

**THE ROLE OF HEALTH SELF-EFFICACY,  
HEALTH ASSERTIVENESS, AND RISK  
PERCEPTION ON THE RELATIONSHIP  
BETWEEN VACCINATION KNOWLEDGE AND  
VACCINATION INTENTION**

**MOHD NAZIR BIN MOHD NAZORI**

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VACCINATION INTENTION**

by

**MOHD NAZIR BIN MOHD NAZORI**

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## LIST OF SYMBOLS

$\alpha$	Cronbach's alpha
$\beta$	Regression weight
Std $\beta$	Standardized regression weight
$\pm$	Plus and minus
$>$	More than
$<$	Less than
$r$	Correlation coefficient
$r^2$	Coefficient of determination
$\chi^2/df$	Chi-squared over degree of freedom (CMIN/DF)
$df$	Degree of freedom
$M$	Mean
$SD$	Standard deviation
$t$	Student's t-value
$F$	ANOVA $F$ -value
$p$	Significance value

## LIST OF ABBREVIATIONS

AMOS	Analysis of Moments Structure
ANOVA	Analysis of Variance
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CVI	Content Validity Index
EFA	Exploratory Factor Analysis
EPPM	Extended Parallel Process Model
HA	Health Assertiveness
HBM	Health Belief Model
HCP	Healthcare Provider/Professionals
HE	Health Self-Efficacy
HEAS	Health Efficacy and Assertiveness Scale
HPV	Human Papillomavirus
I-CVI	Item-Related Content Validity Index
KD	Rural Health Clinic
KK	Primary Health Clinic
KMO	Kaiser-Meyer-Olkin Measure of Sampling Adequacy
KS	Kolmogorov-Smirnov Test
MMR	Mumps, Measle, and Rubella
PhD	Philosophical Doctor
PL	Perceived Likelihood
PoM	Peace of Mind
PS	Perceived Severity
RMSEA	Root Mean Square Error of Approximation
SAGE	Special Advisory Group of Experts
S-CVI	Scale-Related Content Validity Index
SPSS	Statistical Package for Social Sciences
SW	Shapiro-Wilks Test
TLI	Tucker-Lewis Index
TPB	Theory of Planned Behaviour

UK	United Kingdom
US/USA	United States of America
VHDM	Vaccine Hesitancy Determinant Matrix
VI	Vaccination Intention
VK	Vaccination Knowledge
VPD/VPDs	Vaccine-Preventable Disease
WHO	World Health Organization

**PERANAN EFIKASI KESIHATAN, PENEGASAN KESIHATAN DAN  
PERSEPSI RISIKO TERHADAP HUBUNGAN ANTARA PENGETAHUAN  
VAKSINASI DAN NIAT UNTUK MENERIMA VAKSIN**

**ABSTRAK**

Kadar vaksinasi kanak-kanak kebangsaan telah mencapai tahap imuniti kelompok. Namun, kadar kes penyakit cegahan vaksin dan keraguan vaksin menunjukkan pola yang membimbangkan dan memerlukan intervensi promosi kesihatan yang lebih jitu. Efikasi kesihatan, penegasan kesihatan (penegasan dimaklum dan penegasan pendapat), dan persepsi risiko (persepsi kebolehjangkitan dan persepsi keparahan) dicadang sebagai asas untuk penjajaran pengetahuan vaksinasi dan niat untuk menerima vaksin. Kajian Fasa 1 bertujuan untuk (i) membangunkan satu alat ukur terhadap persepsi risiko penyakit cegahan vaksin dalam perspektif kanak-kanak, dan (ii) mengesah dan menguji ketekalan alat ukur bagi pengetahuan vaksinasi, efikasi kesihatan, penegasan kesihatan, persepsi risiko, dan niat untuk menerima vaksin dalam kalangan ibu mengandung. Kajian Fasa 2 pula bertujuan mengenalpasti perkara berikut: (i) Tahap pengetahuan vaksinasi, efikasi kesihatan, penegasan kesihatan, persepsi risiko dan niat untuk menerima vaksin dalam kalangan ibu mengandung; (ii) Perbezaan tahap pengetahuan vaksinasi dan niat untuk menerima vaksin mengikut tahap pendidikan dan pendapatan; (iii) Hubungan antara efikasi kesihatan, penegasan kesihatan, dan persepsi risiko; dan (iv) Kesan mediasi efikasi kesihatan, penegasan kesihatan, and persepsi risiko terhadap pengetahuan vaksinasi dan niat untuk menerima vaksin. Setiap konstruk diukur menggunakan soal selidik secara keratan rentas. Fasa 1 telah mengesah dan menguji tekal alat ukur ke atas 108 ibu mengandung, manakala Fasa 2 telah mencapai objektif kajian

menggunakan 924 ibu mengandung yang hadir ke klinik kesihatan dan klinik desa di daerah Gombak, Klang, Hulu Langat, dan Petaling. Responden kajian dipilih secara persampelan berperingkat dan mereka yang terlibat dalam Fasa 1 tidak terlibat dalam proses persampelan kajian Fasa 2. Kajian Fasa 1 telah menganalisis alat ukur dalam kesahan kandungan, kesahan konstruk menggunakan analisis penerokaan dan pengesahan faktor, serta ketekalan diuji menggunakan indeks alpha Cronbach. Analisa data kajian Fasa 2 dibuat menggunakan analisis deskriptif, Welch ANOVA, dan korelasi Pearson dalam SPSS versi 27 dan pemodelan persamaan berstruktur dalam AMOS versi 27. Dapatan kajian Fasa 1 menunjukkan bilangan item berkurang merentasi konstruk dan senarai item terakhir menunjukkan indeks kesahan dan ketekalan yang memuaskan. Dapatan kajian Fasa 2 pula menunjukkan tahap pengetahuan vaksinasi, efikasi kesihatan, penegasan kesihatan, persepsi risiko, dan niat untuk menerima vaksin yang tinggi dalam kalangan ibu mengandung. Terdapat perbezaan yang signifikan dalam pengetahuan vaksinasi dan niat untuk menerima vaksin mengikut tahap pendidikan dan pendapatan ( $p < 0.01$ ). Efikasi kesihatan menunjukkan hubungan positif yang kuat terhadap penegasan kesihatan ( $p < 0.01$ ), manakala kedua-dua konstruk menunjukkan hubungan positif yang lemah dengan persepsi risiko ( $p < 0.01$ ). Hanya persepsi risiko menunjukkan kesan mediasi penuh terhadap pengetahuan vaksinasi dan niat untuk menerima vaksin ( $p < 0.05$ ). Efikasi kesihatan dan penegasan kesihatan tiada kesan mediasi yang signifikan. Model mediasi menunjukkan indeks yang memuaskan. Memandangkan penegasan kesihatan mempunyai hubungan yang kuat terhadap efikasi kesihatan, maka ibu mengandung perlu digalakkan untuk mendapatkan pengetahuan berkaitan vaksinasi. Kesan positif pengetahuan vaksinasi terhadap niat untuk menerima vaksin hanya berlaku apabila persepsi risiko turut terbentuk. Maka, intervensi pendidikan kesihatan harus memberi



