



# Cost of Managing Chronic Hepatitis B in a Resource-Poor Setting; The Implications for Universal Health Coverage Reform

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## ABSTRACT

**Introduction:** Hepatitis B (HBV) is a global public health problem whose management imposes financial hardship on the patients especially in developing countries with high level of poverty. This study estimated the financial burden of managing HBV by quantifying the direct medical, direct non-medical and indirect costs of managing patients in various stages of chronic hepatitis B virus disease.

**Methods:** This was a descriptive cross-sectional survey that retrospectively collected data on direct medical costs, direct non-medical and indirect costs through interviewed patients. Cluster sampling method was employed to recruit 107 hepatitis B patients at various stages of the disease. Data was analysed using Statistical Package for the Social Sciences (SPSS) and frequencies presented in tables and charts.

**Result:** The extrapolated annual direct medical cost of managing hepatitis B for a patient is ₦354,613 (\$933). Additionally, patients who patronised herbs and other forms of alternative medicine spend an average of ₦205,000 (\$540) per year as part of their direct medical cost. The direct non-medical cost of managing hepatitis B is ₦50,446 (\$133) per patient per year. The indirect cost is ₦159,900 (\$421) per patient per year. The total cost of managing a chronic hepatitis B patient per year is ₦564,959 (\$1,487)

**Conclusion:** The average amount needed to treat this condition is more than the minimum wage of the average patient. There is therefore the need to reduce exclusion and social disparities in patient with chronic HBV through introduction of subsidies for the treatment of chronic hepatitis B as well as establish pre-payment mechanisms that can reduce the need to pay out-of-pocket for their treatment.

## BACKGROUND

Hepatitis B is a potentially life-threatening blood borne disease that affects the liver. It is the commonest infective cause of liver disease that could result in liver cirrhosis and cancer. In WHO African region, over 81 million people are infected with hepatitis B second only to WHO pacific region where it affects 116 million people (1). Hepatitis B virus (HBV) occurs worldwide with high endemicity in sub-Saharan Africa where it is hyper-endemic (prevalence rate >8% of the population), also in Southeast Asia and the Pacific. The prevalence rates in North America, Western and Northern Europe are as low as 0.1% of the population.(2). Nigeria, with the prevalence of hepatitis B virus infection at 11% accounts for 8.3% of the global burden of chronic HBV. The distribution of hepatitis B virus infection by sex in Nigeria is 62.6% male and 37.4% female (3)

Hepatitis B is a global public health problem whose management imposes financial hardship on the patients especially in developing countries with poor health coverage (4). Studies in other parts of the world have shown the cost of treating hepatitis B to be quite high as compared to other illnesses (5 - 7). For a country like Nigeria where up to 95.8% of her citizens pay out-of-pocket for health care, it is important to estimate the cost of managing hepatitis B in order to plan appropriate interventions for such patients(8).

Cost of illness as a part of cost analysis, is one of the basic tools of economic evaluation used to measure the economic burden of a disease or group of diseases and by extension estimate the amount that can be potentially saved or gained by preventing the disease. It is a broad concept of cost that involves both cost from the patients' perspective and cost from the providers' perspective(9). Cost from the patients' perspective involves direct medical cost, direct non-medical cost and indirect cost. It refers to all costs that are completely attributable to the use of a healthcare intervention or illness.(9, 10)

Essentially, direct medical cost include the cost of services such as consultation, drugs, investigations and admission/hospital stay (9). It refers to all costs due to resources use that are completely attributable to the use of a healthcare intervention or illness.(12) Direct medical costs specifically refers to the cost of a defined intervention or all follow-up costs for medications and other healthcare interventions in ambulatory, inpatient and nursing care.(12) It traditionally involves the medical care expenditures for the diagnosis, treatment and rehabilitation of a patient.

