



UNIVERSITI PUTRA MALAYSIA

***FACTORS ASSOCIATED WITH ADHERENCE TOWARDS
DIFFERENT VACCINES OF CHILDHOOD IMMUNIZATION
OF UNDER FIVE CHILDREN AMONG MOTHERS ATTENDING
KLINIK KESIHATAN SEREMBAN***

ZAMZAIREEN BINTI ZAINAL ABIDIN

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By

ZAMZAIREEN BINTI ZAINAL ABIDIN

**Dissertation Submitted to the Department of Community Health,
Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, in
Fulfilment of the Requirements for the Degree of Master of Public Health**

August 2017

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Abstract of dissertation presented to the Department of Community Health,
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August 2017

Chairman: Associate Professor Dr. Muhamad Hanafiah bin Juni, MD, MPH
Faculty: Medicine and Health Sciences

Introduction: Immunization schedule varies among each country based on situations and diseases. Adherence namely completeness and timeliness towards the schedule is the basis of children protection as seroconversion is age-dependent. Hence, even if immunization coverage is persistently high, as of late, vaccine preventable diseases are on the rise.

Objective: To determine the factors associated with adherence (completeness and timeliness) towards different vaccines of childhood immunization of under five children among mothers attending Klinik Kesihatan Seremban.

Methodology: A cross-sectional study was conducted among mothers with under five children attending Klinik Kesihatan Seremban. 320 respondents were selected based on systematic random sampling method. Dependent variable was adherence (completeness and timeliness) and independent variables include socio-demographic characteristics, child factors, healthcare services and logistics. Data was collected using self-administered questionnaires and proforma. All the data that had been collected was analyzed using SPSS version 22 involving descriptive and inferential statistics.

Result: A total of 314 respondents consented, giving a 98.1% response rate. The study revealed that 98.09 % of respondents adhering towards completeness of immunization schedule while a range of 56.5 % to 97.1 % of respondents adhered in term of vaccine timeliness. There was significant association between types of transportation and adherence (completeness) towards immunization schedule ($p=0.041$). Employment status was also significantly associated with

adherence (timeliness) towards BCG vaccine ($p=0.008$), Hepatitis B Dose 1 vaccine ($p=0.018$) and Hepatitis B Dose 2 vaccine ($p=0.040$). There was also a significant association between education level and adherence (timeliness) towards DTaP/IPV/HiB Dose 4 ($p=0.019$). Maternal age group and usage of government clinic was also significantly associated with adherence (timeliness), $p=0.030$ and $p=0.017$ towards MMR dose 1 vaccine. Household income was the predictor for adherence (completeness) towards immunization schedule. The predictors for adherence (timeliness) towards BCG, Hepatitis B Dose 1, Hepatitis B Dose 2 and MMR Dose 1 were employment status, birth order, maternal age and household income respectively.

Conclusion: The findings of this study denote the high level of adherence (completeness) towards childhood immunization schedule but of varying level of adherence (timeliness) towards different vaccine scheduled. Household income was the predictor for both adherence (completeness) and adherence (timeliness) of MMR dose one but of different category. Other predictors include employment status, birth order and maternal age for BCG, Hepatitis dose one and dose two respectively.

Keywords: Adherence, childhood immunization, under five children, timeliness

Abstrak disertasi yang dikemukakan kepada Jabatan Kesihatan Komuniti, Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Sarjana Perubatan Kesihatan Awam

**FAKTOR-FAKTOR YANG BERKAITAN DENGAN KEPATUHAN TERHADAP
VAKSIN IMUNISASI KANAK-KANAK YANG BERBEZA-BEZA DI BAWAH
LIMA TAHUN DI KALANGAN IBU-IBU YANG HADIR KE KLINIK
KESIHATAN SEREMBAN**

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Pengenalan: Jadual imunisasi berbeza-beza di antara setiap negara berdasarkan keadaan dan penyakit di negara tersebut. Pematuhan iaitu pengambilan vaksin yang lengkap dan ketepatan masa terhadap jadual imunisasi kanak-kanak adalah asas dalam melindungi kanak-kanak kerana *seroconversion* bergantung kepada umur. Oleh itu, walaupun liputan imunisasi adalah berterusan pada tahap yang tinggi, sejak kebelakangan ini, penyakit yang boleh dicegah melalui vaksin semakin meningkat.

