FACTORS AFFECTING INFANT BIRTHWEIGHT IN THE FIRST PREGNANCY

THANAPORN HONHABOON

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ชื่อวิทยานิพนธ์ ปัจจัยที่มีผลกระทบต่อน้ำหนักทารกแรกเกิดในมารดาครรภ์แรก

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บทคัดย่อ

การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อศึกษาถึงความสัมพันธ์ระหว่างน้ำหนักทารกแรกเกิดในมารดาครรภ์แรกกับระยะเวลาระหว่างอายุที่มีประจำเดือนครั้งแรกถึงอายุที่ตั้งครรภ์ ความสูงที่เพิ่มในระหว่างตั้งครรภ์ ความสูงก่อนตั้งครรภ์ น้ำหนักก่อนตั้งครรภ์ น้ำหนักที่เพิ่มในระหว่างตั้งครรภ์ การฝากครรภ์ (การมาฝากครรภ์, จำนวนครั้งที่มาฝากครรภ์และอายุครรภ์ครั้งแรกที่มาฝากครรภ์) และการใช้ยาคุมกำเนิดของมารดา (ใช้หรือไม่ใช้, ระยะเวลาที่ใช้และระยะเวลาที่หยุดใช้ยาคุมกำเนิด) และศึกษาถึงความแตกต่างระหว่างน้ำหนักทารกแรกเกิดในครรภ์แรกของมารดาวัยรุ่นและมารดาอายุปกติ

ทำการศึกษาในมารดาครรภ์แรก 482 คน ที่มาคลอดที่โรงพยาบาลราชวิถี กรุงเทพมหานคร โดยแบ่งเป็น 2 กลุ่ม มารดาวัยรุ่น 212 คน และมารดาอายุปกติ 270 คน ข้อมูลที่ศึกษาได้จาก การสัมภาษณ์ วัดส่วนสูงหลังคลอดของมารดาและจากใบบันทึกประวัติของโรงพยาบาล

ผลการศึกษาพบว่า

1. ปัจจัยที่มีความสัมพันธ์กับน้ำหนักทารกแรกเกิดอย่างมีนัยสำคัญทางสถิติ คือ ระยะเวลาระหว่างอายุที่มีประจำเดือนครั้งแรกถึงอายุที่เริ่มตั้งครรภ์ ความสูงที่เพิ่มขึ้นระหว่างตั้งครรภ์ ความสูงก่อนตั้งครรภ์ น้ำหนักก่อนตั้งครรภ์ น้ำหนักที่เพิ่มขึ้นในระหว่างตั้งครรภ์ การฝากครรภ์และจำนวนครั้งที่ฝากครรภ์ของมารดา ($P<0.0001$, $P<0.0001$, $P=0.0055$, $P=0.0038$, $P<0.0001$, $P=0.0475$ และ $P=0.0169$ ตามลำดับ)

ปัจจัยที่พบว่าไม่มีความสัมพันธ์กับน้ำหนักทารกแรกเกิด คือ อายุครรภ์ครั้งแรกที่มาฝากครรภ์, การคุมกำเนิด, ระยะเวลาที่ใช้ยาคุมกำเนิดและระยะเวลาที่หยุดใช้ยาคุมกำเนิด ($P = 0.0833$, $P>0.999$, $P=0.2240$ และ $P=0.0935$ ตามลำดับ)

2. ค่าเฉลี่ยของน้ำหนักทารกแรกเกิดในกลุ่มมารดาวัยรุ่น มีค่าน้อยกว่าในกลุ่มมารดาอายุปกติ อย่างมีนัยสำคัญทางสถิติ ($P<0.0001$)

เมื่อวิเคราะห์ด้วย multiple regression พบว่ามีสัมประสิทธิ์สหสัมพันธ์ทางบวกระหว่าง อายุมารดา น้ำหนักที่เพิ่มระหว่างตั้งครรภ์ ระยะเวลาระหว่างอายุที่มีประจำเดือนครั้ง

แรกถึงอายุที่ตั้งครรภ์ ระยะเวลาที่ใช้ยาคุมกำเนิดของมารดา กับน้ำหนักทารกแรกเกิด (r = 0.376, 0.258, 0.358 และ 0.130 ตามลำดับ) และมีสัมประสิทธิ์สหสัมพันธ์ทางลบระหว่างความสูงที่เพิ่มขึ้นกับน้ำหนักทารกแรกเกิด (r = -0.457) และค่าสัมประสิทธิ์ความแปรผันพหุคูณ (R^2) เพื่อทำนายน้ำหนักทารกแรกเกิด (โดยวิธี stepwise) (ขั้นที่ 1) คือ ความสูงที่เพิ่มในระหว่างตั้งครรภ์ (R^2 = 0.20884), (ขั้นที่ 2) น้ำหนักที่เพิ่มในระหว่างตั้งครรภ์ (R^2 = 0.24979) และ (ขั้นที่ 3) ระยะเวลาที่ใช้ยาคุมกำเนิด (R^2 = 0.25628) สามารถเขียนความสัมพันธ์ออกมาในรูปสมการเส้นตรง คือ

น้ำหนักทารกแรกเกิด (กรัม) = 2927.76810 - 4617.15058 (ความสูงที่เพิ่มขึ้นเป็น ซ.ม.) + 11.79068 (น้ำหนักที่เพิ่มขึ้นเป็น ก.ก.) + 59.08345 (ระยะเวลาที่ใช้ยาคุมกำเนิดเป็นเดือน)

Thesis Title Factors Affecting Infant Birthweight in the First Pregnancy

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ABSTRACT

The purposes of this research were to study the association between infant birthweight and these factors :- duration of age at menarche until first pregnancy, height gain during pregnancy, pre-pregnancy height, pre-pregnancy weight, total weight gain, antenatal care (attending, number of visit and gestational age at first attendance) and birth control (yes/no, duration of using and duration of stop using), and the difference of infant birthweight between adolescent and nonadolescent mothers in the first pregnancy. The subjects consisted of 482 mothers from Rajvithi Hospital, Bangkok Metropolis, Thailand. They were divided into 2 groups, 212 were adolescent and 270 were nonadolescent mothers. The data were collected by interview, measurement of the height of the mothers in cm., and extraction of relevant history from hospital records.

The overall results showed that :-

1. Factors, which were significantly associated with infant birthweight, were duration of age at menarche until 1st pregnancy, height gain during pregnancy, pre-pregnancy height, pre-pregnancy weight, total weight gain, antenatal care (attending) and number of visit to antenatal care, ($P<0.0001$, $P<0.0001$, $P=0.0055$, $P=0.0038$, $P<0.0001$, $P=0.0475$ and $P=0.0169$ respectively)

Factors which were not significantly associated with infant birthweight were antenatal care (gestational age at first attendance), birth control, duration of using birth control and duration of stop

using birth control. (P=0.0833, P>0.9999, P=0.2240 and P=0.0935 respectively)

2. The mean value of infant birthweight among adolescent mothers was significantly lower than of nonadolescent mothers. (P<0.0001)

When multiple regression anlysis was used, there was weak significant positive correlation between maternal age, total weight gain, duration of age at menarche until first pregnancy and duration of using birth control with infant birthweight (r = 0.376, 0.258, 0.358 and 0.130 respectively) and weak significant negative correlation between height gain during pregnancy with infant birthweight. (r = -0.457) And the coefficient of multiple determination (R^2) for predict infant birthweight by stepwise method ; (step number one) were height gain during pregnancy (R^2 = 0.20884), (step number two) total weight gain (R^2 = 0.24979), and (step number three) duration of using birth control (R^2 = 0.25628).

The prediction equation was :-

Infant birthweight in grams.= 2927.76810 - 4617.15058 (height gain in cm.) + 11.79068 (total weight gain in kg.) + 59.08345 (duration in month of using birth control)

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CHAPTER I

INTRODUCTION

Statement of problem

It is generally accepted that birthweight is the most important determinant of perinatal and infant mortality. Early neonatal mortality is strongly dependent on birthweight. This is true not only in developing countries but also in those with an exceptionally high standard of living such as the Nordic countries. (1) There, neonatal mortality of more than 50 percent belonged to the birthweight under 2,500 grams. Neonatal mortality rates of the infant groups with more than 2,500 grams of birthweight was quite low, with little difference between subgroups. A recent report from the W.H.O. Regional Office for South-East Asia revealed that perinatal mortality rates in low birthweight (<2500 grams) were more than five time those of normal birthweight deliveries (2500 grams and over). This was true not only in rural but also in urban areas or even in well equipped hospitals. (2)

Birthweight has been shown to depend on many factors including maternal size, maternal nutrition, maternal smoking habit and parental demographic characteristics. The relative importance of such influences on birthweight may differ in different populations ; for example, the effects of maternal nutrition and socioeconomic status are readily apparent in developing countries but may be less important in industrialized societies.

Therefore, in order to study causes or factors affecting infant birthweight especially low birthweight is the beginning process to prevent health problem because the healthy newborn infants are the foundation of healthy population and the quality of life of future adulthood.