While direct non-medical cost captures costs related to transportation, meals, and patient companions (9). It refers to expenditures as the result of an illness but are not involved in the direct purchasing of medical

services. It often includes such expenditures as travel, lodging, home services and is related to the consumption of other non-healthcare resources like transportation, household expenditures, relocating, property losses, and informal care of any kinds.(13).

Henry Flood and Richard Phelps started their article on understanding indirect cost with a quote "they may be hard to figure and even harder to recover, but they should never be overlooked"(15). Indirect cost refers to the loss of resources due to morbidity and mortality, which inadvertently places a monetary value on the value of human life. For many studies, indirect costs are substantial and can be significantly higher than the direct cost.(9) There has been widespread disagreement about the methods of estimating indirect costs and a lot of it arises from ethical considerations as the idea of placing a monetary value on life raises ethical questions. Because lower values are placed on the elderly and those who do not work, the controversy continues whether such costs should be included in the cost of illness.(9) There are three approaches currently used in estimating indirect cost. They include the human capital method, the friction cost method and the willingness to pay method.

The contributions of direct non-medical costs and indirect costs are often not comprehensively assessed because these data are difficult to collect retrospectively and the methods for collecting them are not very well established. (14) These costs are however very important from a societal perspective and studies have suggested that they represent a significant proportion of the total cost in certain settings. Cost estimates that exclude these other cost components will grossly underestimate the cost of treatment of a condition, especially treatment that depends a lot on the patient's time and that of their care-givers.(14)

A nationwide study conducted in Greece estimated the average cost of illness per year of hepatitis B to be at 2,979 Euros(6). A similar study in Germany placed the average cost at DM 5,974(16). Another study on the direct economic burden of hepatitis B virus-related diseases in Shandong, China, considered the direct medical cost to include total outpatient, inpatient (hospitalization expenditures, nursing, prescription drugs and examination fees) and self-treatment expenditures. This study did not include costs of diagnosis (laboratory test and procedures) as direct medical costs but it estimated the costs of various stages of hepatitis B virus disease focusing on hepatitis B virus-related diseases like acute hepatitis B, severe hepatitis B, chronic hepatitis B, compensated cirrhosis, decompensated cirrhosis and primary liver cancer and estimated the costs as \$2954, \$10834, \$4552, \$7400.28, \$6936 and \$10635, respectively. One limitation of this study is that it looked only at one

component of cost so will not give the total picture of the economic burden of hepatitis B virus disease.(17)

This study therefore is aimed at estimating the financial burden by quantifying the direct medical, direct non-medical and indirect costs of managing patients with various stages of chronic hepatitis B virus disease. The findings of this study will provide evidence that will support ongoing universal coverage reforms in Nigeria. It will also enable policymakers to support such patients with HBV and perform informed budgeting. Furthermore, the findings will enable funding agencies, program managers in government and non-governmental organisations to estimate how much it will require to help such patients (households) in Port Harcourt, Rivers State as they plan for intervention.

## METHODS

### Study design

This was a descriptive cross-sectional survey that retrospectively collected data on direct medical costs and interviewed patients on direct non-medical and indirect costs. It was a health facility-based study where patients were assessed to the household level.

### Study Setting

Data was collected from adult HBV-infected patients receiving care in two teaching hospitals Port Harcourt. This is because they are the only facilities that have the manpower with requisite skills to manage hepatitis B disease and receive referrals from all other health facilities in Port Harcourt. Sample was collected over four months. Patients were clustered according to clinic days they visited the hospital and through simple random sampling, the number of clinic days required to produce the estimated minimum sample size was selected. On the selected clinic day, all the patients that met the inclusion criteria were included in the study. The data were collected with a structured, close-ended, interviewer-administered questionnaire adapted from a previous study [13]. The cost was collected in naira and converted to dollars at the rate of \$1 = N380 [14].

### Study participants

A two-stage sampling method was used to recruit 107 hepatitis B patients at various stages of the disease. Stage 1 was a simple random sampling with which 16 clinic days were selected by balloting while stage 2 involved a systematic sampling to recruit the eligible patients for the study.