fokus kepada membentuk persepsi risiko yang tepat tentang vaksinasi. Kebaharuan kajian ini mendesak perubahan fokus daripada kurang maklumat kepada sifat berkaitan psikologi dalam memahami hubungan dan peranan pengetahuan vaksinasi dan keberhasilannya dalam kalangan ibu mengandung.. Di samping itu, profesional kesihatan diberi maklumat dan lebih terarah menyesuaikan pendekatan dan sasaran dalam menjalankan intervensi. Suatu kaedah memperkasa sifat efikasi kesihatan dan penegasan kesihatan boleh disusun dalam program intervensi dan penggubalan polisi kesihatan berkaitan vaksin kanak-kanak.

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**ABSTRACT**

Current childhood vaccination coverage has achieved herd immunity. However, a concerning trend of vaccine-preventable disease incidence and vaccine hesitancy demand the need for better health promotion interventions. Health self-efficacy, health assertiveness (assert to be informed and assert opinion), and risk perception (perceived likelihood and perceived severity) were proposed as the tailoring basis for the relationship between vaccination knowledge and vaccination intention. This study has two phases. Phase I study aims to: (i) To develop risk perception instrument in the context of childhood vaccination, and (ii) Establish validity and reliability of vaccination knowledge, health self-efficacy, health assertiveness, risk perception, and vaccination intention instruments. Phase II study aims to discover: (i) Level of vaccination knowledge, health self-efficacy, health assertiveness, risk perception, and vaccination intention among pregnant mothers; (ii) Differences in vaccination knowledge and vaccination intention according to education and income level; (iii) Relationships between health self-efficacy, health assertiveness, and risk perception; and (iv) The mediating effect of health self-efficacy, health assertiveness, and risk perception on the relationship between vaccination knowledge and vaccination intention. Each construct was measured using questionnaire in a cross-sectional design. The questionnaire was validated during Phase 1 on 108 pregnant mothers and Phase 2 objectives were addressed using 924 pregnant mothers attending primary and rural health clinic in the district of Gombak, Klang, Hulu Langat, and

Petaling. Respondents were sampled using multi-stage random sampling with those involved in Phase 1 was excluded from Phase 2 study. For Phase 1 study, the instruments were analysed for content validity, construct validity using exploratory and confirmatory factor analysis, and reliability using Cronbach's alpha. For Phase 2 study, data were analysed in SPSS version 27 using descriptive statistics, Welch's ANOVA, and Pearson's correlation, and in AMOS version 27 using structural equation modelling. Results of Phase 1 study reported a reduction in the number of items across measured constructs with the final list of items showing satisfactory validity and reliability. Results of Phase 2 study reveal high level of vaccination knowledge, health self-efficacy, health assertiveness, risk perception, and vaccination intention. There is significant difference in vaccination knowledge and vaccination intention between education and income level ( $p < 0.01$ ). Health self-efficacy show moderate positive relationship with health assertiveness ( $p < 0.01$ ), whereas both constructs showed weak positive relationship with risk perception ( $p < 0.01$ ). Only risk perception shows full mediating effect on vaccination knowledge and vaccination intention ( $p < 0.05$ ), whereas health self-efficacy and health assertiveness are not a significant mediator. The mediation model showed satisfactory fit. As health assertiveness and health self-efficacy is moderately related, mothers should be encouraged to learn about vaccination knowledge. Vaccination knowledge will impact positively on vaccination intention only if high risk perception was formed as a result of the knowledge. Therefore, the focus of health education intervention should be on formation of risk perception related to vaccination. Novelty of this research is in encouraging a shift of focus from information-deficit model to psychological characteristics in understanding vaccination knowledge and vaccination-related outcomes amongst pregnant mothers. Additionally, healthcare professional will be

informed on possible ways to tailor their approach and target of their intervention. An empowering approach that builds upon health self-efficacy and health assertiveness should be considered during intervention and development of policy.

## **CHAPTER ONE**

### **INTRODUCTION**

This chapter introduces the two major perspectives that lead to the problem statement. Perspective of health promotion and informed consent in medical care were introduced and elaborated how both perspectives contribute to the development of the problem statement. This chapter also provides an overview of the vaccine hesitancy both locally and globally. Significant research progress and conceptual development of vaccine hesitancy were noted, especially involving concepts relevant to this study. Problem statements were argued in both theoretical and practical dimensions to justify the constructs hypothesized to mediate vaccination knowledge and vaccination intention relationship. Research objectives and questions were formulated according to the problem statement.

#### **1.1 Health Promotion and Informed Consent Perspective in Vaccination**

According to the World Health Organization (WHO), health promotion is the “process of enabling people to increase control over, and to improve, their health” (World Health Organisation, 2018). Part of the “enabling” constitutes providing equal access to opportunity and resources to enable people to achieve the most in their health. Patients must be able to understand their health knowledge and make an informed decision. Therefore, any health promotional intervention either in the form of educational, mass media or health policy should be rooted in “enabling” people to understand health knowledge and aim at increasing control and improve health. The same can also be said within the case of childhood vaccination. Parents should be provided equal access to opportunity and resources (i.e.: health knowledge) to enable them take control and make informed decisions toward the betterment of their

children's health. Since childhood vaccination involve medical care, it cannot separate from the core human right of self-determination that is reflected in the principle of informed consent.

