

**KNOWLEDGE AND PRACTICE OF PRECONCEPTION  
HEALTH, PERCEPTION AND EXPERIENCE OF  
UTILISING PRECONCEPTION CARE AND ITS  
ASSOCIATION WITH EARLY ANTENATAL BOOKING  
AMONG WOMEN WITH HIGH RISK PREGNANCY IN  
KINTA DISTRICT, PERAK.**

**By**

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## **LIST OF ABBREVIATIONS**

Adj. OR	Adjusted Odds Ratio
BMI	Body Mass Index
CI	Confidence Interval
CDC	Centers for Disease Control
FGD	Focus group discussion
GDM	Gestational Diabetes
IDI	In-depth interview
NICE	National Institute for Health and Care Excellence
PCC	Preconception care
PIH	Pregnancy Induced Hypertension
SD	Standard deviation
STD	Sexually transmitted disease
WHO	World Health Organization

## ABSTRAK

**Pengetahuan dan amalan kesihatan prakehamilan, persepsi dan pengalaman tentang penjagaan prakehamilan dan perkaitan dengan kedatangan awal antenatal dalam kalangan wanita hamil yang berisiko tinggi di Daerah Kinta, Perak.**

Penjagaan prakehamilan adalah pendekatan baru untuk meningkatkan kesihatan kanak-kanak di masa depan melalui pencegahan primer dan untuk memastikan tindakan yang sesuai dan mengelakkan risiko semasa awal kehamilan. Sejumlah besar wanita dikategorikan sebagai kehamilan berisiko tinggi. Kajian ini bertujuan untuk mengetahui pengetahuan dan amalan kesihatan prakehamilan, faktor-faktor yang berkaitan dengan kedatangan awal antenatal dan untuk meneroka persepsi dan pengalaman tentang penjagaan prakehamilan dalam kalangan wanita hamil yang berisiko tinggi di Daerah Kinta, Perak. Ini adalah kajian kaedah campuran yang terdiri daripada kaji selidik rentas kuantitatif dan kajian kualitatif. Survei hirisan lintang telah dijalankan antara Mac dan Disember 2016 di 14 klinik kesihatan di Daerah Kinta, Perak. Wanita yang datang untuk pemeriksaan antenatal kali pertama dipilih secara rawak. Borang soal selidik yang telah divalidasi diberikan kepada peserta. Ia terdiri daripada tiga domain, menilai data sosiodemografi, pengetahuan dan amalan penjagaan prakehamilan. Skor pengetahuan lebih daripada 12 dikategorikan sebagai pengetahuan yang baik, dan skor amalan lebih daripada 8 dianggap sebagai amalan prakehamilan yang baik. Kajian kualitatif melibatkan perbincangan kumpulan berfokus dan temu bual mendalam dijalankan dalam kalangan wanita dengan kehamilan berisiko tinggi yang dipilih secara sengaja daripada mereka yang mengambil bahagian dalam kaji selidik kuantitatif. Sebanyak 490 responden

mengambil bahagian dalam kajian ini. Purata umur responden adalah 29.9 (SD 5.56) tahun. Majoriti responden adalah Melayu, 347 (70.8%). Hanya 23.9% responden yang menghadiri perkhidmatan penjagaan prakehamilan. Secara keseluruhannya, 48.6% responden mempunyai pengetahuan yang baik dan 76.7% mempunyai amalan yang baik untuk kesihatan prakehamilan. Proporsi wanita dengan kedatangan awal antenatal ialah 74.3%. Faktor-faktor signifikan yang dikaitkan dengan kedatangan awal antenatal ialah wanita yang menghadiri perkhidmatan penjagaan prakehamilan (Adj: OR: 1.54; 95% CI: 1.30, 3.98; p = 0.043), kehamilan yang dirancang (Adj: OR: 2.21; 95% CI : 1.42, 3.45; p <0.001) dan amalan kesihatan prakehamilan yang baik (Adj. OR: 1.88; 95% CI: 1.17, 3.01; p = 0.009). Terdapat tiga tema utama dari temubual iaitu: penjagaan prakehamilan adalah untuk merancang keluarga, penjagaan prakehamilan untuk wanita yang mempunyai kehamilan berisiko tinggi dan penjagaan prakehamilan untuk penyediaan kehamilan yang akan datang. Wanita yang menghadiri penjagaan prakehamilan mengalami masa menunggu yang lama dari pendaftaran ke konsultasi, kekurangan privasi dan kerahsiaan, dan memilih untuk berjumpa dengan doktor wanita. Peratusan wanita yang mempunyai kehamilan berisiko tinggi yang menghadiri perkhidmatan penjagaan prakehamilan adalah rendah dan mereka mempunyai pengetahuan yang rendah berkenaan kesihatan prakehamilan. Kebanyakan responden mempunyai persepsi yang salah mengenai penjagaan prakehamilan. Strategi harus memberi tumpuan kepada meningkatkan tahap pengetahuan yang rendah dalam kalangan responden serta salah tanggapan tentang penjagaan prakehamilan seperti yang dikenalpasti dalam kajian ini.