In developing countries, there were high incidences of low birthweight infants. In 1979 the W.H.O.(3) estimated that of the 122 million live infants born in 1979 nearly 21 million had a birthweight

equal to or below 2500 grams and could thus be designated as being of low birthweight. This accounted for 17 percent of all the birth in that year. At the global level this means that about one in every 6 infants has a low birthweight, however the incidence is not evenly spread around the qlobe. In some parts of Asia the ratio is almost 1 in 2, while in the parts of Europe it is only 1 in 17. In Thailand the incidence of low birthweight depends on the area of residence and the availibility of health services such as Bangkok reported 10.6 percent and Khon Kaen 13.5 percent.(3)

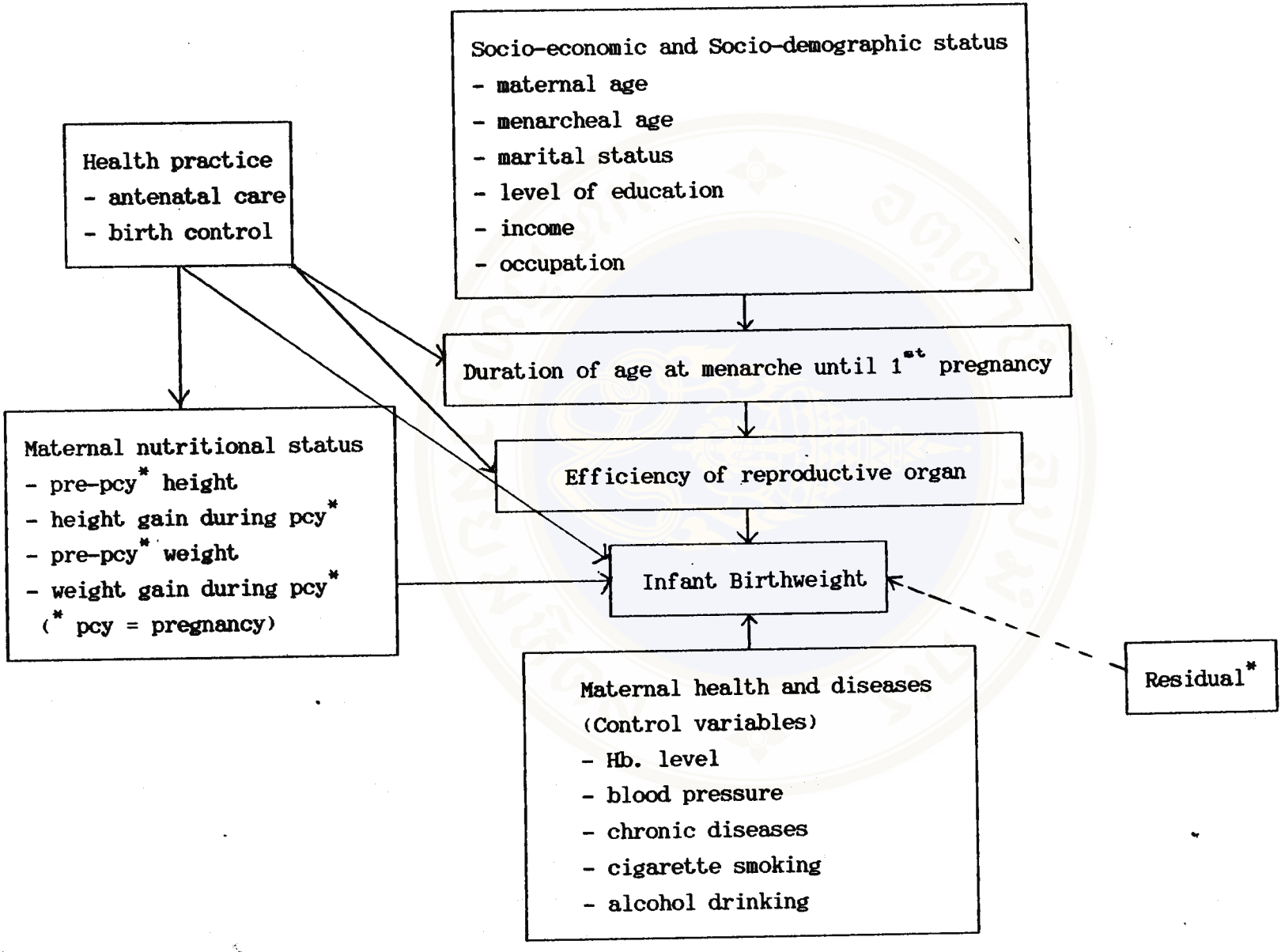
Nowadays, despite advances in obstetrics and neonatal care, special care being planned for low birthweight, with good care available to all infants. But it couldn's reduce a dangerous pregnancy and delivery especially in adolescent mothers. Many studies have found that infant birthweight is dependent on maternal age and reproductive potential. Today with rapid human growth and earlier sexual development. That is the age of menarche is ten years and the mean age of menarche is twelve years. (13) Teenagers are now sexually active at and earlier ages, so that a young adolescent may become a young mother while she is still growing herself. Zlatnik and Burmeister in 1977 (4) demonstrated that mothers past the menarche for one or two years were more likely to have low birthweight infants. Many studies have reported that maternal age less than 19 and greater than 35 years predisposes to the production of low birthweight offspring (5,6,7,8), especially in the first pregnancy.

In order to reduce the unsatisfactory outcome seen in low birthweight infants and young mothers, many researchers have tried to demonstrate the factors involved. The main objectives of this thesis is to study the factors which may influence the birthweight of newborn infants in the first pregnancy. Hopefully the results of this study will serve as a useful guideline to health personnel in the management of the problems of low birthweight and in turn result in an improvement in the health of these infants now and in the future.

General conceptual framework :-

The literature reveals that, there are many factors known to be associated with infant birthweight including maternal age, and parity, stature, pre-pregnancy weight and weight gain during pregnancy, nutritional practices smoking habit, antenatal care, infectious disease, maternal disease, haemoglobin level, socio-economic status, work pattern during pregnancy, marital status, race, birth interval and sex of newborn infants. However these factors have only been studied in general. This study is interested in the first pregnancy and some of the factors which it, especially maternal growth and reproductive potential as shown in the diagram :-

Factors affecting infant birthweight in the first pregnancy



* Residual means other variables which may relate to infant birthweight but have not been controlled or studied

Objectives of this study

1. To study the association between infant birthweights in the first pregnancy and the following factors :-

- Duration of age at menarche until pregnancy
- Pre-pregnancy height
- Height gain during pregnancy
- Pre-pregnancy weight
- Total weight gain
- Antenatal care
- Birth control

2. To study the association between infant birthweights of adolescent mothers and adult mothers in the first pregnancy.

Hypothesis

1. There are associations between infant birth weights and the following facctors :-

- Duration of age at menarche until pregnancy
- Pre-pregnancy height
- Height gain during pregnancy
- Pre-pregnancy weight
- Total weight gain
- Antenatal care
- Birth control

2. Infant birth weights in the first pregnancy of adolescent mothers is lower than in adult mothers

Scope of this study

1. The population studied includes only primigravida women who at full term delivered a single baby without congenital abnormality on the first examination within 24 hours after birth at the Department of Obstetrics, Rajvithi Hospital from December 1987, to June 1988.

2. The information in this study was collected by :-

2.1 interview questionaires by the researcher

2.2 delivery record charts of the hospital

2.3 measurement of the height of mothers after delivery by the researcher

Assumptions of this study

1. The study population is confined to those women delivering at Rajvithi Hospital only, this study can not be extended to represent the entire population.

2. The informations were obtained from the mothers by mean of interviews by the researcher.

3. It should be reminded that association is not necessarily causation.

Limitions of this study:-

Not all of the pregnant women who delivered during the period of this study were recruited. Those women were divided into 2 groups. Firstly, few mothers who had normal infant discharged before we could contact. Secondly, in order to study the height gain and weight gain, the women who couldn't remember the height and weight before pregnancy were excluded from this study.

Type of variables used in this study

1. Independent variables :-

1.1 Study variables

Maternal age

Duration between age of menarche until pregnancy

Pre-pregnancy height

Height gain

Pre-pregnancy weight

Total weight gain

Antenatal care

Birth control

1.2 Controlled variables :-

Socio-economic status, such as :-

- Occupational
- Education level
- Family income

Maternal health and diseases

- Blood pressure not more than 140/90 m.m. Hg.
- Haemoglobin levels not less than 10 gm%
- Chronic diseases, infectious diseases and complications during pregnancy
- Alcohol consumption
- Cigarette smoking

2. Dependent variable :-

Infant birth weight

Definition and meaning of terminology used in this study :-

First pregnancy ; in this study, refers to primigravida mothers with no history of abortion

Full term pregnancy ; in this study, refers to pregnancy between 38 to 42 weeks of gestation estimated by an obstetrician. Routinely, expected date of confinement was calculated from the first day of the last menstrual period by Naegele's rule. Among the group of women whose history of menstruation was not recorded, estimation was made either by palpation of height of fundus or history of any quickening reported by the mother.

Infant birthweight ; means the first weight in grams of the newborn. This weight was measured preferably with in the first hour of life before significant postnatal weight loss has occured.

Infant birth weight levels (9) :-

Normal	> 3,000 gms.
Lower than normal	< 3,000 gms.

Adolescent or teenage mother ; in this study, refers to mothers of 13 to 18 years in age.

Nonadolescent or adult mother ; in this study, refers to mothers of 19 to 34 years in age.

Socio-economic status ; in this study, are indicated by a family income, education level and parental occupation.

Family income ; in this study, refers to income per month from all sources of the family. (In cases of parents with no occupation, the income was obtained from that of the grandparents of the infant).

Disease during pregnancy ; means the disease which may occur before or during this pregnancy and is not caused by pregancy, such as hypertension, heart disease, diabetes mellitus, bronchial asthma etc.

Complication during pregnancy ; refers to the common complications usuually caused by pregnancy, such as hyperemesis gravidarum, bleeding per vagina and toxemia of pregnancy.

Family planning practice ; is this study, refers to the oral contraceptive pill used to prevent pregnancy.

- users ; means a mother who has practiced regulary (in 1 month) family planning after living together with her husband before becoming pregnant.

- nonusers ; means a mother who did not practice family planning after living together with her husband or practiced irregular (in 1 month) family planning.

Antenatal care ; means a mother who came or didn't come, a total number of visits, gestational age at first attendance to the antenatal care clinic during the period of pregnancy.

Pre-pregnancy weight ; means weight before pregnancy by mean of inerview from memory of mothers. If the mother cannot remember, we exclude from this study.

Toal weight gain ; means weight before delivery minus pre-pregnancy weight.

Pre-pregnancy height ; means the height before pregnancy by

mean of interview from memory of mothers. If the mothers cannot remember, we exclude from this study.

