

DEVELOPMENT, VALIDATION AND EFFICACY OF
MATERNAL DIET AND INFANT ALLERGY
PREVENTION MODULE AMONG BREASTFEEDING
PEER COUNSELLORS IN PAHANG

BY

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ABSTRACT

Breastfeeding is recognised to be beneficial for infants as it provides many essential nutrients which can protect from allergies such as asthma and eczema. However, current evidence found that allergies are also prevalent among exclusively breastfed infants. This is due to the fact that the maternal diet during pregnancy and breastfeeding was found to influence the quality and content of breast milk. The risk of allergy among exclusively breastfed infants may be reduced via modulation of maternal diet. Therefore, this study aimed to develop and validate a maternal diet guideline module and evaluate the efficacy of its content in improving the knowledge and attitude of breastfeeding peer counsellors (BPC) in Pahang. This study consists of four phases including Phase 1: Needs Assessment, Phase 2: Module Development and Module Validation, Phase 3: Questionnaire Development and Questionnaire Validation and Phase 4: Intervention Study. Phase 1: Needs Assessment, was conducted among 15 Malaysian Breastfeeding Peer Counsellors (MBFPC) via self-administered questionnaire as preliminary requirement. In Phase 2: Module Development and Module Validation, the module was developed based on needs assessment, theories of reasoned action and planned behavior and current literature review. The validation of the module was done among ten experts. The content of the module was validated using the content validity index (CVI) which are Item-level Content Validity Index (I-CVI) and scale-content validity index (S-CVI). The item-level (I-CVIs) was considered in this study due to its consistency which further calculated into modified kappa statistics. The items with an I-CVI of 0.78 or higher was considered evidence of good content validity. The result showed that the validity of the module had achieved I-CVI of 0.89 which was considered as having excellent content validity with majority of excellent kappa statistic. In Phase 3: Questionnaire Development and Questionnaire Validation, the questionnaire was developed based on four domains which are knowledge, attitude, maternal diet and allergy prevention. The pilot study was done among ten participants of BPC. The content validity of questionnaire were assessed by the six experts and 14 experts for reliability analysis. The I-CVI for questionnaire is 0.97 and overall Cronbach alpha is 0.894 which is considered as having excellent content validity and reliable instrument. In Phase 4: Intervention Study, the cross-sectional study was conducted in all districts in Pahang using convenient sampling method. The self-administered questionnaire were distributed among 72 respondents that fulfilled the criteria. The module was implemented in the intervention study, and the knowledge and attitude (KA) were assessed before and after the intervention. Mean, standard deviation, t-test, ANOVA and correlation test were used as statistical tools in treating the data for knowledge and attitude. In the pre-intervention, majority of the participants had good level of knowledge ($n=37$, 51.4%) and positive attitude ($n=32$, 44.4%) towards maternal diet and allergy. The significant association was found between socio-demographic factors and KA in post-intervention ($p<0.05$). There is also a moderate positive correlation between knowledge and attitude for both pre- and post-intervention ($r=0.668$, $p<0.001$) and ($r=0.547$, $p<0.001$) respectively. The moderate knowledge and positive attitude on maternal diet and allergy had improved after the intervention using the module from 34.7% to 38.9% and from 44.4% to 61.1% respectively. Thus, the developed module had provided a guideline for the BPC in allergy prevention among exclusively breastfed infants. This study also had produce a module with acceptable

validity of its content and an instrument used also have acceptable reliability and validity. The knowledgeable BPC will become a center for conveying the knowledge for mothers to reduce the health burden among breastfed infants for better health outcome and reduce the allergy prevalence.