Objektif: Untuk menentukan faktor-faktor yang berkaitan dengan kepatuhan (lengkap dan ketepatan masa) terhadap vaksin imunisasi kanak-kanak yang berbeza-beza di bawah umur lima tahun di kalangan ibu-ibu yang hadir ke Klinik Kesihatan Seremban.

Metodologi: Kajian hirisan lintang telah dijalankan di kalangan ibu-ibu dengan kanak-kanak bawah lima tahun yang menghadiri Klinik Kesihatan Seremban. 320 responden dipilih berdasarkan persampelan rawak sistematik. Pembolehubah bersandar adalah pematuhan (lengkap dan ketepatan masa) dan pembolehubah bebas termasuk ciri-ciri socio-demografi, faktor anak, servis kesihatan dan logistik. Data dikumpul dengan menggunakan borang soal selidik dan proforma. Data yang telah diperolehi dianalisa dengan menggunakan SPSS versi 22 yang melibatkan statistik deskriptif dan inferensi.

Keputusan: Sejumlah 314 responden bersetuju, dengan itu memberikan kadar tindak balas sebanyak 98.1%. Kajian ini menunjukkan 98.09% responden

mematuhi secara lengkap jadual imunisasi manakala 56.5% hingga 97.1% responden mematuhi secara ketepatan masa vaksin. Terdapat hubungan yang signifikan di antara jenis pengangkutan dan pematuhan (secara lengkap) terhadap jadual imunisasi ($p=0.041$). Status pekerjaan juga dikaitkan dengan kepatuhan (ketepatan masa) terhadap vaksin BCG ($p=0.008$), vaksin Hepatitis B Dos 1 ($p=0.018$) dan vaksin Hepatitis B Dos 2 ($p=0.040$). Terdapat juga hubungan yang signifikan antara tahap pendidikan dan kepatuhan (ketepatan masa) terhadap DTaP/IPV/Hib Dos 4 ($p=0.019$). Usia ibu dan penggunaan klinik kerajaan juga berkaitan secara signifikan dengan kepatuhan (ketepatan masa), $p=0.030$ dan $p=0.017$ MMR dose 1. Pendapatan isi rumah adalah peramal untuk kepatuhan (secara lengkap) terhadap jadual imunisasi. Peramal bagi pematuhan (ketepatan masa) terhadap BCG, Hepatitis B Dos 1, Hepatitis B Dos 2 dan MMR Dos 1 masing-masing adalah status pekerjaan, susunan kelahiran, umur ibu dan pendapatan isi rumah.

Kesimpulan: Kajian ini menunjukkan tahap pematuhan (secara lengkap) yang tinggi terhadap jadual imunisasi kanak-kanak tetapi tahap kepatuhan (ketepatan masa) terhadap vaksin yang telah dijadualkan adalah berbeza-beza. Pendapatan isi rumah adalah peramal kedua-dua kepatuhan (secara lengkap) dan pematuhan (ketepatan masa) MMR dos satu tetapi untuk kategori yang berlainan. Peramal lain termasuk status pekerjaan, susunan kelahiran dan umur ibu untuk BCG, Hepatitis B dos satu dan dos dua.

Kata Kunci: Kepatuhan, imunisasi kanak-kanak, kanak-kanak di bawah lima tahun, ketepatan masa

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I certify that a Dissertation Examination Committee has met on 2nd August 2017 to conduct the final examination of Zamzaireen binti Zainal Abidin on her dissertation entitled "Factors Associated with Adherence Towards Different Vaccine of Childhood Immunization of Under Five Children Among Mothers Attending Klinik Kesihatan Seremban" 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 Master of Public Health.

