



UNIVERSITI PUTRA MALAYSIA

***COST ESTIMATION AND WILLINGNESS TO PAY FOR HEPATITIS B
VACCINATION IN SELANGOR, MALAYSIA***

YOGAMBIGAI RAJAMOORTHY

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By

YOGAMBIGAI RAJAMOORTHY

**Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia, in
Fulfilment of the Requirement for Degree of Doctor of Philosophy**

July 2017

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DEDICATION

This research is dedicated to my late mother, Kamalam Singaram, father, Rajamoorthy Muniandy, my late father in law Munusamy Rengasamy and mother in law, Kaliammah Setharangam, respectable husband, Subramaniam Munusamy, son, Lushaen Subramaniam and little daughter, Shatvika Subramaniam.



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in Fulfilment of the requirement for Degree of Doctor of Philosophy.

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YOGAMBIGAI RAJAMOORTHY

July 2017

Chairman: Prof. Khalid B Abdul Rahim, PhD
Faculty: Economics and Management

The World Health Organization estimated that 240 million humans worldwide were chronically infected by Hepatitis B virus. In Malaysia, one million nationals are estimated to be infected and the projected incidence rate shows an increasing pattern. Moreover, Malaysian household risk behaviour is unknown. HB vaccination for infant was compulsory since 1989; however, those born before 1989 need to spend their own money to be vaccinated in private clinic/hospitals. However, Malaysian health system is moving towards enhancing efficiency, effectiveness, and collaboration with private sectors and non-governmental organisations as well as promoting health tourism. Therefore, standard market price will be required for the HB vaccination, based on the national affordability. This study aims to determine the association between perceptions to Hepatitis B vaccination on respondent's willingness to pay (WTP), to identify the risk behaviors and the determinants of socio-demographic factors on Hepatitis B behavior and to determine the determinants of willingness to pay for Hepatitis b vaccination.

Stratified two stage cluster sampling of 768 respondents with face to face interview were conducted in housing areas in Selangor. Respondents aged above 20 were included in this study. The responses rate of 94% achieved. Partial Least Square-Structural Equation Model (PLS-SEM) was used to test the association between WTP and perception variable using the Health Belief Model (HBM). Multivariate analysis was then conducted to test the relationship between socioeconomic variables with risk behaviour of HB infection. Finally, the Contingent Valuation Method (CVM) were used to estimate Selangor's residents' economic value for the self-paid HB vaccination which determined the WTP mean among the respondents by considering respondents' perceptions of HB and HB vaccination.

The PLS-SEM results showed a positive relationship between perceived susceptibility, perceived barriers, and cues to action with WTP. Perceived barriers had significant influence on perceived benefit of HB vaccination. Multivariate analysis showed that

males are more exposed to the risk behaviour of sharing of needles, razor blades, toothbrushes, getting tattoos, having unhealthy sex behaviours, and abusing alcohol.

The result from CVM showed that respondents were WTP RM337.826 for three doses. Bid value, education, income, race, and perceived susceptibility were the determinants of willingness to pay for Hepatitis B vaccination. The estimated aggregate welfare gains amounts to RM367, 179,025.49. This amount indicates that government is able to allocate this sum amount of money for other expenses, if the majority of the nation is WTP for self-paid HB vaccination.

The findings contribute to implementation of policy with little or no cost to private and public healthcare providers. We suggest that enforcement of policies to the nation by Health Ministry such as increase awareness through social communication including Facebook, webpages, Instagram, television and radio announcements, poster design in various languages, flexi vaccination services, as well as monitoring and regulating the vaccination price in private clinics. The nation should be encouraging to undergo HB screening programme and taking HB vaccine if required at subsidised or discounted priced which may be contributed also by the private health care providers (private sectors).

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan ijazah Doktor Falsafah.

ANGGARAN KOS DAN KESANGGUPAN UNTUK MEMBAYAR BAGI VAKSIN HEPATITIS B DI SELANGOR, MALAYSIA

Oleh

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Pertubuhan Kesihatan Sedunia menganggarkan bahawa 240 juta manusia di seluruh dunia telah kronik dijangkiti oleh virus Hepatitis B. Di Malaysia, sejuta rakyatnya dianggarkan telah dijangkiti dan unjuran kadar insiden menunjukkan corak yang semakin meningkat. Selanjutnya, gelagat risiko isirumah di Malaysia tidak diketahui. Vaksin HB untuk bayi adalah wajib semenjak 1989; namun demikian, mereka yang dilahirkan sebelum 1989 perlu mengeluarkan wang sendiri untuk mendapatkan vaksin di hospital-hospital atau klinik-klinik kerajaan. Namun demikian, system kesihatan rakyat Malaysia sedang menuju ke arah peningkatan kecekapan, keberkesanan, dan kerjasama dengan sector-sektor swasta dan organisasi bukan kerajaan serta mempromosikan pelancongan kesihatan. Oleh itu, harga pasaran seragam adalah diperlukan untuk vaksinasi HB berdasarkan kemampuan rakyat. Kajian ini bertujuan untuk menentukan hubungan diantara persepsi vaksinasi Hepatitis B dan keupayaan membayar responden, mengenalpasti gelagat-gelagat risiko dan penentu faktor sosio demografi ke atas gelagat Hepatitis B dan mengenalpasti penentu kepada keupayaan membayar untuk vaksinasi Hepatitis B.