خلاصة البحث

إن من المعروف أن الرضاعة الطبيعية مفيدة للرضع لأنها توفر العديد من العناصر الغذائية الأساسية التي يمكن أن تحمي من الحساسية مثل الربو والأكزيما. ومع ذلك، توجد الأدلة أن الحساسية منتشرة بين الأطفال الذين يرضعون رضاعة طبيعية حصرية. هذا يرجع إلى أن النظام الغذائي للأم أثناء الحمل والرضاعة الطبيعية تؤثر على جودة ومحتوى حليب الثدي. ويمكن أن يقلل خطر الحساسية بين الرضع الذين يرضعون رضاعة طبيعية حصرية بطريقة تعديل النظام الغذائي للأم. لذلك، هدفت هذه الدراسة إلى تطوير وتحقيق وحدة إرشادات النظام الغذائي للأم وتقييم فعالية محتواها في تحسين معرفة وموقف مستشاري الأقران في الرضاعة الطبيعية (BPC) في باهانج. تتكون هذه الدراسة من أربع مراحل. المرحلة الأولى: تقييم الاحتياجات، مرحلة الثانية: تطوير الوحدة وتحقيق الوحدة، مرحلة الثالثة: تطوير الاستبيان وتحقيق من صحة الاستبيان، مرحلة الرابعة: دراسة التدخل. مرحلة الأولى: تقييم الاحتياجات، إجراؤه على 15 مستشارا من المالبيزيين في الرضاعة الطبيعية (MBFPC) عبر الاستبيان الذاتي كشرط أولي. في مرحلة الثانية: تطوير الوحدة وتحقيق في صحتها، تم تطوير الوحدة بناء على تقييم الاحتياجات، ونظريات العمل المعقول والسلوك المخطط، ومراجعة الأدبيات الحالية. يقوم عشرة خبراء بالتحقق من صحة تلك الوحدة. على الوحدة التحقق من صحة محتواها باستخدام فهرس صلاحية المحتوى (CVI) وهو فهرس صلاحية المحتوى على مستوى العنصر (I-CVI) وفهرس صلاحية المحتوى على المقياس (S-CVI). النظر في مستوى العنصر (I-CVIs) في هذه الدراسة نظرا لاتساقها الذي تم حسابه في الإحصائيات المعدلة. اعتبار العناصر التي تحتوي على I-CVI من 0.78 أو أعلى دليلا على صلاحية المحتوى الجيد. أظهرت النتيجة أن صلاحية الوحدة قد حققت I-CVI بقيمة 0.89 والتي تم اعتبارها ذات صلاحية المحتوى الممتازة مع غالبية إحصائية كاتا الممتازة. في مرحلة الثالثة: تطوير الاستبيان وتحقيق في صحتها، تطور الاستبيان بناء على أربعة مجالات هي المعرفة، والموقف، والنظام الغذائي للأم، والوقاية من الحساسية. تم إجراء الدراسة التجريبية بين عشرة مشاركين من BPC. وتم تقييم صلاحية محتوى الاستبيان من قبل ستة خبراء و 14 خبيرا لتحليل الموثوقية. I-CVI للاستبيان هو 0.97 وألفا كرونباخ هو 0.894 والتي تعتبر ذات صلاحية محتوى ممتازة وأداة موثوقة. في مرحلة الرابعة: دراسة التدخل، أجريت الدراسة المقطعية في جميع المناطق في باهانج باستخدام طريقة عينات ملائمة. تم توزيع الاستبيان الذاتي على 72 مستجيبا استوفوا المعايير. تنفيذ الوحدة في دراسة التدخل، وتقييم المعرفة والموقف (KA) قبل وبعد التدخل. استخدم المتوسط، والانحراف المعياري، واختبار-t، و ANOVA، واختبار الارتباط كأدوات إحصائية في معالجة البيانات من أجل المعرفة والموقف. في مرحلة ما قبل التدخل، كان لدى غالبية المشاركين مستوى جيد من المعرفة (51.4%، n=37)، وموقف إيجابي (n=32، 44.4%) تجاه النظام الغذائي للأم والحساسية. تم العثور على ارتباط كبير بين العوامل الاجتماعية والديموغرافية و KA في مرحلة ما بعد التدخل (p<0.05). هناك أيضا ارتباط إيجابي معتدل بين المعرفة والموقف لكل من ما قبل التدخل وبعده (t=0.668, p<0.001) و (t=0.547, p<0.001) على التوالي. تحسنت المعرفة المعتدلة والموقف الإيجابي تجاه النظام الغذائي للأم والحساسية بعد التدخل باستخدام الوحدة من 34.7% إلى 38.9% ومن 44.4% إلى 61.1% على التوالي. وهكذا، قدمت الوحدة التي تم تطويرها دليلا إرشاديا ل BPC في الوقاية من الحساسية بين الرضع الذين يرضعون رضاعة طبيعية حصرية. أنتجت هذه الدراسة أيضا وحدة ذات صلاحية مقبولة لمحتواها، وتتمتع

الأداة المستخدمة أيضا بموثوقية وصلاحيّة مقبولة. ويسبح العارفين من BPC مركزا لنقل المعرفة للأمهات لتقليل العبء الصحي بين الرضع الذين يرضعون رضاعة طبيعية ولأفضل نتائج صحية وتقليل انتشار الحساسية.

APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion, it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a thesis for the degree of Master of Health Sciences in Nutrition Sciences

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DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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LIST OF ABBREVIATIONS

AAAAI	American Academy of Allergy Asthma and Immunology
ASCIA	Australian Society of Clinical Immunology and Allergy
CVI	Content Validity Index
EAACI	European Academy of Allergy and Clinical Immunology
EPA	Eicosapentaenoic Acid
DHA	Docosahexaenoic Acid
HMO's	Human Milk Oligosaccharide
MAP	Malaysian Allergy Prevention
MBFPC	Malaysian Breastfeeding Peer Counsellor
MCH	Maternal And Child Health
MUFA	Monounsaturated fatty acids
NHMS	Third National Health and Morbidity Survey
PUFA	Polyunsaturated fatty acids
RNI	Recommended Nutrient Intake
SFA	Saturated fatty acids
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Allergy is defined as immunological-mediated and allergen-specific hypersensitivity that lead to different diseases (European Academy of Allergy and Clinical Immunology (EAACI), 2014). Allergy occurs when immune system react to harmless substances that known as allergen which can be found in food, dust mites, medications and pollen (Australian Society of Clinical Immunology and Allergy (ASCI), 2019). It is a mechanism that lead to manifestation of many condition such as anaphylaxis, eczema, asthma, angioderma and rhinoconjunctivitis (EAACI, 2014). According to Valenta, Hochwallner, Linhart and Pahr (2015) the most common allergy is food allergy when the body develop IgE against food allergen. The symptoms of food allergy appears when the food allergen enter the blood via gastrointestinal tract that can affect the site of allergen contact or other organs as well. The allergic sufferer may experience many adverse reactions due to food allergy which may lead to increase medical expenses and reduce the quality of life.

In many developed countries, food allergy has affected about 3% to 6% of children that become one of the health burden of the world (Du Toit, Tsakok, Lack, & Lack, 2016). This is also shown in Malaysia as the prevalence of allergies among children is on the rise. These includes food allergy which range from mild, severe and can also lead to death. One out of three people in Malaysia had food allergy and the number will keep rising up to 50% in 2020 (Din, Rashid, Ramli, & Othman, 2018). Allergy such as food allergy and eczema is the most common chronic disease among

children in many countries including Malaysia. About 8% children worldwide younger than three years old had food allergy while 30% of children had both food allergy and eczema (Din *et al.*, 2018). This had shown that many children are suffering from allergy that need proper management for preventive action.

Breastfeeding was found to benefit the infants and protect from allergies such as asthma and eczema besides providing many essential nutrients for many decades. Exclusive breastfeeding was recommended as part of the nutritional benefits for both mother and infant. However, current evidence found that allergies are also occurs among exclusively breastfed infants (Rajani, Martin, Groetch, & Järvinen, 2020). Food protein-induced allergic proctocolitis occurs nearly 60% of cases among exclusively breastfed infants with more than 20% of breastfed infant had dermatitis (Rajani *et al.*, 2020). Maternal dietary intake was found to contribute to this allergy among exclusively breastfed infants via breast milk. Besides, the birth cohort study of 970 children found that breastfed children were associated with increased risk of food sensitization with also depend on the genetic variants (Martin-Munoz, Pineda, García, Guillén, Rivero, Belver, & Quirce, 2016). Rajani *et al.* (2020) found that atopic dermatitis symptoms among exclusively breastfed infants had influenced by the maternal dietary intake. This is because the quality and content of the breast milk is determine by the dietary intake of mothers during pregnancy and breastfeeding. Maternal diet during pregnancy and breastfeeding had link to the allergic reaction and eczema among infants (Garcia-Larsen, Ierodiakonou, Jarrold, Cunha, Chivinge, Robinson, & Leonardi-Bee, 2018). This can be explained from the food that has been ingested by the mothers will affect the infant's immune system during pregnancy and breastfeeding. This is also stated by Mazzoichi, Venter, Maslin and Agoston (2017) that maternal nutrition has the major impact in the development, maintenance and optimal functioning of infant's immune