Height gain during pregnancy ; in this study, refers to an average of height gain per week of mothers (expressed in centimetres) which were calculated from height after delivery minus height at first attendance for antenatal care clinic and were divided by duration of first prenatal care to delivery. (duration was expressed in weeks). And in case of they had no prenatal care, these mothers must know pre-pregnancy height then average with gestational age at delivery. (per week)

Nutritional status ; is indicated by, pre-pregnancy weight, total weight gain during pregnancy, Pre-pregnancy height, and height gain during pregnancy.

Duration of age at menarche until first pregnancy ; in this study, refers to maternal age at first pregnancy minus maternal age at menarche.

CHAPTER II

REVIEW OF THE LITERATURE

Many previous studies about factors associated with infant birth weight have been reported and published. Most of them have been conducted in other countries. Very few studies have been conducted in Thailand, especially in the first pregnancy and in adolescent mothers.

Factors contributing to the birth weight at various stages of pregnancy are periodically reviewed.

1. Maternal socio-demographic and socioeconomic status :-

1.1 Maternal age

There are many studies showing the relationship between maternal age and infant birth weight. Nowadays despite advances in medicine but the risk of complication during pregnancy and at delivery has not decreased especially in adolescent mothers.

In Thailand after World War II the death rate has decreased rapidly but the birth rate remained high. The result of which is a rapid increase in population growth and the adolescent population will be increased continuouslly from 9.7, 11.1, 9.5, 10.8 and 12.1 percent in 1937, 1947, 1960, 1970 and 1980 respectively and these population have lower menarcheal age too therefore low age of population which active sexually is high. And in 1984, birth rate was decreased about 19:1000 L.B. Trend of birth rate in all mother's age had been decreased but exception in 15-19 years. Because it was found that the birth rate in mother's age lower than 20 years was 12.3, 12.7, 12.9, 12.6 and 12.5 percent in 1980, 1981, 1982, 1983 and 1984 respectively. (10) Effect of these data shows that trend of pregnancy in young mothers age has increased.

Baird, Hytien and Thomson in 1958 (11) found that primigravida mothers younger than 20 years had a highest rate of prematurity. Zlatnik and Burmeister in 1977 (4) had similar findings. The uterus may somehow be structurally or functionally less able to

carry a fetus to term, the uterine vasculature less well-developed in those young women.

Baird in 1964 (6) at Scotland, Papaevannngelou et al. in 1973 (5) at Greece, Bjerre and Varedh in 1975 (8) at Sweden, Oduntan and Ayeni in 1976 (7) at Nigeria described that maternal age as one of the important factors affecting infant birthweight. The incidence of low birthweight was high among mothers whose age was less than 19 years and over 35 years, especially in the first pregnancy.

Lowson in 1977 (12) mentioned that mothers of extreme age groups may encounter special problems. It is possible that ovarian function is not stabilized when the mother is too young and her physical growth has not fully developed. Her reproductive system is not well prepared for pregnancy so that the hormonal effect on her reproductive organs is deficient. This factor may result in complications of pregnancy as well as delivery,

1.2 Menarcheal age :-

Duration of age at menarche until 1st pregnancy and growth in height and weight

Menarche is a definite point of time in puberty of girls. Following menarche there is gradual slowing of the physical growth that has been so dramatic during the preceding few years. Nelson in 1978 (13) described that the rate of weight gain declines, and maximum height is usually reached within 1-2 years after menarche.

The National Academy of Science in 1971 (14) described that when menarche is reached, girls are in the deceleration phase of growth and have achieved all about two inches of their ultimate stature.

In the U.S.A., for example, the average age of menarche is 12.8 years (normal range of 10-16 years). Since after menarche an average growth potential of 7.6 centimeters exists, there is a five-year period in which growth and development continue. (15)

The National Academy of Science in 1971 (14) summarized that girls are at biological risk if pregnancy occurs before cessation of

growth. Because as they are growing, most girls under 17 years have greater nutritional requirements in relation to body size than do adult women. The additional nutrient demands of pregnancy may compromise their growth potential and increase their risk in pregnancy. When growth is complete, usually at 17 years, the nutritional requirements of girls become similar to those of adult women.

Nowadays the trends of menarcheal age have decreased, in countries of Western Europe, and estimated by Tanner to be decreased by about four months per decade. For Thailand, it was studied in some groups of people, by Hauck in 1952-1954 (people near Bangkok) is 15.3 years, Cocharn and Nandwadi in 1977-1978 is 15.8 years, Maungman in 1978 is 12.5-13.2 years, Khanjanathiti et. al. in 1979 is 12.58 years, Chamratrithirong in 1982 is 13.4-14.4 years (16) This data shows that the menarcheal age of Thai's woman has decreased. Also nowadays an increase in sexual freedom has occurred. This augmentation has been related both an earlier age at marriage than before and a younger age at first pregnancy.

Sandler, Wilcox and Horney in 1984 (17) showed that age at menarche was directly related to the age at which a woman married and conceived a first child but was unrelated to total fertility. Women with either early or late menarche were significantly more likely to have an ectopic pregnancy. Overall spontaneous abortion risk declined slightly with increasing age at menarche.

Frisancho et. al. in 1983 (18) found that increasing mean values of age at menarche from the 12^{th} to 16^{th} years of mothers, similarly birthweight increased systemically with increasing maternal age from the 12^{th} to 16^{th} year. Furthermore, young adolescent mothers had smaller and thinner newborns than those born to older women.

Zlatnik and Burmeister in 1977 (4) demonstrated that mothers who had passed the menarche for one or two years were more likely to have low birthweight infant.

Maternal Height and Weight when she is still growing :-

Roche and Davila in 1972 (19) found that growth slows at menarche but does not cease completely until 4 to 7 years later, in healthy young women, adult heights and weights exceed those at menarche by 4.3 to 10.6 cms. and 5 to 10 Kgs..

Baird in 1964 (6) showed that girls having a first child before the age of 16 were shorter and had a greater prematurity rate than older primigravidas. The high rate of prematurity associated with extreme youth may be due to these girls not being fully grown at the time of the first birth. Also prematurity rate is high in stunt mothers with poor nutrition.

Garn and Petzold in 1983 (20) showed that the progeny of teenage mothers (13-19 years) had a higher incidence of prematurity and diminished birth size. Teenage mothers tend to be of small stature and weight. The small size of their infants is in proportion to their smaller size (small stature and weight). They found that prematurity and low birthweight decreased with increasing maternal age from 13 through 19 years of age. These decreases with increasing maternal age were consistent with a weight explanation in that prematurity and low birthweight all decreased with increasing prepregnancy weight.

Horon et. al. in 1984 (21) found that in infants born to primigravida mothers under the age of 16 years, the maternal weight gain was a more important predictor of birthweight than other factors.

Garn et. al. in 1984 (22) found that the stature and weight increase diminished with increasing years since menarche and was small over all. For girls who became pregnant two years after memnarche and whose pregnancies extended into the third year after menarche, annualized stature gains were less than 1 cm/yr., and annualized weight gains were less than 2 Kg./yr. It was clear that there was little gain in stature or weight attributable to the pregnancy period in these teenage girls.

Frisancho et. al. in 1984 (23) studied adolescent mothers ranging in age from 13 to 15 years. About 95 percent of the adolescent

gravidas were primiparous. Based on the height measurements of the teenagers' parents, the adolescents were classified as either still growing or growth completed depending on whether their height was less or greater than their mother's height. Infants of young adolescent mothers who had not completed their expected growth in height were significantly lighter in birthweight than those born to adolescent mothers who had completed their growth.

1.3 Occupation and family income

This had an effected on infant birthweight because profession and income affected diet, living condition, medical care and maternal health.

Papaevangelou et. al. in 1973 (5), Fedric and Adelstein in 1978 (24) found that mothers in low social class (semi or unskilled class) showed a higher rate of low birthweight infants than mothers of high social class (professional class).

Baird in 1964 (6) found that mothers in high social class had the lowest rates of prematurity.

Adelsusi and Lapido in 1976 (25) found that 62.9% of low birthweight infants were born to mothers of low socio-economics class. (low income and low maternal schooling)

Mare in 1982 (26) found that in poor mother (index from annual family income and family size) had low birthweight infant and greater infant mortality than compared with women of higher income and education.

1.4 Education level

Education level may influence access to health care during pregnancy and knowledge of environmental safety.

Eisner et.al. in 1979 (27) showed a strong association between maternal education under 12 years of schooling and birthweight below 2501 gms. for both white and black primigravida women. The same pattern occured for multigravida women.

1.5 Marital status

Wiener and Milton in 1970 (28) stated that marital status was associated with the infants birth weight. The incidence of low birth weight were high among the parent groups who were separated, divorced or living out of wedlock. ($P<0.05$)

Bjerre and Varedh in 1975 (8) found the difference was statistically significant between mothers of the low birthweight children, where 23.8% were unmarried, compared with 14.1% of the mothers of conrol children. Marital status had an indirect effect on low birth weight. Separated and divorced pregnant women usually had more problems related to socio-economic and mental health which in turn affected the birth weight of newborn infants.

2. Maternal nutritional status and food intake :-

2.1 Food intake

Food is essential to life and growth. Without an adequate supply of food and the nutrients it contains, an organism cannot grow and develop normally and eventually it dies. Pregnancy makes many demands on the prospective mother, especially her nutritional needs and those of the unborn infant. During pregnancy two factors that determine energy requirements are changes in the mother's usual physical activity and an increase in her basal metabolism to support the work required for growth of the fetus and the accessory tissue. The cummulative energy cost of this extra work has been estimated at 80,000 k. cal. The total 80,000 k. cal. break down to an addition of only 300 extra k.cal. to the daily allowance of the non-pregnant reference woman. (1,600-2,400 k.cal.) (29). This amount to an increase in maternal weight of 28 lbs., or approximately 1 lb./wk. in the later half of pregnancy. It represents a daily increment of about 200 k.cal. /day, allowing for a decrease in physical activity. (30)

The goal of weight management during pregnancy should be to promote optimum nutrition for the mother and child. There are clear indication that a gain of approximately 20 to 30 lbs. (9-13 kg.)

produces the most favorable outcome. (28)

Beal in 1971 (31) found that the relationship between caloric intake and weight gain during pregnancy was a positive correlation, but the coefficient was statistically significant only for caloric intake in the second trimester. In the third trimester, when many women restricted caloric intake, the correlation with total weight gain was smaller and not of statistical significance.

