

Original Research Article

Are we contented with achieving universal health coverage in treating dengue patients in Sri Lanka?

Nadeeka D. Perera^{1*}, Shamini Prathapan², Amala De Silva³, Dulshika A. Wass⁴,
Ananda Wijewickrama⁵

¹Ministry of Health, Colombo, Sri Lanka

²Department of Community Medicine, Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka

³Department of Economics, University of Colombo, Colombo, Sri Lanka

⁴Department of Psychiatry, Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka

⁵National Institute of Infectious Diseases (IDH), Angoda, Sri Lanka

Received: 09 October 2022

Accepted: 21 November 2022

*Correspondence:

Dr. Nadeeka D. Perera,

E-mail: nadeekaysanth@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: The preventive and curative services for dengue illness cause a significant financial burden on the state health sector. Household costs and out-of-pocket expenditure (OOPE) too are important cost components embedded with dengue illness. The objective was to estimate the household costs and out-of-pocket expenses incurred due to dengue infection among adults who received institutional care in Colombo district, Sri Lanka.

Methods: A longitudinal study was conducted from July to December 2018. Fifty patients recruited from dengue fever (DF) and dengue hemorrhagic fever (DHF) categories. Adults residing in the Colombo district for more than six months prior to dengue illness were recruited based on systematic sampling. Data was collected via an interviewer-administered questionnaire on the day of discharge from the hospital and followed up for two weeks. Unit cost per patient was calculated. Household costs were calculated for 3 phases: ambulatory, during, and post-hospitalization. These components were described using mean, median, standard deviation and inter-quartile range, and OOPE.

Results: The median age in the DF group was 38.5 years and in the DHF group was 28.5 years. The average household cost was US\$ 127.69 (SD=93.32) and US\$ 134.71 (SD=94.31) for DF and DHF patients respectively. Among DF patients 98.03% were borne using OOPE and among DHF patients it was 95.57%.

Conclusions: If an adult member is hospitalized with dengue infection the OOPE is high, which is nearly 25% of a family's monthly income. Strengthening dengue control programme is the key to universal health coverage (UHC).

Keywords: Dengue infection, Household cost, OOPE

INTRODUCTION

Dengue is the most common arthropod-borne infection among humans, and it is caused by an RNA virus from the Flaviviridae family.¹ The global footprint of dengue is rapidly mounting, causing a huge public health challenge at present. With the lack of an appropriate vaccine, targeted therapeutic agents, or effective vector control-strategies, dengue infection is leading to many adverse

physical, psychological, and economic repercussions.² Further, the global incidence of dengue has amplified 30-fold throughout the past fifty years.³

During the year 2018, the total number of notifications received by the epidemiology unit on dengue was 51536. Out of that 10258 have been reported from Colombo district. The total number of confirmed dengue infections for the year 2018 was 32989 and out of that 21.7%

(n=7174) were reported from Colombo district. The second highest number was reported from Gampaha district which accounted for 11.5%. The majority were males (60.38%) and gender was not mentioned in 0.35% of cases.⁴ The total number of hospital admissions in 2015 was 29777, corresponding to 143 per 100,000 population. The case fatality rate was 0.2%, showing a declining trend over the years.⁵

Shepard et al highlight the importance of estimating the economic burden due to dengue specific to the setting.⁶ According to them from 2001 to 2010, an average of 2.9 million dengue cases per year and 5906 deaths in 12 countries in South East Asia (SEA) had been reported. According to their estimates of the disease and economic burden of dengue in 12 countries in SEA, dengue costs 1.65 USD per person annually and the disease burden was estimated as 372 disability-adjusted life years (DALYs) per million population. The DALYs are having a higher rate than several other illnesses including upper respiratory tract infections and hepatitis B.⁶

Senanayake et al reported the findings of the first costing study on dengue illness which was conducted in the Lady Ridgeway hospital for children in Colombo in 2012.⁷ A descriptive cross-sectional study was conducted among 43 DHF patients and 87 DF patients selected randomly. The average system cost per patient of DHF and DF was LKR 24,856 (USD 191) and LKR 10,348 (USD 80) respectively. Direct and indirect medical and non-medical costs incurred by households were LKR 4,758 (USD 36.6) for DHF and LKR 3,965 (USD 30.5) for DF. The total cost per illness for an episode of DHF was LKR 29,744 (USD 228.8). The total cost per episode of DF was LKR 14,326 (USD 110.2). The average hospital stays of DHF and DF patients was 4.8 and 3.8 days correspondingly.⁷

