

ASSESSMENT OF PHYSICAL ACTIVITY
AMONG PREGNANT WOMEN IN
HOSPITAL USM

by

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ABSTRAK

Mengawal berat badan semasa hamil adalah penting dan ia menjadi kebimbangan kepada kesihatan awam kerana berat badan yang berlebihan semasa mengandung boleh menjadi isyarat bermulanya obesiti. Wanita yang aktif melakukan senaman mempunyai kurang risiko berat badan berlebihan semasa hamil berbanding wanita yang mempunyai gaya hidup yang sedentari. Oleh itu, kajian keratan rentas ini dilakukan untuk mengkaji purata penggunaan tenaga dalam seminggu dan juga untuk menyiasat hubungan antara penggunaan tenaga dan kenaikan berat badan semasa mengandung dalam kalangan wanita hamil. Seramai 149 wanita mengandung yang berumur 19 hingga 40 tahun dari Klinik Obstetrik & Gynegology di Hospital USM, Kubang Kerian, Kelantan telah dipilih. Responden mengisi sendiri borang soal selidik iaitu Pregnancy Physical Activity Questionnaire(PPAQ). Selain itu, tinggi dan berat pra-kehamilan telah diambil sama ada daripada rekod perubatan atau dilaporkan sendiri oleh responden untuk menentukan pra-mengandung Indeks Jisim Badan (BMI). Kenaikan berat badan semasa mengandung telah ditentukan berdasarkan garis panduan Institute of Medicine (IOM) 2009. Hasil kajian menunjukkan bahawa dalam kalangan 149 responden, 27.5% responden adalah pada trimester kedua manakala 72.5% responden lagi berada di trimester ketiga kehamilan dan kebanyakan responden tidak mencapai berat badan yang disyorkan oleh garis panduan IOM. Separuh daripada responden terlibat dengan senaman sebelum hamil tetapi semasa mengandung kurang dari 20% daripada mereka melakukan senaman. Ketakutan terhadap kecederaan atau bahaya serta kekurangan masa merupakan sebab-sebab utama yang diberikan oleh responden untuk tidak bersenam. Hasil dari PPAQ menunjukkan bahawa aktiviti rumah dikira dalam jam MET / minggu

menyumbang kepada jumlah penggunaan tenaga tertinggi dalam kalangan responden. Manakala penilaian aktiviti responden mengikut kelas intensiti menunjukkan bahawa responden menghabiskan paling banyak tenaga dalam aktiviti ringan. Tiada hubungan yang signifikan antara jumlah penggunaan tenaga dan kenaikan berat badan di kalangan wanita hamil ($r = -0,009$, $p = 0.92$). Di samping itu, terdapat penurunan intensiti aktiviti fizikal dari trimester kedua ke trimester ketiga kehamilan, walaubagaimanapun, hanya terdapat perbezaan yang signifikan dalam aktiviti sedentari ($p = 0.037$). Kesimpulannya, walaupun keputusan ini tidak menunjukkan perkaitan antara penggunaan tenaga dan kenaikan berat badan semasa mengandung tetapi kajian lain menyokong bahawa aktiviti fizikal boleh mengurangkan risiko kenaikan berat badan berlebihan semasa mengandung. Maka, kajian selanjutnya perlu dijalankan di kawasan tempatan untuk menyesahkan penemuan kajian ini.

ABSTRACT

Controlling weight gain during pregnancy is important and of public health concern because excess weight gain during pregnancy could be the signal of the onset of 'creeping obesity'. Women who were active doing exercise had a low risk of excessive gestational weight gain than women who were had sedentary lifestyle. Hence, this cross sectional study was carried out to examine physical activity and also to investigate the association between physical activity and gestational weight gain among pregnant women. A total of 149 pregnant women that aged 19 to 40 years from the Obstetrics & Gynaecology Clinics at Hospital USM, Kubang Kerian, Kelantan were selected. Participants self-administered the Pregnancy Physical Activity Questionnaire (PPAQ) and height and pre-pregnancy weight were taken from either medical record or self – reported to calculate pre-pregnancy body mass index (BMI). The gestational weight gain was determined using the 2009 Institute of Medicine (IOM) guidelines. The results showed that among 149 respondents, 27.5% was in second trimester while another 72.5% was in third trimester of pregnancy and most of the respondents did not achieve the recommended weight gain rate. Half of respondents engaged with exercise before getting pregnant but during pregnancy less than 20% of them were exercising. Fear of injuries or danger plus lack of time were the main reasons given by respondents for not exercising. The results from PPAQ showed that household activity calculated in MET hour/week constituted the largest amount of energy expenditure among respondents. Meanwhile, an evaluation of respondent's activity according to classes of intensity showed that light activity constituted the highest amount of energy expenditure among

