

ECONOMICS OF HEPATITIS B IN AL-HUSSEIN HOSPITAL/ ROYAL MEDICAL SERVICES

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ABSTRACT

Hepatitis B virus is one of the most common viral infections in humans. It is the major cause for liver disease and liver cancer. Early detection and treatment of HBV patients reflected largely on liver –related health outcomes. This study is composed of two main parts. The first part is descriptive analytical qualitative study based on interview of 100 health workers in al Hussein hospital at Royal Medical Services. The second part of the study is calculating the cost of treatment (in term of medications only) for patients with CHB at the protocol pharmacy in al Hussein hospital, and comparing it with the cost of vaccination. By evaluating the knowledge and the experience of the health care providers, a big shortage was founded. Lack of awareness and continuous education programs was noticed. A concentrated effort is needed to vaccinate the health care provider and empowering them with knowledge and good education about HBV, because of the economic value of vaccination compared to the costing of CHB treatment.

INTRODUCTION

Hepatitis B virus (HBV) is considered as one of the smallest infectious viruses that affect humans^[1], it's a DNA virus^[2] and resulted in worldwide serious health problems^{[3][4]} that lead to substantial morbidity and mortality.^{[5][6]} It's called the silent killer.^[4]

HBV is one of the most common viral infection in humans.^{[2][7]} Globally it is considered as number two carcinogenic agent after tobacco.^[2] Its lead to 500000 to one million death each year world widely.^{[2][3][1]}

HBV has 100 times infectious power than HIV.^[2] It has the ability to remain at any surface that is contacted with for approximately one week.^[3] It is the major cause for liver disease and liver cancer^{[8][4]}, rating as the 10th cause of death in the world wide.^[9]

Hepatitis B is defined as a virus that lead to liver inflammation and transmitted from one individual to another by the blood.^{[10][3]} HBV infection is divided into acute and chronic diseases. Acute hepatitis B is characterized by inflammation in the liver and last from 1-6 months and may lead to liver failure^[2], recovery maybe within three months.^[1]

Early detection and treatment of HBV patients reflected largely on liver –related health outcomes.^[11] Acute hepatitis B usually require symptomatic relief, no specific treatment is required^{[3][1][2]}

Chronic hepatitis B (CHB) is a lifelong liver inflammation that leads to morbidity and mortality cases from liver cancer, where the risk of progression depends mainly on immunity.^[2] Also it's resulted in a major economic burden on the society.^[9] Patients with CHB virus are more susceptible for liver cirrhosis and hepato cellular carcinoma.^[11]

Different consequences for HBV infection is present^{[3][1]}, this depend largely on patient's immune system, recognized stage of disease and the age of the patient.^[3]

Few treatments are available for CHB like: lamivudine, adefovir, pegylated interferon alpha, entecavir, by which the replication power of the virus is inhibited.^{[2][1]} Hepatitis B treatment usually inhibit the virus not eradicate it.^[12]

A multinational study revealed that CHB have a significant reduction in health related quality of life.^[6] But majority of patients with CHB are a symptomatic, so they usually not aware of their infections. Because of that CHB patients are called the healthy carrier^{[2][3]}, and this makes the calculation of prevalence is difficult.^[2]

The most common route of virus transfer is the vertical transmission or so called perinatal transmission from the mother to her infant at birth.^{[2][3][1][7][13]} It is not transferred by contaminated food or water or any other vectors.^[7] The most affected age in Europe for acute and chronic infections was between 25-34 years.^[13] Also horizontal transmission between family members,

tattooing using non sterile instruments plays an important mean of transfer.^[14]

According to the prevalence of chronic HBV infection, the world can be divided into three areas

1. High prevalence where the percentage is higher than 8% like: south east asia, pacific basin (excluding japan, Australia, new Zealand), sub-saharan Africa, parts of the middle east, some countries in eastern Europe
2. Intermediate prevalence where the percentage between 2-8%
3. Low prevalence where the percentage is lower than 2% like: north America, western and northern Europe, Australia and part of south America.^[3]

In Jordan it was founded that in the mid of eighties of the last century, the prevalence of hepatitis B was 9 %.^[14] According to^[8], the incidence of hepatitis B among Jordanian in 2003 was 0.8 per 100.000 populations per year.

