



UNIVERSITI PUTRA MALAYSIA

***NUTRITIONAL STATUS AND PREGNANCY OUTCOMES BETWEEN
ANAEMIC AND NON ANAEMIC PREGNANT WOMEN IN HULU SELANGOR,
MALAYSIA***

NURZALINDA ZALBAHAR @ ZABAHA

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By

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Anaemia among pregnant women has been documented to be associated with low birth weight and poor health status of the newborns. Anaemia due to lack of certain nutrients before and during pregnancy remains a great concern worldwide. Chronic nutrient deficiencies during the pregnancy stage will affect not only the health status of the mother but also the infant's birth weight and general development. A comparative study on nutritional status and pregnancy outcomes between anaemic and non-anaemic pregnant women were done. This study was conducted in the districts of Hulu Selangor, Selangor. A total of 188 pregnant mothers in their third trimesters and fulfilling the inclusion criteria from five health clinics (KK Kuala Kubu Baru, KK Kalumpang, KK Rasa, KK Hulu Yam, and KK Serendah) were recruited and interviewed. A set of questionnaires were used to collect data on socio-demographic background, history of pregnancy, and other health related data. Dietary intake was assessed using a Semi-Quantitative Food Frequency Questionnaire. Pregnancy outcome data and infant nutritional and health data were collected after delivery and after the infant has reached one month of age. All data were analyzed by using SPSS version 16.0 and dietary data

with Nutritionist Pro version 2.4.1 was used to analyze subjects' nutrient intake. Independent t-test was used to compare differences of means between the two groups. Out of 188, 90 were anaemic (A) and 98 were non-anaemic (NA). The mean values for haemoglobin levels for (A) and (NA) subjects were 10.1 ± 0.8 g/dl and 11.9 ± 0.7 g/dl, respectively. The mean age for anaemic mothers was 29.1 ± 5.1 and that of non-anaemic mothers was 29.1 ± 5.2 years old. Majority of them had secondary level education and ranked at the fourth Social Class level with the range of monthly household income between RM1001-2000. About 40% of the subjects were fulltime housewives. The rest were working in government and private sectors. The mean weight gain was 8.1 ± 4.7 kg for (A) and 7.9 ± 4.6 kg for (NA) throughout their pregnancies. Majority of the babies were delivered normally, and 2% of non-anaemic mothers delivered stillbirth infants. Only 13% of the babies were delivered by Caesarean section and 1% by the vacuum method for anaemic subjects, while 22% were delivered by Caesarean section by non-anaemic subjects. Majority of the infants given birth by the subjects had normal birth weights (>2.5 kg). The mean birth weight for babies of anaemic subjects was 3.2 ± 0.5 kg, while that of non-anaemic subjects was 3.1 ± 0.5 kg. About 39.5% for (A) and 44.9% for (NA) gave birth to preterm babies with a mean of 36 weeks and 32 weeks respectively. After one month of age, both (A) and (NA)'s infants were not significantly different on weight, length, chest circumference and head circumference. In terms of nutrient intake, there were significant differences between (A) and (NA) on carbohydrate ($p = 0.001$) and calcium ($p = 0.049$) intakes. Other nutrient intake showed no significant difference between the two groups. MANOVA analysis were done included confounding factors which also shown significantly indifference on birth weight and term birth of infants

between anaemic and non-anaemic subjects. Thus the overall results indicated that the nutritional status and pregnancy outcomes between both groups were similar. However, the concern was towards all pregnant women with or without anaemia on understanding and implementing good nutritional status in order to have good pregnancy outcomes. Ongoing research need to be done and focus on those who having more severe anaemia status which has low haemoglobin level of less than 9g/dl.