respondents. There was no significant correlation between total energy expenditure and weight gain among these pregnant women ($r = -0.009$, $p = 0.92$). However, there was a decrease in physical activity intensities from second trimester to third trimester of pregnancy. But, the difference was statistically significant only for sedentary activity ($p = 0.037$). In conclusion, although the result showed that there is no association between energy expenditure and gestational weight gain, other studies had suggested that physical activity can reduce risk of excessive gestational weight gain. Therefore, further studies need to be carried out in local setting in order to confirm the current findings.

DECLARATION


I declare that this report entitle “Assessment of Physical Activity among Pregnant Women in Hospital USM” is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : 

Name : NIK FARHANA BT NIK KHAIRU ZAMAN

Date : 07 July 2013

I hereby declare that I have read through this report entitle “Assessment of Physical Activity among Pregnant Women in Hospital USM” and found that it has comply the partial fulfilment for awarding the degree of Bachelor of Health Science (Nutrition). I am satisfied with her work and no objection for the thesis to be examined by the appointed examiners by the School of Health Sciences, Universiti Sains Malaysia (USM). Thank you.

Signature : 

Supervisor's Name : DR. SOO KAH LENG

Date : 07 July 2013

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CHAPTER 1

INTRODUCTION

1.1 Study Background

Regular physical activity is important in all stages of life including during pregnancy. Physical activity can be defined as any bodily movement produced by skeletal muscles that result in energy expenditure. However it is distinct from exercise in which it means any planned, structured and repetitive bodily movements that are performed to improve physical fitness. Physical activity can be categorised by three different components namely occupational work, household or other chores and leisure – time physical activity (MDG, 2010). Physical activity can maintain or improve the health status and prevent the development of chronic diseases. Due to the current rapid rises of diseases such as diabetes, arterial hypertension, cardiovascular disease and obesity, the importance of physical activity is emphasized as it is the best way for the prevention and the treatment of these diseases (Wojtyla *et al.*, 2012). According to WHO (2009), physical activity can give positive benefits to health but sedentary or inactive is risk factor for mortality and causing an estimated 6% of death globally (WHO, 2009).

The NHMS III that had been conducted in 2006 reported that about 5.5 million Malaysian adults were physically inactive, which represented 43.7% of adults

population. Women were significantly inactive (50.5%) compared to men (35.3%) (MDG, 2010). In a new research finding shows that men were more active (16%) than women (10%) (Poh *et al.*, 2010). Apart from that in Ireland, the prevalence of pregnant women who are exercise is 21.5% while 11.7% reported no physical activity at all (Walsh *et al.*, 2011). Obviously, there is still low awareness about physical activity among Malaysian women and same goes to pregnant women.

Pregnancy can cause many physiological changes and the ability of pregnant women to perform exercise is limited. Furthermore, pregnant women are worried to do exercise during pregnancy because they perceived physical activity would give negative impact to their body system as well as the development of their fetus. Recently, new findings shows that there is no adverse effect to the maternal and baby outcomes when pregnant women doing moderate physical activity (Davies *et al.*, 2003).

Moreover, regular moderate physical activity gives a lot benefits to the mothers and babies. The potential maternal benefits included, improve cardiovascular function, improve body endothelium function, also in type 2 diabetes (DeSouza *et al.*, 2000; Maiorana *et al.*, 2001), reduced in pregnancy weight gain (Ghodsi and Asltoghiri 2012; Jiang *et al.*, 2012), reduced risk of occurrence of preeclampsia (Sorensen *et al.*, 2003; Saftlas *et al.*, 2004) and gestational diabetes (Dyck *et al.*, 1999; Dempsey *et al.*, 2004), low back pain, reduced depression (MS.Poudevigne and O'Connor 2005; Poudevigne and PJ.O'Connor 2006), less complicated labour (Beckmann, 1990) and lower frequency

of caesarean section (Beckman, 1990; Clapp, 1990). Besides that, pregnant women who are active at early pregnancy show an improve of growth of placental and its size become large, and increase amount of placental villi (Jackson *et al.*, 1995; Clapp, 2003). As a result, blood flow to placenta increased as well as the transport of oxygen and nutrients also increased to the fetus and this gives positive effect on the development of the fetus (Clapp, 2003). Meanwhile, fetal benefits included lower fat mass or fatty tissue, accelerate the neuro-behavioural maturity of the fetus and improve the tolerance to stress.