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This is to confirm that:

- the research conducted and the writing of this dissertation was under our supervision;
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LIST OF ABBREVIATIONS

CDC	Centers for Diseases Control and Prevention
WHO	World Health Organization
EPI	Expanded Programme on Immunization
BCG	Bacille Calmette-Guerin vaccine
Hep B	Hepatitis B
DTP1	Diphtheria/Tetanus/Pertussis vaccine dose 1
DTP3	Diphtheria/Tetanus/Pertussis vaccine dose 3
IPV	Inactivated Polio Vaccine
HIB	Haemophilus Influenza B vaccine
DTP-HiB	Diphtheria/Tetanus/Pertussis and Haemophilus Influenza B vaccine
MCV1	Measles vaccine dose 1
MCV2	Measles vaccine dose 2
MMR	Measles, Mumps, Rubella vaccine

CHAPTER 1

INTRODUCTION

1.1 Background

Administration of a vaccine to stimulate an individual's immune system in order to develop specific immunity to a disease-causing organism is termed as immunization. This process enhances an individual's immune system becoming fortified against an agent of disease (Centers for Disease Control and Prevention, 2017). The definition of immunization is "the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine" (World Health Organization, 2017b). Immunization can be active or passive.

Childhood immunization has been one of the most substantial public health interventions in the past century (Ehreth, 2003). Globally, sickness, disability and death due to vaccine-preventable diseases are prevented through immunization (World Health Organization, 2016b).

The World Health Organization (WHO) Expanded Programme on Immunization (EPI) that was launched in 1974 recommended that all countries with high incidence of poliomyelitis, diphtheria, pertussis, tetanus, measles and tuberculosis infection should initiate their respective immunization programme. By 1997, Hepatitis B vaccine subsequently was incorporated in the programme (Ministry of Health Malaysia, 2004). Based on WHO EPI, it is advised that the determination of childhood immunization schedule is of a country's own decision as there is no ideal immunization schedule. However, infants must achieve protection before they are at high risk of getting the disease.

Immunization as an international programme was introduced 50 years ago (World Health Organization, 2013), and in Malaysia, the National Immunization Programme began 10 years later. Under 5 mortality rate has markedly reduced from 93/1000 live births in 1960 to 7/1000 live births in 2015 (The World Bank, 2015) as shown in Figure 1.1. Nationally, children are provided with free of charge immunization and it is included as part of the maternal and child health services in the country. Government facilities offer this service both in urban and rural areas (Shah et al., 2012).

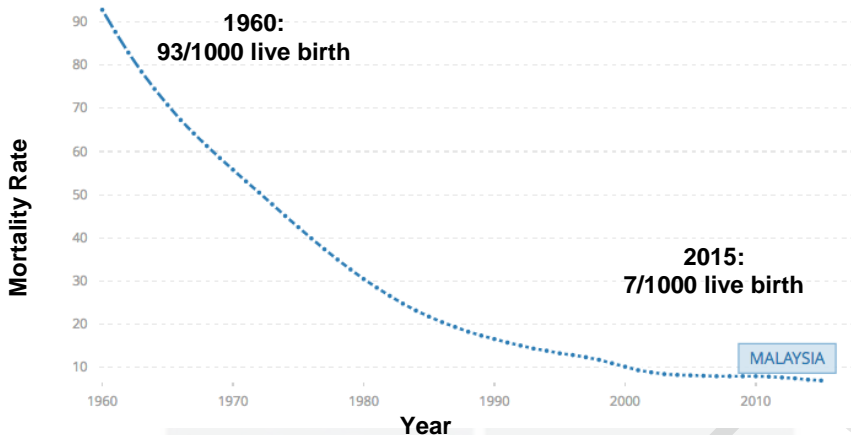


Figure 1.1: Under 5 Mortality Rate for Malaysia (1960 – 2015)
(Source: The World Bank, 2015)

As of mid 2015, the total world population was about 7.3 billion people and the total number of under five children in the same year was 670,928 (United Nations, 2015). Globally, for the same year, the immunization coverage was of varying level namely, BCG 88%, Hep B 84%, DTP1 91%, DTP3 86%, HIB 64%, Polio 86%, MCV1 85% and MCV2 61% (World Health Organization, 2017c).

