illness) made up the largest share (51.3%). Direct medical costs accounted for 33.8%; direct non-medical costs (patient and their relatives) represented 14.9%. Cost levels and compositions varied by level of health facilities. More attentions should be paid on prevention, control of foodborne diarrhea cases in Vietnam. Ensuring safety of food depends on efforts of everyone involved in food chain continuum, from production, processing, and transport to consumption.

Keywords: Costs; Hospitalization; Foodborne Diseases; Diarrhea; Vietnam

INTRODUCTION

Foodborne diseases comprise a broad spectrum of diseases result from consumption of food containing pathogens such as bacteria, viruses, parasites or the food contaminated by poisonous chemicals or bio-toxins (1,2). Although majority of the foodborne illness cases are mild and self-limiting, severe cases can occur in high risk groups resulting in high mortality and morbidity in this group. The high risk groups for foodborne diseases include infants, young children, and the elderly (3).

Food-borne disease is a common cause of diarrhea, being responsible for 33%-90% of cases (4). Disease-causing organisms in food are transmitted far and wide. Rapid urbanization worldwide is adding to risks, as urban dwellers eat more food prepared outside the home that may not be handled or prepared safely - including fresh foods, fish, meat, and poultry (5).

Vietnam is undergoing a rapid social and economic developments resulting in speedy urbanization, changes in the methods for animal production, food marketing systems, and food consumption habits. These changes will undoubtedly have major impacts on human exposures to food poisoning. The chang-

es in animal production, processing, distribution networks for meat, animal products, and the shift from wet markets to supermarkets will impact food safety risks in Vietnam (6). Food safety is a public health priority for the Government of Viet Nam. The World Health Organization, based on modeling approach, has estimated that the human cost of food-borne diseases, lost production from diseases and related market losses surpasses \$1billion a year (2% of GDP) (7). However, to our knowledge, empirical data on economic costs of foodborne diseases are still largely lacking in Vietnam. Therefore, the present case study aimed to estimate the costs of hospitalization for foodborne diarrhea cases in selected health facilities in Vietnam.

MATERIALS AND METHODS

Design

This is a facility-based cost-of-illness study. Cost-of-illness studies analyze the total costs incurred by a society due to a specific disease or health condition (8).

Study perspective and format

Costs associated with hospitalization for foodborne diseases were estimated from the societal perspective using retrospective approach.

Costs included

We included both direct and indirect costs of hospitalization of foodborne diarrhea cases: 1) Direct medical costs: This cost included the costs relating directly to the patients while undergoing medical care at the health facilities. They included the cost of clinical staff, imaging diagnostics, lab test, medicine, medical consumables, capital costs, overhead, and admin costs; 2) Direct non-medical cost: Patient and their caregiver costs of travels, foods, accommodation, and other related costs; 3) Indirect costs: Productivity losses of the patients and their caregivers.

Study settings

Due to the budget and time constraints, this study was conducted in seven health facilities in Northern Vietnam, including one national hospital (National Hospital of Tropical Disease located in Ha Noi capital city of Vietnam), 2 provincial hospitals (Hung Yen Provincial General Hospital of Hung Yen province from the North and Nghe An Provincial General Hospital of Nghe An province from the Center of Vietnam), 2 district hospitals (Khoai Chau District Hospital from Hung Yen province and Do Luong District Hospital from Nghe An province) and 2 commune health centers (one from Khoai Chau district and one from Do Luong district). The health facilities were purposively selected based on expert's opinion as they expected to represent different levels of health system in Vietnam in terms of patient case mix and treatment standards for foodborne diarrhea cases.

Selection of cases

All suspect cases of foodborne diarrhea, as diagnosed by doctors, who admitted to the studied health facilities during June-August, 2013 were selected. This period was expected to have more cases of foodborne diarrhea. Most of the suspect cases had consumed raw or poorly cooked foods and then had three or more loose stools in 24 hr or three or more times vomiting in 24 hr, or diarrhea with at least one additional symptom or vomiting with at least two additional symptoms. Additional symptoms were abdominal pain, abdominal cramps, nausea, blood in stool, and stool in black, mucus in stool, fever, diarrhea or vomiting. In this study, laboratory tests for confirmation were only done at national hospitals and for some cases who were treated at provincial hospitals.