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Kejadian kelahiran bayi kurang berat badan dan status kesihatan yang lemah adalah dipengaruhi oleh kejadian anemia ketika hamil. Bahkan, ia menjejaskan tumbesaran dan kesihatan anak selepas lahir. Kejadian anemia akibat kekurangan nutrien ini masih merupakan isu antarabangsa. Maka, kajian perbandingan status pemakanan dan hasil kelahiran di kalangan ibu hamil anemia dan ibu hamil normal ini dilakukan di daerah Hulu Selangor melibatkan lima buah Klinik Kesihatan (KK Kuala Kubu Baru, KK Kalumpang, KK Rasa, KK Hulu Yam, and KK Serendah). Sejumlah 188 ibu hamil trimester ketiga terlibat dalam kajian ini dan ditemu bual mengguna satu set borang soal selidik. Data berkaitan latar belakang, sejarah kehamilan yang lepas dan status kesihatan diperolehi. Maklumat pengambilan nutrien juga diperolehi dengan menggunakan borang Borang Kekerapan Pengambilan Makanan Semi Kuantitatif.. Seterusnya, data hasil kehamilan dan status kesihatan bayi diambil selepas lahir dan berumur 1 bulan. Data-data yang diperolehi seterusnya dianalisa menggunakan SPSS version 16.0. Data pengambilan makanan dianalisa menggunakan Nutritionist Pro versi 2.4.1. Terdapat 90 ibu hamil yang anemia dan 98 yang normal. Ujian t-test tidak bersandar digunakan untuk membuat perbandingan antara min dua kumpulan tersebut. Min umur ibu hamil anemia

(A) adalah 29.1 ± 5.1 tahun dan ibu hamil normal (N) ialah 29.1 ± 5.2 tahun. Majority ibu hamil (A) dan (N) mempunyai taraf pendidikan sekunder dan merupakan Kelas Sosial keempat. Jumlah pendapatan seisi rumah bagi ibu hamil (A) dan (N) adalah diantara RM1001-2000. Min pertambahan berat badan sepanjang hamil ialah 8.1 ± 4.7 kg bagi (A) dan 7.9 ± 4.6 kg bagi (N). Paras haemoglobin (A) ialah 10.1 ± 0.8 g/dl dan (NA) ialah 11.9 ± 0.7 g/dl. Majoriti bayi dilahirkan secara normal dan terdapat 2% bayi yang meninggal dunia dari (N). Kelahiran melalui pembedahan adalah 13% dan 1% dengan menggunakan kaedah Vacuum dari ibu (A), manakala 22% ibu (N) melahirkan menggunakan kaedah pembedahan. Majoriti bayi yang lahir mempunyai berat lahir normal (>2.5 kg) dengan min berat lahir bayi bagi ibu (A) adalah 3.2 ± 0.5 kg dan 3.1 ± 0.5 kg bagi ibu (N). Terdapat 39.5% ibu (A) dan 44.9% ibu (N) melahirkan bayi pramatang dengan min 36 minggu dan 32 minggu. Selepas berumur 1 bulan, bayi bagi kedua ibu (A) dan (N) mempunyai status pemakanan yang normal. Bagi pengambilan nutrien, terdapat perbezaan yang signifikan antara ibu (A) dan ibu (N) pada pengambilan karbohidrat ($p = 0.001$) dan kalsium ($p = 0.049$). Namun, tidak terdapat perbezaan yang signifikan bagi nutrien yang lain antara dua kumpulan ini. Perbezaan yang tidak signifikan diperolehi dalam analisis MANOVA yang melibatkan 'confounding factors' untuk berat lahir dan tempoh kelahiran pada kedua-dua kumpulan ibu hamil. Maka, kesimpulan yang diperolehi dari kajian ini menunjukkan status pemakanan dan hasil kelahiran ibu hamil (A) dan (N) adalah sama. Bahkan, penjagaan kesihatan yang baik ketika hamil dari aspek pemakanan bagi memperolehi hasil kehamilan yang sihat adalah untuk semua ibu hamil tidak terkecuali yang bukan anemia. Kajian pada masa akan datang yang memfokuskan

kepada ibu hamil anemia yang lebih teruk (tahap haemoglobin kurang dari 9g/dl) adalah diharapkan bagi mendapatkan perbezaan pada ibu hamil normal dan anemia.



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Nurzalinda Zalbahar

10 Mei 2009

DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.