The inclusion criteria were patients on management for HBV that have been on treatment for at least six months and those that have completed treatment. Six

months allowed for enough time for the treatment pattern to be established and a patient can be completely treated and discharged within this time [12]. Coinfected patients were excluded from the study for ease of analysis and clarity in communicating the findings.

### Variables

The variables measured in this study include the sociodemographic characteristics, direct medical cost, direct non-medical cost and indirect cost.

### Bias

Recall bias was a concern in this study seeing that respondents needed to remember how much they spent on services accessed up to a three month prior to the time. This was mitigated by verifying the services respondents received within the period from their hospital folders and attaching their known prices from hospital price list to reduce the impact of recall bias.

### Study size

The sample size for this study was computed using the Cochran's formula for cross-sectional studies. Significance level of 95% (1.96), a proportion of catastrophic expenditure in a previous study for hepatitis B of 50% (0.5), degree of freedom of 10% (0.1) and non-response of 10% (0.1), the minimum sample size was estimated to be 107 HBV patients.

### Statistical analysis

Data was analysed using Statistical Package for Social Sciences version 25 and frequencies presented in form of tables and charts.

Direct medical cost included the cost of consultation, drugs (orthodox and alternative medicine), investigations and admission/hospital stay. This cost was collected per month and extrapolated to a year. The cost of all this, haven been collected as described above, was calculated as the direct medical cost for the different stages of hepatitis B and C disease using the formula below

Annual cost per patient = (Cost per visit X Visits per year) + (Cost per admission X Admissions per year)

Where;

Cost per visit includes the total amount spent on consultation, drugs, investigation on that particular visit.

Cost per admission includes the total amount spent on medical services during an admission episode.

The use of charge for estimation of cost was considered the most appropriate approach.(18)

The cost computation was done for an average of six visits per year for hepatitis B

All costs are derived in naira and converted to the dollar equivalent at the rate of \$1 = N380.

Direct non-medical cost which includes the cost of travel (transportation to and from the hospital), meals and accommodation where utilised was done using the same formula below.

Annual cost per patient = (Cost per visit X Visits per year) + (Cost per admission X Admissions per year)

Indirect cost was estimated using the human capital approach, the patient's income prior to the illness was used to estimate his/her income loss as a result of visiting the hospital. Each patient's income was reduced to the hour so it can be used for estimation. For those not working, productivity loss was estimated assuming the patient's income to be the minimum wage.

Time loss valuation (Human Capital Approach, not adjusting wages)

Indirect Cost = ( $t_{\text{visit}} \times W$ ) + ( $t_{\text{hospitalisation}} \times W$ ) + ( $t_{\text{travel}} \times W$ ) + ( $t_{\text{pick up drugs}} \times W$ )

Where;

$t_{\text{visit}}$  Time spent per visit including waiting time

$t_{\text{hospitalisation}}$  Hospitalisation (admission) duration

$t_{\text{travel}}$  Travel time

$t_{\text{pick up drugs}}$  Time employed to pick up drugs

W is patient-reported pre-illness wage (from the survey), or wage of the lowest paid unskilled government worker (minimum wage).

Estimation of guardian/companion cost

$$C^g = TFO + IC^g$$

Where;

$C^g$  = Guardian cost

TFO = Travel + Food + Other (including accommodation)

$IC^g$  = Guardian time loss value

## RESULTS

A total of 150 patients were approached for this study with 135 completed responses giving a 90% response rate.

The household heads were almost all males, 91% and only 9% were female. The average age of household heads was 48 years. Majority of the household heads, 89%, were married. Almost two – thirds of the household heads that participated in this study had tertiary education. They engaged in different occupation, ranging from civil service to artisanal jobs, some were professionals like engineers and teachers while others are retired. Their major sources of income were salary (45%) and business (49%). About 6% of the patients' household heads depended on welfare to pay for health care services as seen in table 1.