Kata kunci: *Penjagaan prakehamilan, kesihatan prakehamilan, pengetahuan, amalan, kedatangan awal antenatal, persepsi, pengalaman*

## ABSTRACT

**Knowledge and practice of preconception health, perception and experience of utilising preconception care and its association with early antenatal booking among women with high risk pregnancy in Kinta District, Perak.**

Preconception care is a promising new approach to improve the health of future children through primary intervention and to ensure appropriate action and avoid risks in early pregnancy. A greater number of women are being categorized as high risk pregnancies due to shift in maternal age and obesity prevalence. This study aims to determine the preconception health knowledge and practice, factors associated with early antenatal booking and to explore the experiences and perceptions of preconception care among antenatal women with high risk pregnancy in Kinta District, Perak. This is a mixed-method study comprising of a quantitative cross-sectional survey and an exploratory qualitative study. A cross-sectional survey was conducted between March and December 2016 at 14 health clinics in Kinta District, Perak. Women who came for their first antenatal booking were randomly selected. A validated interviewer guided questionnaire was administered. It consisted of three domains, assessing sociodemographic data, knowledge and practice of preconception care. Knowledge score of more than 12 was categorized as good knowledge, and practice score of more than 8 was considered as good preconception practice. The qualitative study using focus group discussion and in-depth interview were conducted among women with high risk pregnancy selected through purposive sampling among those who had participated in the quantitative survey. A total of 490 respondents participated in the study. The mean age was 29.9 (SD 5.56) years old. Majority of

respondents were Malay 347 (70.8%). Only 23.9% of respondents attended preconception care. About 48.6% of the respondents had good knowledge and 76.7% had good practice of preconception health. The proportion of those who attended early antenatal booking was 74.3%. The significant factors found to be associated with early antenatal booking were women who attended preconception care (Adj. OR: 1.54; 95% CI: 1.30, 3.98;  $p=0.043$ ), planned pregnancy (Adj. OR: 2.21; 95% CI: 1.42, 3.45;  $p<0.001$ ) and preconception health practice (Adj. OR: 1.88; 95% CI: 1.17, 3.01;  $p=0.009$ ). There were three major themes emerged from the interview which are: women's perceived preconception care is for family planning, preconception care is indicated for women with high risk pregnancy and preconception care as for preparation for the next pregnancy. Women who attended preconception care experienced long waiting time from the registration to the consultation, lack of privacy and confidentiality, and preferred to be seen by female doctors. Proportion of antenatal women with high risk pregnancy who attended preconception care were low and they had fair knowledge on preconception health. Most of the respondents' perception of preconception care was incomplete. Strategies should focus on improving the low level of knowledge as well as misconception about preconception care as identified in this study.

*Keywords: Preconception care, preconception health, knowledge, practice, antenatal booking, perceptions, experiences.*

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Overview of preconception care**

“Preconception care” is the provision of biomedical, behavioral and social health interventions to women and couples before conception occurs, aimed at improving their health status, and reducing behaviours, individual and environmental factors that could contribute to poor maternal and child health outcomes (Samuel *et al.*, 2006; Ministry of Health, 2013; World Health Organization, 2013). This refers to the formal health services and interventions offered to potential women. This needs to be differentiated from preconception health. “Preconception health” refers to the health of women before they get pregnant (Centers for Diseases Control, 2014). For this thesis, preconception health knowledge and practice refers to knowledge and practice as understood and practiced by women.

Preconception care brings attention to the missing component in the existing health system for addressing the needs of adolescents, women and their partners before pregnancy is planned or occurs. Thus, it offers a process of delivering direct or indirect healthcare interventions with the potential to identify and modify the biomedical, behavioural and social risk factors that determine reproductive health outcomes. It aims at improving the overall health status of adolescents, women and children, as well as ensuring healthy adulthood by targeting risk behaviours for

noncommunicable diseases. A revised document by World Health Organization pertaining to areas addressed by preconception care include nutritional conditions, tobacco use, genetic and medical conditions, infertility, environmental health, interpersonal violence, unwanted pregnancy, sexually transmitted disease, mental health, psychoactive substances use and vaccine preventable diseases (World Health Organization, 2013).

According to the World Health Organization, 4 out of 10 women stated that their pregnancies are unplanned (World Health Organization, 2013). As a result, necessary health interventions provided once a woman and her partner decided to have a child will be too late in 40% of pregnancies. As a consequences, these account for at least 20% of maternal and fetal morbidities and mortalities worldwide (World Health Organization, 2013).