Anderson et. al. in 1972 (32) described that nutritional requirements for the adolescent during pregnancy vary widely, depending on the rate of growth and stage of maturation of the expectant mother. Early maturing girls who reach menarche at the peak of their growth spurt may conceive before their skeletal, including pelvic, maturation has been completed. This girls have high caloric needs. It the physical activity of the woman remains the same during the second and third trimesters of pregnancy, an additional 200 calories is needed to meet the energy costs of pregnancy.

Lechtig et. al. in 1975 (33) showed that there was a significant difference between mean birthweight and two levels of caloric supplementation during pregnancy. (low supplement group ; <20,000 calories ; high supplement group ; >20,000 calories.). They concluded that caloric supplementation during pregnancy (>20,000 calories) produced the observed increase in birthweight.

2.2 Maternal height

Maternal height is clearly related to birthweight. Baird in 1957 (6) in a study of Aberdeen primigravidas found that the highest prematurity rates were in mother under 61 inches. Oduntan and Ayeni in 1976 (7), Bjerre and Varendh in 1975 (8), Fedric and Adelstein in 1978 (23) found that low birth weight at term was associated with low maternal height and in shorter mothers low birth weight was more than in taller mothers especially in mothers under 155 cms..

Frisancho et. al. in 1983 (17) who studied mothers 12-25 years of age indicated increasing mean values of height at delivery

from the 12th to 16th year. Similary, newborn weight increased systemically.

Nondasuta et. al. in 1986 (34) in a study of the relationship between birthweight and maternal height showed the increase of mean birthweight with the increase in maternal height as linear.

2.3 Pre-pregnancy weight and weight gain

Singer, Westphal and Niswander in 1968 (35) studied the relationship of maternal weight gain to birthweight. Weight gain was defined as the difference between pre-pregnancy weight and weight at the time of admission for delivery. The data indicated that the greater the maternal weight gain during pregnancy, the better the birthweight of infants. Niswander et. al. in 1969 (36) had similar findings.

The study of Edwards et. al. in 1979 (37) compared the frequency of perinatal complications between who were 10% or more below standard weight for height at the onset of pregnancy and match control subjects who are normal weight for height. It found that :-

- A twofold increase in the delivery of low birth weight infants occurred among under weight woman despite adequate total weight gain for the duration of pregnancy as well as appropiate rate of weight gain by trimester. Scott in 1966 (38), Urrusti et. al. in 1972 (39) had similar finding.

- Under weight woman and normal weight control subjects who gained less than 12 pounds were delivered of low birth weight infants with equal frequency.

Niswander and Jackson in 1974 (40) in an analysis of 32 characteristics and conditions of pregnancy found that the pre-pregnancyweight and maternal weight gain were of the greatest importance.

Beal in 1971 (31) found a significant correlation between caloric intake in the second trimester and total weight gain during pregnancy. Smaller correlations were found between birth weight and

maternal weight and weight gain.

Miller and Hassanein in 1974 (41) found that the birthweight of infants of mothers with weight gain of less than one half pound (0.23 kg.) per week in the second and third trimester was less than of mothers with weight gain of more than a pound (0.46 Kg.) in the same time.

Naeye in 1979 (42) found that during pregnancy the optimal weighttt gain which tended to have the least perinatal mortality and healthy infants for normally proportioned mothers was 20 pounds, underweight mothers 30 pounds and overweight mothers 16 pounds.

Naeye et. al. in 1973 (43) found that there was no relationship between maternal stature and fetal growth when comparison were made between the offspring of short and tall women within a single nutritional category. Thus, a short, overweight mother with a high gestational weight gain did not produce a smaller infant than a tall, over weight mother who had a similar high weight gain.

Love and Knich in 1965 (44) found that the heavier the mother before pregnancy, the heavier her infant ; there was a significant positive correlation between maternal preconception weight and the birthweight. This correlation remained significant after correction by the length of gestation. Also taller the woman, the heavier was her infant. This correlation remained significant after correction by the length of gestation. The correlation between maternal height and the birth weight was less than between maternal weight and birth weight, and when corrected by the maternal weight, was reduced until it was insignificant.

Bergner and Susser in 1970 (45) found that mother's height is best considered as an indirect index of her weight, for the effect of height on birth weight disappears when maternal weight is controlled.

Winikoff and Debrovner in 1981 (46) found that weight gain was more significant to birthweight in women of low weight for height ; and in women of intermediat weight for height, the significant variable was maternal prepregnancy weight ; in women of high weight

for height the outcome was best explained by maternal height.

Gormican et. al. 1980 (47) analysis for data showed that an increased maternal weight gain was accompanied by a statistically significant increas in infant birth weight. An increase in maternal pre-pregnancy weight was accompanied by an increase in infant birthweight.

2.4 Haemoglobin level

It is generally accepted that in pregnancy there is a fall in haemoglobin level as the result of haemodilution and anemia is the most common complication of pregnancy.

Hellman in 1971 (48) said that anemia exists in women of haemoglobin is less than 12 gm. per 100 ml. in the nonpregnant state, or is less than 10 gm. per 100 ml. during pregnancy or the peuperium.

Kaltreider and Johnson in 1976 (49) showed that patients with haemoglobin values less than 9 gm. per 100 ml. were found to have significantly higher incidence of low birthweight deliveries.

Adelsusi and Lapido in 1976 (25) found that maternal anemia accounted for quite a high percentage of low birthweight babies.

Williams in 1985 (29) described that the diagnosis of iron deficiency anemia is made on the basis of a haemoglobin concentration value of 10 gm. per 100 ml. of blood or less, and a haematocrit value of 30 percent or less.

Pritchard in 1970 (14) showed that if the haemoglobin level is less than 11 gm. per 100 ml. in late pregnancy, anemia should be suspected.

3. Health practice :-

3.1 Antenatal care

Prenatal care has been accepted as one of the basic ingredients in the establishment of good obstetric medical service. Recent studies of pregnancy outcome have shown a progressive decline of perinatal and infant mortality in all risk categories. The decline

has come at a time of change in many aspectes of maternal and infant care, with an increased availability of means for spacing or preventing pregnancies.

The purpose of antenatal care is to have the mother arrive at the end of her pregnancy in good health and to deliver a healthy baby. Mothers who attend antenatal care units and have a complete medical check up at their first visit to detect abnormalities and assess fetal growth. Mothers are given advice about pregnancy and also given information on possible danger signs that detect early complications, which endanger the life or health of the mother and infant.

Baumgartner in 1962 (50) found that mothers who attended antenatal care units had less lower birthweight infants than mother who did not attend.

Kane in 1964 (51) found that in low birth weight infants (2001-2500 gms.) there was a correlation between the number of prenatal visits and perinatal mortality, especially in the first pregnancy.

Wiener and Milton in 1970 (28) found that birth weight related to trimester of prenatal care Negro women who came late or not at all for prenatal care were at greatest risk of having low birth weight infants. (<2,500 gms.)

Eisner et. al. in 1974 (27) showed that mother who had no prenatal care had a higher incidence of low birthweight babies.

Leveno et. al. in 1985 (52) found that women seeking prenatal care had a significantly decreased incidence of low birth weight infants compared with those without such care.

Gortmaker in 1979 (53) found that women without prenatal care more frequently delivered low birthweight infants with a significantly increased perinatal mortality.

3.2 Birth control before conception :-

Supphalek in 1983 (54) studied factors affecting low birth weight infants. She found that the oral pill was the most popular

method of contraception, and that infant birth weight was significantly associated with birth control practice before conception. Mothers who practiced birth control had the highest incidence of delivering infants of normal birth weights. Those who had never practiced any form of birth control seemed to have a significantly high incidence of infants with low birth weight.

4. Residual :-

Other factors have affected infant birthweight, such as smoking habit during pregnancy (55, 56, 57), alcohol abuse during pregnancy (58), previous abortion (59), races (60, 61, 62), obstetric complication during pregnancy (63, 64), previous low birthweight delivery (65, 66) and multipara (67).

CHAPTER III

MATERIALS AND METHODS

The study design is of a crossectional study (retrospective type)

1. Simple selection and size :-

The sample were all mothers who delivered at the Obstetrics Department of Rajvithi Hospital during the period of December 1987, to June 1988 and had the following characteristics :-

1.1 maternal age below 19 years in adolescent group and 19-34 years in nonadolescent group

1.2 full term and the first pregnancy, with no history of abortion.

1.3 single delivery without any congenital abnormalities on the first examination within 24 hours after birth

1.4 no chronic diseases and severe illness such as renal disease, heart disease and hypertension

1.5 no complication disease during pregnancy

1.6 Health status is with in normal limit :-

- Haemoglobin is not below 10 gm%
- Blood pressure is not high above 140/90 m.m. Hg.

1.7 no cigarette smoking and no alcohol intake

2. Sample size :-

From Pilot study ; 10 primiparous of each group (adolescent and nonadolescent mothers) were collected and calculated with the selected variable was duration of age at menarche until first pregnancy

$$\text{Formula : } n = \frac{(Z\sigma)^2}{d}$$

2.1 Sample size of adolescent mothers (n_1) was calculated from duration of age at menarche until first pregnancy variable

$\bar{X}$ = 2.4, S.D. = 10.74, σ = 1.153

and allowable error like this (d) :-

$$2.30 < \mu < 2.61$$

$$d \sim 1/2\ (2.61-2.30) = 0.155$$

when ; α = 0.05 2- tail, z = 1.96

$$\text{So } n_1 = \frac{(1.96 \times 1.153)^2}{0.155} = 212$$

2.2 Sample size of nonadolescent mothers (n_2) was calculated from duration of age at menarche until first pregnancy variable too

$\bar{X}$ = 7.9, S.D. = 3.541, σ = 12.538

all allowable error like this (d) :-

$$6.0 < \mu < 9.0$$

$$d \sim 1/2\ (9.0-6.0) = 1.5$$

$$\text{So } n_2 = \frac{(1.96 \times 12.538)^2}{1.5} = 268$$

3. Instruments

The questionaires was designed according to the information described in the objectives and hypothesis for the interview and additional information was collected from hospital records of those pregnant women.