**Table 1; Socio-Demographic Characteristics of Household Heads**

Characteristics	Hepatitis B	
	Frequency (n=135)	Percentage (%)
Sex		
Male	123	91.1
Female	12	8.9
Age		
Young (<30)	14	10.4
Middle age (31 – 60)	106	78.4
Elderly (>60)	15	11.1
Marital Status		
Married	109	88.7
Currently Single	26	11.3
Education		
No Education	5	3.7
Primary	5	3.7
Secondary	28	20.7
Tertiary	97	71.9
Occupation		
Artisan	12	8.9
Business	58	43.0
Civil Servant	22	16.3
Farmer	6	4.4
Pensioner	6	4.4
Professional	27	20
Unemployed	4	3.0
Source of Income		
Salary	61	45.2
Business Proceeds	66	48.9
Welfare	8	5.9

Table 2 illustrates the direct medical cost of managing viral hepatitis B per patient per year (at an average of six visits per year) as derived from this study is N345,613 (registration N2,062; consultation N5,022; drugs N98,676; investigations N34,167, admission for

an average stay of two weeks N214,686). The patients who patronized Alternative medicine incurred an extra mean expenditure of N205,000 in direct medical expense per year.

**Table 2. Direct Medical Cost of Managing Hepatitis B**

Cost Variables	Hepatitis B	
	Mean	SD
Registration (Naira)	2,062	2,347
Consultation (Naira)	5,022	7,830
Drugs (Naira)	98,767	55,173
Investigations (Naira)	34,167	92,495
Admission (Naira)	107,343	110,643
Alt medicine (Naira)	205,000	48,744

SD – standard deviation

As seen in table 3, the direct Non-Medical Cost (Plus Patient companions cost) of managing Hepatitis B per patient per year (at an average of six visits per year) is

N50,446 per year (Transportation; N2,698; Food N13,908; Accommodation N33,840).

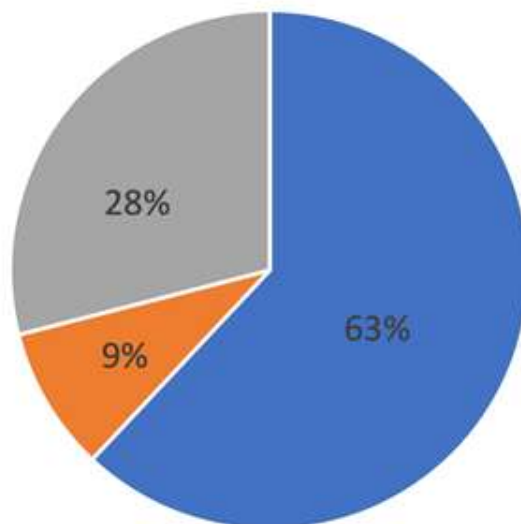
### Indirect cost of managing hepatitis B.

**Table 3. Direct Non-Medical Cost of Managing Hepatitis B**

Diagnosis		Transportation	Food	Accommodation
Hepatitis B	Mean	1366	4320	20500
	Std. Deviation	779	6930	25300
Patients Accompanier's Cost				
	Mean	1332	9588	13340
	Std. Deviation	1624	16335	5780

The Indirect cost for managing Hep B in this study is N114,000 and patient accompaniers cost is N45,900 making a total of N159,900 per year (at an average of six visits per year).

### Contributing Costs of Managing Hepatitis B



■ Direct Medical Cost ■ Direct Non-medical Cost ■ Indirect Cost

Figure 1 shows the various proportions of the components on the total cost. Direct medical cost is 345, 613 (63%), direct non-medical cost is 50,446 (9%) and indirect cost is 159,900 (28%) making a total cost of N564,959

### DISCUSSION

The findings of this study shows that the high cost of managing viral hepatitis B can have significant public health implications like reduced access to care, increased health disparities, deepen catastrophic health expenditure and worsen disease transmission.