In addition, about 35% of pregnancies among women with untreated gonococcal infections result in low birth weight infants and premature deliveries, and up to 10% result in perinatal death. Estimates indicate that eliminating smoking before or during pregnancy could avoid 5–7% of preterm related deaths and 23–24% of cases of sudden infant death syndrome. Thus, preconception care can make a difference and has a positive effect on a range of health outcomes (World Health Organization, 2013).

Women with high risk condition such as diabetes and hypertension should receive preconception care before they get pregnant. Women with diabetes who obtain preconception counseling have better preconception glycaemic control and were



more likely to have favourable pregnancy outcomes (Abou-Zahr & Wardlaw, 2001). It should be provided by a multidisciplinary team, which includes physician, obstetrician, dietitian, diabetes nurse educator and other health care providers. Women with diabetes should be advised on pregnancy planning and to get pregnant only when the woman has good glycaemic control, has had appropriate assessment and management of comorbidities, and has discontinued potentially unsafe medications during pregnancy and the importance of notifying the health care team without delay in the event of conception (Ministry of Health, 2013).

Pregnancy outcomes remain very poor for women with type 1 and type 2 diabetes, with two to threefold increase in risk of malformations and fourfold increase in perinatal death compared with women without diabetes (Macintosh *et al.*, 2006). Lack of preconception care is a major risk factor for poor pregnancy outcome, with a fivefold increase in risk of either a major malformation or perinatal death (Murphy *et al.*, 2010).

## **1.2 Preconception care in Malaysia**

In Malaysia, preconception care was introduced in 2002. The components of preconception care are; screening for medical conditions and medical risk factors such as overweight, obesity, smoking status, alcohol use and substance abuse; management and optimization of medical conditions and risk factors, for example diabetes, hypertension, heart disease, epilepsy and renal disorders; nutrition and supplementations such as screening for malnutrition, iron deficiency anemia and

folic acid supplementation; and family planning includes contraception services and counselling (Ministry of Health, 2013).

The objectives of preconception care are to deliver preconception services to women and their partners as follows : (1) to achieve a conducive physical and mental condition prior to pregnancy so that the fetus develops in an optimized environment to promote normal and healthy growth; (2) to screen the women for any medical conditions or risk factors and initiate intervention; (3) to manage medical conditions and achieve optimization according to the recommended guidelines; (4) to promote women and their partner to plan their pregnancy by means of counselling, health promotion and education; and (5) to promote healthy life changes in order to achieve positive maternal and foetal outcome (Ministry of Health, 2013).

In Malaysia, currently all government health premises (health clinics and hospitals) provide the service. Preconception care services at health clinics are led by Family Medicine Specialists and Obstetrics & Gynaecologist lead the services at hospital level. A woman need to approach the medical staff to enquire on the service availability and its procedures. All medical and health personnel from health clinics and hospitals are responsible in providing the services. Paramedics are involved in screening and initial counselling. Medical officers and specialists are involved in more specialized care. Health clinics provides preconception care services to most women. However complicated medical conditions with co-morbidities requiring subspecialist care will be referred to the respective hospital (Ministry of Health, 2013).

In Kinta, preconception care starts as early as 6 weeks post-partum especially in very high-risk woman. Every woman attending the health clinic or hospital should be given preconception care services regardless of the reason for the clinic visit. Opportunistic screening identifies risk factors and referral to the doctor if needed. If preconception care is indicated, the woman will be registered and regular preconception care follow-up will ensue (Kinta District Health Office, 2014). The services provided to all women in reproductive age together with other services such as maternal and child health services.

### **1.2.1 Screening for medical conditions and medical risk factors**

All women in child bearing age should be encouraged to get their health risks assessment for cardiovascular health with regards to weight bearing and proposed appropriate lifestyle modifications. Women with body mass index (BMI) of more than 23 kg/m<sup>2</sup> should be counselled on the risks of infertility. Evidence has revealed that preconception underweight and overweight are risk factors for adverse pregnancy and neonatal outcomes (Doherty *et al.*, 2006; Abenheim *et al.*, 2007; Driul *et al.*, 2008; Chen *et al.*, 2009). It is suggested that preconception body mass index should be maintained within the normal range of 18.5–22.9 kg/m<sup>2</sup> and controlled through diet and exercise modifications (Dean *et al.*, 2014). The interventions for healthy diet and exercise should be started from late childhood and early adolescent years to be effective ( Eiben *et al.*, 2005; Black *et al.*, 2010). Routine preconception care with regards to weight should include calculating BMI for women of reproductive age, increasing awareness regarding the risks associated with being overweight or underweight, develop individualized dietary plans

including consumption of a variety of healthy foods in adequate amounts, and dietary supplements (especially a multivitamin containing 400 µg of folic acid, calcium and vitamin D, and iron) (Eiben *et al.*, 2005). A focus on screening, treating and preventing sexually transmitted diseases (STDs) in the preconception period is vital, as well as educating couples about the risk of vertical transmission of such infections to the child (Posner *et al.*, 2006).