Informed consent is an overriding concept that has an ethical and legal implication in the practice of modern medicine (Hall et al., 2012). It basically involves three elements that are: doctor, patient and health decision (A. Schwartz & Hasnain, 2002). The two prior elements interact to produce the latter element and bind both doctor and patient to it. Knowledge, communication style and interpretation of knowledge have been the underlying components that comes into play in the interaction between doctor and patient (Peretti-Watel et al., 2015; J. L. Schwartz & Caplan, 2011). It ultimately concludes in a health decision. As such, the “enabling” process in health promotion is further emphasised within the principle of informed consent. Parents should be made able to access and understand vaccination knowledge in a way that increase their sense of control and ability to improve the health of their children through vaccination.

With these perspectives in mind, literature discussing vaccination knowledge and childhood vaccination outcomes have shown some mixed findings. In the case of vaccine hesitancy, research has indicated that those vaccine-hesitant parents may be more knowledgeable in vaccination as compared to vaccine acceptor parents (Dubé et al., 2013). The research findings indicated the absence of adequate informed decision-making in parents regarding childhood vaccination. In the case of improving vaccination knowledge amongst parents, many researches have reported that imparting knowledge about vaccination to parents does not necessarily lead to expected vaccination outcomes (Aharony & Goldman, 2017; Connors, 2017). More disturbing was some parents reported being overwhelmed by the quantity and quality of

vaccination knowledge given and available to them that consequently lead them to deviate from an objective-based judgement (Wang et al., 2015). In the context of health promotion and informed consent, it can be interpreted that the effort to educate parents on childhood vaccination has deviate them from making an informed decision.

Thus, understanding the psychological constructs that are related or pre-requisites to the vaccination knowledge processing are important to shed insight into these puzzling findings. Commissioning a unified health promotion material may be ineffective, or worse counterproductive, without considering the psychological constructs relation to the information processing of vaccination knowledge.

As parents are generally the legal guardian and health decision-maker for their children, the study of psychological constructs related to the cognitive ability to understand and make action are very important. Vaccine Hesitancy Determinant Matrix (VHDM), a matrix to map determinants of vaccine hesitancy, has included several psychological constructs that were known to lead to vaccine hesitancy (N. E. MacDonald & SAGE Working Group on Vaccine Hesitancy, 2015). Researches by Connors (2017), Schwartz & Hasnain (2002) and Turner, Rimal, Morrison, & Kim (2006) have concluded and suggested several psychological constructs to be considered before any educational intervention is done. Variables such as health self-efficacy, risk perception, and health assertiveness are proposed to have a dynamic relationship with the cognitive ability to understand and process knowledge regarding health and its consequent product, health decision. This research argues that the educational intervention should be tailored according to the three psychological constructs mentioned above: health self-efficacy, health assertiveness, and risk perception.

## **1.2 Learning Points from Vaccine Hesitancy Research**

Vaccine hesitancy is an issue that dates back since the introduction of the current modern practice of medicine. Though medical research on vaccine has been based on advanced technology, rigorous safety requirements, and multi-centre efficacy studies, several arguments based on the tenets from the early years of vaccination still survived until now. This has been a focus of interest for researchers from the perspective of medical practitioners, patients, and interventionist. Discussion and critique on the conceptual perspectives of vaccine hesitancy were also done.

On conceptual grounds, definition of “vaccine hesitancy” has been proposed in many ways by researchers. The term “vaccine hesitancy” have been debated for its inclusiveness and accuracy. An alternative terminology “vaccination hesitancy” seems to be more inclusive and accurate to define the behavioural aspect of vaccination rather than the actual vaccine product. However, researchers in the past have used the terminology “vaccine hesitancy” in definitions that encompass all the said aspects, thus the terminology was maintained (N. E. MacDonald & SAGE Working Group on Vaccine Hesitancy, 2015). A thorough discussion on the definition of vaccine hesitancy has been made by Peretti-Watel, Larson, Ward, Schulz, & Verger (2015). Vaccine hesitancy has been defined either in cognitive, attitudinal, behavioural or a combination of any prior perspectives by different researchers of the field. Cognitive perspective may include beliefs across fields (ie: health, locus of control, political, human rights, etc.) or knowledge whereas attitude and behaviour relate directly towards vaccination. Attitude can be seen in a spectrum of negative to positive attitude towards vaccine and/or vaccination. Behaviour can be seen in a spectrum of total rejection to total acceptance of vaccination. To add more to the complexity, parents with negative or neutral belief on vaccination (cognitive) may not be vaccine-hesitant



(attitude) and may fully vaccinate their children (behaviour). Similarly, parents with positive beliefs towards vaccination (cognitive) may be vaccine-hesitant (attitude) and decided to withhold vaccination (behaviour). Vaccine hesitancy may also occur for certain type of vaccine (alternative immunization) despite readily accepting basic vaccination schedule (Krawczyk et al., 2015). Therefore, the complexity of the cognitive, attitude and behavioural profiles in vaccination leads to differing opinion on how to conceptualize and operate the term vaccine hesitancy.

Whilst having differing definition, researchers from particular perspectives tend to subscribe to a specific opinion that reflects the significance of their background. For example, those from public health services tend to view behavioural definition as central to vaccine hesitancy while other dimensions are complementary. Research based on this perspective measures hesitancy by using the vaccination schedule as benchmark to decide delays/refusal and use vaccination coverage percentage, vaccine preventable disease (VPD) incidence and VPD mortality rate as outcome.

To ameliorate these differences, the World Health Organization has commissioned a working group of experts to review literature regarding vaccine hesitancy and suggest a universally acceptable framework. The SAGE Working Group on Vaccine Hesitancy of World Health Organization has agreed to define “vaccine hesitancy” as “to delay in acceptance or refusal of vaccination despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence.” (N. E. MacDonald & SAGE Working Group on Vaccine Hesitancy, 2015). They also reported succinctly several issues involving terminologies, scope and models to categorize factors predicting vaccine hesitancy. Vaccine hesitancy predictive factors were initially categorized by WHO EURO

Vaccine Communications Working Group in 2011 into the 3C model: *complacency*, *confidence* and *convenience*. Complacency was defined as the low perception of risk to vaccine-preventable disease leading to the unnecessary need for vaccination. Several factors were established leading to complacency, in particular mentioned was self-efficacy. Confidence was defined as the trust of individuals to three main areas: vaccine, healthcare system and policies. Conflicts arising from trust may have roots in monetary relation or expertise refutation. Finally, convenience was defined as healthcare environments that are conducive for vaccination such as physical availability, the appeal of health services, and the ability to understand health knowledge and so on.