Thalagala et al assessed the public sector costs of dengue control activities and the direct costs of hospitalizations in the Colombo district, during the epidemic year of 2012 from the perspective of the ministry of health.⁸ The total cost of dengue control and reported hospital admissions was estimated at US\$ 3.45 million (US\$ 1.50 per capita) in the Colombo district in 2012. Personnel costs accounted for the major proportion of the total costs of dengue control activities (79%) and hospitalizations (46%). A per capita cost of US\$ 0.42 for dengue control activities was estimated. The average costs per hospitalization fluctuated between US\$ 216-609 for pediatric cases and between US\$ 196-866 for adult cases conferring on the severity of the disease and treatment setting.⁸

The cost of an illness provides information at the micro- and macroeconomic levels, to decide on a suitable price of interventions in the diagnosis and management of an illness and to estimate appropriate funds for health policies.⁹ Considering the costs related to a country's health system, both the systemic costs borne by the

government and the costs abided by households are both important since it is the total costs that define the ideal provision and utilization of health services.¹⁰

In Sri Lanka, dengue infection has been a major public health concern since 1960. The preventive and curative services place a financial burden on the state health sector.⁸ Further, the household cost, mainly as an OOPe is an important cost component embedded with dengue infection. It is one costing element included in the societal perspective. The household costs are the expenses borne by the patient and his family due to the hospitalization of the patient with dengue illness. It is described under two broad categories: direct costs and indirect costs. The direct costs are categorized into direct medical costs and direct non-medical costs. The medical costs are the costs incurred due to patients' treatments, medications, investigations, etc. Non-medical direct costs include costs incurred for traveling, caregivers, special foods, and lodging. The indirect costs are based on the productivity loss by the patient or the household caregiver due to the illness.¹¹ Non-medical costs and income losses are a larger financial burden than direct medical costs for households., UHC, incorporates the need for all individuals to receive quality health services without suffering financial hardship. This study focused on estimating the household costs (particularly the OOPe) incurred due to dengue among adults who received institutional care in Sri Lanka.

METHODS

Study design, setting and population

A longitudinal study was conducted to describe the direct and indirect household costs incurred to the household when an adult patient, confirmed with DF and DHF received institutional care in infectious diseases hospital in Colombo district, Sri Lanka. The study was carried out from July to December 2018.

Eligibility criteria

Only adults aged between 18-60 years residing in Colombo district for more than six months prior to DF/DHF episode were recruited for the study. DF patients were clinically and/or serologically confirmed. DHF patients were clinically and radiologically and/or serologically confirmed. The patients who had been transferred from another hospital, those who were already diagnosed with a mental illness, pregnant mothers, and patients who were unable to comprehend an interviewer-administered questionnaire in Sinhala were excluded.

Data collection

In recruiting participants for the study, the patients admitted with DF/DHF were checked for eligibility criteria. Every other day by visiting the selected wards, the eligible patients as described earlier were enrolled.

Systematic sampling technique was used to recruit patients for the study. From the prepared list the first patient was selected randomly and after that, every other patient on the list was selected as eligible to participate in the study. The selected patients were interviewed on the day of discharge from the hospital. To capture the period after the acute infection the study participants were followed up until two weeks after the date of the discharge.