### **1.2.2 Management and optimization of medical conditions and risk factors**

Women with chronic health illnesses such as diabetes, hypertension or hyper/hypothyroidism should be counselled about the risks associated with their disease during pregnancy, and the essential to change medication treatments while pregnant or conceiving to optimize hormonal levels and to prevent any drug related harm to the fetus. Management and counselling of diabetic women during the preconception period is much more beneficial than during pregnancy (Ray *et al.*, 2001; Wahabi *et al.*, 2010). Preconception care for women with pre-gestational diabetes should include education about the importance of strict glycaemic controls with an HbA<sub>1C</sub> level of less than 6-7% to prevent congenital anomalies; teaching on self-monitoring targets; advised on the effect of poor glycaemic control on maternal complications and fetal complications; advised about diet (as per protocol for diabetes); and healthy physical activity for weight management (Lassi *et al.*, 2014). Screening to detect pre-diabetic or type 2 diabetes is crucial for high risk women who are obese or overweight or those who have a strong family history of diabetes (Ray *et al.*, 2001).

### **1.2.3. Nutrition and supplementations**

Folic acid supplementation is a primary prevention in reducing the risk of neural tube defects (NTDs) in the newborn (Virget *et al.*, 1990; Kirke *et al.*, 1992; Suarez *et al.*, 2000). However, many women are still unaware of how much their nutritional status influences their pregnancy outcomes, and improving women's nutritional behaviours should therefore begin during their earlier reproductive years. Women who plan to conceive should take 400ug of folic acid three months prior to pregnancy (World Health Organization, 2009). Women who had previously given birth to an infant with a NTD require higher levels of folic acid supplementation (800µg). Health provider should assess women's dietary habits and discuss the significance of micronutrients as part of routine preconception counseling. Other nutrition specific interventions such as iron and calcium supplementations should be emphasize on women who planned to get pregnant (Angeles *et al.*, 2005).

### **1.2.4 Family planning**

Inadequate delivery of family planning interventions, resulting in unintended pregnancies, subsequent abortions, and maternal mortality (World Health Organization, 2013). A recent report demonstrated a high unmet need for family planning in developing countries with the lowest contraceptive prevalence rates (Bhutta *et al.*, 2015). The evidence revealed the risk of long (>60 months) and short inter-pregnancy intervals (<6 months) on preterm births, low birth weight and small for gestational age babies (Conde *et al.*, 2005; DeFranco *et al.*, 2007; Cecatti *et al.*, 2008). The evidence suggests that counselling can help women understand the

possible risks to themselves and their children of very short and very long interpregnancy intervals, and the risks of having an unintended pregnancy and unsafe abortion (Solo *et al.*, 1999). Women should be counseled to wait for 18-24 months after pregnancies ending in a live birth, and at least 6 months after an abortion before trying to conceive again, and should be provided with appropriate contraceptive interventions.

### **1.3 Early antenatal booking**

Antenatal care is a continuum of preconception care. Based on the survey by the Ministry of Health Malaysia, only 67% of women came for early antenatal booking in 2013 (Norzarina *et al.*, 2015). Women who had attended preconception care are more likely to have early antenatal booking (Abou-Zahr & Wardlaw, 2001). This is because women who had preconception care before pregnancy received advice on the importance of early contact for antenatal booking (Temple *et al.*, 2006).

Many experts have strongly recommended that pregnant women should begin antenatal care during the first trimester to receive timely risk assessment or education (Johnson *et al.*, 2003). Early antenatal booking is associated with many benefits which include accurate dating, early detection of medical disorders that could threaten the pregnancy and its outcome, as well as objective assessment of maternal baselines such as weight, blood pressure and urinalysis that may provide a picture of the preconception condition of the woman (Abou-Zahr & Wardlaw, 2001). Furthermore, early antenatal booking has been linked with optimal utilization and

appreciable reduction of perinatal morbidity and mortality, irrespective of the place of care (Abou-Zahr & Wardlaw, 2001).

Many women are unaware that they are pregnant until they miss their menstrual cycle, which can occur approximately six to eight weeks into their pregnancies; accordingly, these women have their first antenatal booking during or after this period (Brundage, 2002). The first trimester is a crucial period for the development of important organs. Thus, major poor outcomes have already been determined prior to these women's first antenatal booking. Counselling and prevention efforts implemented after the organogenesis period, therefore do not improve outcomes related to congenital malformations (Moos, 2004).

#### **1.4 Problem statement**

Preconception care is widely recognized as a way to optimize women's health through biomedical and behavioural changes prior to conception, ultimately to improve pregnancy outcomes (Dean *et al.*, 2012). In terms of prevention, preconception care is one of the primary prevention strategies for the future baby and prospective women (De Weger *et al.*, 2011).