Data collection

Data collected by the research team from Department of Health Economics and Center for Health System Research of Ha Noi Medical University, Ha Noi, Viet Nam. The research team mem-

bers, who had experiences in costing studies, were trained on techniques for data collection. The research team worked closely together with health facility staff for collecting the cost data. Data on direct medical costs were collected from hospital bills (direct medical charges) of the patients and adjusted based on interviewing with hospital financial staff on the extent to which the direct medical charges covered the actual costs (as the health facilities in Vietnam only collected partial fees). Data on direct non-medical costs were gathered by interviewing with the patients and their relatives. Productivity losses of patients and their relatives (the value of time spent when unable to work as productively because of an illness or side effect, earnings lost while traveling to health-care facilities, and productivity losses associated with caregiver time) were estimated by multiplying the cost of 1 day of lost productivity by the mean number of days lost from performing productive work as a result of the illness (human capital approach).

Data management and analysis

Excel spreadsheets were used in entering and analyzing the cost data. We estimated the cost per treatment episode of foodborne disease at different health facility levels. The currency used was Vietnamese Dong, presented here in 2013 prices. For international comparison, we provide the unit costs in US dollars (US\$) at the average exchange rate for the period of January to December 2011: 20,619.6 VND to 1 US\$.

Ethics statement

Permissions to conduct this study were approved by Hanoi Medical University as well as Hung Yen and Nghe An Provincial Health Authorities. Informed consent was obtained from all the informants.

RESULTS

Characteristics of the study respondents

During the study period, 87 foodborne diarrhea cases were included. Of which, there were 50 men (57.5%) and 37 women (42.5%). A majority of the patients were aged 16-59 yr old (83.9%). There were five cases aged equal or less than 15 yr (5.7%) and 9 cases aged 60 yr and over (10.3%). On average, each patients spent 2.8 days at the studied health facilities for treatment (4.4 days, 3.2 days, 2.5 days, and 1 day at national, provincial, district, and commune health facilities, respectively) (Table 1).

Costs per hospitalization episode for foodborne diarrhea cases

On average, the costs per treatment episode and per hospitalization day for foodborne diarrhea case were US\$ 106.9 and US\$ 33.6, respectively. The costs per treatment episode and per hospitalization day for foodborne diarrhea case were highest at na-

Table 1. Characteristics of the study respondents

Parameters	National hospital	Provincial hospital	District hospital	Commune health center	Overall
Number of patients	18	34	22	13	87 (100)
Gender					
Men, n (%)	12	22	8	8	50 (47.5)
Women, n (%)	6	12	14	5	37 (42.5)
Age					
Equal or less than 15, n (%)	2	1	1	1	5 (5.7)
16-59 yr, n (%)	13	29	16	12	73 (83.9)
60 yr and over, n (%)	3	2	3	1	9 (10.3)
Average length of stay (day)	4.4	3.2	2.5	1	2.8

Table 2. Costs per hospitalization episode for foodborne diarrhea cases by health facilities

Costs	National		Province		District		Commune		Overall	
	VND	US\$	VND	US\$	VND	US\$	VND	US\$	VND	US\$
Direct medical costs										
Amount	1,396,174	67.7	795,391	38.6	651,339	31.6	108,241	5.2	737,786	35.8
% of total cost		32.6		32.5		37.1		33.0		33.8
Direct non-medical costs (patients and relatives)										
Amount	1,286,683	62.4	250,000	12.1	230,668	11.2	20,000	1.0	446,838	21.7
% of total cost		30.0		10.2		13.1		6.1		14.9
Indirect cost (costs of times due to the patient's illness)										
Amount	1,600,000	77.6	1,400,000	67.9	875,000	42.4	200,000	9.7	1,018,750	49.4
% of total cost		37.4		57.3		49.8		60.9		51.3
Total costs per hospitalization episode										
Amount	4,282,857	207.7	2,445,391	118.6	1,757,007	85.2	328,241	15.9	2,203,373.9	106.9
% of total cost		100.0		100.0		100.0		100.0		100.0
Total costs per hospitalization day (amount)	973,377	47.2	764,185	37.1	702,803	34.1	328,241	15.9	500,767	33.6

VND, Vietnamese Dong.