The high cost of managing hepatitis B combined with the high out-of-pocket payment in this clime will inadvertently reduce presentation at health facilities.

Indigent patients will explore other cheaper means of care even if they are they unwholesome because that is what they can afford. This can lead to delays in diagnosis and treatment, which can increase the risk of serious liver damage, liver cancer, and death. Lack of access to care can also contribute to the spread of the virus, as people who are unaware of their infection are more likely to transmit the virus to others. The high cost can also contribute to health disparities with poor access amongst the poor affecting disease prevalence and rate of spread.



Presenting the costs in the dollar equivalent at an exchange rate of N380 to the dollar showed that the direct medical cost of managing hepatitis B for a patient per year is ₦354,613 (\$933). This includes the cost of one-off registration, the cumulative cost of annual consultation, which is usually paid for every clinic visit or review for admission, cost of drugs and cost of investigations. Additionally, some patients who patronised herbs and other forms of alternative medicine spend an average of ₦205,000 (\$540) per year as part of their direct medical cost. The direct non-medical cost of managing hepatitis B as derived from this study is ₦50,446 (\$133) per patient per year and this essentially covers costs for food, transportation and patient accompanier's cost. The indirect cost of managing hepatitis B in this study is ₦159,900 (\$421) per patient per year. This covers the cost associated with the loss of resources due to morbidity and mortality. The total cost of managing a chronic hepatitis B patient per year as derived from this study is ₦564,959 (\$1,487).

These amounts derived for the direct medical, direct non-medical and indirect costs are lower than the amounts reported in similar studies in Shangdong China in 2013 (5) and that reported in Greece in 2017 (6). Both studies were multi health facility-based and the respondents were studied at household levels, much like this study. However, this difference could be attributed to the different correlating economic indices like inflation and exchange rate of those countries at the time of the study. Also, the purchasing power parity (PPP) which is a macroeconomic metric used to compare economic productivity and standard of living between two countries, is significantly different between Nigeria, China and Greece.

Specifically, the amount reported in this study for the direct non-medical cost is equivalent to 9% of the total cost of managing hepatitis B per patient per year. This value is the same as the upper limit of 3 – 9% reported in Shangdong China in 2013 (5). The proportionate direct non-medical cost from both studies is similar despite the differences in time and economic indices because it is reported in proportions and not absolute numbers. This result also goes to show that the direct non-medical cost is not a major part of the patient's costs though it cannot be ignored as it contributes to the total patient costs and could determine if the patient will come to the facility to access care or not.

The indirect cost as seen from this study is three times the direct non-medical cost. This finding agrees with the statement by Henry Flood and Richard Phelps that the indirect medical cost though difficult to estimate should never be overlooked (15). The relatively high indirect cost could also point to the efficiency or lack of it, of the health system in these hospitals. If the outpatients are efficiently attended to on time, they will spend less time

in the hospital and this will, in turn, drive down their indirect cost which is a function of how much time they spend in the hospital.

The amounts estimated for the management of these conditions are quite meagre compared to the actual amount needed to cover the treatment of these conditions. This study focused mainly on the patient's perspective of the cost of illness. This is only the first step in trying to estimate the cost of illness. There is a need for further research on the provider aspects, which will throw light on the cost of providing the services for the patients. That aspect of the cost will reveal the direct Government subsidies that are often seen in financing healthcare in Nigeria. The cost from the patient perspective and that from the provider perspective put together with Government spending will give the societal perspective of the cost of illness.

This study also found that the total cost of managing a hepatitis B patient for a period of one year is ₦564,959 (\$1,487). Breaking these figures down to the months, it will be ₦47,070 (\$124) for hepatitis B. Meaning that a hepatitis B patient who earns a minimum wage of ₦30,000 (\$79) a month will need more than a 100% of their monthly earning to treat their condition for one month. This clearly shows that the cost is beyond such patient's reach if he has to pay out-of-pocket. This inability to cover the cost constitutes a major setback in accessing healthcare and further worsens the health indices from the region. For this patient to access healthcare as at when needed, there needs to be a form of affordable pre-payment plan or the cost is subsidised significantly.