Study instrument

An interviewer-administered questionnaire was used in data collection. The household cost was centered on actual expenses and the disaggregate method was used to conduct an in-depth analysis of the costs incurred among patients. The retrospective survey method and the scenario-building technique were used in deciding the costing elements. All the known costing elements were listed down, preparing the conceptual framework. Next, the assumptions involved were considered in consultation with experts in the field. Thirdly, considering all the assumptions and the cost elements, the questionnaire was prepared. Fourthly, judgmental validity and the reliability of the tool were assessed.¹⁰ The questionnaire consisted of several sections; the socio-demographic information, questions related to costing details during the ambulatory period; whether the patient had taken treatment prior to hospitalization and the costs incurred due to medical consultation, investigations, and medicines, costs incurred for travel, and for special foods and things needed for the hospital admission, costing details during the hospitalization period; transport cost to reach the hospital, and transport cost to bring food and essential items to the hospital. (Routing travel costs for visiting the patient was not considered), costs incurred due to the person accompanying the patient to the hospital (traveling, food, other), costs incurred due to purchasing medicines and cost for investigations done outside, costs due to special food items and other consumables, costs incurred due to the by-stander, costs incurred to household members if they have to stay in a lodge during this period (costs for lodging, food, etc.), indirect costs incurred to the patient and or household members if no-pay leave was taken during the ambulatory and hospitalization period. Total workdays lost due to illness episode was recorded with the number of no-pay days. Costs incurred during the post-hospitalization period of up to two weeks; whether the patient had taken treatment during the post-hospitalization period and the costs incurred due to medical consultation, investigations, and medicines, costs incurred for traveling home and for other consultations, costs incurred due to special food and other consumables due to illness, costs incurred due to religious rituals due to this illness episode, information regarding lost income due to no-pay leave, using of saved money due to this illness episode, obtaining of loan facilities due to this illness episode and compensation received via insurance. The questionnaire was pretested prior to the data collection.

Statistical analysis

The costs were basically categorized into two: direct and indirect household costs. Direct costs occur due to resource use and costs associated with medical care, drug costs, costs of investigations (medical costs), costs of non-medical services, special food, etc. (Non-medical costs). Indirect costs occur due to the number of days lost from productive work by the patient and family members due to the illness. Unit cost per patient was calculated. The household costs were calculated for three phases; ambulatory costs, costs incurred during hospitalization, and post-hospitalization costs. These components were described using mean, median, standard deviation, and interquartile range. Costs were also compared against household income. Further, the OOPE due to dengue among adults was calculated. All costs were calculated in LKR and converted to US\$ for presentation. The conversion rate as of 31st December 2018 is US\$ 1=LKR 182.89. In 2016, the average monthly income of a household in Colombo was US\$571.82.

Ethical considerations and administrative clearance

The purpose of the study was explained to the patients and informed written consent was taken prior to data collection. Prior to study implementation, administrative requirements were fulfilled by taking permission from the relevant authorities. Ethical clearance was obtained from the ethics review committee, faculty of medicine, Kelaniya.

RESULTS

The socio-demographic characteristics of the study participants are illustrated in Table 1.

The age of participants in both groups showed a non-normal distribution. The median age in the DF group was 38.5 years and in the DHF group was 28.5 years. Approximately 80% were Sinhala Buddhists in both categories (Table 1).

Among the DF group, 82% (n=41) and among the DHF group, 94% (n=47) had passed the G.C.E O/L examination or attained higher educational qualifications. The total monthly income of the household was obtained and categorized into five groups. Considering the income distribution, the median household monthly income among DF patients was US\$ 273.39 (IQR=164.03-416.92) and among DHF patients was US\$328.07 (IQR=218.71-492.10). The majority (52%, n=26) were belonging to Low and Medium levels of socioeconomic status in the DF group, and in the DHF group, 76% (n=38) were of a similar socioeconomic status (Table 2).

A summary of direct household costs considering the time of receiving treatment and care is shown in Figure 1 and 2.

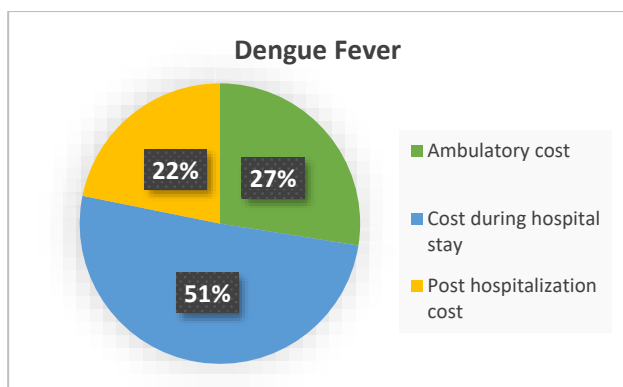


Figure 1: Description of direct household cost by the time of receiving treatment in the DF category.

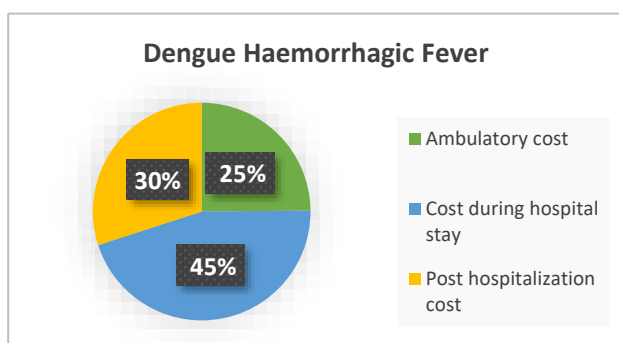


Figure 2: Description of direct household cost by the time of receiving treatment in the DHF category.