Table 3. Direct costs per hospitalization episode for foodborne diarrhea cases by health facilities

Cost	National			Province			District			Commune			Overall		
	VND	US\$	%	VND	US\$	%	VND	US\$	%	VND	US\$	%	VND	US\$	%
Clinical staffs	475,000	23.0	34.0	280,000	13.6	35.2	179,688	8.7	27.6	28,125	1.4	26.0	240,703	11.7	30.7
Lab test	111,203	5.4	8.0	88,980	4.3	11.2	124,406	6.0	19.1	0	0.0	0.0	81,147	3.9	9.6
Medicine	415,012	20.1	29.7	276,208	13.4	34.7	197,543	9.6	30.3	53,000	2.6	49.0	235,441	11.4	35.9
Medical consumables	63,593	3.1	4.6	25,600	1.2	3.2	57,405	2.8	8.8	5,000	0.2	4.6	37,900	1.8	5.3
Capital costs	98,670	4.8	7.1	52,294	2.5	6.6	33,085	1.6	5.1	12,276	0.6	11.3	49,081	2.4	7.5
Overhead, admin costs	232,696	11.3	16.7	72,308	3.5	9.1	59,213	2.9	9.1	9,840	0.5	9.1	93,514	4.5	11.0
Total direct costs per hospitalization episode	1,396,174	67.7	100.0	795,391	38.6	100.0	651,339	31.6	100.0	108,241	5.2	100.0	737,786	35.8	100.0
Total direct costs per hospitalization day	317,312	15.4		248,560	12.1		260,535	12.6		108,241	5.2		233,662	11.3	

VND, Vietnamese Dong.

tional hospital (US\$ 207.7 and US\$ 47.2, respectively) and were lowest at commune health center (US\$ 15.9). The indirect cost (costs of times to the patient and their relatives due to the patient's illness) made up the largest share (51.3%). The direct medical costs accounted for 33.8% and the direct non-medical costs (the patient and their relatives) represented 14.9% (Table 2).

Table 3 shows the levels and compositions of the direct costs. Overall, the medicine costs made up the largest proportions (35.9%) followed by the personnel costs (30.7%). The costs of medical consumables accounted for the smallest share (5.3%). The direct cost compositions varied by level of health facilities.

While the personnel cost made of the largest shares at national and provincial health facilities (34.0% and 35.3%, respectively), the costs for medicine accounted for the highest proportions at district hospitals and commune health center (30.3% and 49.0%).

DISCUSSION

This pilot study has provided preliminary empirical evidence on economic burden of foodborne disease in Vietnam. We found that, on average, the costs per hospitalization episode for foodborne diarrhea case was US\$ 106.9. This figure is higher than

Table 4. Total annual costs associated with hospitalization for foodborne diarrhea in Vietnam

Parameters	Scenario 1 (Based on figure on the proportion of gastroenteritis specifically attributable to foodborne transmission from Australia = 32%) (15)	Scenario 2 (Based on figure on the proportion of gastroenteritis specifically attributable to foodborne transmission from USA = 35.5%) (16)
Population of Vietnam in 2013 (13)	90,388,000	90,388,000
Rate of diarrhea admitted to health facilities (per 100.000) (14)	210.57	210.57
Total cases of diarrhea admitted to health facilities	190,330	190,330
Total cases of diarrhea admitted to health facilities due to foodborne diseases (15,16)	60,906	67,567
Of which, number of cases treated at each level of health care facilities (17)		
Number of cases treated at national hospital (4%)	2,436	2,703
Number of cases treated at provincial hospital (45%)	27,408	30,405
Number of cases treated at district hospital (36%)	21,926	24,324
Number of cases treated at commune health centers (15%)	9,136	10,135
Costs per hospitalization episode (US\$)		
At national hospital	208	208
At provincial hospital	119	119
At district hospital	85	85
At commune health centers	16	16
Total costs of hospitalization (US\$)		
At national hospital	506,023	561,370
At provincial hospital	3,250,407	3,605,921
At district hospital	1,868,327	2,072,675
At commune health centers	145,432	161,339
Total costs of hospitalization at all levels of health facilities (US\$)	5,770,190	6,401,305
GDP Vietnam 2013 (Billion US\$) (18)	172.73	172.73
Total annual costs associated with hospitalization for foodborne diarrhea in Vietnam as % of GDP	0.003	0.004