Stratified two stage cluster sampling daripada 768 responden melalui temubual telah dijalankan di sekitar kawasan perumahan di Selangor. Responden yang berumur 20 tahun ke atas dimasukkan ke dalam kajian ini. Kadar respon yang diperolehi ialah 94%. Partial Least Square-Structural Equation Model (PLS-SEM) digunakan untuk menguji hubungan diantara WTP dan pembolehubah persepsi dengan menggunakan HBM. Analisis multivariasi dijalankan kemudian untuk menguji hubungan diantara pembolehubah sosio ekonomi dengan gelagat risiko oleh jangkitan HB. Akir sekali, CVM digunakan untuk menganggarkan nilai ekonomi penduduk Selangor untuk membayar sendiri vaksinasi HB yang menentukan min WTP dikalangan responden dengan mengambilkira persepsi responden terhadap HB dan Vaksinasi HB.

Hasil PLS-SEM menunjukkan hubungan positif diantara kecenderungan yang dirasakan, halangan yang dirasakan dan isyarat untuk bertindak dengan WTP. Halangan yang dirasakan mempunyai pengaruh yang signifikan ke atas faedah yang dirasakan terhadap

vaksinasi HB. Analisis multivarians menunjukkan bahawa lelaki lebih terdedah kepada gelagat risiko untuk berkongsi jarum, pisau cukur dan berus gigi, mendapatkan tatu, mempunyai gelagat seks yang tidak sihat dan menyalahgunakan alcohol. Hasil daripada CVM menunjukkan bahawa responden sanggup membayar RM 337.826 untuk tiga dos. Nilai tawaran, pendidikan, pendapatan, bangsa dan kecenderungan yang dirasakan adalah penentu kepada kesanggupan membayar vaksinasi Hepatitis B. Anggaran keuntungan kebajikan agregat adalah to RM367, 179,025.49. Jumlah ini menunjukkan kerajaan mampu memperuntukkan sejumlah wang ini untuk lain-lain perbelanjaan sekiranya majority rakyat sanggup membayar sendiri vaksinasi HB.

Penemuan ini menyumbang kepada pelaksanaan dasar dengan sedikit atau tidak kos kepada penyedia penjagaan kesihatan swasta dan awam. Kami mencadangkan penguatkuasaan dasar kepada negara oleh Kementerian Kesihatan seperti meningkatkan kesedaran melalui komunikasi sosial termasuk Facebook, laman web, Instagram, pengumuman televisyen dan radio, reka bentuk poster dalam pelbagai bahasa, perkhidmatan vaksinasi flexi, serta memantau dan mengawal selia harga suntikan Di klinik swasta. Negara harus digalakkan menjalani program pemeriksaan HB dan mengambil vaksin HB jika diperlukan pada harga bersubsidi atau diskaun yang mungkin disumbangkan oleh penyedia penjagaan kesihatan swasta (sektor swasta).

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I certify that a Thesis Examination Committee has met on 25th July 2017 to conduct the final examination of Yogambigai a/p Rajamoorthy on her thesis entitled " Cost estimation and willingness to pay for Hepatitis B vaccination in Selangor, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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LIST OF ABBREVIATIONS

AVE	Average Variance Extracted
CVM	Contingent Valuation Method
CM	Choice Modelling
CS	Consumer Surplus
CV	Compensating Variations
CBM-SEM	Covariance Based SEM
CDF	Cumulative Distribution Function
CR	Composite Reliability
CUES	Cues to action
EPI	Expanded Programme on Immunisation
EV	Equivalent Variations
GDP	Gross Domestic Product
HBM	Health Belief Model
HBV	Hepatitis B virus
HPM	Hedonic Price Methods
HIV	Human Immunodeficiency Virus
HPV	Human Papiloma Virus
HTMT	Heterotrait-Monotrait
PLS-SEM	Partial Least Square- structural Equation Model
PB	Perceived Barriers
PBE	Perceived Benefit
PS	Perceived Susceptibility
PSE	Perceived Severity
RP	Revealed Preference
SP	Stated preference
TEV	Total Economic Values
TCM	Travel Cost Method
VIF	Variance Inflator Factor
WHO	World Health Organization
WTP	Willingness to pay

CHAPTER 1

INTRODUCTION

1.1.1 Background of Study

1.1.1 General Information on Hepatitis B

Hepatitis results in the inflammation of the liver caused by a viral infection. There are five main types of Hepatitis, referred to alphabetically as A, B, C, D, and E. Hepatitis types A and E are caused by populated water and food. Hepatitis types B, C, and D are caused by contact with infected body fluids. Hepatitis B and C are the most dangerous, and common causes of liver cirrhosis and cancer.