NURZALINDA ZALBAHAR @ ZABAHA

Date:

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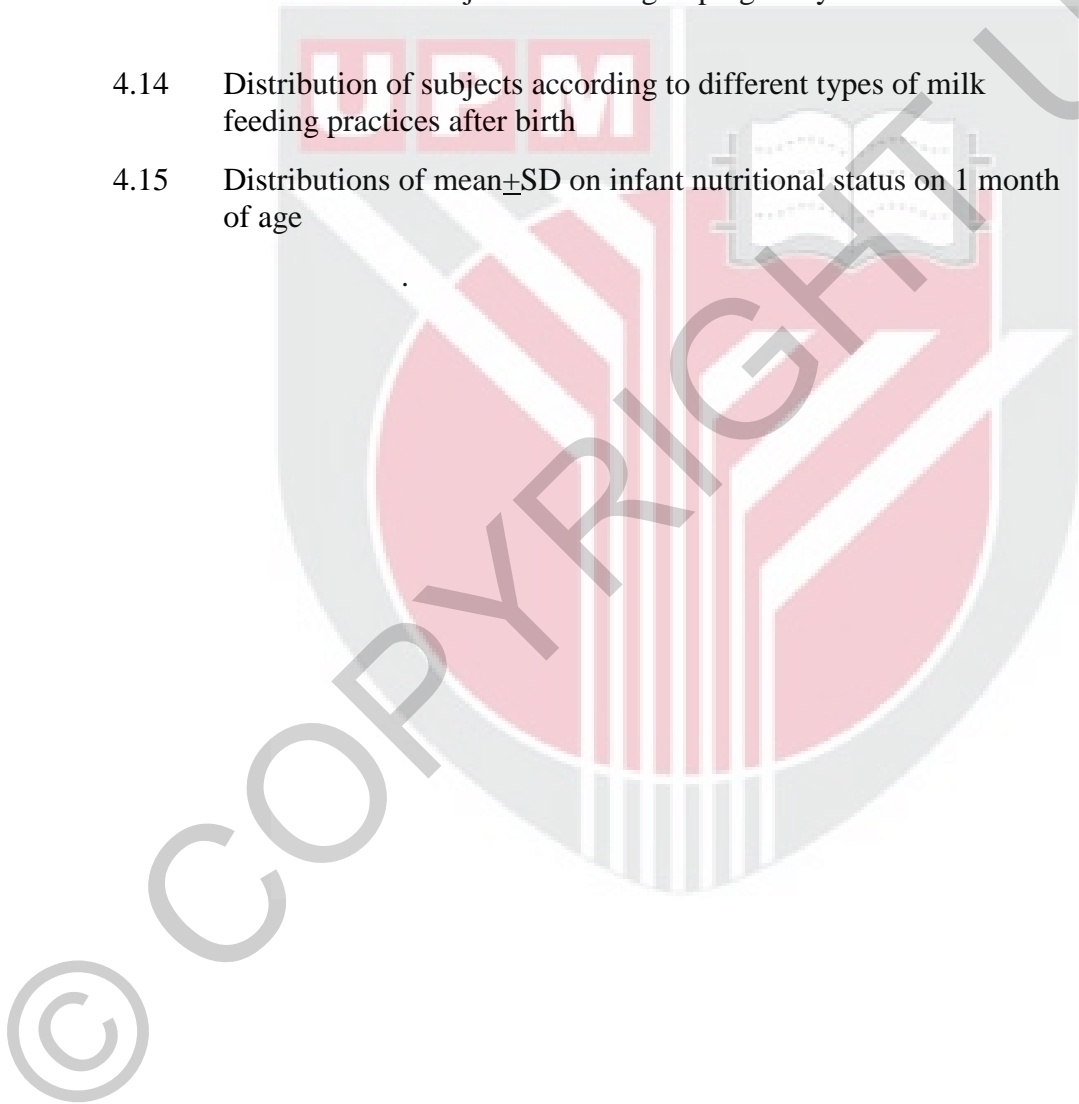
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CHAPTER 1

INTRODUCTION

1.1 Introduction

Pregnancy is the most intense period in the life of a woman. Diverse changes evolve almost all of the physiological parts of her body. The specific sequences of these physiological changes are naturally adapted by mothers. The expansion of plasma volume, nutrient stores, placental weight, uterine blood flow and fetal weight are the elements which take part in the changes (Brown et al., 2004). The adaptations of this crucial period are strongly interrelated to the nutritional status before and during pregnancy.