the cost estimates for hospitalizations of diarrheal cases due to rotavirus in Vietnam (US\$ 36) (9). A study conducted in Trinidad and Tobago in 2009 reported the cost of hospitalization for a gastro-enteritis of US\$ 78, accounting for 0.53 percent of a citizen annual income (10). Another study done in the Netherland in 2004 found that the cost of hospitalization for a gastro-enteritis was US\$ 74, representing around 0.27 percent of annual per capita GDP (11). In fact, the length of stay of the foodborne diarrhea patients revealed in our study (2.8 days) was a bit longer than the figures reported by the studies from Trinidad and Tobago (2.3 days) (10), and from the Netherland (2.6 days) (11). A study from Canada reported that the average duration of hospital stay for an acute gastro-enteritis case was 3.7 days (12).

In this study, as expected, the costs of hospitalization for foodborne diarrhea cases were higher at higher levels of health facilities (central, provincial and district health facilities) because both average length of stay were longer and the costs per hospitalization day (especially medical costs such as personnel and medicines costs) were higher there. In fact, the patients with more severe health conditions were more likely to be admitted to health facilities located at higher levels. Patients who were treated at higher levels of health facilities and their relatives normally had to pay more for food, accommodation, and transportation, etc. resulting in higher direct non-medical costs. In addition, indirect cost associated with the foodborne diarrhea cases who were treated at higher level of health facilities were also higher (especially the costs to the care givers). In this study, we

found that the indirect cost (costs of times to the patient and their relatives due to the patient's illness) made up the largest share (51.3%) and the direct non-medical costs (the patient and their relatives) represented as high as 14.9%. Similar pattern was found in a study on cost of Rotavirus in Vietnam) (9). As the direct non-medical costs and indirect costs are substantial to society, they should be included in future health economic studies, especially economic evaluation of intervention against foodborne diseases.

Based on the total number populations in Vietnam (13), the rate of diarrhea admitted to health facilities (14), the proportion of gastroenteritis specifically attributable to foodborne transmission from Australia (15) and from USA (16), pattern of health care utilization in Vietnam (17), and the figures on costs of hospitalization for foodborne diarrhea cases from this study, we found that the total annual costs associated with hospitalization for foodborne diarrhea cases range between 5.8-6.4 US\$ millions, made up 0.003%-0.004% of GDP of Vietnam (Table 4). It is worthwhile to note that the cost of hospitalization for foodborne diarrhea cases is only part of economic burden caused by foodborne diseases. If the costs of mortality and other morbidities were added, the losses due to the foodborne diseases would be much higher. More attentions should be paid on prevention and control of foodborne diarrhea cases in Vietnam.

Limitation of this study

This pilot study has several limitations and we considered this

study as a snapshot on the costs of hospitalization for foodborne diarrhea cases in Vietnam. Given limitations in time and budget as well as the dearth of data, we were not able to get confirmation of foodborne diarrhea cases who were treated at district hospital and commune health center as laboratory tests (such as specimens for microbiologic testing) for differential diagnoses. We could not estimate the costs by type of pathogens, by age groups and severities of diseases. We were also not able to include the costs for self-treatment (for mild and self-limiting) and outpatient cares as well as the losses due to mortality associated with foodborne diseases.

CONCLUSION

Cost of hospitalization for foodborne in Vietnam is substantial. More attentions should be paid on prevention and control of foodborne diarrhea cases in Vietnam. Ensuring the safety of food depends on the efforts of everyone involved in the food chain continuum, from production, processing, transport to consumption. Further study on economic aspects of foodborne diarrhea cases are needed to provide further insights into the problems associated with foodborne diarrhea cases in Vietnam.

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DISCLOSURE

The authors have no conflicts of interest to disclose.

AUTHORS CONTRIBUTION

Study design: Hoang VM, HA AD, Nguyen VH. Data collection, analysis: Hoang VM, Tran TA. Writing: Hoang VM, Ha AD, Nguyen VH. Approval of the final manuscript: all authors.

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