Table 1: Socio-demographic characteristics of the study population.

Characteristics	DF, (n=50)		DHF, (n=50)	
	N	%	N	%
Age (Years)				
18-25	16	32	20	40
26-35	7	14	13	26
36-45	10	20	8	16
46-60	17	34	9	18
Sex of the patient				
Male	27	54	29	58
Female	23	46	21	42
Ethnicity				
Sinhala	43	86	40	80
Tamil	2	4	3	6
Moor	5	10	6	12
Burger	0	0	1	2
Religion				
Buddhism	40	80	36	72
Hindu	2	4	3	6
Catholic	3	6	5	10
Islam	5	10	6	12
Marital status				
Married	27	54	30	60
Unmarried	20	40	20	40
Divorced	1	2	0	0
Widowed	2	4	0	0

Table 2: Description of socio-economic characteristics of the study population.

Characteristic	DF, (n=50)		DHF, (n=50)	
	N	%	N	%
Highest educational level				
Not gone to school	2	4	0	0
Grade 1-5	1	2	1	2
Passed grade 5	2	4	1	2
Passed grade 8	4	8	1	2
G.C.E. O/L ¹ passed	21	42	21	42
G.C.E. A/L ² passed	14	28	17	34
Diploma/ vocational training	2	4	4	8
Degree/ postgraduate	4	8	5	10
Total monthly income (LKR)				
Less than 25,000	7	14	4	8
25,000-50,0000	22	44	17	34
50,001-75,000	9	18	11	22
75,001-100,000	3	6	9	18
More than 100,001	9	18	9	18
Current employment status				
Employed	32	64	31	62
Not employed	18	36	19	38
Social class*				
I-higher professionals and administrators	4	8	11	22
II-lesser professional occupations	6	12	3	6
III-skilled occupations	14	28	16	32
IV-semi-skilled occupations	16	32	15	30
V-unskilled and not employed	10	20	5	10
Socio-economic level**				
High	24	48	12	24
Medium	14	28	25	50
Low	12	24	13	26

*Adopted from Kasturiratne.¹² **A composite score based on the occupation and education of the head of the household and the condition of the house. Adopted from Kasturiratne.¹²

Considering the direct household costs, in both DF and DHF categories, investigation costs were reported as zero during the hospitalization period. During this period 64% of expenses in the DF category and 57% of expenses in the DHF category had been spent on costs for traveling to bring food and essential items to the hospital and for lodging. Considering the direct ambulatory costs, among the DF category, 58% of costs were due to consultation and investigations and among the DHF category, it was 48.8%. During the post-hospitalization period, the medical consultation costs were 1.6% and 8.3% of total direct costs among DF and DHF categories respectively.

Table 3: Description of indirect household costs (financial losses) for the household of study participants.

Cost component	DF		DHF	
	Median (IQR) (US\$)	Mean (SD) (US\$)	Median (IQR) (US\$)	Mean (SD) (US\$)
During ambulatory period and hospital stay	15.04 (0.0-51.94)	27.61 (34.61)	0.0 (0.0-26.92)	19.19 (32.71)
During post-hospitalization period	0.0 (0.0-52.29)	29.7 (40.02)	0.0 (0.0-54.68)	31.68 (47.11)
Total indirect household cost	30.07 (0.0-110.86)	57.32 (61.77)	0.0 (0.0-109.36)	50.87 (71.45)

Table 4: Total household costs incurred by the study population.