Good maternal nutrition does play a significant role in balancing the fluctuating requirements of pregnancy. Energy, mineral and vitamin requirements usually increase during pregnancy. Most of the energy is derived from sources in the diet which consists of carbohydrates, proteins and fats. These macronutrients are crucial for achieving appropriate weight gain as well as being sources of energy. Besides, micronutrients such as minerals and vitamins play a significant role in the growth and development of

maternal and fetal tissues. Adequate nutrient intakes and a well-balanced diet are important to fulfill those needs. Hence, a well-nourished and good health status of a pregnant woman will have a significant influence on a healthy pregnancy as well as the pregnancy outcome. Therefore, it is crucial to ensure that mothers have an appropriate nutrient intake, either from a healthy diet or from supplements.

The effects of inadequate maternal nutrition on pregnancy outcomes are well documented. Deficiencies of certain nutrients have also been one of the factors which lead to negative pregnancy outcomes. Women during the pregnancy stage will easily encounter several unwanted consequences and are more exposed to malnutrition and diseases. Deficiencies of certain micronutrients such as iron, folate and vitamin B are associated with several unwanted pregnancy outcomes. For instance, anaemia due to insufficient intake of certain micronutrients during pregnancy remains a great concern worldwide. Low haemoglobin levels among pregnant women have been documented to be associated with low birth weight and poor general health status of infants (Allen, 2000).

1.2 Problem Statement

Pregnancy is a period of increased metabolic demands, with changes in the woman's physiology (Ladipo, 2000) and the requirements of a growing fetus. This important stage of life consists of a series of small, continuous physiological adjustments that affect the metabolism of all nutrients. The adjustments undoubtedly vary widely from woman to

woman depending on her pre-pregnancy nutritional status, genetic determinants of fetal size, and maternal lifestyle behaviors (King, 2000).

Maintaining good nutritional status in the pre-conception stage is as important as during the nine months period of gestation. Besides, inadequate intake of macronutrients and micronutrients during pregnancy do contribute to negative pregnancy outcomes. However, many pregnant mothers possibly do not have enough nutrients to fulfill adequate nutrient intake requirements. Several factors have been determined to contribute to this problem. Low socioeconomic factors, educational level, physiological changes, as well as an inadequate dietary intake have been some of the factors contributing to the lack of important nutrients during pregnancy (King 2000; King, 2003; Bhargava et al., 2001). Besides, there is a lack of focused information on the food consumption patterns and dietary intake of pregnant mothers. Therefore, awareness on adequate and healthier food intake should be considered as one of the aspects related to reducing malnutrition among pregnant women.

The state of being anaemic among pregnant women is contributed by the inadequate intake of certain nutrients through daily food consumption. Insufficient intake of micronutrients such as iron, folic acid, and vitamin B12 is related to the prevalence of anaemia among pregnant women. Iron deficiency resulting in anaemia is highly prevalent among pregnant mothers in developing countries due to the increased iron need and is seldom met by changes in diet and is also due to poor absorption (Beard, 2000). Micronutrient supplementation and fortification of foods have been suggested to assist mothers in preserving their nutrition requirements during pregnancy. However, the

supplements provided by health care services are not well-adhered to by some pregnant mothers due to psychological and cultural factors (Ladipo, 2000).