The questionaire consisted of general information, and also mother and newborn infant information.

4. Data collection

Information used in this study was collected from the following sources :-

4.1 Interview form, the mothers were interviewed and requested to answer the questionaire to cover all the data needed.

4.2 Delivery record, O.P.D. card and chart of the mothers

4.3 Mesurement of the height of those mothers after delivery by the researcher

5. Data analysis :-

The statistical analysis in this study was computed by micro computer which used the SPSS/PC+ programme.

These analysis were :-

5.1 Descriptive statistics ; using simple and crosstabulation

5.2 Analytical statistics ; the chi-square test was applied in order to test the statistical association of qualitative data, t-test was applied in order to test the statistical association of quantitative data

5.3 Pearson product moment correlation coefficient was used to find the association between the variables

5.4 The multiple regression analysis was used to study the effect of the independent variables on dependent variables

5.5 The significant level was 0.05

CHAPTER IV

RESULT

These were 482 mothers recruited in this study. They were divided into 2 groups. A total sample of 212 primiparous adolescents (aged 13 to 18 years) were compared with 270 primiparous nonadolescents (aged 19 to 33 years), 79.3 percent of these adolescent mothers were in the range of 16 to 18 years in age, the remainding 20.7 percent were aged less than 16 years and the youngest group (aged 13 years) were 0.9 percent.

The mean age of the adolescent mothers was 16.623 years. (SD = 0.086) (Table 1)

Table 1 Number and percentage distribution of adolescent mothers classified by age

maternal age (y)	n	%	Cum.%
13	2	0.9	0.9
14	12	5.7	6.6
15	30	14.1	20.7
16	40	18.9	39.6
17	64	30.2	69.8
18	64	30.2	100.0
total	212	100.0	

$\overline{X}$ = 16.623, S.D. = 1.26

In nonadolescent mothers 70.7 percent were in the range of 20 to 33 years in age. The mothers aged 19 years were 29.3 percent. The mean age of the nonadeolescent mothers was 21.874 years. (S.D.= 3.042) (Table 2)

Table 2 Number and perentage distribution of nonadeolescent mothers classified by age

maternal age (y)	n	%	Cum.%
19	79	29.3	29.3
20	37	13.7	43.0
21	39	14.4	57.4
22	27	10.0	67.4
23	16	5.9	73.3
24	17	6.3	79.6
25	21	7.8	87.4
26	9	3.3	90.7
27	9	3.3	94.1
28	2	0.7	94.8
29	7	2.6	97.4
30	4	1.5	98.9
31	2	0.7	99.6
32	0	0	99.6
33	1	0.4	100.0
total	270	100.0	

$\bar{X}$ = 21.874, S.D. = 3.042

General characteristics (Table 3)

- Religion

It was found that 97.2 percent of adolescent mothers and 95.2 percent of nonadolescent mothers were Buddhist. No significant difference was found between the 2 groups concerning religious preference. (P = 0.3812)

- Marital status

It was found that 90.6 percent and 92.2 percent of adolescent and nonadolescent mothers respectively were couples. Marital status distribution was not significantly different between the 2 groups. (P = 0.6295)

- Education level

Mother ; Most of these adolescent mothers (67.5 percent) and nonadolescent mothers (69.3 percent) had finished prathomsuksa, 4.7 percent of adolescent and 3.0 percent of nonadolescent mothers were not educated at all.

It was found that education level was not significantly different between the 2 groups. (P = 0.4566)

Father ; Most of these fathers of the infants among adolescent (54.2 percent) and nonadolescent mothers (54.1 percent) had no education or had finished prathomusuksa, the remainding 35.4 percent of fathers of infants amongst adolescent, and the 29.6 percent of fathers of infants amongst nonadolescent mothers had finished mathayomsuksa. Only 8.9 percent of fathers amongst adolescent and 14.5 percent of fathers amongst nonadolescent mothers had finished above mathayomusksa.

It was found that father's education was not significantly different between the 2 groups. (P = 0.3179)

- Parental occupation

Mother ; Most of the adolescent (74.5 percent) and nonadolescent mothers (64.1 percent) were house-wives. The remainding amongst adolescent and nonadolescent mothers were ; temporary employees (9.4 and 14.9 percent), merchants (7.1 and 7.8 percent), labourers 4.7 and 5.2 percent) and students. (4.2 and 8.5 percent).

It was found that marternal occupation was not significantly different between the 2 groups. (P = 0.1023)

Father ; Most of the fathers of infants among adolescent and nonadolescent mothers were temporary employees (38.7 and 46.3 percent), the remainding were ; permanent employees (29.3 and 31.5 percent), labourers (16.5 and 12.2 percent), merchants (8.0 and 7.0 percent), students and no occupation. (7.5 and 3.0 percent). It was found that the father's occupation was not significantly different between the 2 groups. (P = 0.0787)

- Family income

The mean value of the family income in the adolescent mothers group was 3023.52 $\pm$ 1415.29 bahts and for the nonadolescent mothers group was 3133.13 $\pm$ 1534.46 bahts. It was found that the family income was not significantly different between adolescent and nonadolescent mothers. (P = 0.417) (Table 4)

Table 3 Number and percentage distribution of general characteristics of mothers classified by maternal age

General characteristics of mothers	Age of mother (Y) < 19		19-34		Total	
	n	%	n	%	n	%
Religion						
Buddhism	206	97.2	257	95.2	463	96.1
Other	6	2.8	13	4.8	19	3.9
Total	212	100.0	270	100.0	482	100.0
$X^2 = 0.76676$, d.f. = 1, P = 0.3812						
Marital status						
couples	192	90.6	249	92.2	441	91.5
separated, divorced	20	9.5	21	7.8	41	8.5
Total	212	100.0	270	100.0	482	100.0
$X^2 = 0.23279$, d.f.= 1, P = 0.6295						
Education level :-						
- Mother's education						
none	10	4.7	8	3.0	18	3.7
prathomsuksa	143	67.5	187	69.3	330	68.5
mathayomsuksa	50	23.6	57	21.1	107	22.5
above mathayomsuksa	9	4.2	18	6.7	27	5.6
Total	212	100.0	270	100.0	482	100.0
$X^2 = 2.605$, d.f. = 3, P = 0.4566						

Table 3 (continued)

General characteristics of mothers	Age of mother (Y) < 19		19-34		Total	
	n	%	n	%	n	%
- Father's education						
none and prathomsuksa	118	55.7	151	55.9	269	55.8
mathayomsuksa	75	35.4	80	29.6	155	32.2
above mathayomsuksa	19	8.9	39	14.5	58	12.0
Total	212	100.0	270	100.0	482	100.0
X^2 = 2.394, d.f. = 2, P = 0.3179						
Occupation :-						
- Mother's occupation						
labourer	10	4.7	14	5.2	24	5.0
temporary employee	20	9.4	39	14.9	59	12.2
merchant	15	7.1	21	7.8	36	7.5
house-wife	158	74.5	173	64.1	331	68.7
student	9	4.2	23	8.5	32	6.6
Total	212	100.0	270	100.0	482	100.0
X^2 = 7.7226, d.f. = 4, P = 0.1023						

Table 3 (continued)

General characteristics of mothers	Age of mother (Y) < 19		19-34		Total	
	n	%	n	%	n	%
- Father's occupation						
labourer	35	16.5	33	12.2	68	14.1
permanent employee	62	29.3	85	31.5	147	30.5
temporary employee	82	38.7	125	46.3	207	42.9
merchant	17	8.0	19	7.0	36	7.5
student and none	16	7.5	8	3.0	24	5.0
Total	212	100.0	270	100.0	482	100.0

X^2 = 8.51, d.f. = 4, P = 0.0787

Table 4 (general characteristics) ;
Mean and standard deviation of family income classified by maternal age

maternal gae (Y)	n	Family income ($\bar{X} \pm$ S.D.) (baht)
< 19	212	3023.52 ± 1415.29
19 - 34	270	3133.13 ± 1534.46

t-test = 0.81, d.f. = 480, P = 0.417

Menarcheal age :-

The mean value of menarcheal age for adolescent mothers was 13.75 years. (S.D. = 1.17) and for nonadolescent mothers was 14.43 years. (S.D.= 1.46) (Table 5)

It was found that menarcheal age of adolescent mothers was significant lower than of nonadolescent mothers. (P <0.0001)

Age at marriage :-

The mean value of age at marriage of adolescent mothers was 16.32 years (S.D. = 1.64) and nonadolescent was 21.10 years. (S.D.= 3.15) (Table 5)

Age at pregnancy :-

The mean value of age at pregnancy of adolescent mothers was 16.54 years. (S.D. = 1.70) and nonadolescent mothers was 21.66 years. (S.D.= 3.62) (Table 5)

Table 5 Mean and standard deviation of menarcheal age, age at marriage and age at first pregnancy classified by maternal age.

Variables	Age of mother (Y)				
	< 19	19-34	t-test	d.f.	P-value
	$\bar{X} \pm$ S.D.	$\bar{X} \pm$ S.D.			
menarcheal age	13.75 ± 1.17	14.43 ± 1.46	5.60	480	<0.0001
age at marriage	16.32 ± 1.64	21.10 ± 3.14			
age at first pregnancy	16.54 ± 1.70	21.66 ± 3.62			

Infant birthweight and maternal age :-

From table 6, it was found that maternal age of less than 19 years had the high incidence (75.5 percent) of infant birthweight below 3,000 gms, whereas maternal age between 19-34 years had a low incidence (24.5 percent) of infant birthweight below 3,000 gms.