Meanwhile, in Malaysia, the total population up to mid of the same year was about 31 million people and the total number of under five children in that year was 2,477 (United Nations, 2015). The immunization coverage was as follows: BCG 98.53%, 3rd dose Hep B 99.27%, 3rd dose DPT-Hib 99.04%, 3rd dose Polio 99.04% and MMR 93.07% (Ministry of Health Malaysia, 2016). Apart from MMR immunization, the accomplishment of the EPI in Malaysia is reflected on high childhood immunization coverage, 95% and more (Ministry of Health Malaysia, 2016b).

However, evaluating the performance of immunization programme solely on the basis of immunization coverage attainment is a misrepresentation (Olusanya, 2010). There are still outbreaks of vaccine preventable diseases occurring despite of high coverage (Blumberg, Enanoria, Lloyd-smith, Lietman, & Porco, 2014). Children are more at risk in getting ill in relation to infectious diseases and vaccination delay may cause them to be vulnerable due to their young age with risk of getting vaccine preventable diseases (Omer, Salmon, Orenstein, deHart, & Halsey, 2009).

Seroconversion is age-dependent therefore, it is important that infants acquire protection as young as possible (Ministry of Health Malaysia, 2004). Non-adherence towards recommended immunization schedule will intensify children's period of susceptibility (Yu Hu, Yaping Chen, Jing Guo, Xuewen Tang, & Lingzhi Shen, 2014). Adherence towards the schedule is essential in preventing escalation of children's risk of never fully completing the schedule. A domino effect is also generated in the event of a delay in one vaccine for catch-up amendments in routine visits (Guerra, 2007).

Based on 45 low and middle-income countries, the median delays of adhering to scheduled immunizations were; 2.3 weeks for BCG, 2.4 weeks for DTP dose 1, 6.2 weeks for DTP dose 3 and 2.7 weeks for MCV dose 1. Furthermore, there were delays up to 19 weeks for the twelve studied countries; 10 weeks delay for BCG, 8 weeks for DTP dose 1, 19 weeks for DTP dose 3 and 11 weeks for MCV dose 1 (Clark & Sanderson, 2009). Likewise, in a more recent article, timely immunization was; 65 % for BCG, 67 % for DTP 1st dose, 41 % for DTP 3rd dose, and 51 % for MCV. Delays were also reported to be between 2-4 weeks despite 31 low and middle-income countries having high immunization coverage namely; 98% for BCG and 91 % for MCV (Akmatov & Mikolajczyk, 2012). Moreover, in a local study, the authors discovered that even though the coverage of the recommended immunization based on childhood immunization was more than 95 %, but overall only 63.5 % (n=304) was appropriate with age (Awadh, Hassali, Al-Iela, & Bux, 2015).

The many factors that are associated with adherence towards childhood immunization schedule can be categorized into socio-demographic characteristics, child factors, healthcare services and logistics. Socio-demographic characteristics include maternal age, religion, education level, employment status, marital status, number of children and household income. Child factors include child's birth order and child's caregiver. Healthcare service factor, include the use of government or private healthcare services. Lastly, logistics factor includes distance to health facility and types of transportation.

1.2 Problem Statement

Vaccine preventable disease would result in increased morbidity and mortality when in actual fact, it can be prevented (Chris-Otubor, Dangiwa, Ior, & Anukam, 2015). Immunization is well known as one of the most successful public health intervention in terms of reducing diseases, disability and deaths (Andre et al., 2008). Immunization schedules are devised to attain; a balance of durability of protection, effectiveness of protection at susceptible ages and vaccine safety, therefore adherence to the schedule is crucial (Clark & Sanderson, 2009). Ensuring completeness with the consideration of timeliness is of essential importance for the successfulness of immunization programme in the prevention of vaccine preventable diseases by maximally protecting the children (Dummer, Cui, Strang, & Parker, 2012). However, immunization timeliness is rarely reported in national statistics (Suarez, Simpson, & Smith, 1997). Hence, significant delays may be concealed and immunization timeliness ignored.