In 2015 the prevalence was 2% among blood donor, 15% of the cases had no identified reason for infection.^[14]

Until now no recent studies on the prevalence of hepatitis B in Jordan is available. But according to ministry of health, vaccination plays an important role in declining the number of reported cases.^[14]

VACCINATION

The first recommendation for hepatitis B vaccine in U.S was in 1982 for high risk groups.^{[15][2]} Vaccination against hepatitis B saves money and lives, it's the only vaccine against major human cancer^[3], and it could prevent a major fraction of new infections.^{[2][3]}

Three effective strategies for preventing HBV infection are approved: behavior modification, passive immune prophylaxis, acute immunization.^[7]

Vaccination against hepatitis B composed of three injections over approximately a period of seven months^{[10][1]}, but it's important to say that no long term guarantee for HBV vaccine.^[5] HB vaccine is considered safe and more than 90% effective in preventing HBV infections.^[3]

Cost of vaccination differ from country to country and until now no supplier for hepatitis B is preferred^[10], but according to WHO infant routine vaccination should be one of the basic parts of national immunization schedule in the world.^{[2][1]}

WHO argued two strategies that should be implemented, the first one is the routine infant immunization and the second one is the additional immunization which is based on the epidemiology of HBV.^[3]

In order to improve the effectiveness of hepatitis program, all of the following is needed: political support, financial resources securing, national response and collaboration between health and non-health program. Also human rights and ethical principles like equity, fairness should addressed.^[1]

Vaccination is vital for high risk groups like health care worker, injecting drug user, renal dialysis patients, infants from mother with CHB^{[2][1]} also patients with acquired or congenital immunodeficiency disorder like HIV infections.^{[3][1]} And for traveler to endemic countries.^[14]

Vaccination campaign in Europe decreased the trend rate of the registered acute infection.^[13] A study in North America revealed that adolescent vaccination is attractive economically.^[16] Vaccination among Gambia infant against hepatitis B was founded to be highly cost effective and affordable.^[5] This is complied with a study in USA, where HB vaccination was for adults with diabetes between the age of 20-59 years old.^[15]

The national perinatal hepatitis B prevention program (PHBPP) in U.S resulted in the reduction of the perinatal and childhood infection numbers, and it constitutes a cost- effectiveness use of the resources.^[17] A study in Vietnam revealed that HBV vaccination among newborns decreased carrier rate by 58%.^[18]

Although in china a study founded that vaccination among children and adolescent (age between 15-19 years) is cost saving, china registered that greatest burden of CHB infection and liver cancer in the world. 7.5% of china population has CHB (95 million of the Chinese population).^[19]

Finally its important to say that Routine infant vaccination could save more than 80% HBV related death.^[20] High percentage of mothers in Jordan had good knowledge and orientation toward vaccination. More than 97% of the mothers had their baby vaccination cards. Excellent educational practice and motivation from the health care provider reflected on mother compliance with the vaccination program, reflected in high vaccination coverage.^[21]

In contrast to that lower vaccination coverage was founded in Jordan among Syrian refugee child (12-23 months), more effort is needed to improve the accessibility of the vaccination program.^[22]

COSTING ISSUES

The major barrier in HBV treatment is the costing issues, that's range from facilities required to medication needed.^[7] Actually no accurate estimates of the cost of hepatitis B are available.^[2]

The total cost of hepatitis B varies among countries and range from 40 M EUR for Italy, 520 M for south Korea,

589 M for Germany, 5.1 Billion for U.S Of America.^[2]
In Canada, cost of CHB patient range from (7000 to 9000 dollar) yearly.^[12]

In Iran, the total cost for patient with chronic hepatitis B disease per year was 3094.5 dollar during 2012.^[9]

In addition to vaccine cost, other cost should be considered like cold chain investment, AD syringes, training courses for health workers and patients, and evaluation and assessment of the consequences of immunization.^[3]

MATERIAL AND METHOD

This study is composed of two main parts. The first part is descriptive analytical qualitative study based on interview of 100 health workers in al Hussein hospital at Royal Medical Services. Participants were selected randomly from nurses, doctors and pharmacists.

Participant were asked two questions, the first one if they had ever received HBV vaccine in their lives, the second question was if they had ever attend a training or a workshop about any related topic to HBV during the last three years.

The second part of the study is calculating the cost of treatment (in term of medications only) for patients with CHB at the protocol pharmacy in al Hussein hospital. The data for the two parts was collected by a pharmacist employed in the same hospital.