As mentioned earlier, women who were active doing exercise had a low risk of excessive gestational weight gain than women who were had sedentary lifestyle (Jiang *et al.*, 2012). During pregnancy, maternal metabolism will be changed especially maternal weight gain that normally increase approximately 9 – 10 kg of body weight (Barakat *et al.*, 2011). But extra weight gain during pregnancy can have complication and high susceptibility for maternal overweight, obesity and bad complication to the maternal health status (Mottola *et al.*, 2010). Controlling weight gain during pregnancy is important of public health concern because weight that is gained during pregnancy could be the signal of the onset of ‘creeping obesity’ and associated with health problem (Brown, 2002). Since Malaysia had been facing with the epidemic of overweight and obesity which had been proved by the news that stated Malaysia had rank in first place among ASEAN countries and in Pacific Asia, Malaysia is in rank number six that had most obese people (MOH, 2011).

As we already knew that moderate physical activity gives positive effect to both mothers and babies, there is also negative effect. Too aggressive in terms of doing physical activity among pregnant mother can lead to low birth weight and increase the risk of premature delivery, whereas low to moderate exercise could prevent them from happening (Magann *et al.*, 2002; Both *et al.*, 2010). According to WHO (2012), low birth weight can be defined as a newborn baby which weighing less than 2,500 grams, and lately the prevalence of low birth weight among lives birth in Malaysia is 11% from year 2005 – year 2010 (WHO, 2012). Some studies indicate the incidence of low birth weight in Hospital Kuala Lumpur is 13.5% among lives birth (Tahir *et al.*, 1991) and in Lundu Hospital, Sarawak which is 11.84% of low birth weight among lives birth (Yadah, 1994). This percentages show that the prevalence of low birth weight in Malaysia is still in public health concern.

While summing up the above information it should be emphasized that both excessive intense physical activity and sedentary lifestyle give negative effects to pregnant mother, development of fetus, types of delivery and also the state of baby in later life (Wojtyla *et al.*, 2012). And pregnant women who are engaged in physical activity can contribute positively to health without negative effects on fetal condition or outcome of labour and delivery.

1.2 Rationale

This study is important because there is limited study regarding physical activity among pregnant women in Malaysia. This study aimed to assess energy expenditure and identify the barriers of physical activity among pregnant women. Moreover, this study identified the association between physical activity and gestational weight gain. Gestational weight gain is important during pregnancy. Because too little weight gain during pregnancy resulting low birth weight or premature delivery meanwhile too much weight gain during pregnancy can lead to macrosomia which can affect the later life of infant and mother. So, exercise is important in maintaining a body weight and attempts to encourage women to remain active during and following pregnancy should be supported. Apart from that, this study can make an important contribution to public health through lowering the burden of illness due to overweight and obesity. Besides, this study can give some ideas in promoting physical activity during pregnancy because it assessed and identified the factors that prevent pregnant mothers from doing physical activity. Researchers also accessed the level of knowledge among pregnant women regarding the benefits of physical activity and identified some sources that provided pregnant mothers with such information.

1.3 Objectives

General Objective

- To investigate physical activity among pregnant women in Hospital USM

Specific Objectives

- To assess energy expenditure during pregnancy
- To identify the barrier and benefits perception of physical activity among pregnant women
- To compare intensity of energy expenditure between second trimester and third trimester of pregnancy
- To investigate the relationship between energy expenditure and gestational weight gain among pregnant women

1.4 Hypothesis

Ho: There is no association between energy expenditure and gestational weight gain among pregnant women.

HA: There is association between energy expenditure and gestational weight gain among pregnant women.