Infection of Hepatitis B occurs when the Hepatitis B virus (HBV) enters the bloodstream and reaches the liver. Once in the liver, the HBV reproduces and releases a large number of new viruses into the bloodstream. Before reaching this stage, the human body naturally has two types of defences against HBV. Firstly, the white cells, which protect the body from infectious attacks, destroy the infected liver cells. Secondly, the human body also produces antibodies which are present in the blood to destroy the virus. During the infection and recovery processes, the liver, which is fully infected by HBV, may not be able to function normally, causing illness and affecting the entire body (CDC, 2000).

According to the U.S Department of Health and Human Services, Hepatitis B infection is divided into two categories: short term and long term (CDC, 2000). In the short term category, acute illness can lead to loss of appetite, tiredness, pain in the muscles, diarrhoea, vomiting, and jaundice. In this category, adults display symptoms but children who are infected do not show any. The long term category is chronic infection. At this stage, most patients do not show any symptoms and have a prolonged infection, which can lead to liver damage (cirrhosis), liver cancer, and ultimately death.

According to the World Health Organisation (2009), there are two routes to Hepatitis infection. One is vertical transmission, such as childbirth or from family members to children in early childhood. The second route is horizontal transmission, such as sexual contact, occupational exposure, tattooing, and infected needles. Hepatitis B is transmitted via vertical transmission in higher endemic areas and causes chronic infection. In low endemic areas, sexual contact and contaminated needles are the main causes of infection.

Most people do not experience any symptoms if they are infected, but may develop chronic liver infection that can lead to cirrhosis of liver and/or cancer. However, some people do experience symptoms, like yellowing of skin and eyes (jaundice), dark urine, vomiting, and abdominal pain. WHO reports indicated that among healthy adults who are infected with HBV, 90% of them are most likely to recover within six months.

People who are infected with Hepatitis B can be treated with drugs such as *interferon* and antiviral agents. This type of treatment can slow the viral progress to cirrhosis stage and improve long term survival. Patients with cirrhosis sometimes are given liver transplants, usually as a last option. Prevention is better than cure. This disease can be controlled and avoided by the Hepatitis B vaccination. WHO recommends that all infants should receive Hepatitis B vaccine within 24 hours of birth. Usually, three to four scheduled doses of the Hepatitis B vaccination are recommended. In a three-dose schedule, the first dose *Monovalent* is given, followed by the same *Monovalent* or a combined vaccination at the second and third schedules. In a four-dose schedule, the first dose *monovalent* is usually followed by either the *monovalent* or the combined vaccines thereafter. The protection lasts at least twenty years, although some protection is lifelong.

1.1.2 Hepatitis B Situation Worldwide.

World Health Organisation has estimated that 240 million humans were chronically infected by HBV, especially in low and middle income countries, and that globally 240 million are chronically infected, while 650,000 individuals die each year due to liver cirrhosis or hepatocellular carcinoma (World Health Organisation, 2015). However, three quarters of the world's Chinese population are infected with chronic Hepatitis B, followed by Sub-Saharan Africa and Western Pacific (Poynard, 2004).

Half of the universal population lives in a high endemicity area for Hepatitis B, with more than a five percent prevalence rate in sub-Saharan Africa, East Asia, the Balkan regions, the Pacific Islands, and the Amazon Basin of South America; meanwhile, Central Latin America, North America, and Western Europe have an infection rate of below two percent (World Health Organisation, 2015). Nevertheless, chronic Hepatitis B ranks as the tenth main cause of death worldwide (Hatzakis et al., 2011; Walter et al., 2011).

1.1.3 Hepatitis B Situation in Malaysia

HBV infection is an upcoming public health problem in developing countries like Malaysia (Qua and Goh, 2011) and is very common in Asian countries (Maynard, 1990; Romano et al., 2011; Sung et al., 1990). In Malaysia, an estimated one million nationals are chronically infected with the Hepatitis B virus (Khairullah and Merican, 2004). Hepatitis B virus infection is one of the main causes of liver cirrhosis in Malaysia (Qua and Goh, 2011). The ratio of infection between the males and females is 2:1 or 3:1 (Khairullah and Merican, 2004; Yap, 1994). In the studies conducted on ASEAN, the majority of the carriers of HBsAg in Malaysia are the Chinese, compared to Malays and Indians (Qua and Goh, 2011; Sung et al., 1990). Approximately 1.4 million Hepatitis patients in Malaysia are Chinese whose infection is through vertical transmission (Daily Express, 2013), and one in every 20 suffers from chronic liver disease caused by Hepatitis (Fernandez, 2012).