Severe anaemia among pregnant women increases maternal mortality (WHO, 1992) and results in infants with a low birth weight (Scholl and Hediger, 1994) as well as pre-term delivery (Scholl and Reilly, 2000). Severe anaemia ($Hb < 9\text{g/dl}$) has a significant association with pregnancy outcomes and also contributes to maternal morbidity and mortality in developing countries (Brabin, 2001). Pre-term delivery and low birth weight infants also occurred in either severe, mild or moderate ($Hb < 11\text{g/dl}$) levels of anaemic pregnant woman (Lee et al., 2006; Rasmussen, 2001). The risk of pre-term delivery and low birth weight infants was 4 and 1.9 times higher among anaemic mothers, respectively (Lone et al., 2004). This condition will further affect the infant's growth development and nutritional status in later life (Fall et al., 2003). Besides, there will be more unwanted problems facing the child in relation to his or her cognitive development in the future.

In Asia, the estimated prevalence of anaemia among pregnant women is 60% (Rush, 2000), while in Malaysia, among pregnant mothers who attended government clinics, 30.3% were found to be anaemic ($Hb < 11\text{g/dl}$) and 2.3% of them have haemoglobin levels of less than 9 g/dl (Ministry of Health, 2007). There are still cases of severe and mild anaemia among pregnant mothers reported each year as shown in Table 1.1. Actions have been taken to overcome the prevalence of anaemia among pregnant mothers. These serious efforts are still being implemented in order to reduce the prevalence occurring each year. It is crucial to take into consideration the prevalence of

anaemia among women to avoid the negative effects during the childbearing stage as well as its contribution to abnormal pregnancy outcomes (Allen, 2005).

Table 1.1: Prevalence of anaemia (%) among pregnant mothers attending government health clinics in Malaysia (2000-2006)

Year	Hb < 9g/dl (%)	Hb 9 - 11 g/dl (%)
2000	3.1	30.3
2001	2.9	25.7
2002	2.8	24.4
2003	4.2	39.5
2004	3.0	35.3
2005	2.3	30.3
2006	2.0	26.8

(Ministry of Health, 2007)

Therefore, the above statistics raised a few research questions:

1. Despite the overall better standard of living (compared to the last decade) of the Malaysian population, why is the prevalence of anaemia still high among pregnant women?
2. Do pregnant mothers consume adequate nutrients from their diets and are there any differences between anaemic and non-anaemic pregnant women?
3. Do pregnant mothers comply with the supplementation regimen provided by the health care services?
4. Do pregnant women with anaemia experience negative pregnancy outcomes and are there any differences between anaemic and non-anaemic pregnant women?
5. Do babies borne by anaemic mothers have unsatisfactory nutritional status?

These questions need to be answered in order to reduce the problem of anaemia among pregnant women.

1.3 Significance of The Study

Studies of the nutritional status and pregnancy outcomes between anaemic and non-anaemic pregnant women are still scarce in Malaysia. Therefore, this study will provide data in relation to the dietary consumption among pregnant mothers; as well as to identify the differences in daily intake and food patterns between anaemic and normal pregnant mothers. Likewise, data obtained from this study involving negative pregnancy outcomes will further be clarified. As a result, it can extend information and expand the knowledge database on the nutritional status of Malaysian pregnant mothers.

Selangor is one of the states in Malaysia which has a high prevalence (31.7%) of anaemic pregnant mothers (MOH, 2006). Studies done on anaemic subjects in the state of Selangor, which has the highest rate of anaemic pregnant mothers, will further clarify the factors which contribute to the prevalence of anaemic mothers in the country. Focus will be on the unmodifiable factors, such as socioeconomic status and nutrient intakes among pregnant mothers. The relationship between the consequences of pregnancy and dissimilarity in haemoglobin levels among mothers can also be identified. Data obtained will give a better understanding on the importance of practicing a healthy dietary intake and pre-natal health monitoring during pregnancy at any level of socioeconomic situations.

Maintaining a good nutritional status during pregnancy is very crucial in order to have normal pregnancy outcomes and healthy infants. The information obtained would give an idea on how to improve and modify existing programs provided by authorized organizations, such as the health care services, in order to reduce negative pregnancy outcomes caused by inadequate nutrient intake. Thus, more attention and care will be given to undernourished and anaemic pregnant mothers in order to educate the mothers on the importance of sufficient nutrient consumption and adherence to nutrient supplementation given. These will lead to achieving better health status among pregnant mothers and infants in the future.