Preconception care is important to reduce several risk behaviours and exposures that can affect fetal development and subsequent outcomes (Hood *et al.*, 2007). Therefore, it should be planned to address reproductive system problems, to reduce environmental hazards, toxins and medications that are known teratogens, to promote nutrition and folic acid intake, to advise on weight management, to detect problems

related to genetic conditions, family history, substance use, chronic diseases and infectious diseases, to advise on vaccinations, family planning, psychosocial concern, domestic violence, and housing. In addition to this, preconception care is also associated with increase antenatal care, delivery care and post natal care service utilizations which are the corner stone to improve maternal and child health (American College of Obstetricians and Gynecologists, 2005).

Despite the interventions in place, progress in maternal and child health outcomes over the last 20 years has been slow globally. Studies showed that less than 1/3<sup>rd</sup> of women of childbearing age visited health institutions and speak with a health care provider prior to pregnancy about their health status and its potential impact on pregnancy outcome (World Health Organization, 2013). Studies have shown that the women's preconception health knowledge and practice in developing countries is low (Tieu *et al.*, 2010; Dunlop *et al.*, 2013; Ahmed KM *et al.*, 2015). A study by Rosnani et al in 2016 showed women attending maternal health clinic in Kelantan have fair knowledge towards preconception care however, they have poor preconception care practices (Rosnani *et al.*, 2016).

Preconception care is a neglected but a critical component of maternal and child health care services (Geffen D, 2007). Therefore, in settings where there is low awareness of preconception care, promotion of preconception care among reproductive age group women is important to boost maternal health care services and to reduce complications during antenatal care, institutional delivery and post natal care.



## **1.5 Rationale of the study**

Various studies have reported that maternal and perinatal morbidities or mortality were associated with late antenatal clinic attenders. However, there is very limited study regarding factors influencing early antenatal booking among women with high risk pregnancy in Malaysia. Pregnancy outcomes of women who book late were significantly poorer than those who book early, due to high preterm delivery rates, low birth weight babies, and a very high incidence of caesarean section rates. The higher incidence of antenatal complications such as antepartum haemorrhage and anaemia among the late bookers are factors that lead to poor outcomes for the infant and mother (Owolabi *et al.*, 2008).

Based on Ministry of health report on maternal mortality, we are now witnessing a changing trend in maternal deaths from direct obstetric causes to indirect maternal deaths (Ministry of Health, 2013). These indirect causes such as maternal anemia, preexisting diabetes and heart diseases are preventable death. By addressing the importance of preconception care among women with high risk condition will lead to reduction in indirect causes of maternal death.

In Kinta, the number of antenatal women with high risk condition is increasing in number whereas the uptake of preconception care is still low (Kinta District health Office, 2014). There is a need to look at why the utilisation of preconception care among women with high risk condition is low.

A cohort study among postnatal women found that women who utilized preconception care were more likely to attend early for antenatal service than women who do not use preconception care services (Liu *et al.*, 2006). Thus, preconception care is very important with many advantages towards fetal and maternal outcomes. Firstly, there is convincing evidence that health and nutritional problems such as anaemia and obesity, vaccine preventable diseases such as rubella, and mental health problems such as depression, contribute to poor maternal and child health outcomes. There is also convincing evidence that health damaging behaviours e.g. tobacco and alcohol use, and risk factors e.g. individual genetic conditions such as thalassemia, may contribute to poor maternal and child health outcomes as do too early and rapid, successive pregnancies. These factors may be addressed through effective preconception care services.

Secondly, there are effective biomedical, behavioural and social interventions that when delivered before conception occurs, address many health behaviours problem. For example, rubella vaccination can prevent congenital rubella and folic acid supplementation can prevent neural tube defects. Thus, preconception care can contribute to reducing maternal and childhood mortality and morbidity.

Preconception care could result in large health and social benefits to the community. By supporting women to make well-informed and well-considered decisions about their fertility and health, preconception care could contribute to social and economic development of families and communities. In addition to that, there is a need to see

how knowledge and practice on preconception health associated with early antenatal booking. Furthermore, there is a lack of clarity about women's understanding of preconception care which could not be answered using a questionnaire.

Therefore, the main aim of this study was to look into high risk women's understanding regarding preconception care which will help in estimating the preconception care needs of high risk group of women and which in turn could help to prepare the necessary resources and strengthen programs for better maternal health services. The other main purpose of the current study was addressing the knowledge and practice gap with regard to factors associated with early antenatal booking among women with high risk pregnancy. Understanding the factors benefit in a way that women as well as care givers intervene on those factors. This study is also believed to benefit many concerned stakeholders in decision making and policy development.

### **1.6 Research questions**

1. What is the proportion of antenatal women with high risk pregnancy who had attended preconception care in Kinta district, Perak?
2. What are the level of preconception health knowledge and practice among antenatal women with high risk pregnancy in Kinta district, Perak?
3. What are the factors associated with early antenatal booking among women with high risk pregnancy in Kinta district, Perak?
4. What is the perception and experience of women with high risk pregnancy in Kinta district, Perak with regards to preconception care?