The Malaysian Health Ministry's records show that 5% of Malaysians are infected with Hepatitis B and more than 80% of the patients are between the ages of 25 and 55 years (Lim, 2012). Since the three-dose schedule Hepatitis B vaccine programme was

introduced in Malaysia in 1989, the rate of infection was successfully reduced to 0.3%, exceeding the World Health Organisation’s target of 1% (Lim, 2012). However, the infectious and parasitic diseases which include Hepatitis B remain the third leading cause of death in Malaysia in recent years (Health Fact 2012).

1.1.3.1 Increasing Hepatitis B Cases in Malaysia

In Malaysia, there are six types of vaccines to cure preventable diseases such as Hepatitis B, measles, diphtheria, tetanus (others), tetanus neonatorum, and whooping cough. Out of these six diseases, Hepatitis B is categorised as a “silent killer” and the most serious health problem worldwide (Jaganathan and Vyas, 2006). This is mainly due to its nature of delayed symptoms that requires 30 to 60 days for infection detection. In addition, Hepatitis B patients are exposed to severe liver cancer risk at a later stage of the disease.

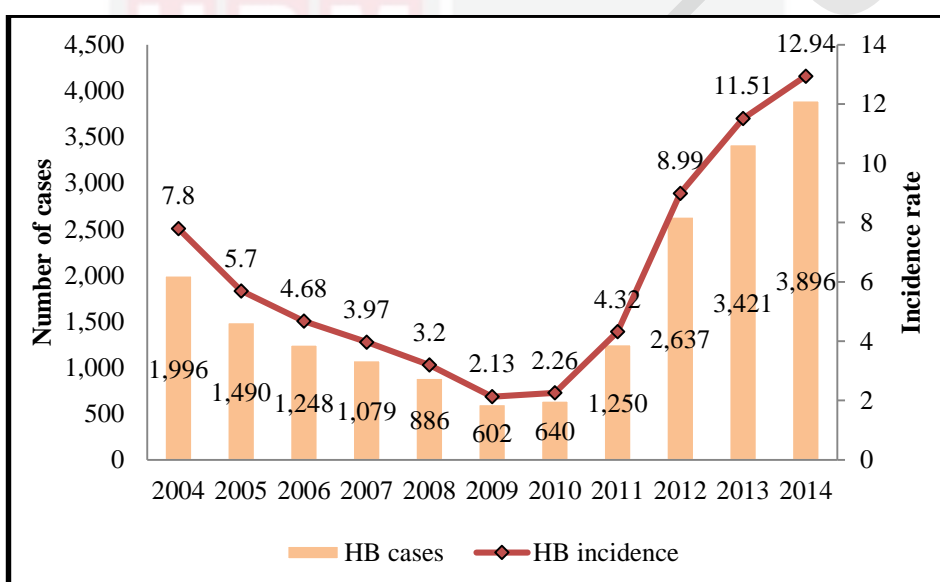


Figure 1.1: Number of Cases and Incidence Rate of Hepatitis B Reported in Malaysia, 2004-2014.

(Source: Health Indicator (2003-2015), Malaysian Ministry of Health)

Note: Incidence rate per 100,000 populations

Figure 1.1 shows the number of cases and incidence rate reported in 2004 and 2014. In the year of 2004 and 2009, HB incidence rate declines to 72.69%. However, after 2010, the incidence rate increased from 2.26 in 2010 to 12.94 in 2014, which shows 472.57% increased. The projected incidence rate and number of HB cases for Malaysia for years 2003 and 2030 also show an increase pattern (Rajamoorthy et al., 2016).

1.1.3.2 The Mortality Rate of HB Higher Compare to Other Vaccine Preventable Diseases.

Nationwide, although hepatitis B is included in Malaysian National Immunisation Programme (NIP), hepatitis B were ranked as the highest in the mortality rate compared to other vaccine-preventable diseases such as measles and diphtheria (Figure 1.2). Furthermore, hepatitis B showed a rise in mortality rate in the year of 2010, 2012, and 2014 despite slightly drop in 2009, 2011, and 2013. A sharp increase of 125% was seen between 2013 and 2014. This trend does not correlate with the effort of hepatitis B vaccination therefore awareness of the nation towards hepatitis B should be revised.