1.5 Conceptual Framework

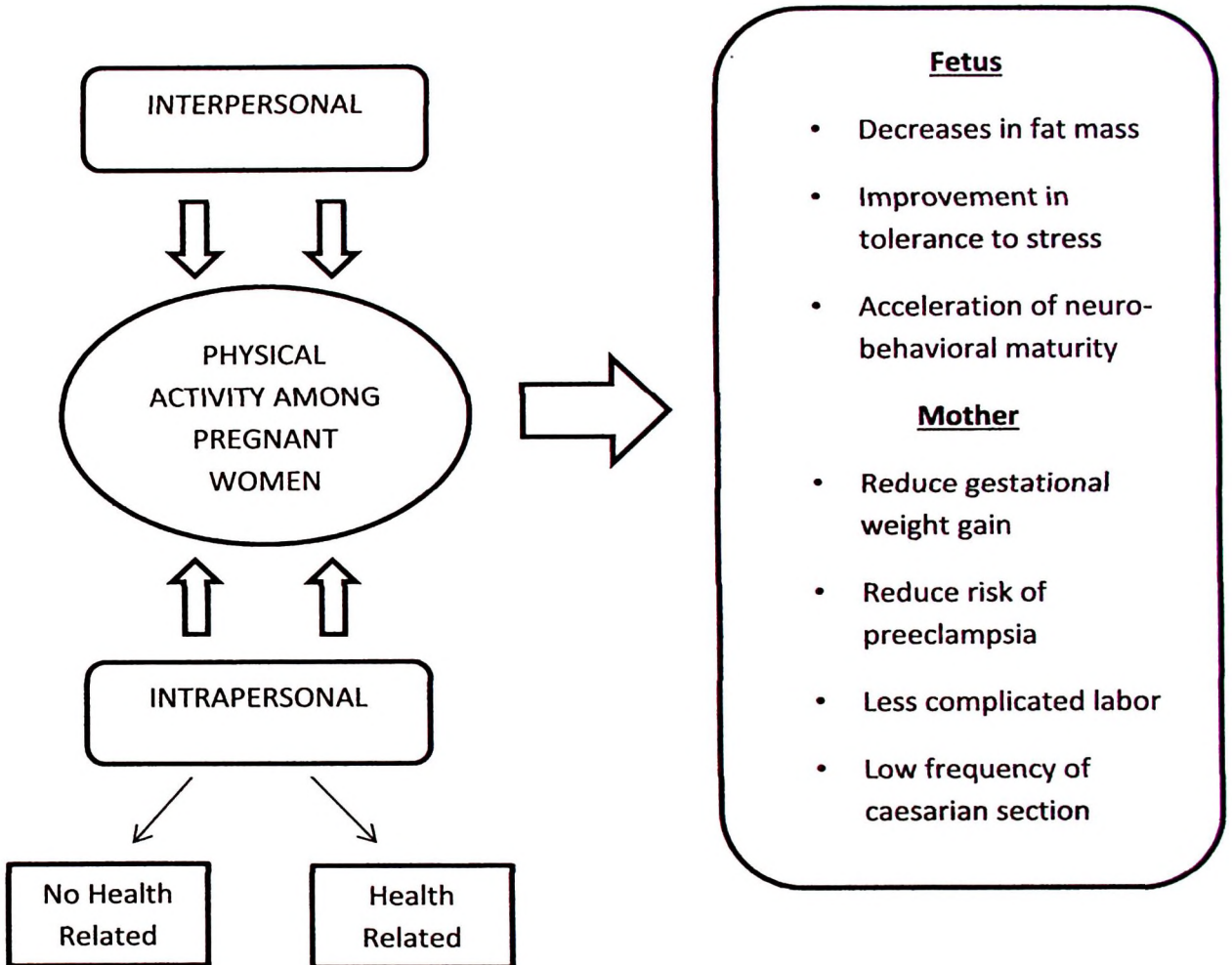


Figure 1.1 Conceptual Framework

1.6 Terminology

Physical Activity

Any bodily movement produced by skeletal muscles that result in energy expenditure.

Physical Activity Level

A method of quantifying or characterising physical activity, commonly according to its type, frequency, duration and intensity. Physical activity level (PAL), obtained as the total energy expenditure (TEE) divided by the BMR.

Gestational Weight Gain

There are three types of gestational weight gain namely: total weight gain (weight just before delivery minus weight just before conception); net weight gain (total weight gain minus the infant's birth weight); and rate per week (weight gained over a specified period divided by the duration of that period in weeks).

CHAPTER 2

LITERATURE REVIEW

2.1 Physiology changes during pregnancy

During pregnancy, maternal physiology will change. Basically, there are two phases of physiological changes during pregnancy, namely first half and second half of pregnancy. First half of pregnancy is related to maternal anabolic changes which they build the capacity of mother's body to deliver the large quantities of oxygen, nutrients and blood to the fetus as a preparation for the second half of pregnancy. Meanwhile, in second half of pregnancy related to maternal catabolic changes because the body preserve large amount of energy and nutrient for the development of the foetus (Brown *et al.*, 2002). Approximately 10% of fetal growth is accomplished in the first half of pregnancy, and the remaining 90% in the second half of pregnancy (King, 2000). All nutrients from the mother will be transfer to the fetus across the placenta which acts as the barrier to some harmful compounds like alcohol, drugs, viruses and excessive level of some vitamins. The placenta acts as a producer for hormone and enzyme, allows gas exchange between mother and fetus and remove the waste products from the fetus (Brown *et al.*, 2002).