### **1.7 General objective**

To determine the preconception health knowledge and practice, factors associated with early antenatal booking and to explore the experiences and perceptions of preconception care among women with high risk pregnancy in Kinta District, Perak.

### **1.8 Specific objectives**

1. To determine the proportion of antenatal women with high risk pregnancy who attended preconception care in Kinta District, Perak.
2. To determine the level of preconception health knowledge and practice among antenatal women with high risk pregnancy in Kinta district, Perak
3. To determine factors associated with early antenatal booking among antenatal women with high risk pregnancy in Kinta District, Perak.
4. To explore the perceptions and experiences of preconception care among antenatal women with high risk pregnancy in Kinta District, Perak.

### **1.9 Research hypotheses**

Early antenatal booking was associated with attending preconception care, level of preconception health knowledge and practice, sociodemographic and obstetric characteristics of antenatal women with high risk pregnancy in Kinta district, Perak.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter summarises the current understanding of preconception care, preconception health knowledge and practice, barriers to uptake of preconception care and factors contributing to early antenatal booking. A literature search was conducted using Science Direct, Scopus and PubMed for articles with no date limitations using a search strategy combining the MESH terms: “preconception” and “antenatal booking” and “knowledge” and “practice”. When relevant articles were located and reviewed, we searched their reference lists for additional articles.

#### **2.2 Preconception care**

Every pregnancy should be a safe and wonderful experience for both women and offspring. Ideally, women of reproductive age-group should be in their optimal health status to prepare for any possible future pregnancy. Hence, the National Institute for Health and Care Excellence (NICE) has published some recommendations for preconception care (PCC). Preconception care should provide a comprehensive information to the women, such as risks and outcomes of pregnancy, importance of pregnancy planning and contraception, body weight, proper dietary advice, as well as medications to be avoided and health status assessment (Earle *et al.*, 2017). In addition, The Centers of Disease Control and Prevention suggested

health insurance coverage on preconception care for women with low incomes, as well as public health surveillance on the impact of preconception care in order to increase the evidence to promote preconception care (CDC, 2014).

The aim of preconception care is to empower women and optimize their health prior to conception for better pregnancy outcomes (Nik Mazlina *et al.*, 2014; Sri Wahyu, 2015; Earle *et al.*, 2017). Another objective of preconception care is to prevent high risk pregnancies, i.e. pregnancies which are ‘too many, too close’, and occurred among women who are ‘too young or too old’ (Sivanesaratnam, 1988). Genuis (2017) summarized preconception care into two broad approaches, i.e. to ensure maternal nutritional and physiological adequacy and to avoid or minimize toxic exposure, be it from the environment or social behavioral toxics.

However, several limitations of preconception care was identified by different authors. Mahmud and Mazza (2010) found that for type two diabetes, different guidelines (American Diabetes Association versus NICE guidelines) had set different target to achieve, as well as different management options prior to conception. For example, there was insufficient specific and practical recommendations on the types of contraception most suitable for these patients and the duration of preconception folate supplementation that these women should take. Teenagers were not included in preconception care due to social norms and they were not aware of its importance (Omar *et al.*, 2010).

### **2.3 Preconception care services**

The scope of preconception care as mentioned earlier include screening and optimizing medical conditions and medical risk factors, nutrition and supplementations, family planning, patient's education and informed choice regarding pregnancy risks, management options and reproductive alternative (Sri Wahyu, 2015). Preconception care should be started as early as six weeks postpartum, or at least three months before conception (Sri Wahyu, 2015). Ideally, the service should be offered to every woman at all times in all health facilities, regardless of the reason for visit, i.e. via opportunistic screening. Therefore, preconception care should be integrated into all health services at all levels (CDC, 2014).

A study was conducted to evaluate the effectiveness of preconception care services in Hungary between 1984 and 2010. The author found that the rate of preterm birth had reduced significantly during this period, due to preconception screening and treatment of sexually transmitted diseases among women. There was also a reduction in congenital abnormalities such as neural tube defects and congenital cardiac malformations. More males were seen to participate in family planning health system, and more couples with preconception risk factors had better access to secondary care (Czeizel, 2012).

## **2.4 Women with high risk pregnancy and preconception care**

In Malaysia, all pregnant women attending antenatal care will be stratified according to their risk factors and the level of care needed, by using color coding system. Those with eclampsia, pre-eclampsia, heart disease, uncontrolled diabetes, antepartum hemorrhage, abnormal fetal heart activity, severe anemia, premature contraction, leaking without uterine contraction, severe asthmatic attack, epilepsy and prolonged fever of more than five days will be coded as 'red', which required urgent referral to hospital and shared care between Obstetrics and Gynecology Specialist and Family Medicine Specialist. This is followed by other color coding of yellow, green and white. White color coding indicates antenatal women without any risk factors classified under other color coding and can be managed by staff nurses and community nurses (Ministry of Health, 2013).