RESULTS

For the first part: Majority of the health care providers didn't receive any vaccination against HBV during their lives, with a percentage of 60. Only 40% had received a vaccine in their lives. From this analysis with a special emphasis on pharmacists' vaccination, only 19% of the pharmacists had received vaccination, with 81% of them didn't receive any vaccination against HBV.

By evaluating the knowledge and the experience of the health care providers, a big shortage was founded. Lack of awareness and continuous education programs was noticed, as shown in the table 1 below:

Table 1: Assessment of health worker vaccination and training.

Participants	Received HBV vaccination	Didn't receive HBV vaccination	Attended a training or a workshop related to HBV during the last three years
All healthcare workers	40%	60%	18%
pharmacists	19%	81%	9%

For the second part: the data was collected until 22/3/2018, the number of patients was as the following: Zeffix (lamivudine) 260, ribaverin 1, pegasis 180(interferon) 1, hepsera (adefovir) 67, Baraclude (entecavir) 73 patients as shown in table 2 below:

Table 2: Total cost of antiviral medication in the protocol pharmacy/ RMS.

Medication name	Estimated international price	Number of CHB patients treated with	Monthly total cost of the medication per patient	Monthly total cost of medication for protocol pharmacy patients
Zeffix 100mg	\$ 104 per 28 tablets	260	3.71 X 30 = \$111.5	\$ 28990
Ribaverin 200mg	\$134 per 40 tablets	1	134 X 3 = \$402	\$ 402
Pegasys 180	\$770 per injection	1	770 X 4 = \$3080	\$ 3080
Hepsera 10mg	\$ 346 per 30 tablets	67	\$ 346	\$ 23182
Entecavir 1mg	\$ 578 per 30 tablets	73	\$ 578	\$ 17340
Total		402		72994

By comparing antiviral medication prices with the centers for disease control (CDC) vaccine price in table 3 below, it is obviously noticed that vaccination is the most cost effect weapon against HBV.

Table 3: CDC HB vaccine price list (www.CDC.gov).

Vaccine	Manufacturer	Brand name	Packaging	CDC cost per dose	Private sector cost per dose
Hep B Pediatric/adolescent	Glaxosmith kline	Engerix B	10 pack- one dose syring	12.30	22.40
Hep B Pediatric/adolescenc	Merck	Recombivax HB	10 pack- one dose syring	12.30	23.95

DISCUSSION

Although of chronic hepatitis B economic and health burden, it is not viewed as public health priority, suffer from lack of awareness and financial support.^[2] Especially in low income countries.^[4] CHB do not have the same level of research funding when compared with other diseases.^[2]

Our study confirmed the finding of other studies performed in Jordan that the majority of Jordanian health workers need adequate training to subjects related to hepatitis infections, and they showed the interest for that.^[8] World widely there is limited training and experience of the majority of healthcare worker in evaluating patients with CHB.^[1]

In Jordan all health facilities implemented the standard policies for infection control with single use instrumentation.^[14] And this is noticed in our hospital in RMS, but a concentrated effort is needed to vaccinate the health care provider and empowering them with knowledge and good education about HBV.

Robust supply chain management is required to ensure the availability of medical consumables and medicines in the health care system with the lowest cost.^[1] And this is applied in the RMS where every patient fined his monthly dose of antiviral medication, which is always available and accounted for.

Recommendations

First of all increasing the priority of CHB should be done. Continuous research is needed to obtain precise evaluation for the incidence and prevalence of CHB in Jordan. More supervision is needed for health worker practices especially in hemodialysis unit.^[14]

More studies for the assessment of the wants of patients with HBV and their families. Increasing the awareness about HBV using condensed workshops, brochures, posters.^[14]

Increasing awareness is the responsibility of policy maker, the government, and the media, and all health workers. Extensive and vigorous educational program, for high risk patients and health workers, to decrease the chance of transitions.

On the other hand, Extensive screening program for blood products to prevent the transfer of HBV. In health care setting, WHO recommended the followings: hand hygiene, health care provider s training, donated blood testing, safe disposal of sharps and wastes, recommendation of oral formulations as first line treatment instead of injections.^[1]

Also Improving the coverage of vaccination program is required, it's the most effective and efficient mean of prevention. Establishing a collaborative program for hepatitis B is required. In addition to that, following up

the vaccination program for the health worker and high risk people or groups.^[14]

Limitations

Larger and random sample is needed; data is collected from one hospital. More intensive evaluation of the knowledge is required using quantitative analysis. Also prices that's used in the calculations is the prices of CDC, not RMS tender prices.

External analyst is recommended to confirm the results.

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