A women's body gains a good deal of water during pregnancy and total body water increases in pregnancy range from 7 to 10 litres. About two-thirds of the expansion is intracellular (blood and body tissues) and one-third is extracellular (fluid in

the spaces between cells). Plasma volume begins to increase progressively to 50% by 34 weeks of gestation. Plasma volume expansion is correlated with clinical performance and birth weight. Poor plasma volume expansion is associated with a poorly growing fetus and poor reproductive performance. The primary reason that causes pregnant women feel tired and become exhausted easily when doing exercise during pregnancy is associated with plasma volume increases in the second and third months of pregnancy (Brown *et al.*, 2002).

In early pregnancy, cardiac output increases about 30 – 50% as a result of an increase in heart rate and stroke volume. Heart rate also increases up to 16% or 6 beats per minute. As pregnancy progresses, blood flow increases to all organs. Arterial blood pressure may decrease in the first half of pregnancy as a result of increased peripheral vasodilatation and in order to maintain perfusion. As a result, increased cardiac output and decreased blood pressure in the first half of pregnancy. Moreover, minute ventilation increases 30 – 40% by late pregnancy due to increased tidal volume. Oxygen consumption also increases 15 – 20%, resulting in an increase in alveolar and arterial P_{AO_2} (partial pressure of oxygen) and fall in P_{ACO_2} (partial pressure of carbon dioxide) levels. In addition, glomerular filtration rate (GFR) increases early in pregnancy, up to 50 – 60% by term. As a result of the increased GFR, serum levels of urea and creatinine decline. There is also a large increase in tubular sodium reabsorption during pregnancy, promoted by increased aldosterone, estrogen, and deoxycorticosterone (Brown *et al.*, 2002).

Many of the metabolic adjustments of pregnancy are well established in early pregnancy, when fetal nutrient demands are still minor. Increased amount of nitrogen and protein during pregnancy is important need for synthesis of new maternal and fetal tissue. The increased need for protein will reduce levels of nitrogen excretion and the conservation of amino acids for protein tissue synthesis (Brown *et al.*, 2002). Changes in carbohydrate and lipid metabolism occur during pregnancy to promote the availability of glucose to the fetus. In early pregnancy, insulin production increase by as much as 15% and in late pregnancy, insulin action is 50 – 60% lower than in non-pregnant state (Catalano *et al.*, 1993). By the third trimester, basal and 24-hour mean insulin concentrations may double (Lesser and Carpenter, 1994).

These alterations in maternal insulin sensitivity affect not only glucose metabolism but also lipid metabolism, resulting in decreased ability of insulin to suppress lipolysis (Catalano *et al.*, 2002). The metabolic changes in insulin sensitivity that occur during pregnancy are modified by inflammatory factors (Friedman *et al.*, 2008). In women with normal glucose tolerance during pregnancy who lose significant weight postpartum, there is a return to normal metabolic function. However, in women with GDM, if there is no decrease in postpartum weight, the risk of getting diabetes and metabolic syndrome is high.

2.2 Gestational Weight Gain

2.2.1 Weight Gain during Pregnancy

Weight gain during pregnancy is an important consideration because newborn weight and health status tend to increase as weight gain increases. In 2009, the Institute of Medicine (IOM) published revised gestational weight gain guidelines that are based on pre-pregnancy body mass index (BMI) ranges for underweight, normal weight, overweight and obese women recommended by World Health Organization (WHO) and are independent of age, parity, smoking history, race and ethnic background. The higher the weight before pregnancy, the lower the weight gain needed to produce healthy sized infants. Recommended weight gains for women entering pregnancy underweight, normal weight, overweight and obese are displayed in Table 2.1 below.

Table 2.1 New Recommendations for Total and Rate of Weight Gain During Pregnancy, by Prepregnancy BMI

Pregpregnancy BMI	Total Weight Gain	Rates of Weight Gain for 2nd and 3rd Trimester
	Range in kg	Mean (range) in kg/week
Underweight (< 18.5 kg/m ²)	12.5 – 18.0	0.51 (0.44 – 0.58)
Normal weight (18.5 – 24.9 kg/m ²)	11.5 – 16.0	0.42 (0.35 – 0.50)
Overweight (25.0 – 29.9 kg/m ²)	7.0 – 11.5	0.28 (0.23 – 0.33)
Obese (≥ 30.0 kg/m ²)	5.0 – 9.0	0.22 (0.17 – 0.27)

Adapted by Kathleen *et al.* (2009).