Moreover, future research can utilize this data to further investigate problems related to anaemia and other micronutrient deficiencies among high risk groups such as pregnant teenagers or pregnant mothers over the age of 40 years old. This will lead to the development of better health care for infants and children as well as the general community, in order to achieve a state of well-being for the population in the state of Selangor.

1.4 Conceptual Framework of The Study

All the elements in the conceptual framework were determined and this served as a guide for this study. As shown in Figure 1.1, several factors including socio-demographic, socioeconomic and health status of the subjects may contribute to low or

high haemoglobin levels during pregnancy. The main aspect highlighted was the haemoglobin level which was the indicator used to distinguish between anaemic and non-anaemic subjects. Then, the different levels of haemoglobin during pregnancy were used as the major variable to study and to compare the pregnancy outcomes and infant nutritional status of the subjects.



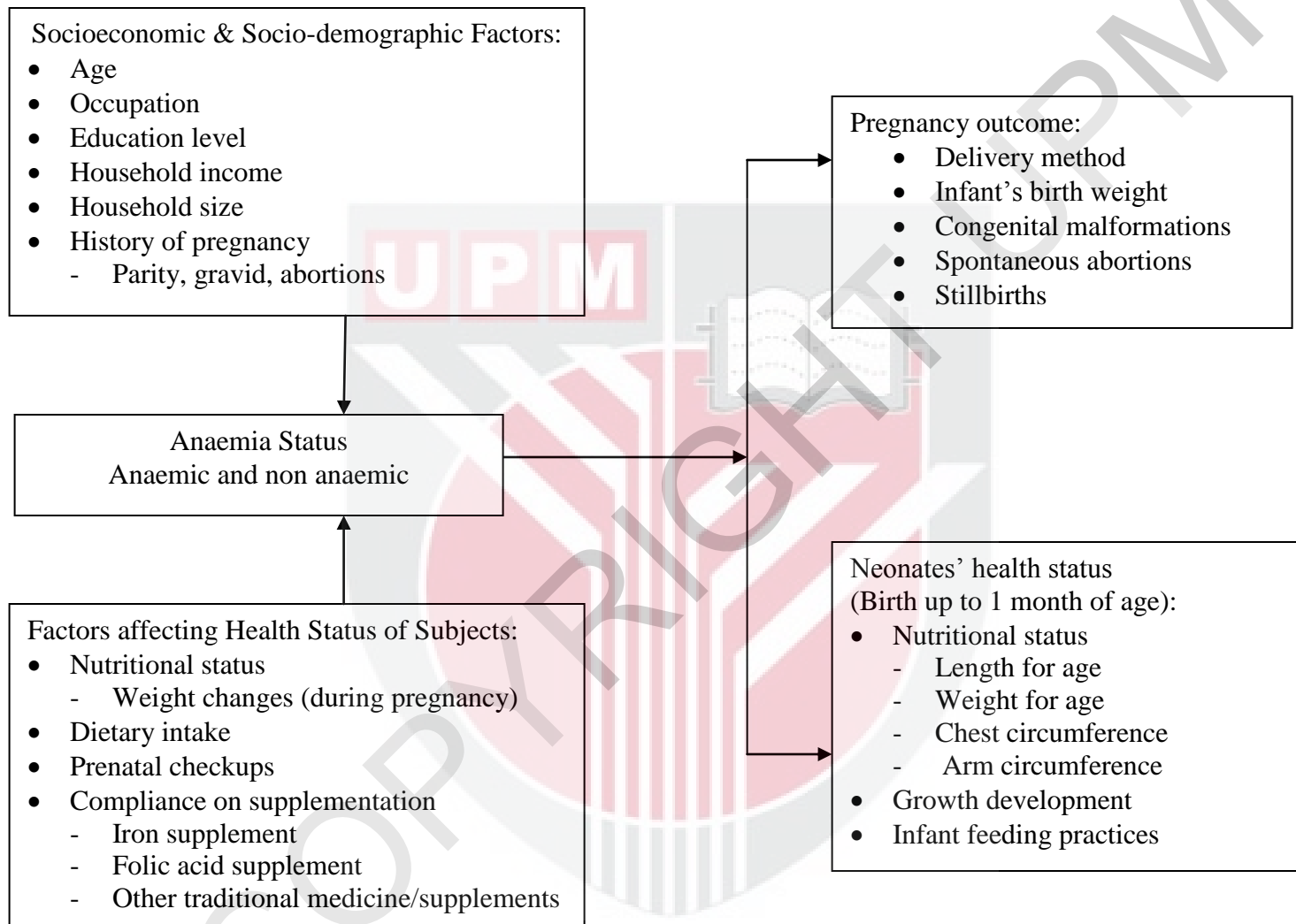


Figure 1.1: Conceptual framework of the study

1.5 Research Objective

1.5.1 General Objective:

To compare the nutritional status and pregnancy outcomes between anaemic and non-anaemic pregnant women.

1.5.2 Specific Objectives:

1. To determine the socioeconomic factors, history of pregnancy, weight gain, supplements adherence level, food taboo, pica habits and dietary intake of subjects
2. To determine the pregnancy outcomes (delivery method, birth weight of infants) of the subjects.
3. To determine the subjects neonates' nutritional and health status after birth up to one month.
4. To compare the socioeconomic factors, history of pregnancy, weight gain, supplements adherence level, food taboo, pica habits and dietary intake between anaemic and non-anaemic pregnant women.
5. To compare the pregnancy outcomes (delivery method, birth weight of infants) between anaemic and non-anaemic pregnant women.
6. To compare subjects neonates' nutritional and health status after birth up to one month between anaemic and non-anaemic pregnant women.

1.6 Null Hypotheses

1. There is no significant difference in the socioeconomic factors, history of pregnancy, weight gain, supplements adherence level, food taboo, pica habits and dietary intake between anaemic and non-anaemic pregnant women.