The recent review suggested categorizing predictive factors differently into a model named Vaccine Hesitancy Determinant Matrix: *contextual*, *individual and group* and *vaccine/vaccination-specific influences*. Definition and examples of factors that fall under each dimension are described in Table 1 below. Many of the discussions agree to the many points discussed by Peretti-Watel, Larson, Ward, Schulz, & Verger (2015). Comparison of both models, this research opine that the new model allows better utilisation in undertaking research on the topic as factors are categorized into distinctive dimensions, unlike the previous model. Though the previous model has the ease of understanding, several research variables overlapped between their 3Cs dimension. The matrix below should be the framework to focus and design research on vaccination. The findings related to vaccine hesitancy provide many clues to the understanding how parents need and use vaccination knowledge to make their decision. In view of the health promotion perspective to “enable” parents improve their control on their children’s health, the importance of vaccination knowledge in making informed decision and the VHDM below, this research proposed a method to tailor

educational intervention whilst providing a way to measure and predict outcome of such intervention. The role of knowledge in vaccination must be central to the decision-making process and at the same time appreciate the different need and impact of vaccination knowledge on the parents.

**Table 1.1**

*Vaccine Hesitancy Determinants Matrix*

Domain	Factors
<p><b>Contextual influences</b></p> <p>Influences arising due to historic, socio-cultural, environmental, health system/institutional, economic or political factors</p>	<ul style="list-style-type: none"> <li>a. Communication and media environment</li> <li>b. Influential leaders, immunization programme gatekeepers and anti- or pro-vaccination lobbies</li> <li>c. Historical influences</li> <li>d. Religion/culture/gender/socio-economic</li> <li>e. Politics/policies</li> <li>f. Geographic barriers</li> <li>g. Perception of the pharmaceutical industry</li> </ul>
<p><b>Individual and group influences</b></p> <p>Influences arising from personal perception of the vaccine or influences of the social/peer environment</p>	<ul style="list-style-type: none"> <li>a. Personal, family and/or community members' experience with vaccination, including pain</li> <li>b. Beliefs, attitudes about health and prevention</li> <li>c. Knowledge/awareness</li> <li>d. Health system and providers – trust and personal experience</li> <li>e. Risk/benefit (perceived, heuristic)</li> <li>f. Immunization as a social norm vs. not needed/harmful</li> </ul>
<p><b>Vaccine/vaccination – specific issues</b></p> <p>Directly related to vaccine or vaccination</p>	<ul style="list-style-type: none"> <li>a. Risk/benefit (epidemiological and scientific evidence)</li> <li>b. Introduction of a new vaccine or new formulation or a new recommendation for an existing vaccine</li> <li>c. Mode of administration</li> <li>d. Design of vaccination programme/Mode of delivery (e.g., routine programme or mass vaccination campaign)</li> <li>e. Reliability and/or source of supply of vaccine and/or vaccination equipment</li> <li>f. Vaccination schedule</li> <li>g. Costs</li> <li>h. The strength of the recommendation and/or knowledge base and/or attitude of healthcare professionals</li> </ul>

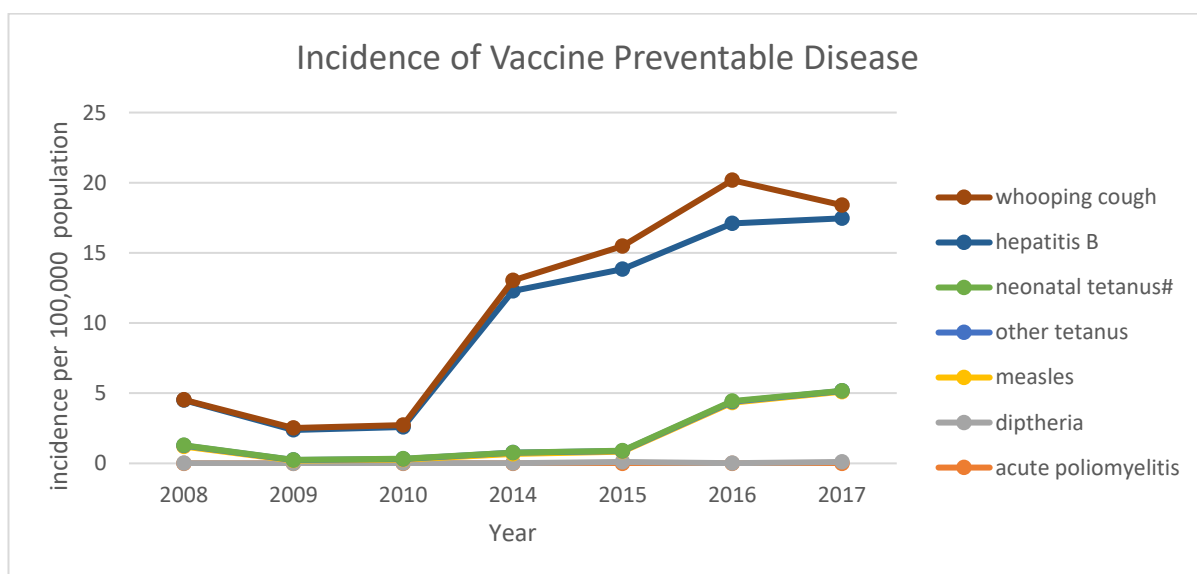
*Note.* Adapted from “Vaccine hesitancy: Definition, scope and determinants.” by N. E. MacDonald, & SAGE Working Group on Vaccine Hesitancy, 2015, *Vaccine*, 33, 4161–4164.

### 1.3 Vaccination Status in Malaysia

Health promotion perspective follows closely that of public health view on the topic. As discussed earlier, public health experts use several behaviour-related indicators as outcome for vaccination (to the same extent, vaccine hesitancy). Vaccination-related information was regularly released by the Ministry of Health Malaysia on a yearly basis. From 2008 to 2010, incidence rate for VPD per 100,000 population (except for neonatal tetanus which measure per 1,000 live birth) showed improvement. However, fast-forward to 2014 and subsequent years until recently, a large leap in incidence rates of VPD were observed (Ministry of Health Malaysia, 2009, 2010, 2011, 2014, 2015, 2017b, 2017a).