cell. Maternal dietary intake that consist of allergen can affect the infant's immune system which lead to the allergic reaction regardless of exclusive breastfeeding practice. Improper maternal dietary intake is one of the important determinants that contribute to the allergic prevalent among exclusively breastfed infants. Thus, the risk of allergy among exclusively breastfed infants may be reduced via modulation of maternal diet.

There are many factors that cause the allergic reaction among breastfed infants including maternal dietary intake and environmental causes. The associate factors such as lack of knowledge regarding the allergy also can contribute to the increasing prevalent of allergic reaction among infants. This had been supported by the current study that the major factor of food allergy among children is lack of knowledge and awareness among public as well school nurses, hospital staff and paediatricians (Din *et al.*, 2018). Giving the education and implementation of the intervention to the society especially mothers are important in order to prevent the allergic reaction among children. This had been addressed by Din *et al.* (2018) that the development of specific education intervention and improvement are needed for better quality of life among food allergy sufferers especially the infants.

In relation to breastfeeding practice, breastfeeding peer counsellors (BPC) had been established to support the mothers in many ways. Chapman *et al.* (2010) stated that initiatives of having BPC are effective to promote breastfeeding and related maternal-child health programs. BPC can give positive impact to the mothers as they are close to mothers to share and support the mothers with the knowledge regarding the allergy prevention besides promoting breastfeeding. This can be one of the effective way to educate the mothers via BPC as an intervention to prevent the allergy among infants. Having good knowledge and attitude among BPC can help mothers to reduce the allergy prevalence among exclusively breastfed infants. Thus, this study was

conducted to construct a guideline module for BPC towards reduction of allergic reaction and the intervention studies to assess the knowledge and attitude among BPC. Improved knowledge and attitude among BPC can give positive impact in the allergic prevention among exclusively breastfed infants for future health benefits.

1.2 STATEMENT OF THE PROBLEM

Breastfeeding practice in the first 24 months of infant's life is recommended by World Health Organization (WHO) as it provides many essential nutrients to the infant (Rashid, Shamsuddin, Ridhuan, Amalina & Sallahuddin, 2018). Breast milk is needed for optimal growth and development of infants. Among the benefits of breast milk includes support immune system, lower risk of sudden death, prevention of many diseases, and protect against allergies among breastfed infants (Rashid *et al.*, 2018).

One of the benefits of breastfeeding is to reduce the risk of allergic reaction. However, there is conflicting evidence on protective role of breast milk in relation to allergy development in breastfed infants. The incident of allergy development is high among exclusively breastfed infants with the increase prevalence of allergies among children in Malaysia. The study done by Yadav and Naidu (2015) showed that atopic dermatitis is the most prevalent (65.7%) allergy symptom among Malaysian children aged below two years. More than half of children are likely to develop food allergy with atopic dermatitis due to IgE-mediated food allergy. The current studies done by Din *et al.* (2018) shows that approximately 90% of Malaysian children experiences food allergy and eczema. Surprisingly, allergic reactions such as eczema and dermatitis also occur among exclusively breastfed infant. This number will keep increasing if there is no prevention step had been taken.