Because underweight women tend to retain some of the weight gained in pregnancy for their own needs, they need to gain more weight in pregnancy than do other women. Whereas, overweight and obese women are able to use a portion of their energy stores to support fetal growth, so they need to gain less.

2.2.2 Factors that Impact on Gestational Weight Gain

Depression is one of the factors that might be determinants of gestational weight gain. Bodnar *et al.* (2009) found that women with gestational weight gain below the ranges recommended by IOM (1990) had higher risk of major depression, regardless of their BMI. Another study done by Webb *et al.* (2009) revealed that pregnant women who gained in excess of the ranges recommended by IOM (1990) were more likely to have high depressive symptoms than women who gained weight in the ranges recommended by IOM. A case control study conducted among Mexican pregnant adolescents indicated that there is an association between depressive symptoms and excessive fat deposition in Mexican pregnant adolescents (Casanueva *et al.*, 2000).

Dietary intake also influenced on gestational weight gain. Finding by Ligiou *et al.* (2004) indicated that increased gestational weight gain at the end of second trimester of pregnancy was associated with higher intake of protein and lipids of animal origin and low intake of carbohydrates. Women who consumed three or more servings of fruits and vegetables per day gained 1.81 pounds less than those who consumed fewer serving during pregnancy (Olson and Strawderman, 2003). Apart from dietary intake, physical

activity also can be the factor that influences weight gain during pregnancy. Physical activity during pregnancy is associated with reduced risk of excessive gestational weight gain. Pregnant women who were physically active have nearly 10% reduction of the average gestational weight gain and 40% less risk of excessive gestational weight gain compared with sedentary lifestyle group (Jiang *et al.*, 2012). Moderate exercise during pregnancy was found to be safe for both mother and fetus and to improve overall maternal fitness and well – being as well as maternal and fetal outcomes (Morris and Johnson, 2005).

The report of the Physical Activity Guidelines Advisory Committee (HHS, 2008) concluded that moderate physical activity is not associated with an increased risk of low – birth weight, preterm delivery, or early pregnancy loss. In addition, pregnant women that participated in vigorous activities has been associated with small reductions in birth weight compared to less active women (Hegaard *et al.*, 2007) but not with gestational age at birth (Duncombe *et al.*, 2006).

2.3 Overview of physical activity during pregnancy

Physical activity helps to maintain or improve the health status and prevent development of many disorders. It is recommended to all stages of life including pregnancy due to its health benefits. For example, exercise during pregnancy will give positive impacts to both mother and baby such as reduced risk of caesarean section and a

stillbirth (Dumith *et al.*, 2012). Even though many studies had exposed their findings which stated there is a lot of benefits when exercise during pregnancy, but still there is little awareness among pregnant women (Ribeiro and Milanez 2011). It proved from previous study showed that only 3% of day had been spent on walking, shopping, cycling or exercise while the remaining time were spent on care-giving and household including 34% of energy expenditure is spent on sleeping or lying on a sofa, 35% on sitting and another 28% was spent on light household and care (Raaij *et al.*, 1990).

2.4 Recommendation of physical activity during pregnancy

Some organizations had developed the guidelines for physical activity during pregnancy. Women who perform intense exercise during pregnancy can lead to negative health impacts for both mother and baby (Wojtyla *et al.*, 2012). This is because the insufficient blood flow to the fetus, reduction in partial pressure in placental blood, decrease in pH of blood in the placental and blood of the fetus (Hatch *et al.*, 1998) and body overheating due to the increase in the cutaneous blood flow (Wojtyla *et al.*, 2012). The U.S. Department of Health and Human Services (DHHS) recommended pregnant women to do exercise at least 150 minutes per week (Smith *et al.*, 2011). But, this recommendation seems to be impossible to achieve during pregnancy because of some factors.

In 2002, the American College of Obstetrics and Gynaecology (ACOG) had updated the guidelines and recommended that pregnant women who are not previously active and without any medical complications to exercise for 30 minutes per day (Vladutiu *et al.*, 2010). The duration of exercise had been studied and proved that pregnant women who are engage with exercise at least 30 minutes daily in their last trimester of pregnancy had better cardiovascular fitness compared to sedentary pregnant women (Melzer *et al.*, 2010). However, recently there are guidelines suggest pregnant women should exercise at least 10 minutes per day to gain benefits (Smith *et al.*, 2011). The ACOG also suggested that overheating of body should be avoided by doing the activities in short period, for example doing exercises in intervals of 15 minutes. Warning signs to terminate exercise during pregnancy are vaginal bleeding, dizziness, headache, chest pain, amniotic fluid leakage and decreased fetal movement.