**Figure 1.1**

*Incidence of Vaccine Preventable Disease 2008-2010 & 2014-2017*



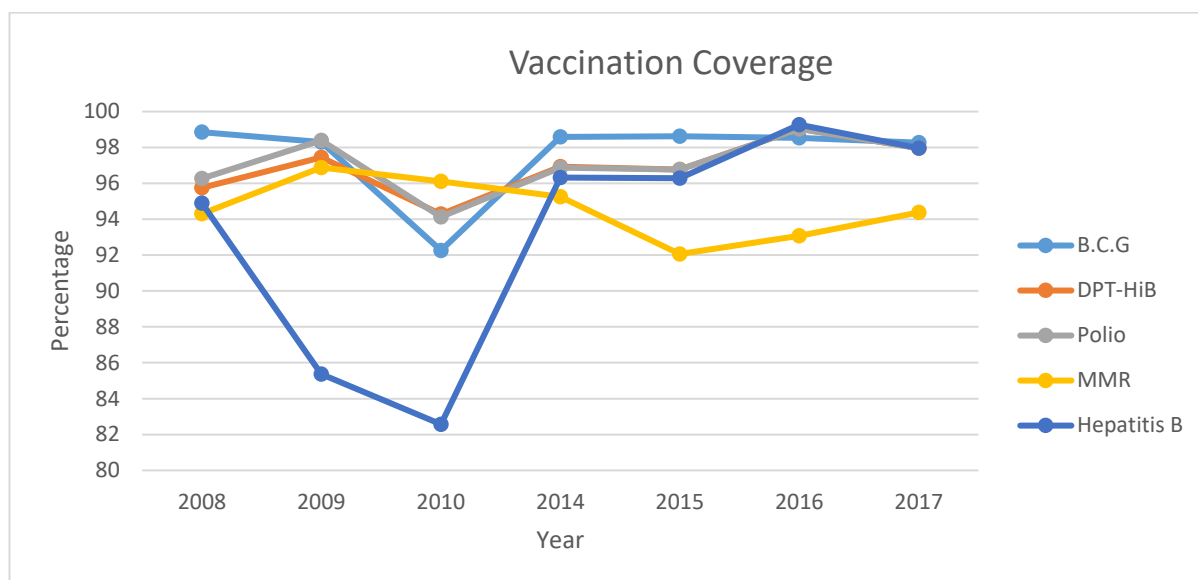
*Note.* Adapted from “Health facts.” (Ministry of Health Malaysia, 2009, 2010, 2011, 2014, 2015, 2017b, 2017a).

The trend from 2008 to 2010 on vaccination coverage showed a decreasing trend for all related vaccines. From year 2014 to year 2017, vaccination coverage trend

is generally good (90 % and above) with exception to MMR vaccine that showed slight decreasing trend.

**Figure 1.2**

*Trend of Vaccination Coverage 2008-2010 & 2014-2017*



*Note.* Adapted from “Health facts.” (Ministry of Health Malaysia, 2009, 2010, 2011, 2014, 2015, 2017b, 2017a).

#### **1.4 Overview of Factors Associated with Vaccine Hesitancy**

On patient perspectives, studies have revealed several demographic properties, psychological concepts, social variables and temporal factors showing a significant influence to vaccine hesitancy (Dubé et al., 2013). These factors can be fitted into the Vaccine Hesitancy Determinants Matrix as shown above. Several factors that have relevance to this research are discussed. It mainly focusses on factors from the “individual/group influence” dimension of the Vaccine Hesitancy Determinants Matrix.

The basis of current medical practice has changed from a paternalistic approach to shared decision-making between parents and doctors (Salmon et al., 2015). As such, parents are relatively more active in seeking vaccination knowledge, discuss and

deliberate on their decision to vaccinate children. This is especially true in young, educated and semi-professional parents equipped with information-seeking behaviour from books, research articles, social media, and the internet (Greenhalgh & Wessely, 2004). Vaccine hesitant parents have been shown to be well-informed and active in seeking vaccination knowledge (Dubé et al., 2016). Activism in vaccine-hesitant parents extends to advocating their opinion and knowledge in the physical world and the limitless internet. The presence of vaccine-hesitant messages, narrative and information on the internet has been feared to effectively influenced those doubtful or neutral attitude towards vaccination refusal (Dubé et al., 2014, 2016; Fu et al., 2011; Salmon et al., 2015). Reports regarding a significant portion of vaccinating parents without adequate knowledge regarding vaccine-preventable disease, vaccine risk and benefits fuel this concern (Dubé et al., 2013).

Fu, Rosenbloom, Wang & Nowak (2011) reported that even in a situation with adequate knowledge and understanding of the impact of their decision, parents still proceed to be vaccine-hesitant. Thus, a form of assertiveness exists within the decision-making process. A subsequent report by Salmon, Dudley, Glanz & Omer (2015) reaffirm this tendency to be assertive as parents demand to be informed and share decision-making with their doctors. Assertiveness in health is in line with the concept of informed consent that has been the root of modern medical practice (Hall et al., 2012). Patients are encouraged to be aware, educated and direct their health situation instead of being a passive follower. This encouragement comes not only from human rights principle but as well as the improvement in medical ethics. Patients that have a good understanding about their health tend to have a better prognosis, general health and function. However, if assertiveness comes with misinformed and poor

quality of knowledge, it may present in a situation as reported by Fu, Rosenbloom, Wang & Nowak (2011).

Another major factor is the risk perception of parents. Studies have shown parent's perceiving low susceptibility or likelihood of getting vaccine preventable disease tend to be among vaccine hesitant parents (Dubé et al., 2013; Salmon et al., 2015). These perceptions are possible due to the success of vaccination in eradicating vaccine preventable disease and healthy lifestyle (eg: nutrition, supplements, etc.). Success of vaccination also impacted on the perception of vaccine preventable disease severity. Parents are less exposed to the severity of the disease as the incidence of severe VPDs are almost non-existent whereas the existence of side-effects from vaccination exists in current time. Researches in several countries have shown that high risk perception act as promoter to vaccination (Larson, Jarrett, et al., 2014). In particular, perception of severity about a vaccine preventable disease (VPD) positively influence decision to vaccinate children in parents and decision to advocate vaccination amongst healthcare professionals. Greenberg, Dubé, & Driedger (2017) on the other hand reported majority of their parent samples consider benefit and risk of vaccine to make their decision to vaccinate children. Perception of risk does not directly lead to vaccination without understanding the benefits of vaccination. In all, risk perception influences parental decision to vaccinate their children.