Infant birthweight was significantly associated with maternal age. ($P < 0.0001$)

The mean value of infant birthweight of adolescent mothers was 2870.36 $\pm$ 284.73 gms. and nonadolescent mothers was 3203.13 $\pm$ 275.30 gms. (Table 7)

It was found that infant birthweight of adolescent mothers was significantly lower than of nonadolescent mothers. ($P < 0.0001$)

Table 6 Number and percentage distribution of mothers classified by infant birthweight

Infant birthweight	Age of mother (Y)				Total	
	< 19		19-34			
	n	%	n	%	n	%
< 3,000	139	75.5	45	24.5	184	38.2
⩾ 3,000	73	24.5	225	75.5	298	61.8
total	212	100.0	270	100.0	482	100.0

X^2 = 118.25187, d.f. = 1, P < 0.0001

Table 7 Mean and standard deviation of infant birthweight classified by maternal age

maternal age (Y)	n	Infant birthweight ($\bar{X} \pm$ S.D.) (gm.)
< 19	212	2870.36 ± 284.73
19 - 34	270	3203.13 ± 275.30

t-test = 13.01, d.f. = 480, P <0.0001

Duration of age at menarche until first pregnancy :-

Most of adolescent mothers (58.0 percent) had a duration of age at menarche until first pregnancy between 3-5 years, 40.1 percent had a duration af age at menarche until first pregnancy between 0-2 years, only 1.9 percent had a duration of age at menarche until first pregnancy > 6 years where as most of nonadolescent mothers (70.7 percen) had a duraion of age at menarche until first pregnancy > 6 years, 29.3 percent had a duration of age to menarche until first pregnancy between 3-5 years and nobody had a duration of age a menarche until first pregnancy between 0-2 years. It was found that the duration of age at menarche until first pregnancy was significantly different between adolescent and nonadolescent mothers. (P <0.0001) (Table 8)

From table 11, it was found that the duration of age at menarche until first pregnancy was significantly associated with infant birthweight. (P <0.0001)

It is interesting to note that with an increase in the duration of age at menarche until first pregnancy (> 5 y.), there was a higher incidence of infant birthweight >3,000 gms. and a lower incidence of infant birth weight <3,000 gms.

The statistical analysis between the duraion of age at menarche until first pregnancy and infant birthweight among adolescent and among nonadolescent mothers group are present in Appendix B (Table 9 and 10)

Table 8 Number and percentage distribution of mothers classified by duration of age at menarche until first pregnancy

duration of age at menarche until first pregnancy (Y)	Age of mother (Y) < 19 n	%	19-34 n	%	Total n	%
0 - 2	75	40.1	-	-	85	17.6
3 - 5	123	58.0	79	29.3	202	41.9
⩾ 6	4	1.9	191	70.7	195	40.5
Total	212	100.0	270	100.0	482	100.0

X^2 = 270.8323, d.f. = 2, P < 0.0001

Table 11 Number and percentage distribution of infant birthweight classified by duration of age at menarche until first pregnancy

duration of age at menarche until first pregnancy (Y)	Infant birthweight (gm.) < 3,000 n	%	⩾ 3,000 n	%	Total n	%
0 - 2	52	28.3	33	11.1	85	17.6
3 - 5	100	54.3	102	34.2	202	41.9
⩾ 6	32	17.4	163	54.7	195	40.5
Total	184	100.0	298	100.0	482	100.0

X^2 = 69.1805, d.f. = 2, P = <0.0001

Height gain during pregnancy :-

Most of the adolescent mothers (66.0 percent) had a height gain ranging from 0.04-0.07 cm./wk. The remainding 21.2 percent had a height gain of ⩽0.03 m./wk. and 12.8 percent had a height gain ⩾0.08 cm./wk. It showed that the height gain during pregnancy did not cease completely. (Table 12)

From table 13, among adolescent mothers group ;

It was found that the height gain during pregnancy was not significantly associated with infant birthweight. (P = 0.1895)

From table 15, when combinating of adolescent and nonadolescent mothers, the height gain during pregnancy was significantly associated with infant birthweight. (P<0.0001)

Among infants with birthweight <3000 grams it was found that the prevalence of maternal height gain $\geq$ 0.08 cm/week was 10.3 percent comparing with 2.7 percent among those with birthweight $\geq$ 3000 grams.

Table 12 Number and percentage distribution of adolescent mothers classified by height gain during pregnancy

Height gain (cm./wk.)	Age of mother (Y) < 19	
	n	%
⩽ 0.03	45	21.2
0.04 - 0.07	140	66.0
⩾ 0.08	27	12.8
Total	212	100.0

Table 13 (among adolescent mothers ; <19 Y)
Number and percentage distribution of infant birthweight classified by height gain during pregnancy

Height gain (cm./wk.)	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
⩽ 0.03	34	24.4	11	15.1	45	21.2
0.04 - 0.07	86	61.9	54	74.0	140	66.0
⩾ 0.08	32	13.7	8	10.9	27	12.8
Total	184	100.0	73	100.0	212	100.0

$X^2 = 3.32657$, d.f. = 2, P = 0.1895

Table 15 Number and percentage distribution of infant birthweight classified by height gain during pregnancy

Height gain (cm./wk.)	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 0.03	78	42.4	231	77.5	309	64.1
0.04 - 0.07	87	47.3	59	19.8	146	30.3
⩾ 0.08	19	10.3	8	2.7	27	5.6
Total	184	100.0	298	100.0	482	100.0

$X^2 = 62.1230$, d.f. = 2, $P < 0.0001$

Pre-pregnancy height :-

Most of the adolescent (78.3 percent) and nonadolescent mothers (78.9 percent) pre-pregnancy height was ≥150 cms.

It was found that the pre-pregnancy height of the mother was not significantly different between adolescent and nonadolescent mothers. (P>0.9999) (Table 16)

From table 19, the pre-pregnancy height of mother was significantly associated with infant bisthweight. (P = 0.0055)

Among infants with birthweight < 3000 hrams it was found that the prevalence of maternal prepregnarcy height < 150 cms. was significantly greater than that found in the group with birthweight ≥ 3000 hrams (28.3 percents comparing to 17.1 percents).

The statistical analysis between the pre-pregnancy height and infant birthweight among adolescent and among nonadolescent mother group are presented in Appendix B (Table 17,18)

Table 16 Number and percentage distribution of mothers classified by pre-pregnancy height of mother

Pre-pregnancy height (cm.)	Age of mother (Y) < 19		19-34		Total	
	n	%	n	%	n	%
< 150	46	21.4	57	21.1	103	21.4
⩾ 150	166	78.3	213	78.9	379	78.6
Total	212	100.0	270	100.0	482	100.0

X^2 = 0.0019, d.f. = 1, P >0.9999

Table 19 Number and percentage distribution of infant birthweight classified by pre-pregnancy height of mothers

Pre-pregnancy height (cm.)	Infan birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 150	52	28.3	51	17.1	103	21.4
⩾ 150	132	71.7	247	82.9	379	78.6
Total	184	100.0	298	100.0	482	100.0

X^2 = 7.7618, d.f. = 1, P = 0.0055

Pre-pregnancy weight :-

Most of the adolescent (71.2 percent) and nonadolescent mothers (57.4 percent) had a pre-pregnancy weight <50 kgs.

It was found that the pre-pregnancy weight was significantly different between adolescent and nonadolescent mothers. (P = 0.0003) (Table 20)

And adolescent mothers had the high rate of pre-pregnancy weight <50 kgs. (71.2 percent)

From Table 23, the pre-pregnancy weight was significantly associated with infant birthweight. (P = 0.0038).

Greater prevalence of mothers with pre-pregnancy weight <50 kgs. (71.7%) was found in the group of infants with birthweight <3000 gms. comparing to that of 54.8% in the group of infants with birth wieght ≥ 3000 gms.

The statistical analysis between the pre-pregnancy weight and infant birthweight among adolescent and among nonadolescent mothers group are presented in Appendix B (Table 21,22)

Table 20 Number and percentage distribution of mothers classified by pre-pregnancy weight

Pre-pregnancy weight (kg.)	Age of mother (Y) < 19		19-34		Total	
	n	%	n	%	n	%
< 50	151	71.2	155	57.4	306	63.5
⩾ 50	61	28.8	115	42.6	176	36.5
Total	212	100.0	270	100.0	482	100.0

X^2 = 9.1958, d.f. = 1, P = 0.0003

Table 23 Number and percentage distribution of infant birthweight classified by pre-pregnancy weight

Pre-pregnancy weight (kg.)	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 50	132	71.7	174	58.4	306	63.5
⩾ 50	52	28.3	124	41.6	176	36.5
Total	184	100.0	298	100.0	482	100.0

X^2 = 8.1794, d.f. = 1, P = 0.0038

Total weight gain :-

From table 24 it was found that 76.4 percent and 56.7 percent of adolescent and nonadolescent mothers had a total weight gain during pregnancy <12.5 kgs., while only 23.6 percent of adolescent mothers and 43.3 percent of nonadolescent mothers had a total weight gain during pregnancy ≥ 12.5 kgs.

It was found that the total weight gain during pregnancy was significantly different between adolescent and nonadolescent mothers. (P <0.0001)

It also showed that the number of adolescent mothers who had a total weight gain of less than 12.5 kgs. (76.4 percent) was higher than of nonadolescent mothers (56.7 percent), where as the number of nonadolescent mothers who had a total weight gain ≥ 12.5 kgs. (43.3 percent) was higher than that of adolescent mothers. (23.6 percent)

From table 27, the total weight gain during pregnansy was significautly associated weth infaut birthweight. (P < 0.0001)

Among infants with birthweight < 3000 gms, 81.5 percents were born from mothers who gained less than 12.5 kgs. during pregnancy whereas 55.4 percents found in those with birthweight ≥ 3000 gms.