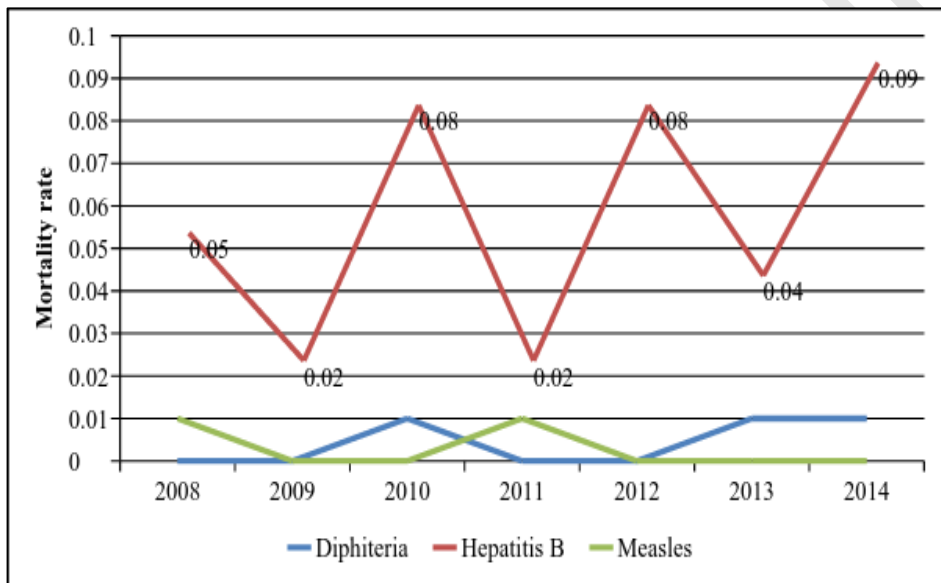


Figure 1.2: Top Three Mortality Rate of Vaccine Preventable Disease Reported in Malaysia 2008-2014

(Source: Health Fact, Health Informatics Centre, Ministry of Health Malaysia.)

1.1.3.3 Estimated Prevalence of Hepatitis B Surface Antigen (HBsAg) Markers Higher in Malaysia

Geographical distribution of the Hepatitis B infection was categorised as low prevalence (less than 2 percent) for children aged 5 to 9 years in 2005. However, the prevalence rate for adults aged 19 to 49 years was categorised as high prevalence, with more than 8 percent (Ott et al., 2012). Some studies categorised Malaysia as a low endemicity of Hepatitis B (André, 2000); conversely, other studies indicated that the prevalence of HBsAg in Malaysia is considered high (Merican et al., 2000). Using the prevalence rate of HBsAg makers in the general population by researchers Merican et al. (2000), the number of HBsAg makers are estimated in Table 1.1, following.

Table 1.1: Estimated Prevalence of HBsAg Markers in Asian, 2014

Countries	¹ Prevalence of HBsAg markers in general population (%)	¹ Chronic HB patients (%)	² Total population 2014 (million)	Number of HBsAg makers in 2014 population (million)
China	4.6	78	1364	63
Indonesia	2.5-5.0	26	254	13
Japan	0.8	36	127	1
Korea	7.3	45	75	6
Philippines	5-16	64.5	99	16
Thailand	>8	50	68	5
Singapore	6	70	5	0.3
Malaysia	3-5	75.3	30	1

(Source: ¹Adapted from Merican et al. (2000)²; World Development Indicator, 2014)

Although China has a higher population when compared to Malaysia, Malaysia has a higher rate of prevalence (3 to 5%) when compared to China (4.6%) (Merican et al., 2000). Referring to Table 1.1, 1 million Malaysian and 63 million Chinese are estimated to be infected with hepatitis B in 2014.

1.1.3.4 Malaysians' Perception on HB Vaccination

Examining the Malaysians' perceptions of vaccination is very important to determine their behaviour towards immunisation, especially for Hepatitis B vaccination. The medical occupation field in Malaysia requires all medical personnel to have compulsory HB vaccinations due to their exposure to the HB virus and occupational risk. Most of the healthcare workers are aware of the risk of Hepatitis B (Hesham et al., 2005; Lim and Rashwan, 2003), except initially the requirement of HB vaccination was not well received by the Malaysian dental practitioners, due to their fear of plasma-derived HB vaccines (Yaacob and Samaranayake, 1989). It is obvious, therefore that the level of knowledge regarding hepatitis B vaccination may not influence their personal perception on the importance of taking the vaccine.

1.1.3.5 Low HB vaccine coverage of Infants in Malaysia under the Expanded Programme on Immunisation (EPI)

Although the HB vaccination was available worldwide since 1982, the Malaysia government did not vaccinate infants with a free HB vaccination under EPI until the year 1989 (Khairullah and Merican, 2004; Ng et al., 2005). The success of this programme were observed by the reduction of HBsAg carriers, with an 84% efficacy level (Chen, 2009). However, vaccination during infancy provided a low immunity to HB infection (Ng et al., 2013). Figure 1.3 shows the actual immunisation coverage for the Hepatitis B vaccination for 1st and 3rd doses as well as WHO estimated coverage of infants in Malaysia between 2004 and 2014.