The findings and suggestions from research on vaccine hesitancy above are very beneficial in understanding how it influences parental decision to vaccinate. Previous work by Cooke & Sheeran (2004) that studied the translation process from decision to behaviour have shown the influence of several variables on the translation process. To some degree, the firmness of that decision will translate into vaccination behaviour either to accept, delay or refuse childhood vaccination. The latter two

vaccination behaviours are considered as vaccine hesitant according to the definition proposed by WHO's SAGE Working Group on Vaccine Hesitancy (N. E. MacDonald & SAGE Working Group on Vaccine Hesitancy, 2015).

### **1.5 Problem Statement**

Current epidemiological estimation worldwide puts vaccine hesitancy from 0.8 % to 40 % depending on the population of study and methods employed (Giambi et al., 2018; Lo & Hotez, 2017; Noor Ani et al., 2017; Wan Rohani et al., 2017). In Malaysia specifically, two studies have identified concerning increase in percentage of refuser (Faridah, 2017) and low seropositive immunity for a vaccine preventable disease (Hazlina et al., 2016). Recent National Health and Morbidity Survey in 2017 reveals complete vaccination coverage stands at 86.4 % of Malaysian children (Lim et al., 2017) and a study in Kedah revealed incidence rate of vaccine refusal range from 4.7 % to 10.5% (Chan et al., 2018). Such levels may lead to poor herd immunity causing those at risk (e.g.: unable to be vaccinated due to medical or temporal reasons) contracting a vaccine preventable disease. Kusnin (2017) also reported that vaccine refusal is increasing; an indication that those neutral or hesitant attitude have become a refuser. Vaccine hesitancy also provides an interesting perspective in health decision-making that is; the individual responsible for decision is not the one receiving the intervention. Healthcare services are geared towards promoting health by educating parents on the importance of childhood vaccination as evidenced by MyHealth initiative (Health Information Unit, 2018), 3-tier counselling for vaccine refusal (Chan et al., 2018) and other health education materials readily available at any primary clinics. Almost all local research done on childhood vaccination take root in the information deficit model. Studies were done to assess knowledge, attitude and practice on vaccination (Awadh, 2015; Jeyachelvi et al., 2016; Kandeepan, 2016;



Mastura, 2016; Mastura et al., 2018) and the impact of educational intervention on vaccination uptake (Awadh, Hassali, Al-lela, Bux, Elkalmi, & Hazrina, 2014; Nor Fatma, 2018; Owais et al., 2011). The educational intervention was designed based on a specific population profile thus missing a significant variation in the population. As noted above, each parent requires different level of vaccination knowledge and too much knowledge can deviate them from objective judgement (E. Wang et al., 2015). None of these researches have consider the psychological constructs that facilitate learning of vaccination knowledge.

As discussed above in introduction, imparting knowledge through health promotion may not lead to vaccination intention (Aharony & Goldman, 2017; Connors, 2017). Tannenbaum et al. (2015) in their meta-analysis on educational intervention has emphasised the need to know the audience before an intervention is delivered. In the context of this study, it is possible to identify some commonalities among mothers that can be used to tailor an educational intervention. Dube et al. (2013) have reported the paradox between knowledge and vaccination behaviour. There were parents despite having adequate knowledge chose not to vaccinate their children and the opposite is true as well. Worse, Wang, Baras & Buttenheim (2015) have reported parents feeling overwhelmed with the vaccination knowledge subsequently deviate them from objective-based judgement. Thus, understanding the psychological characteristics that are related or pre-requisites to the knowledge processing are important to shed insight into these puzzling findings. Standardized health promotion materials may be ineffective, or worse counterproductive, when vaccination knowledge is given without considering the patient's psychological characteristics (Rossen et al., 2016). Therefore, there is a need to explore variables to explain this paradoxical relationship.

Vaccine Hesitancy Determinant Matrix (VHDM) identified self-efficacy was a significant factor in predicting vaccination-related outcomes (Dubé et al., 2013). Better health self-efficacy predicted better vaccination knowledge (Gerend & Barley, 2009), and higher vaccination uptake (Myhre et al., 2020). Therefore, health self-efficacy may jointly act or fully explains the relationship between vaccination knowledge and vaccination intention. Several research have examine the interaction between health self-efficacy and risk perception in predicting info-seeking activities (Turner et al., 2006) and vaccination uptake (A. Schwartz & Hasnain, 2002). Risk perception can be seen as precursor or outcome of info-seeking activities and contributed to vaccination-related outcomes. Similarly, risk perception may influence the relationship between vaccination knowledge and vaccination intention. Finally, the paradoxical relationship between vaccination knowledge and vaccination intention suggests the presence of assertiveness in parents. High assertiveness must be present for parents to refuse vaccination despite having good vaccination knowledge. However, assertiveness has never been explored in the context of parents deciding to vaccinate their children. Therefore, variables such as health self-efficacy, risk perception, and health assertiveness are proposed to have a dynamic relationship with the cognitive ability of parents to understand and process knowledge regarding vaccination and its consequent product; health decision. The VHDM has classified these constructs under the “individual/group dimension” of factors. A better understanding of parent’s profile based on their psychological constructs is a must to guide effective educational intervention.

In childhood vaccination, MacDonald & SAGE Working Group on Vaccine Hesitancy (2015) have reported, albeit briefly, the influence of health self-efficacy on vaccine hesitancy. Research on Taiwanese influenza vaccination of children showed

health self-efficacy has a positive relationship with parental intention to vaccinate (Chen et al., 2015). Ruiter, Kessels, Peters, & Kok (2014) in their meta-analytic review on the effectiveness of intervention based on fear and risk perception recommended that message that impart self-efficacy is an important complement to the current intervention.

Despite the importance of health self-efficacy established above, research on this variable in explaining its influence on the relationship between vaccination knowledge and vaccination-related outcome in childhood vaccination is absent. It has been noted that differing level of health self-efficacy need a tailored vaccination knowledge communication (Kaufman et al., 2018). Parents with low self-efficacy may become complacent and leave the decision to the doctors or becomes overwhelmed with vaccination knowledge that they become fearful of what they don't understand. Keane et al., (2005) particularly recommend tailored vaccination knowledge to the attitudes and beliefs (eg: health self-efficacy) of parents. Certain type of information has been shown to relate negatively towards intention to vaccinate (H. O. Lee & Kim, 2015). Thus, proper understanding on how health self-efficacy impact parent's vaccination knowledge is important to provide knowledge according to "reasonable person standard" in aiding health decision (Hall et al., 2012). Such understanding can guide the design and provision of health education materials to aid and inform parents in making decision on childhood vaccination. It is a healthcare disaster if the information provided on childhood vaccination pushes parents away from it due to being overwhelmed with the quantity and quality of information. Similarly, a simplified version of health knowledge on childhood vaccination may be inadequate for certain parents with better health self-efficacy. Hence, unable to convince them on the benefits of vaccination.