In a recent cross-sectional study conducted among primary care clinics in Selangor, the authors classified high-risk women as those tagged with yellow and red coding, while green and white coding as low risk women. Of 522 participants, 28% were classified as high-risk women and 20% of these high-risk women had attained the age of 35 years and above. Malays constituted 67% of high risk women in this study, and 2.1% were teenage pregnancies (Yeoh *et al.*, 2016). Another study examined the use of contraception among Malaysian married women within the age of 18 to 50. The authors found that among 450 participants, 54.4% had hypertension, 53.3% had diabetes, 11.3% had connective tissue diseases and 4.2% had heart disease. Despite these illnesses, 71.2% of the diabetic women, 68.6% of women with connective



tissue diseases, 65.3% of hypertensive women and 26.3% of women with heart disease had unmet needs of family planning (Manaf *et al.*, 2012).

Other researchers had analyzed data from prepregnancy screening forms collected from government primary health care clinics in Selangor. Majority of the women (80.8%) had unmet need of contraception despite having risks for pregnancy and 35.2% were either overweight or obese (Nik Mazlina *et al.*, 2014). Another case-control study examined the associated factors with low birth weight babies at selected primary care clinics in Malaysia. They reported that preconception consultation was low in both case (2.6%) and control (4.2%) and the authors also found that unplanned pregnancy and women who did not take folic acid supplementation at their preconception stage were at higher risk to have low birth weight babies (Sutan *et al.*, 2016).

A cross-sectional study conducted in Brazil among antenatal women revealed that 28.4% of the respondents were teenagers. A higher proportion of preconception health behaviors adoption was observed among women with planned pregnancy (19.6%) as compared to women with ambivalent pregnancy (4.4%) (Borges *et al.*, 2016). A systematic review was conducted to identify the uptake of preconception care among women with chronic health conditions. The researchers found that the prevalence of uptake of preconception care occurred between 18.1% and 45% among these women. The prevalence was dependent largely on their health condition, i.e. women with type one or type two diabetes were usually being focused more as compared to other chronic health conditions such as overweight or obesity (Steel *et al.*, 2015). Data from United States Pregnancy Risk Assessment Monitoring System

showed that among preconception women, 21.9% were obese, 1.8% had diabetes, 6.9% had asthma, 2.2% had hypertension, 1.2% had heart problem and 10.2% had anemia, while 23.2% used tobacco and 50.1% used alcohol. However, only 30.3% of women had prepregnancy health counselling before getting pregnant (D'Angelo *et al.*, 2007).

A study using national database in United States had found that among women aged 19 to 45 years old, 27% of pregnant women and 39% of non-pregnant women had chronic illness. Among all these women, majority had mood disorders, followed by arthritis, hypertension, asthma, thyroid disease, chronic obstructive pulmonary disease, heart disease, diabetes, cancer and substance abuse (Chatterjee *et al.*, 2008). Hence, it is important that more people are aware of the availability of preconception care and use the service to optimize their health status before conception.

A study carried out in China found that abnormal prepregnancy body mass index was associated with preterm birth. Whereas taking preconception folic acid supplementation was able to reduce the risk of preterm birth in all women (Wang *et al.*, 2015). Maternal obesity was also related to stillbirth, gestational diabetes, childhood obesity and glucose intolerance in the next generation (Mullins *et al.*, 2016). Another study was also conducted in China to look at preconception anemia. It was found that 77.8% of women within reproductive age-group had anemia (hemoglobin level less than 120g/dL) at their preconception stage. These women were then being followed up until they get pregnant and delivered. Then the authors discovered that women with preconception moderate anemia had 6.5 times greater risk of delivering a low birth weight babies and five times greater risk of having fetal

growth retardation (Ronnenberg *et al.*, 2004). Potential women seem to be unaware of the optimal health status that they should have before they become pregnant.

Babies who born to women with pre-existing diabetes has higher risk of developing congenital malformations such as cardiac abnormality and neural tube defects. This is especially true if they do not achieve optimal glycemic control during early pregnancy (less than 10 weeks gestation), which is also the critical period of organogenesis (Hawthorne, 2005; Lassi *et al.*, 2014). Preconception care was shown to be effective in optimising HBA1c especially during first trimester of pregnancy (Lassi *et al.*, 2014). Despite this, approximately 40 to 80% of women with diabetes did not plan their pregnancy, therefore they failed to seek preconception care (Hawthorne, 2005). Another study estimated that approximately one third of women with pre-existing diabetes attending preconception care (Earle *et al.*, 2017). The literatures suggested that women with pre-existing diabetes to start taking folic acid three months prior to conception and stop smoking, in addition to optimize their blood glucose control and review their diabetes complications if any (Hawthorne, 2005; MOH, 2013; MOH, 2015).