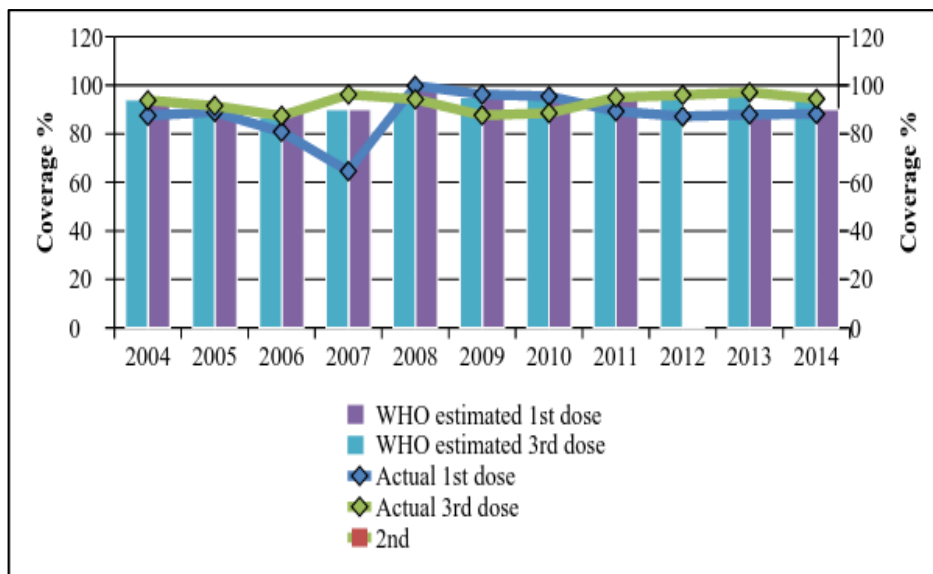


Figure 1.3: Hepatitis B 1st and 3rd Dose Actual Immunisation Coverage and WHO Estimated Coverage of Infants in Malaysia, 2004-2014

(Source: Health Indicator (2004- 2014), Malaysian Ministry of Health; WHO database)

Overall, Hepatitis B first and third doses reached the estimated batch marks of WHO, except in 2007. However, the estimated and the actual coverage of Hepatitis B vaccination for infants are still below 100%. In Sabah, the prevalence of defaulters of HB immunisation among children aged 12 to 24 months highlighted that there were higher numbers of defaulters for the third dose (37.7%) followed by 5.7% for the second dose and no defaulters for the first dose. (Azhar et al., 2013). This shows the tendency to abstain from vaccination is influenced by the multiple dosage regime and booster of the vaccine. Other factors related to avoidance of immunisation among children include mother's employment status, family size and maternal age (Azhar et al., 2013).

One study indicated that the persistence of higher protection prevails for at least 20 years in the primary three doses recombined vaccination when compared to the lesser doses (Hudu et al., 2013). This clearly shows that Malaysian population who had less HB doses and the unvaccinated population are at high risk of HB infection.

However, some studies have concluded that immunisation at childhood gives poor protection against Hepatitis B virus (Hammit et al., 2007; West and Calandra, 1996). Even though people who were born after year 1989 were immunised under the EPI, the level of protective antibodies is less than 50% (Ng et al., 2013). A study conducted on total of 2923 new students enrolled from 2005 to 2010 in Faculty of Medicine and Faculty of Dentistry, University of Malaya shows that HBsAg prevalence was 1.08%, which is 15 out of 1390 students born before 1989, and only 0.20%, which 3 out of 1533 students born after 1989 (Ng et al., 2013). The researchers also conclude that 66.14% of the students who were vaccinated during infancy had no demonstrable immunity at the time of screening in year 2010 and 33.86% of the students still had chances to be infected (Ng et al., 2013). The researchers also propose that a voluntary vaccination program

should be initiated in Malaysia to prevent Hepatitis B (Ng et al., 2013).

1.1.3.6 Government Expenditure on HB Vaccination and Treatment Increased

Based on Malaysia's Health Plan 10 (2011- 2015), Malaysians' spending on healthcare is still relatively low, despite the higher income level of society. This clearly shows that in spite of the ability to pay, Malaysians generally still depend on government healthcare provision. With a rising population and the government continuing to provide free or highly subsidised healthcare, the budget will eventually be negatively affected, potentially bringing about a budget deficit. The World Health Organisation recommended that all countries should spend 5% of GDP (or GNP) on health (Savedoff, 2005). However, in Malaysia, the government has spent less than 4% of GDP on health expenditure over the past seventeen years (1995 to 2012), which is still considered a low percentage given the World Health Organisation's target of 5%. Figure 1.4 shows that expenditure for all vaccines increased by 40.66% in 2014 compared to 2011 whereas the cost of HB vaccination alone increased 11.52% from 2011 to 2014.