2.5 Benefits of physical activity during pregnancy

As we already knew, women who engage in exercise during pregnancy gain many positive effects to both mothers and babies. In the study that had been conducted by Evenson and Bradley regarding perceived benefits of exercise, result showed almost all respondents agreed that light exercise can give benefits (98%) compared to moderate exercise (73%) and intense exercise (13%). In the same study, Evenson and Bradley successfully showed that nearly three – fourths of pregnant women agreed that exercise can improve the health of their baby (Evenson and Bradley, 2010). The potential maternal benefits are, improve cardiovascular function, improve body endothelium

function, also help in controlling blood glucose level (DeSouza *et al.*, 2000; Maiorana *et al.*, 2001), minimize weight gain during pregnancy (Ghodsi and Asltoghiri 2012; Jiang *et al.*, 2012), reduced the risk of occurrence of preeclampsia (Magnus *et al.*, 2008) and gestational diabetes (Dyck *et al.*, 1999; Dempsey *et al.*, 2004), low back pain, improves mood (MS.Poudevigne and O'Connor 2005; Poudevigne and PJ.O'Connor 2006), less complicated labour (Beckmann 1990), and lower frequency of caesarean section (Brown 2002).

There are a lot of new studies shown the benefits of exercise during pregnancy which indicate that nearly 94% of women agreed that exercise can improve labour and delivery (Evenson and Bradley, 2010). Another study showed that the pregnant women in exercise group had low risk of caesarean delivery (6.7%) compared to pregnant women in sedentary group (28.1%) (Melzer *et al.*, 2010). Magnus and colleagues suggested that the risk of preeclampsia can be reduced by doing regular exercise and they had reported that the 20% reduction of risk of preeclampsia among women who are engage in exercise (Magnus *et al.*, 2008). As mention above, physical activity is related to the reduction of gestational weight gain. There is an evident that had been clearly shown in the research that conducted by Jiang *et al.*, (2012) resulted reduction in gestational weight gain between 1.4 to 1.6 kg among pregnant women who engage exercise compared to sedentary group and at once can reduce the percentage of overweight and obese women. In addition, pregnant women who are consistently doing exercise have less deposited fat, improved fitness and have low cardiovascular risk (Clapp, 2008).

Fetal benefits include the lower of fat mass or fatty tissue mass which is the ratio between fat – free mass of newborn to the fatty tissue mass is important which theoretically indicated that the lower of the percentage of fat mass in newborn's body, the lower the tendency to the occurrence of chronic disease in the offspring (Wojtyla *et al.*, 2012). When pregnant women doing physical activity, it will increase the percentage of fat – free mass and later on will be beneficial to the newborn because reduced the risk of chronic disease in future (Clapp and Capeless, 1990). Moreover, it can accelerate the neuro-behavioural maturity of the foetus and improve the tolerance to stress (Wojtyla *et al.*, 2012).

2.6 Precautions and Barriers of Physical Activity during Pregnancy

There are some precautions when doing exercise during pregnancy. Firstly, pregnant women should avoid the exercise with higher risk of falling because of the potential for collision, loss in balance and risk in falling (Vladutiu *et al.*, 2010). Next, pregnant women should avoid an exercise in lying position during second and third trimester but not in first trimester (Artal, 1999; Evenson and Bradley, 2010), because it can create the pressure on the wall of inferior vena cava vein and will lead to decrease of the cardiac output and symptomatic arterial hypotension (Artal, 1999). But there are some study that recently had been conducted shows that 17% pregnant women agreed that should avoided lying position exercise during first trimester and 64% agreed exercise in lying position should do more in second trimester and 81% during third trimester (Evenson and Bradley, 2010). Lastly, diving during pregnancy is not

recommended because it can cause an air embolism and decompression sickness in the fetus (Camporesi, 1996).

There are some factors that occurred behind these problems which had been exposed and explored by some researchers. The following factors were associated with low level of physical activity in pregnancy, including tiredness (Dunn *et al.*, 1999; Ribeiro and Milanez, 2011), discomfort (Ribeiro and Milanez, 2011), lack of time (Dunn *et al.*, 1999; Ribeiro and Milanez, 2011), lack of motivation (Ribeiro and Milanez, 2011), and low level of knowledge (Wojtyla *et al.*, 2012). A part from that, higher level of physical activity was influenced by younger age, higher level of schooling, encouragement by the physician, prenatal care, and low parity (Domingues and Barros, 2007; Ribeiro and Milanez, 2011; Dumith *et al.*, 2012).