The statistical analysis between the total weight gain and infant birthweight among adolescent and among nonadolescent mothers group are presented in Appendix B (Table 25,26)

Table 24 Number and percentage distribution of mothers classified by total weight gain

total weight gain (kg.)	Age of mother (Y) < 19		19-34		Total	
	n	%	n	%	n	%
< 12.5	162	76.4	153	56.7	315	65.4
⩾ 12.5	50	23.6	117	43.3	167	34.6
Total	212	100.0	270	100.0	482	100.0

X^2 = 19.59143, d.f. = 1, P < 0.0001

Table 27 Number and percentage distribution of infant birthweight classified by total weight gain

total weight gain (kg.)	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 12.5	150	81.5	165	55.4	315	65.4
⩾ 12.5	34	18.5	133	44.6	167	34.6
Total	184	100.0	298	100.0	482	100.0

X^2 = 33.21716, d.f. = 1, P < 0.0001

Antenatal care (attending)

Most of the infants among adolescent and nonadolescent mothers (89.6 and 96.3 percent) were born from mothers who attended the antenatal care clinic, while only 10.4 and 3.7 percent of them were bron from mothers who did not receive care during pregnancy. (Table 28)

It was found that the antenatal care (attending) was significantly different between adolescent and nonadolescent mothers. ($P = 0.0196$)

But from table 31, the antenatal care (attending) was significantly associated with infant bisthweight ($P = 0.0475$)

The rate of altending antenatal clinic of mothers in the group of infants with birthweight < 3000 gms. is 88.6 percents which is significantly lower than that (95.3 percents) in the group of infant with birthweight $\geq$ 3000 gms.

The statistical analysis between the atenatal care (attending) and infant birthweight among adolescent and among nonadolescent mothers group are presented in Appendix B (Table 29,30)

Table 28 Number and percentage distribution of mothers classified by antenatal care (attending)

A.N.C (attending)	Age of mother (Y) < 19		19-34		Total	
	n	%	n	%	n	%
yes	190	89.6	260	96.3	450	93.4
no	22	10.4	10	3.7	32	6.6
Total	212	100.0	270	100.0	482	100.0

X^2 = 5.5969, d.f. = 1, P = 0.0196

Table 31 Number and percentage distribution of infant birthweight classified by antenatal care (attending)

A.N.C (attending)	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
yes	166	88.6	284	95.3	450	93.4
no	18	11.4	14	4.7	32	6.6
Total	212	100.0	270	100.0	482	100.0

X^2 = 3.9601, d.f. = 1, P = 0.0475

Antenatal care (number of visit) :-

Table 32 showed that 59.5 percent of adolescent mothers and 33.8 percent of nonadolescent mothers attended antenatal care clinic less than 5 times and 40.5 percent of adolescent mothers and 66.2 percent of nonadolescent mothers attended ⩾ 5 times. It was found that the number of visits to antenatal care clinic was significantly different between adolescent and nonadolescent mothers. (P <0.0001) It is interesting to note that the number of nonadolescent mothers visiting the antenatal care clinic ⩾ 5 times (66.2 percent) was higher than of the adolescent mothers. (40.5 percent)

Frem table 35, the number of visits to anternatal care clinic was significantly associated with infarit birthweight. (P = 0.0169)

Mothers who altended antenatal clinic less than 5 times during pregnancy were found in the group of infants with birthweight < 3000 gms. more than in the group with birthweight ≥ 3000 gms. (52.4 Vs. 40.1 percents).

The statistical analysis between the number of visits antenatal care and infant birthweight among adolescent and among nonadolescent mothers group are presented in Appendix B. (Table 33,34)

Table 32 Number and percentage distribution of mothers classified by number of visits to antenatal care

A.N.C (number of visits)	Age of mother (Y) < 19 n	%	19-34 n	%	Total n	%
< 5	113	59.5	88	33.8	201	44.7
⩾ 5	77	40.5	172	66.2	249	55.3
Total	212	100.0	260	100.0	450	100.0

X^2 = 28.1437, d.f. = 1, P < 0.0001

Table 35 Number and percentage distribution of infant birthweight classified by number of visits to antenatal care

A.N.C (number of visits)	Infant birthweight (gm.) < 3,000 n	%	⩾ 3,000 n	%	Total n	%
< 5	57	52.4	114	40.1	201	44.7
⩾ 5	79	47.6	170	59.9	249	55.3
Total	166	100.0	284	100.0	450	100.0

X^2 = 5.8936, d.f. = 1, P = 0.0169

Antenatal care (gestational age at first attendance for antenatal care)

Most of the adolescent mothers (55.8 percent) and nonadolescent mothers (50.4 percent) attended antenatal care clinic at the first time when their gestational age were in the second trimester, whereas 34.7 percent of adolescent and 25.0 percent of nonadolescent mothers attended antenatal care clinic when their gestational age were in the third trimester, only 9.5 percent of adolescent and 24.6 percent of nonadolescent mothers attended antenatal care clinic when their gestational age were in the first trimester. (table 36)

It was found that the gestational age at first attendance for antenatal care was significantly different between adolescent and nonadolescent mothers ($P < 0.0001$)

From table 39, it was found that the gestational age at first attendance for antenatal care was not significantly associated with infant birthweight. ($P = 0.0833$)

The statisticaly analysis between the gestational age at first attendance for antenatal care and infant birthweight among adolescent and among nonadolescent mothers group are presented in Appendix B (Table 37,38)

Table 36 Number and percentage distribution of mothers classified by gestational age at first attendance for antenatal care

Gestational age at 1st attendance for A.N.C.	Age of mother (Y) < 19 n	%	19-34 n	%	Total n	%
1st trimester	18	9.5	64	24.6	82	18.2
2nd trimester	106	55.8	131	50.4	237	52.7
3rd trimester	66	34.7	65	25.0	131	29.1
Total	190	100.0	260	100.0	450	100.0

X^2 = 17.9964, d.f. = 1, P < 0.0001

Table 39 Number and percentage distribution of infant birthweight classified by gestational age at first attendance for antenatal care

Gestational age at 1st attendance for A.N.C.	Infant birthweight (gm.) < 3,000 n	%	⩾ 3,000 n	%	Total n	%
1st trimester	22	13.3	60	21.1	82	18.2
2nd trimester	89	53.6	148	52.1	237	52.7
3rd trimester	55	33.1	76	26.8	131	29.1
Total	166	100.0	284	100.0	450	100.0

X^2 = 5.0704, d.f. = 2, P = .0833

Family planning practice :-

- Birth control practice

The majority of cases (57.1 percent) had never or irregularly practiced birth control and 42.9 percent had practiced birth control before conception. (Table 40)

It was found that birth control practice was not significantly different between adolescent and nonadolescent mothers. (P = 0.3258)

From table 43, it was found that the birth control practice was not significantly associated with infant birthweight. (P >0.9999)

The statistical analysis between the birth control practice and infant birthweight among adolescent and among nonadolescent mothers group are presented in Appendix B. (Table 41,42)

Table 40 Number and percentage distribution of mothers classified by birth control practice

Family planning practice	Age of mother (Y) < 19		19-34		Total	
	n	%	n	%	n	%
Birth control :-						
used	85	40.1	122	45.2	207	42.9
irregularly and unused	127	59.9	148	54.8	275	57.1
total	212	100.0	270	100.0	482	100.0

X^2 = 1.06, d.f. = 1, P = 0.3258

Table 43 Number and percentage distribution of infant birthweight classified by birth control practice

Birth control practice	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
used	78	42.4	129	43.3	207	42.9
irregularly and unused	106	57.6	169	56.7	275	57.1
total	184	100.0	298	100.0	482	100.0

X^2 = 0.0009, d.f. = 1, P > 0.9999

- Duration of using birth control practice :-

Table 44 showed that 56.3 percent of adolescent and 72.9 percent of nonadolescent mothers used birth control practice equally for 3 months and over. The remainding 43.5 percent of adolescent and 27.1 percent of nonadolescent mothers used birth control practice lower than 3 months. It was found that the duration of using birth control practice was significantly different between adolescent and nonadolescent mothers. (P = 0.0218)

It is interesting to note that the number of adolescent mothers who used birth control practice lower than 3 monthes (43.5 percent) was higher than of nonadolescent mothers. (27.1 percent).

From table 47, the duration of using birth control practice was not significantly associated with infant birthweight. (P = 0.2240)

The statistical analysis between the duration of using birth control practice and infant birthweight among adolescent and among nonadolescent mothers group are present in Appendix B. (Table 45,46)

Table 44 Number and percentage distribution of mothers classified by duration of using birth control practice

duration of using birth control practice (mo.)	Age of mother (Y) < 19		19-34		Total	
	n	%	n	%	n	%
< 3	37	43.5	33	27.1	70	33.8
⩾ 3	48	56.5	89	72.9	137	66.2
total	85	100.0	122	100.0	207	100.0

X^2 = 5.3653, d.f. = 1, P = 0.0218

Table 47 Number and percentage distribution of infant birthweight classified by duration of using birth control practice

duration of using birth control practice (mo.)	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 3	31	39.7	39	30.2	70	33.8
⩾ 3	47	60.3	90	69.8	137	66.2
total	78	100.0	129	100.0	207	100.0

X^2 = 1.5627, d.f. = 1, P = 0.2240

- duration of stop using birth control practice until pregnancy

Table 48 showed that 72.9 percent of adolescent and 50.8 percent of nonadolescent mothers stopped using birth control practice lower than 3 months. The remainding 27.1 percent of adolescent and 49.2 percent of nonadolescent mothers stopped using birth control practice equally for 3 months and over. It was found that the duration of stop using birth control practice was significantly different between adolescent and nonadolescent mothers. (P = 0.0003)

From table 51, it was found that the duration of stop using birth control practice was not significantly associated with infant birthweight. (P = 0.0935)

The statistical analysis between the duration of stop using birth control practice and infant birthweight among adolescent and among nonadolescent mothers group are presented in Appendix B. (Table 49,50)

Table 48 Number and percentage distribution of mothers classified by duration of stop using birth control practice until pregnancy

duration of stop using birth control practice (mo.)	Age of mother (Y) < 19		19-34		Total	
	n	%	n	%	n	%
< 3	62	72.9	62	50.8	124	59.9
⩾ 3	23	27.1	60	49.2	83	40.1
total	85	100.0	122	100.0	207	100.0

X^2 = 9.3063, d.f. = 1, P = 0.0003

Table 51 Number and percentage distribution of infant birthweight classified by duration of stop using birth control practice until pregnancy

duration of stop using birth control practice (mo.)	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 3	53	67.9	71	55.0	124	59.9
⩾ 3	25	32.1	58	45.0	83	40.1
total	78	100.0	129	100.0	207	100.0

X^2 = 2.8568, d.f. = 1, P = 0.0935

However the researchs on adolesent pregnancy and identify questions that remain unanswered. The relationship of health habits to maternal age and infant birthweight is complex. It has been suggested that, compared with adult women, adolescents have poorer health habits during pregnancy (68)

Moreover, pregnancy in early adolescence (<15 years of age) may identify young women whose lifestyle would jeopardize infant outcome at any maternal age. (69) In addition to age, socioeconomic status is associated with perinatal mortality : the heigher the socioeconomic status the lower perinatal mortality rate at any maternal age. (70) To better understand the possible role of biologic maturity socioeconomic status was controlled.