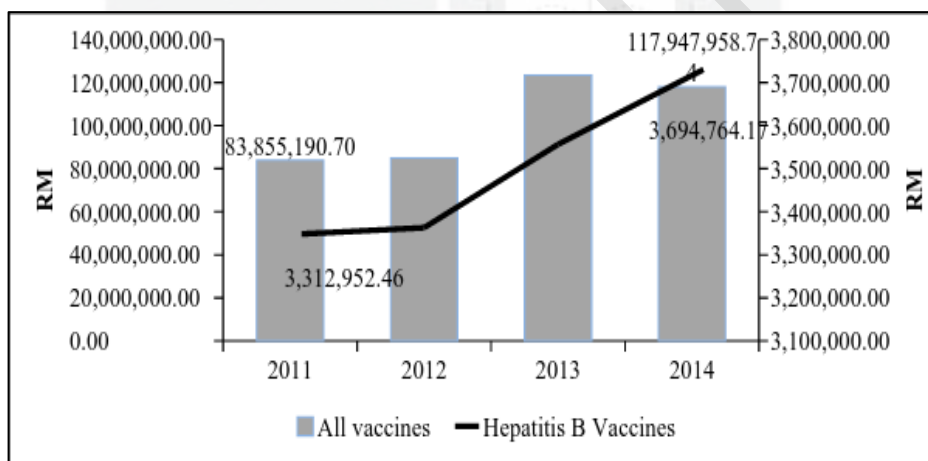


Figure 1.4: Sales of Hepatitis B Vaccines and All Vaccines, 2011– 2014

(Source: Medicines Price Unit, Pharmaceutical Services Division, MOH Malaysia 2015)

The chronic HB infected patients were treated with interferon alpha 2A, interferon alpha 2B, and lamivudine (Lavanchy, 2014).

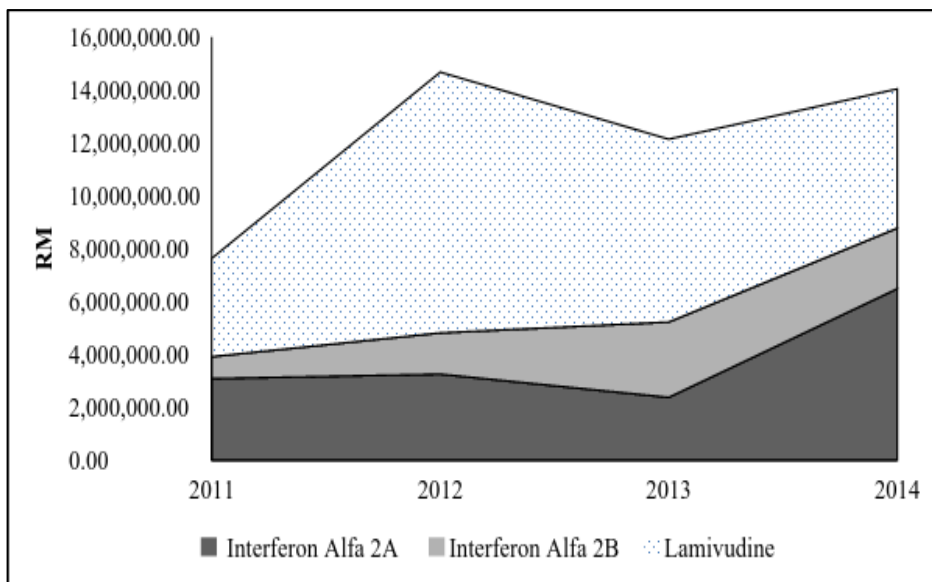


Figure 1.5: Sales of Interferon Alfa 2A, Interferon Alfa 2B and Lamivudine 2011 – 2014

(Source: Medicines Price Unit, Pharmaceutical Services Division, MOH Malaysia 2015)

Figure 1.5 revealed that the expenditure of this treatment trends up and down for the past four years. However, compared to 2011 and 2014, all the expenditures for treatment increased; 110.1% for interferon alpha 2A, 266.19% for interferon alpha 2B, and for lamivudine 41.54%. Hepatitis B infection has increased in Malaysia, which suggests it will be an upcoming health problem and thus increase the expenses for the treatment, hospitalisation and preventative measures. Since vaccination is the most effective in prevention, emphasis on hepatitis B vaccination should be continued. This must be supported by surveillance data in vaccinated children as well as giving booster to those who do not developed protective immunity level despite taken 3 doses of the vaccine (Chen, 2009). All the actions are important to ensure the success of hepatitis B vaccination programme but these would impact on the economy by the additional cost given to work force in public health, laboratory expenses for detection of immunity level as well as additional booster dose.

1.2 Problem Statement

Hepatitis B infection will be a public health problem and major impact to the health system in Malaysia since number of cases, incidence rate reported increasing and mortality rate of HB among the highest compare to other vaccine preventable disease. The HBsAg marker in Malaysia is higher even when compared to other countries with higher populations (Merican et al., 2000).

In fact, HB infection rate is reduced with an infant immunisation programme; however, an inability to control the HB carrier in adult will cause the HB infection cases to rise (Williams, 2006). For that reason, the public should be made aware of proper medical

examinations to ensure better HB protection. In addition, if they have a family history of Hepatitis B, or any immediate family member or life partner diagnosed with the disease, risk prevention and vaccination are the best form of protection against the infection and the virus. Therefore, it is important for the Malaysian government to identify the risk behaviours to prevent the spread of the diseases. Since most of the studies have only given priority to analysing this issue on occupational risk perspective, the main intention of this study is to address the public's perceptions of the Hepatitis B vaccination.