Descriptions	DF		DHF	
	Median (IQR) (US\$)	Mean (SD) (US\$)	Median (IQR) (US\$)	Mean (SD) (US\$)
Direct cost	45.79 (21.67- 104.76)	70.38 (67.06)	68.07 (37.93-126.99)	83.84 (62.66)
Indirect cost	30.07 (0.0-110.86)	57.32 (61.77)	0.0 (0.0-109.36)	50.87 (71.45)
Total household cost	112.98 (44.54-187.45)	127.69 (93.32)	122.12 (64.31-180.53)	134.71 (94.31)
OOPE	112.98 (44.54-177.79)	125.18 (92.33)	100.61 (60.4-178.7)	128.75 (92.42)

With reference to the medical costs, the median ambulatory cost for the DF category was US\$ 5.54 (IQR=0.00-19.6) and for the DHF category, it was calculated as US\$ 7.86 (IQR=3.3-17.3). The medical cost element accounted for 72.5% and 57.3% of expenses during the ambulatory period in DF and DHF categories respectively. During the hospital stay, the medical costs in both categories are less than 1% of the total direct household cost. During the post-hospitalization period, medical costs accounted for 9.6% and 22.3% of post-hospitalization costs in the DF and DHF categories respectively.

The indirect household costs comprised the lost earnings of the patient and household members (acting as caregivers). The description of indirect costs is described in Table 3. More than 50% of expenses as indirect costs had occurred during the post-hospitalization period accounting for 51.8% and 62.2% among DF and DHF categories respectively (Table 3).

Among the patients who were employed, during the post-hospitalization period, 78.1% (n=25) and 84% (n=27) in DF and DHF categories had obtained leave from the routine occupation. More than 50% of patients had to take no-pay leave in both categories. The average number of workdays lost by patients due to this illness episode in the DF category was 9.7 (SD=9.7) and in the DHF category was 10.5 (SD=10.5). The average number of no-pay days was 5.7 (n=8.3) and 6.3 (SD=9.7) among DF and DHF categories respectively. For a household member in the DF category, the average number of workdays lost was 2.6 (SD=6.8) and among the DHF category, it was 2.08 (SD=3.6). The average number of no-pay days for household members was 2.3 (SD=6.8) and 0.76 (2.6) among DF and DHF categories respectively.

Nearly 50% (DF: n=25 and DHF: n=30) in both categories had to use their saved money due to the current illness episode. Ten percent in the DF category and 12% in the DHF category obtained loan facilities and the majority of them (60% in DF and 66.7% in DHF) were paying interest on the loan. In both DF and DHF categories, 18% (n=9) were having protection from an insurance scheme. Among the DF category among those who were having an insurance scheme, 66.6% were based on the government, and among the DHF category, all insurance schemes were by the private sector. Among the DF category, out of the nine study participants who possessed an insurance scheme, only one applied for compensation. No one was able to compensate for the whole expenses in both categories. In DF category, the median coverage of expenses was US\$ 0.0 (IQR=0.0-0.0) except in hospital admission coverage, which was US\$ 0.0 (IQR=0.0-20.5). In DHF category, median hospital admission coverage was US\$ 8.2 (IQR=0.0-65.6).

The total household cost is comprised of the total direct costs and the total indirect costs incurred by the household. The median total household cost was US\$ 112.98 (44.5-187.45) and US\$ 122.12 (64.3-180.5) among DF and DHF categories respectively. The major proportion of costs was due to direct costs in both categories. Direct costs are composed of 55.1% and 62.2% of total cost among DF and DHF categories correspondingly. OOPE during the illness episode was calculated by subtracting the compensations received, from the total costs. The median OOPE was US\$ 112.98 (IQR=44.54-177.79) and US\$ 100.61 (IQR=60.4-178.7) among DF and DHF categories respectively (Table 4).

DISCUSSION

This is the first attempt to describe the household costs and the OOPE among adults with dengue infection in Sri

Lanka. We selected the Colombo district which is reported to have 20% of the case population of dengue. The study was conducted in the Institute of Infectious Diseases which was one of the main centers specialized in dengue management, and data was collected within a six-month period, which enabled us to have uniform data. Only adults aged between 18-60 were included, since costing elements may be different from paediatric patients.

From the total household cost, direct costs composed the majority, estimated as 55.1% and 62.2% among DF as well as the DHF categories respectively. Of the direct costs, nearly 30% had been spent on traveling to bring food and essential items to the patient. The traveling cost to just visiting the patient was not included in the study. Though the meals are served in the hospitals, it is culturally based that the Sri Lankans do tend to bring food from their households and visit the patients offering them psychological support. One salient finding was that the costs for investigations during the hospitalization period were zero indicating that the costs were minimized with the involvement of the state in the patient management.