There are several factors that cause the allergic reaction to occur such as ethnicity, sex, atopic family history, atopic dermatitis (AD), and related genetic polymorphisms (du Toit *et al.*, 2016). Although the genetic was found to be the main factor, many other factors also were found to contribute to the food allergy such as maternal diet during pregnancy and breastfeeding. This was stated by van den Elsen, Garssen, Burcelin and Verhasselt (2019) that maternal nutrition intake plays an important role in shaping the early microbiota composition and function of babies. The maternal diet can influence the quality of human milk which can lead to allergic reaction among exclusively breastfed infants. The allergen that will be secreted via the breast milk can affect the allergy development among the breastfed infants. This was supported by Ridley, Sitarik, Joseph, Kim, Zoratti, Ownby and Johnson (2018) that there is an interaction between maternal dietary intakes during pregnancy which affect the allergies among infants. During pregnancy and lactation, the maternal dietary intake plays a crucial role in fulfilling the energy, macronutrient and micronutrient needs for the infants. The tissue levels of fatty acids during pregnancy and lactation are directly related to the dietary intake as well as the reserved capacity and the metabolic utilization of fatty acids in synthesis, oxidation and transport process (Barrera *et al.*, 2018). Thus, improper maternal dietary intake may affect the protective nutrients that will be transferred to the infants. This indicates that the maternal diet is important in producing sufficient and a good quality of milk which is free from allergy inducers.

Besides, du Toit *et al.* (2016) stated that the maternal diet during pregnancy and breastfeeding is responsible for the prevention of food allergy in most of the observational studies. This is also supported by Whitehead (2018) that maternal nutrition and supplementation intake during pregnancy and breastfeeding can modulate the infant's immune system. The maternal dietary intake has the potential effect in

reducing the allergic reaction among infants. The preventive action can be done via modulation of maternal nutrition as it can affect the infant's immune system towards allergic reaction. Furthermore, there is still lack of guideline regarding the maternal dietary intake for the allergic prevention among exclusively breastfed infants. Therefore, it is important to construct a guideline module for pregnancy and breastfeeding mothers in order to reduce the risk of allergies among breastfed babies.

Apart from that, there is still lack of awareness and knowledge regarding the prevention of food allergy among children in Malaysia (Din *et al.*, 2018). In 2012, the knowledge regarding the maternal diet during pregnancy is also low in Malaysia (Tenaw, Anega and Teachbele, 2018). The previous study also shows that the need of proper source information and education intervention for better prevention is still significant as the demand for better health is high among population (Din *et al.*, 2018). The positive effect had shown when the intervention was done to improve the knowledge on the food allergy which proved that a guideline module and intervention can help in the prevention of allergies among breastfed infants. This is also supported by Din *et al.* (2018) that the intervention can improve the knowledge on food allergy as it can help to increase knowledge and management of the food allergy among children. Tenaw *et al.* (2018) stressed that maternal nutrition is important for health benefits to both mother and infant but no study had been done regarding knowledge and attitude among pregnant and breastfeeding mothers.

Thus, it is important to construct and validate the maternal guideline module and to identify the knowledge and attitude of intervention via maternal diet guideline module with regards allergy prevention among exclusively breastfed infants.

1.3 PURPOSE OF THE STUDY

This research was conducted to construct a maternal dietary guideline module and validate the module towards prevention of allergic reaction among exclusively breastfed infants. The knowledge and attitude were identified to assess the effectiveness of the intervention via maternal dietary guideline module. The current evidence had shown an increasing number of allergy prevalence among children which is at a worrying state. This is also occur among exclusively breastfed infants that were believed to prevent from allergy when practising exclusive breastfeeding. According to Moossavi, Miliku, Sepehri, Khafipour and Azad (2018) allergic reaction such as asthma can be prevented among breastfed infant if practicing breastfeeding practice. The breast milk contain growth factor, antibodies, and living cell that can protect the breastfed infants from many diseases and infection (Australian Breastfeeding Association, 2017). Despite of many benefits had been addressed, the breastfed infants also reported to experience the allergic reaction without being introduce to the food allergen. Most of breastfed infants also experienced serious allergic reaction such as asthma and eczema that need our attention and action. There are many studies on the importance of breastfeeding practice had been documented but little was known how the allergies also occurs among breastfed infants and how to prevent the allergic among them. Breastfeeding was found to have association with the allergy prevalence among breastfed infants. Maternal diet had been identified to influence the breast milk composition that lead to increase the risk of allergy among breastfed infant. Therefore, modification of maternal diet is essential in the prevention of allergy among breastfed infants. Furthermore, there is no specific guideline for maternal diet during pregnancy and breastfeeding to prevent the allergies among breastfed infants in Malaysia.