Malaysia's economically productive population aged between 15 and 64 is 68.45% of a total population of 29.9 million in 2013 (Statistic Department of Malaysia, 2013). Among individuals born before 1989 (and, therefore, not covered under the compulsory HB vaccination programme) were aged between 26 and above. These groups of Malaysians should immunise themselves against the HBV so that they may prevent infection and promote a healthy and, therefore, productive workforce. The community should also be aware of the immunity level towards hepatitis B despite 3 doses of vaccine by doing serology investigation which will determine the necessity of additional booster of the vaccine.

Hepatitis infections contribute to the majority of cirrhosis and primary liver cancer cases worldwide (Perz et al., 2006). Because liver disease develops over years, it can contribute to direct and indirect medical costs, lost work, and lost productivity in the long term (Lavanchy, 2004). However, a study conducted in South Korea in 1997 estimates US\$959.7 million total cost, including vaccine, indirect, and direct costs of HBV related diseases (Yang et al., 2001). This estimation is equal to 3.2% of the health expenditure of South Korea (Yang et al., 2001). Therefore, it is paramount that the Malaysian government determines the national willingness to pay for HB vaccines, in order to reduce the government's expenditure on HB vaccination. This has not been studied empirically from the Malaysian healthcare perspective.

Currently, HB vaccinations are available at a cost of RM50 to RM100 per dose in private clinics and hospitals for adults. Conversely, in public hospitals, the cost of one dose HB vaccination for infants is RM2.43 and adults RM4.87. Moreover, since 1989, the Malaysian government has vaccinated infants with free HB vaccination. A majority of adults born before 1989 are not immune to Hepatitis B (Ng et al., 2015). Therefore, to ensure herd immunity in this country, issuing HB vaccinations to adults should be implemented. However, currently adult vaccinations are only given to high-risk groups of people and healthcare workers in the public clinics and hospitals, which leaves an unprotected adult population. The underlying problem in Malaysia is that there is no policy to control the pharmaceutical price of private healthcare providers which leads to different selling prices, set individually by each healthcare professional (Hassali et al., 2015; Hassali et al., 2012). Meanwhile, the Eleventh Malaysia Plan (2016-2020) highlighted that the Malaysian health system is moving towards enhancing efficiency, effectiveness, and collaboration with private sectors and non-governmental organisations. The evolution of this two-tier healthcare system will increase the spending expenditure of the population with diverse control over healthcare prices, including vaccination. Furthermore, the corporatisation of the university hospitals and the government specialist hospital will limit the price variations. Therefore, standard market price will be required for the HB vaccination, based on the national affordability, which

is the main aim of this study.

1.3 Research Questions

Questions to answer in this study include:

1. What is the Malaysian perception of severity, perception of sustainability, perception of benefit, and perception of barriers to the Hepatitis B vaccination and how does respondents' perception affect their willingness to pay?
2. What are the respondents' risk behaviours and the relationship between socio demographics factors on HB risk behaviour?
3. What are the determinants of the Hepatitis B vaccination?

1.4 Objectives

The general objective of this study is to determine the perception regarding Hepatitis B infection, the risk behaviors lead to the infection and the cost estimation of the preventive vaccine. The specific objectives follow:

1. To determine the association between perception of severity, perception of sustainability, perception of benefit and perception of barriers to Hepatitis B vaccination on respondents' willingness to pay.
2. Identify the risk behaviors and the determinants of socio-demographic factors on Hepatitis B behavior.
3. To determine the determinants of willingness to pay for Hepatitis b vaccination.

1.5 Significance of the Study

First, the risk behaviour among the general population is important for foreseeing its future and current impact on the health system. Nevertheless, in Malaysian perspective studies, none of the studies focusing on risk behaviour of Hepatitis B consider it an important issue to predict future trends in order to reduce the Hepatitis B infection in Malaysia. However, this issue has already been studied from a Romanian perspective.

Second, from a health perspective, consumer perception is very important to determine behaviour upon vaccination. This is the first study that will be conducted in Malaysia to assess the respondent's perception towards the Hepatitis B vaccination using Health Belief Model.

Third, currently Hepatitis B vaccination is available at no charge to Malaysian infants. Considering the nation's willingness to pay for HB vaccination, the government could allocate available healthcare resources (vaccine) at cost-control efficiency.

Fourth, since the introduction of EPI program in 1989, adults who were born before 1989 experience low Hepatitis B immunisation rates and are considered a high risk group as

they were not protected by this mandate. At the moment, there are no policies or compulsory vaccinations enforced on this highly productive group who can still contribute immensely to economic development. So, this study intends to examine their willingness for pay for HB vaccination and to recommend the best policy development to reduce HB infection rate in Malaysia.

Last, at this moment, very few studies were conducted to determine the willingness to pay for vaccinations in Malaysia. Thus, this research can be used as a reference by researchers or policy makers in the future when examining the willingness to pay for vaccinations against other diseases.



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