However, another studies that had been conducted in United Kingdom indicate that sleeping is highly important than exercise during pregnancy (Evenson *et al.*, 2009). In addition, there are other reasons why pregnant women avoid to do exercise. According to the same study, one – third of the women preferred not to exercise because of injuries or danger that could harm to the baby while fewer agreed that they lack of motivation to exercise during pregnancy (Evenson *et al.*, 2009). Another study that had been conducted among 266 Polish pregnant women during their third trimester had showed 32% of pregnant women know what they want to do, another 32% lack of time or being too busy to exercise and the remaining 10% are having medical problems (Rutkowska and Lepecka-Klusek, 2002).

Despite, some pregnant women probably know the benefits of exercise but they are lacking of support or motivation to engage in exercise during pregnancy. This is partly due to health concern toward herself and her fetus and not want to overdo it (Ribeiro and Milanez, 2011). Nevertheless, there are some high – risk pregnant women who are advised to avoid from doing exercise because of medical complication (Dumith *et al.*, 2012).

CHAPTER 3

METHODOLOGY

3.1 Research Design

This research is a cross-sectional study, conducted among healthy pregnant women at Obstetrics & Gynaecology Clinics at Hospital USM from April 2013 to Mei 2013.

3.2 Sampling method

We used non probability sampling which is convenience sampling method. Non probability sampling means the probability of selection of each case is not known and the research findings cannot be generalized to the whole population. Convenience sampling method is in which most readily available cases are chosen for the study. The advantage of using this sampling method is the sample is generally easy to access but the sample may not be representative of the target population.

3.3 Study Location

This study had been carried out in Obstetrics & Gynaecology Clinics, Hospital USM, Kubang Kerian, Kelantan.

3.4 Sample of Study

The participants involve pregnant women in 2nd and 3rd trimester, have singleton pregnancy.

3.5 Sample Size Calculation

Sample size is calculated according to formula by Daniel (1999) as below:

$$n = \frac{Z^2 p (1-p)}{d^2}$$

n = estimated sample size

Z = standard value at confidence level at 95% = 1.96

p = estimated prevalence for women who are having active physical activity level

d = margin error set at 5% = 0.05

Based on a study conducted in year 2010 on physical activity level among Malaysian adults by Poh *et al.*, (2010), the prevalence of women who are having active physical activity level was 10 %. Hence,

$$\begin{aligned} n &= \frac{(1.96)^2 (0.1) (1-0.1)}{(0.05)^2} \\ n &= \frac{0.346}{(0.05)^2} \\ n &= 138.3 \\ n &= \underline{\underline{138}} \end{aligned}$$

By taking into account a 20% drop-out rate, the desired sample size for this study is **166**.

3.6 Inclusion and Exclusion Criteria for Research

3.6.1 Inclusion Criteria

- 2nd and 3rd trimester
- Singleton pregnancy

3.6.2 Exclusion Criteria

- Pregnant women who had multiple pregnancy
- Pregnant women who has disease such as heart disease
- Pregnant women who were too weak or exhausted to contribute meaningful information for the study
- Pregnant women who refuse to sign consent form

3.7 Instrument for Data Collection

Self-administered questionnaires were used to collect information. The questionnaires that were used including Pregnancy Physical Activity Questionnaire (PPAQ) and social – demographic questionare that was divided into 3 sections which are personal detail information, perception on physical activity and dietary intake. The

investigators were present during administration of questionnaires to assist the respondents so that the questions are fully understood and well-completed.

The PPAQ is a semi – quantitative questionnaire that asks the respondents to report on the time spent participating in 32 activities, including household/caregiving activities (13 activities), occupational (5 activities), sports/exercise (8 activities), transportation (3 activities) and inactivity (3 activities). The respondents are asked to select a category for each activity to the nearest amount of time spent per day or week. The duration ranges from 0 to 6 or more hours per day, and from 0 to 3 or more hours per week during the subject’s current trimester. An open – ended section of questionnaire allows each respondent to add activities that are not listed. The translated and cross – cultural adaptation of the Malay version of PPAQ was used in this study. The self – administration of the questionnaire takes approximately 10 minutes. It is short in length, self-administered, and easily understood by respondents in a variety of settings, making it useful for epidemiologic research and health education during pregnancy (Chasan-Taber *et al.*, 2004).

The pre – pregnancy heights and weight of the respondents were taken from either medical record or self – reported and utilized to calculate Body Mass Index (BMI) value. By using the 2004 WHO BMI classification, the respondents were classified into four categories which are underweight, normal weight, overweight and obese. The assessment of gestational weight gain were carried out by using the 2009 Institute of