However, multiple studies have discussed that untimely immunization predispose threats among susceptible children (Akmatov & Mikolajczyk, 2012; Babirye et al., 2012; Bielicki, Achermann, & Berger, 2012; Lernout et al., 2014; Wagner et al., 2014)

Vaccine preventable diseases persistently continue to be one of the main health issues among children in the developing countries despite high immunization coverage; more than 95% (Ministry of Health Malaysia, 2012, 2013, 2014). As being depicted nationally, vaccine preventable diseases are still a major problem in Malaysia. Nationally in 2015, the incidence rate of vaccine preventable disease per 100,000 population were 12.65 for Hepatitis B, 4.32 for Measles, 3.08 for Pertussis and 0.01 for Diphtheria (Ministry of Health Malaysia, 2016b). There was a sporadic case of Diphtheria in Langkawi, Kedah which had been observed in November 2015 with a death of an eight-year-old that was noted to have incomplete immunization (Director General of Health, Malaysia, statement release in January 5th 2016). There were also 28 diphtheria cases and 5 deaths and again, the factor of 'completeness' of immunization is strongly advised for the prevention of vaccine preventable diseases (Director General Health, Malaysia in August 26th 2016).

1.3 Significance of Study

Adherence to recommended immunization schedule is essential because of the rise of vaccine preventable disease despite high immunization coverage (Papachrisanthou, Lorenz, & Loman, 2016). Immunization if not timely, it is not adhered, leading to unprotected children even though there is high immunization coverage, and subsequently the rise of vaccine preventable diseases (Fadnes et al., 2011).

It is of benefit that this study is conducted to identify the adherence towards scheduled immunization and determining its associating factors among mothers of under five children. Minimal local researches have been conducted on this topic therefore, by obtaining this information; further understanding shall assist in addressing the associating factors so that susceptible children are fully receiving the benefits of the National Immunization Programme. The incorporation of both completeness and timeliness into routine immunization coverage statistics may help to enhance the national immunization coverage and perhaps reduce vaccine preventable diseases, benefit the public, improve healthcare services and as a baseline of framework of intervention for policy makers.

1.4 Research Questions

- 1.4.1 What is the adherence (completeness) towards childhood immunization schedule of under five children among mothers attending Klinik Kesihatan Seremban?
- 1.4.2 What is the adherence (timeliness) towards childhood immunization schedule of under five children among mothers attending Klinik Kesihatan Seremban?
- 1.4.3 What are the socio-demographic characteristics (maternal age, religion, education level, employment status, marital status, number of children and household income) influencing the adherence (completeness and timeliness) towards childhood immunization schedule among mothers?
- 1.4.4 What are the associating factors (child factors, healthcare services and logistics) influencing the adherence (completeness and timeliness) towards childhood immunization schedule among mothers?
- 1.4.5 What are the predictors of adherence (completeness and timeliness) towards childhood immunization schedule among mothers?

1.5 Objectives of the Study

The study objectives can be subdivided into general and specific objectives.

1.5.1 General Objective

- 1.5.1.1 To determine the associated factors of adherence (completeness and timeliness) towards different vaccines of childhood immunization of under five children among mothers attending Klinik Kesihatan Seremban.

1.5.2 Specific Objectives

- 1.5.2.1 To determine the adherence (completeness) towards childhood immunization schedule of under five children among mothers attending Klinik Kesihatan Seremban.
- 1.5.2.2 To determine the adherence (timeliness) towards childhood immunization schedule of under five children among mothers attending Klinik Kesihatan Seremban.
- 1.5.2.3 To determine the socio-demographic characteristics (maternal age, religion, education level, employment status, marital status, number of children and household income) influencing adherence (completeness and timeliness) towards childhood immunization schedule among mothers.
- 1.5.2.4 To determine the factors influencing (child factors, healthcare services and logistics) adherence (completeness and timeliness) towards childhood immunization schedule among mothers.
- 1.5.2.5 To identify the predictor of adherence (completeness and timeliness) towards childhood immunization schedule among mothers.

1.6 Research Hypothesis

- 1.6.1 There is no association between socio-demographic characteristics (maternal age, religion, education level, employment status, marital status, number of children and household income) and adherence (completeness and timeliness) towards childhood immunization schedule.
- 1.6.2 There is no association between factors (child factors, healthcare services and logistics) influencing with adherence (completeness and timeliness).
- 1.6.3 There is no predictor on adherence (completeness and timeliness) towards childhood immunization schedule among mothers attending Klinik Kesihatan Seremban.

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