Rimal & Real (2003) in their experimental study has established that health self-efficacy and risk perception jointly affect patient's health decision and information seeking behaviour. In line with the concept of informed consent and Rimal's conceptual formulation, it is inherent that health self-efficacy is studied concurrently with risk perception. In addition, Schwartz & Hasnain (2002) reported that risk perception affects health decision depending on the type and way of health knowledge provided to the patients. A direct implication towards informed consent has been seen in their experimental study and points to the crucial role played by these psychological constructs.

Similar associations were seen for particular dimension of risk perception towards vaccination intention or behaviour (He et al., 2015; Offutt-Powell et al., 2014). Parental prevention behaviour, perceived child health status, worry about child getting influenza, and perceived control have a positive association with intention or uptake of vaccination. Thus, importance of risk perception towards vaccination uptake has been shown. In this research, risk perception will be studied concurrently with health self-efficacy following recommendation from Rimal & Real (2003). Previous studies lack consideration of both variables concurrently, lack insight into the dynamics that operate between these two variables, and its influence on the relationship between vaccination knowledge and intention. He, Liao, Huang, Feng & Zhuang (2015) perhaps have considered both variables in their study (termed perceived control) but utilized different conception and a limited measure of health self-efficacy (dual-scale single item). Furthermore, there is a lack of standardization in quantitative assessment of risk perception in childhood vaccination (Liao et al., 2013a). Currently, comparison and accumulation of research findings on risk perception in vaccination are difficult due to different instrumentation. Therefore, there is a need to develop an instrument to

measure risk perception in childhood vaccination and established reliability and validity of such instrument.

Assertiveness has been related to conception of self and self-efficacy (Brashers et al., 1999; Renger, 2018). Again, interrelation of concepts that are the focus of this study are observed, hence the need to study in concurrent. Research on assertiveness in general health situation have yield understanding of its importance in shared decision-making, mental health and physical health (Arancibia et al., 2016; Joseph-Williams et al., 2014). Interestingly, Joseph-Williams, Elwyn & Edwards (2014) pointed out that patients need both knowledge and power to be involved and give informed consent. In the context of childhood vaccination, a mismatched between knowledge and health decision has been reported (Dubé et al., 2013). This suggests a degree of assertiveness present in parents that, despite have adequate knowledge on vaccination subsequently hesitant or refuse vaccination for their children as this decision contradicts professional recommendation.

Surprisingly, discussions on assertiveness in childhood vaccination have focused primarily on the role of healthcare professionals (McKinnon & Palmquist, 2016; Mills, 2016; Yaqub et al., 2014). All research agree that healthcare professionals need to be more assertive in recommending vaccination. Therefore, including assertiveness in this study will contribute to the gap in understanding parent's decision-making process and may explain discrepancies in the relationship between vaccination knowledge and vaccination-related outcomes. In terms of practical application, a different approach is needed to address highly assertive parents to motivate them to consider vaccination from a neutral standpoint and deliberate objectively on knowledge to come up with a decision.

In all, the study of above psychological constructs in influencing the relationship between vaccination knowledge and vaccination-related outcome is crucial. Interrelation between these psychological constructs have been noted from literature reviews. Constructs have shown significant relationship with either vaccination knowledge, vaccination intention or vaccination behaviour. As of current, there is no study analysing all these constructs concurrently using structural equation modelling technique. Previous quantitative studies that do examine one or two constructs pertinent to this research utilizes correlational or regression analysis techniques to test their hypothesis (Chen et al., 2015; Fadda et al., 2015; Petrovic et al., 2011; Rozbroj et al., 2018). Studies that do utilize structural equation modelling technique only cover one or two constructs relevant in this research (Liao et al., 2011, 2013b; Low et al., 2017; Phillips et al., 2018; Veldwijk et al., 2015). None of these studies have analysed the mediating role of the constructs and the relationship between the constructs.

## **1.6 Research Objectives**

General objective:

To examine the dynamic role of psychological characteristics in relation to vaccination knowledge and vaccination intention.

### ***1.6.1 Specific Objective: Phase I Validation Study***

- i. To develop an instrument measuring risk perception in the context of childhood vaccination.
- ii. To establish validity and reliability of vaccination knowledge, risk perception, health self-efficacy, health assertiveness, and vaccination intention

questionnaire amongst pregnant mothers in Petaling, Klang, Gombak, and Hulu Langat.

### ***1.6.2 Specific Objectives: Phase II Mediation Study***

- i. To determine the level of vaccination knowledge, health self-efficacy, risk perception, health assertiveness, and vaccination intention amongst pregnant mothers in Petaling, Klang, Gombak, and Hulu Langat.
- ii. To compare differences of vaccination knowledge and vaccination intention between education and income level.
- iii. To examine the relationship between health self-efficacy, risk perception, and health assertiveness.
- iv. To analyse the mediating effect of health self-efficacy, risk perception, and health assertiveness on the relationship between vaccination knowledge and vaccination intention.

## **1.7 Research Questions**

The research questions were also organized based on the phase of the study. The questions are as followed:

### ***1.7.1 Phase I Validation Study***

- i. What is the validity and reliability of vaccination knowledge, risk perception, health self-efficacy, health assertiveness, and vaccination intention questionnaire amongst pregnant mothers in Petaling, Klang, Gombak, and Hulu Langat?

### ***1.7.2 Phase II Mediation Study***

- i. What is the level of vaccination knowledge, health self-efficacy, risk perception, health assertiveness, and vaccination intention amongst pregnant mothers in Petaling, Klang, Gombak, and Hulu Langat?
- ii. What are the differences in vaccination knowledge and vaccination intention between education and income level?
- iii. What is the relationship between health self-efficacy, risk perception, and health assertiveness?
- iv. Is there any mediating effect of health self-efficacy, risk perception, and health assertiveness on the relationship between vaccination knowledge and vaccination intention?