2. There is no significant difference in the pregnancy outcomes (delivery method, birth weight of infants) between anaemic and non-anaemic pregnant women.
3. There is no significant difference in neonates' nutritional and health status after birth up to one month between anaemic and non-anaemic pregnant women.

1.7 Operational Definitions

An operational definition shown in Table 1.2 was used as a guide in order to explain and define all the variables used in this study. Anaemia measured using haemoglobin levels in this study was the independent variables where as history of pregnancy (gravid and parity), nutritional status, and pregnancy outcomes (low birth weight and preterm birth infant) was the dependent variables used.

Variables	Operational definition
Anaemia	Abnormally low haemoglobin level due to pathological condition(s). Iron deficiency is one of the most common, but not the only cause of anaemia. Other causes of anaemia include chronic infections, particularly malaria, hereditary haemoglobinopathies and other micronutrient deficiencies, particularly folic acid deficiency. It is worth noting that multiple causes of anaemia can coexist in an individual or in a population and contribute to the severity of the anaemia(WHO, 2001b)

Nutritional status	The state of a person's health in terms of the nutrients in his or her diet. Comprehensive nutritional assessments of anthropometric, biochemical, clinical and dietary component are used to define this term.
Pregnancy outcomes	Results of conception and ensuing pregnancy, such as sex ratio, infant birth weight, spontaneous abortion, congenital malformations, low birth weight, preterm delivery or stillbirth.
Haemoglobin (Hb)	Haemoglobin is the protein molecule in red blood cells that carries oxygen from the lungs to the body's tissues and returns carbon dioxide from the tissues to the lungs. The iron contained in haemoglobin is responsible for the red color of blood
Low birth weight(LBW)	Infant weighing less than 2500 g at birth
Preterm birth	Infant born before the thirty-seventh completed week (259 days) of gestation.
Parity	The number of previous deliveries experienced by a woman.
Gravid	Number of pregnancies a woman has experienced.



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