The majority of the patients with chronic viral hepatitis have no pre-payment plans as such pay out-of-pocket from their monthly salaries or from their business proceeds. Some utilized previous savings to pay for health care while the remaining depend on friends, relatives, sell their assets or take a loan to pay for their treatment. These findings are similar to a study done in Bayelsa State, although that study was not facility-based and looked at costs of managing any health condition in general. This means that a good proportion of respondents have to wait for when salaries are paid before, they can access treatment for their condition. That's even for those whose salaries can cover the cost. This could lead to delayed access to needed healthcare services leading to poor compliance and sometimes worsening of health condition and consequently increasing the cost of care. A reasonable proportion of study participants also have to pull money from their business proceeds to pay for healthcare. This adversely affects the fortune of such businesses and unfavourably impact on their growth.

Almost all of the respondents reported that paying for their treatment, partially or absolutely affected their ability to make other household expenditure. This

further buttresses the fact that management of these conditions is expensive and constitutes a financial burden to the household<sup>92</sup>.

There is therefore a need to introduce health financing schemes to remove the burden of payment for treatment of hepatitis B at the point of service delivery, from the patients, in line with universal health coverage reforms.

## CONCLUSION

This study revealed that the treatment of hepatitis B is expensive considering the income profile of the patients. The average amount needed to treat this condition is more than the minimum wage of the average patient. There is therefore the need for innovative financing plans including waivers, and subsidies for persons living with Hepatitis B in resource-poor regions of the world.

One of the concepts of universal health coverage emphasizes the range of health services provided. There is a need to expand the coverage of donor funding for long-term communicable diseases like HIV and tuberculosis to include hepatitis B. The incidence of these conditions has been greatly reduced directly because of the activities of donor agencies.

Other methods of reducing the burden of payment for healthcare by hepatitis patients will be to increase the uptake of health insurance among these patients as well as establish pre-payment mechanisms that can reduce the need to pay out-of-pocket for their treatment. States and Local Governments can institute a conditional cash transfer scheme that refunds the patients every expense on transportation and food while receiving treatment. This can also cover for the patients' accompanier as well. This will go a long way to ease the burden arising from direct non-medical cost and encourage compliance with the treatment schedule.

Non-Governmental Organisations should consider funding the treatment of hepatitis B seeing that the exact costs of managing these conditions can be computed, budgeted for and funded. This recommendation is on the finding that funding attention had not been adequately channeled toward hepatitis B because the costs of managing these conditions had not been clearly estimated.

The cost estimates of this study were from the patient's perspective and it would be needful for future studies to determine the provider perspective of the cost of managing hepatitis B and explore possible wastes in the management of such patients. With these findings determined and the prevalence of hepatitis B also studied and reported, the exact amount required to

manage these conditions per year can be determined to aid planning and budgetary allocation for health.

## Limitations of the study

The limitations of this study include potential recall bias in retrieving retrospective data on income and expenditure estimates but this was mitigated by limiting such data to 1 month, verifying the services respondents received within the period from their medical records in the hospital and comparing cost of services/products with known prices from hospital price list to reduce the impact of recall bias. Another limitation was the sample size for the study. Hepatitis B is not as prevalent as other long-term conditions like HIV or Tuberculosis. However, the minimum sample size required for this study was met within a reasonable time for the study. Subsequent studies will benefit from the recruitment of patient over a longer period of time to recruit as many respondents as possible to the study.

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## Authors' contributions

AAA and DSO were involved in the conceptualization, planning and implementation of the study. Data collection team was headed by AAA. AD reviewed the questionnaire and aided data collection. All authors contributed to the interpretation of the results and read and approved the final manuscript.

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