### **1.8 Hypotheses**

The hypotheses were proposed based on specific research objectives of Phase II Mediation Study. Only null hypothesis was provided as statistical analysis tested for the likelihood of null hypothesis to be true (Malhotra, 2019).

- i. H<sub>0</sub> 1: There is no significant difference in level of vaccination intention between education and income level.
- ii. H<sub>0</sub> 2: There is no significant difference in vaccination knowledge between education and income level.
- iii. H<sub>0</sub> 3: There is no significant relationship between health self-efficacy and health assertiveness.
- iv. H<sub>0</sub> 4: There is no significant relationship between health self-efficacy and risk perception.



- v. H<sub>0</sub> 5: There is no significant relationship between health assertiveness and risk perception.
- vi. H<sub>0</sub> 6: There is no significant mediating effect of health self-efficacy on the relationship between vaccination knowledge and vaccination intention.
- vii. H<sub>0</sub> 7: There is no significant mediating effect of health assertiveness on the relationship between vaccination knowledge and vaccination intention.
- viii. H<sub>0</sub> 8: There is no significant mediating effect of risk perception on the relationship between vaccination knowledge and vaccination intention.

### **1.9 Significance of Research**

Theoretically, this research allows understanding of psychological characteristics relevant to the understanding and processing of vaccination knowledge. Dynamics between health self-efficacy, risk perception, and health assertiveness can be explored and understood. Current research regarding relationship between vaccination knowledge and vaccination-related outcomes have shown mixed findings. Lack of knowledge on vaccination is common in vaccine acceptor and adequate knowledge on vaccination is common in vaccine hesitant parents. This study's variables may present in a mediating effect on the relationship between vaccination knowledge and vaccination-related outcomes. As proposed by the theoretical framework, this research operationalized vaccination-related outcomes using vaccination intention.

As noted above, there is no standardized instrument in measuring risk perception in childhood vaccination. This research aims to develop such instruments by aggregating previous research and qualitative exploration of other potential items to include in the instrument. The instrument will establish content, construct validity,

and reliability on local sample. This development will introduce a standardized instrument allowing comparable research findings in studies involving risk perception in childhood vaccination.

Hypothetically, important psychological characteristic that facilitate acquisition of vaccination knowledge can be identified. This can be use as basis to tailor educational intervention. Additionally, psychological characteristic that mediate the relationship between vaccination knowledge and intention can be use as the focus of intervention. Ultimately, health professionals agree on the benefits of childhood vaccination to the public health. Thus, health promotion will be better informed from the result of this study in reviewing content of their health education materials. Path analysis in structural equation modelling will indicate which psychological construct pre-requisites the development of other constructs. With such knowledge, an empowering approach that build such construct can be included in the educational intervention.

Practically, the precise understanding of interrelationship between the psychological constructs to health decision will help intervention researchers, health practitioners and health promotion services to tailor their health education materials appropriately. Previous research has noted and recommended a tailored approach towards educational intervention, but none has proposed an empirically driven suggestion as basis in tailoring the intervention. Different quality and quantity of vaccination knowledge is needed to address different psychological constructs. This is true especially in a standard nation-wide intervention programme. Several versions of health education materials can be devised based on psychological characteristics. Model developed from this research can be used as guide for tailoring content and measure to assess effectiveness of the educational intervention. For local health

practitioner intervening in small communities, the outcome of this study will inform them the importance of tailoring their intervention to suit the psychological constructs of the local community. A screening questionnaire can be utilised to identify parent's profile based on their level of psychological constructs. Approach towards promoting vaccination can be tailored according to the psychological constructs. For example, healthcare practitioner can learn persuasive communication skills to address parents with high assertiveness level or health education activities can incorporate empowering goals to improve health self-efficacy and assertiveness in parents. Intervention empowering a pre-requisite psychological construct can be developed. Improvement in that construct will lead to incremental effect in other psychological constructs conducive for learning vaccination knowledge. This intervention may come in the form of specific communication skills involving healthcare professional or construct-building activities involving parents.

## **1.10 Definition of Terms: Theoretical and Operational**

### ***1.10.1 Childhood Vaccination***

Childhood vaccination refers to any health prevention programme that administered vaccine to those under the age of 13 years old. Throughout the literature, several terminologies exist that are used synonymously with "vaccination", that are: immunisation (Lam et al., 2011), inoculation (Yue et al., 2016), jab (Hull et al., 2020), and shot (Prati et al., 2012). These alternate terms have been used in various vaccines that are available for children; from basic to supplementary.

In this study, the term "childhood vaccination" was used to refer to the basic vaccines that protect against 13 vaccine-preventable disease for children under the age of 13 years old (Ministry of Health Malaysia, 2018). These vaccines were provided

free-of-charge for Malaysian, and for a fee for non-Malaysians. The preference to use “vaccination” as opposed to other alternate term is made to be consistent with the umbrella term of “vaccine hesitancy” as used by the WHO’s Strategic Advisory Group of Experts (SAGE) for vaccination research (Dubé et al., 2013).

### ***1.10.2 Vaccination Knowledge***

Vaccination knowledge may include knowledge on the vaccine, process related to vaccination, vaccine preventable disease, and consequence of action or inaction. Each of these topics may also contain a spectrum of basic to advance knowledge. Several previous research has operationalised any combination of the above as items to measure vaccination knowledge (Manthiram et al., 2014; Pan et al., 2014; Sundaram et al., 2018). Vaccination knowledge has also been operationalised in the perspective of misinformation (Hofstetter & Rosenthal, 2014; Waisbord et al., 2010). This introduces a different type of vaccination knowledge that theoretically works against improving vaccination-related outcomes.

In this research, vaccination knowledge is operationalised by knowledge related to the vaccine, vaccination process, and consequence of action as developed by Awadh et al. (2014b). In total, the original instrument consists of ten items tapping into the three dimensions above: on a nominal scale response.

### ***1.10.3 Vaccination-Related Outcomes***

In vaccination research, outcomes can be defined in terms of knowledge, attitude/perception, or behaviour. For example, educational intervention studies have often measured outcome according to improvement in vaccination-related knowledge (Awadh, Hassali, Al-Jela, Bux, Elkalimi, & Hazrina, 2014; Saeterdal et al., 2014). Several studies measured outcome based on attitude or perception towards vaccination