The OOPE consisted of 98.03% of total costs incurred by DF patients and among DHF patients it accounted for 95.59%. This indicates the high OOPE incurred on the households once a member is diseased with dengue illness. According to statistics from the department of census and statistics, in 2016, the average monthly income of a household in the Colombo district was US\$571.82. Therefore nearly 25% of a monthly income was spent by a household if a single adult was hospitalized with dengue illness. It was evident that the OOPE on adults infected with dengue illness is causing a huge additional economic burden on the households. This is a very significant finding since Sri Lanka is in the backdrop of reaching UHC.

CONCLUSION

100% of investigation costs were covered by the government during the hospitalization period, which indicates the positive involvement of the state in the management of dengue illness, which has reduced a major portion of costs on the households as well. Considering the total household cost, direct costs composed the majority, estimated as 55.1% and 62.2% among DF and DHF categories respectively in which a major portion was spent on traveling to bring food and essential items to the hospital. Among both categories, the average number of workdays lost due to illness for the patient was 10 days, which reflects the impact on the country's economy. Considering all the factors, Sri Lanka needs to monitor the progress that we make in the health system toward the prevention of dengue infection. One such indicator is the proportion of the population that spends a large amount of household income on health, which is nearly 25% of a patient's family income once

they are admitted with dengue illness, and this needs to be reduced urgently. Strengthening the dengue control programme is the key to reaching UHC.

ACKNOWLEDGMENTS

The authors would like to thank the data collection team and the study participants.

Funding: This study was funded by the University of Sri Jayewardenepura under the research grant - ASP/01/RE/MED/2018/73

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee by Faculty of Medicine, Kelaniya, Sri Lanka (P/78/02/2018)

REFERENCES

1. Shepard DS, Undurraga EA, Lees RS, Halasa Y, Lum LC, Ng CW. Use of multiple data sources to estimate the economic cost of dengue illness in Malaysia. *Am J Trop Med Hygiene*. 2012;87(5):796-805.
2. Simmons PC, Farrar JJ, Chau NV, Wills B. Dengue: Review Article. *N Eng J Med*. 2012;366(15):1423-32.
3. World Health Organization. Dengue Fact Sheet. Regional Office of South East Asia: Geneva: World Health Organization. 2012. Available at: <http://www.who.int/mediacentre/factsheets/fs164/en/>. Accessed on 26 Oct, 2022.
4. Ministry of Health. Epidemiology of Dengue, National Dengue Control Unit, Ministry of Health, Sri Lanka. 2019.
5. Ministry of Health. Annual Health Bulletin, Ministry of Health, Sri Lanka. 2015.
6. Shepard DS, Undurraga EA, Halasa YA. Economic and disease burden of dengue in Southeast Asia. *PLoS Neglected Trop Dis*. 2013;7(2).
7. Senanayake M, Jayasinghe S, Wijesundera D, Manamperi M. Economic cost of hospitalized non-fatal paediatric dengue at the Lady Ridgeway Hospital for Children in Sri Lanka. *Sri Lanka J Child Heal*. 2014;12:43(4).
8. Thalagala N, Tissera H, Paliyawadana P, Amarasinghe A, Ambagahawita A, Wilder-Smith A et al. Costs of dengue control activities and hospitalizations in the public health sector during an epidemic year in urban Sri Lanka. *PLoS Neglected Trop Dis*. 2016;10(2).
9. Zaleski ID. Why cost-of-illness studies are important and inform policy. *Vascular Med*. 2008;13:251-3.
10. De Silva A. Review of Costing Studies Conducted in Sri Lanka, 1990-2004. National Commission on Macroeconomics and Health, Ministry of Healthcare and Nutrition. 2007.
11. Armien B, Arredondo J, Carabali M, Carrasquilla G, Castro R, Durand L et al. Costing dengue cases and outbreaks: A guide to current practices and

procedures. Pan American Health and Education Foundation, International Vaccine Access Center, and Dengue Vaccine Initiative, Baltimore, MD. 2012.

12. Kasturiratne KTAA, Morbidity pattern and economic burden of non-communicable diseases at Tertiary care level. Theses: Post Graduate Institute of Medicine, University of Colombo, Sri Lanka. 2003.

Cite this article as: Perera ND, Prathapan S, De Silva A, Wass DA, Wijewickrama A. Are we contented with achieving universal health coverage in treating dengue patients in Sri Lanka? *Int J Community Med Public Health* 2022;9:4334-40.