Women who entered pregnancies with chronic hypertension had higher risk of pre-eclampsia and other organ dysfunctions. Their fetus posed increase risk of intrauterine growth retardation, low birth weight, fetal loss and placental abruptio. Fetal exposure to certain unsuitable antihypertensive drugs early in pregnancy was associated with fetal hypospadias (Lassi *et al.*, 2014). Meanwhile, women with congenital heart disease faced the risk of recurrence in their offspring, which varies from 3% to 50% (Canobbio *et al.*, 2017). In a study providing preconception care

counselling to 50 women with Fontan circulation, 19 had decided to proceed with pregnancy despite being counselled regarding the severity of their disease and pregnancy risks. Therefore, the authors suggested that other factors were more important in affecting the women's decision on conception rather than their disease severity alone (Cauldwell *et al.*, 2016).

Another study was conducted among 139 women with chronic kidney disease in Japan. The authors found that 28% of these women had progressed from lower to higher chronic kidney disease stage during pregnancy while 20.1% had developed pregnancy-induced hypertension. Factors associated with the deterioration of renal function among women with chronic kidney disease include glomerulonephritis, significant proteinuria prior to pregnancy and treatment with antiplatelet agents (Fukasawa *et al.*, 2016). In another cohort study, the authors found that 60% of the women with chronic kidney disease on regular dialysis delivered prematurely, and 60% of them developed pre-eclampsia. All of them required more intensified dialysis and erythropoietin-stimulating agents during pregnancy (Chang *et al.*, 2016). Hence, these women should be counselled prior to pregnancy regarding all the possible unwanted outcomes of pregnancy.

There are other diseases which increase the risk of undesired outcomes to both women and fetus. For example, women who had thyroid disease stand a greater risk for both maternal and fetal complications, such as hypertensive disorders of pregnancy, spontaneous abortion, congenital anomalies and preterm birth. Ideally, the women should be at euthyroid state at conception and the risk of pregnancy be well-explained to these women, as well as anti-thyroid drugs side effects to the

pregnancy (Lassi *et al.*, 2014). Systemic lupus erythematosus (SLE) is an autoimmune disease frequently found among women of reproductive age-group. A systematic review discovered that an active disease state at conception was associated with three-times higher risk of pregnancy-induced hypertension, 77% higher rate of another flare during gestation and increase risk of preterm births (Lassi *et al.*, 2014). Women with SLE should be stratified according to their disease severity and activity state during preconception care, and only those in disease remission state were safe to plan for pregnancy (Knight and Nelson-Piercy, 2017). Meanwhile, systematic review found that women with epilepsy who had received preconception counselling had no abnormal fetus in their subsequent pregnancy compared to 19% of control who had abnormal fetus and three pregnancy terminations. Women with epilepsy frequently had unplanned pregnancy due to interactions of anti-epileptic drugs with contraception. Thus, preconception care focus on these women were needed to revise their diagnosis and the necessity to continue with anti-epileptic drugs, optimization of drugs and folic acid supplementation to prevent neural tube defects (Lassi *et al.*, 2014).

## **2.5 Preconception health knowledge and practice**

Knowledge is one of the determinants of health literacy (WHO, 2009). Without adequate knowledge, people are unable to make appropriate decision for their health. Pregnancy is an important life stage for a woman and a critical phase that determine a baby's health. It requires optimal health status to achieve optimal outcomes. However, not all women have adequate knowledge and practice to prepare for the journey of pregnancy.

A cross sectional study in Ethiopia revealed that the knowledge of preconception care were poor among the reproductive age-group women. Majority (68.2%) never heard about preconception care and did not know where to obtain preconception care services. Eighty percent did not know why preconception care was needed while 69% did not know the importance of preconception care. Women's age, history of family planning usage and educational status of the women and spouse were found to be the predictors for knowledge scores on preconception care (Ayalew *et al.*, 2017). Meanwhile, health care providers perceived that future parents did not feel the need for preconception care and had poor knowledge on preconception care in general. Even general practitioners were reluctant to deliver preconception care to their patients as it was not a cost-effective form of care (M'hamdi *et al.*, 2017).

In Qatar, a study was done to assess the knowledge of women in reproductive age-group regarding folic acid and factors associated with its usage. The authors found that 53.7% had never heard about folic acid. Among these women, only 14% knew that folic acid can help to prevent congenital malformations in fetus. Majority of them (63.4%) knew about folic acid from their doctors. However, only 20.3% of the respondents took folic acid supplements. The women's age and total number of pregnancy were not significantly associated with the intake of folic acid supplement before pregnancy. The higher the educational level of the women, the more likely that they were aware of the importance of folic acid and took them before or during pregnancy (Bener *et al.*, 2006).