In addition to high perinatal mortality, infants of adolescent mothers are at increased risk for prematurity and low birthweight. (71,72,73,74,75) However, factors other than maternal immaturity may be responsible. For example, maternal race, weight prior to pregnancy, weight gain during pregnancy and infant gestational age.

However, some varibales were not independently associated with birth weight then multivariate analysis was used to asses the the independent impact of infant birthweight and health habits variables. Those results were showed in table 52,53 and 54.

The study of independent variables (maternal age, maternal weight gain, duration of age at menarche until first pregnancy, duration of using birth control and height gain) and infant birthweight in the multiple regression.

The correlation matrix presented in table 52, showed some significant among independent variables (maternal age, maternal weight gain, duration of age at meanrche until first pregnancy, duration of using birth control and height gain) and infant birthweight. To ensure that the effect of some important independent variables was controlled, the multiple regression analysis by stepwise method was also used.

Table 52 The correlation matrix of maternal age, maternal weight gain, pre-pregnancy height, duration of age at menarche until 1st pregnancy, duration of using birth control, height gain and infant brithweight

variables	maternal age	maternal weight gain	pre-pregnancy height	dur.of age at men. until 1st preg	dur of using B.C.	height gain	infant birthweight
maternal age	1,000	0.127*	-0.037	0.906**	0.127*	-0.697**	0.376**
maternal weight gain		1.000	0.083*	0.139*	0.002	-0.125*	0.258*
pre-pregnancy height			1.000	-0.013	-0.089*	0.013	0.040
duration of age at menarche until 1st preg.				1.000	0.105*	-0.644*	0.358*
duration of using birth control					1.000	-0.114*	0.130*
height gain						1.000	-0.457**
infant birthweight							1.000

* P = .01

** P = .001

Table 53 revealed that there was weak significant positive correlation between maternal age, maternal weight gain, duration of age at menarche until first pregnancy and duration of using birth control with infant birthweight. ($r = 0.376, 0.258, 0.358, 0.180$; $P < 0.05$) respectively. These mean that the mothers who had increasing age at pregnancy, total weight gain, duration of age at menarche until first pregnancy and duration of using birth control ought to have increasing infant birthweight.

And there was weak significant negative correlation between height gain and infant birthweight. ($r = -0.457$, $P<0.05$) It mean that the mothers who had more increasing the height gain ought to have decreasing infant birthweight.

Table 53 Correlation coefficient between infant birthweight and maternal age, maternal weight gain duration of age at menarche until 1st pregnancy, duration of using birth control and height gain.

Variables	r	p-value
maternal age	0.376	< 0.0001
maternal weight gain	0.258	< 0.0001
duration of age at menarche until 1st pregnancy	0.358	< 0.0001
duration of using birth control	0.130	< 0.0030
height gain	-0.457	< 0.0001

From table 54

When the regression analysis by stepwise method was used, the height gain was selected and entered on the step number one into the multiple regression equation. It was found that the regression of infant birthweight on height gain was significant at p-value <0.0001. And height gain could explain the relation of changing in infant birthweight with coefficient of multiple determination = 0.20884, (R^2 = 0.20884, P <0.0001) It revealed that height gain could prophesy right on infant birthweight equal 20.884%.

Then when increasing the weight gain variable which was entered on the step number two into the multiple regression equation. It was found that the regression of infant birthweight on the height gain and weight gain were increased with significant at p-value <0.0001. And height gain and weight gain could explain the relation in changing of infant birthweight with coefficient of multiple determination which was increased and become = 0.24979. (R^2 = 0.24979, P<0.0001) It revealed that height gain and weight gain could prophesy right on infant birthweight equal 24.979%.

And the last variable was the duration of using birth control which was entered on the step number three into the multiple regression equation. It was found that the regression of infant birthweight on height gain, weight gain and duration of using birth control were increased with significant at p-value = 0.0451. And the height gain, weight gain and duration of using birth control could explain the relation in changing of infant birthweight with coefficient of multiple determination which was increased and become = 0.25628. (R^2 = 0.25638, P=0.0451) It revealed that height gain, weight gain and duration of using birth control could prophesy right on infant birthweight equal 25.628%.

So the prediction equation was :-

Infant birthweight in grams.= 2927.76810 - 4617.15059 (height gain in cm.) + 11.79068 (total weight gain in kg.) + 59.08345 (duration in month of using birth control)

Table 54 The Coefficient of multiple correlation (R) between independent variables which was selected to the regression equation and coefficient of multiple determination (R^2) for predict infant birthweight with the selected independent variables.

Step var	R	R^2	F-test	p-value
Height gain	0.45699	0.20884	122.74528	<0.0001
Total weight gain	0.49979	0.24979	77.34665	<0.0001
Duration of using birth control	0.50624	0.25678	53.18118	=0.0451

CHAPTER V

DISCUSSION AND RECOMMENDATIONS

Discussion :-

The results from this study will be discussed in the following manner :-

This study was controlled by maternal health and disease (blood pressure, chronic diseases, alcohol drinking and cigarette smoking). The socioeconomics status (level of education, income and occupation of parents) was not significantly different between adolescent and nonadolescent mothers. The results of factors which associated with infant birthweight in the first pregnancy had confirmed the hypothesis of findings as followed :-

1. Maternal sociodemographic and socioeconomic status :-

1.1 Maternal age

It was found that maternal age in the first pregnancy was significantly associated with infant birthweight. ($P<0.0001$) The mean value of infant birthweight of adolescent mothers was significantly lower than that of nonadolescent mothers ($P<0.0001$).

This finding was consistent with the previous studies of Baird, Hytein and Thomson (1958), Baird (1964), Papaevangelou (1973), Bjerre and Varedh (1975), Oduntan and Ayeni (1976), Zlatnik and Burmeister (1977). It might be due to the complete growth and sufficiency of the reproductive organs in the age group 19-34 years and among adolescent mothers, it is possible that her ovarian function is not yet stabilized, when mother is too young, her physical growth is not yet fully developed. Her reproductive system is not well prepared for pregnancy so that the hormonal effect on her reproductive organ is deficient. This factor may result in complications in pregnancy and delivery. However, socio-economic status and another factors also play an important role. Because many of the women who are from low socio- economic families also have little education, these two related factors affect the maternal care, and nutritional status

during pregnancy and delivery, but in this study socio-economic status was not significantly different between adolescent and nonadolescent mothers, whereas the physical growth among adolescent mothers are still growing on.

1.2 Duration of age at menarche until first pregnancy and growth in weight and height.

The duration of age at menarche until 1st pregnancy was significantly associated with infant birthweight. ($P<0.0001$)

This result conformed to the study of Zlatnik and Burmeister (1977), Frisancho et. al. (1983). They demonstrated that there is a statistically significant increase in deliveries of low birthweight infants (< 2,500 gms.) at the younger age (15 and under years old). On the top of this, Zlatnik and Burmeister (1977) found that mothers who had passed the menarche for one or two years were likely to have low birthweight infant. (<2,500 gms.)

It can be speculate that a less duration of age at menarche until first pregnancy might predispose to premature emptying of the uterus, since the uterus would have had fewer cycles of explosure to ovarian hormones prior to the pregnancy. In other words, the uterus might somehow be structurally or functionally less able to carry a fetus to term. It is possible that the uterine vasculature is less well-developed in those young women conceiving closer to menarche than it is in those with a higher duration of age at menarche until 1st pregnancy. Perhaps there are resultant differences in the degree to which uterine or placental blood flow increases in pregnancy.

Nutritional influences may be involved. The growth spurt usually occurs prior to menarche and linear growth is not complete until four years after menarche. Therefore a pregnant woman with a short duration of age at menarche until first pregnancy must satisfy the nutritional needs required for her own growth as well as those of her fetus. Failure to meet these nutritional needs may result in intrauterine growth retardation and perhaps in premature labour.

- Maternal height and weight when she is still growing :-

It was found that the height gain during pregnancy among adolescent mothers did not cease completely. This finding supported the previous studies of Roche and Davila (1972), Garn et. al. (1984). They conclude that growth slows at menarche but does not cease completely until 4 to 7 years later. For girls who became pregnant two years after menarche, annualized stature gains were less than 1 cm. /yr., and annualized weight gains were less than 2 Kg./yr.

But this study was found that the height gain during pregancy among adolescent mothers was not significantly associated with infant birthweight. ($P = 0.1895$) This finding did not support the previous studies of Baird (1964), Garn and Petzold (1983) and Frisancho et. al. (1984) who found that height gain during pregnancy was significantly associated with infant birthweight. The difference may stem from the fact that in this study we have included full term, primigravida whereas Baird (1964), Garn and Petzold (1983) used all parities and all deliveries ; and Frisancho (1984) indicated mothers' height less than that of her own mothers as a sign of incomplete growth where as in this study used the actual increment in height.

When combining adolescent and nonadolescent mothers in the anlysis the height gain during pregnancy was significantly associated with infant birthweight ($P < 0.0001$)

And the above finding demonstrated that there was no variation in birthweight within the group of motherrrs who had not complete their growth but there was significant variation in birthweight when comparing between the group with completed and incompleted growth.

It can be hypothesized uteroplacental blood flow is the main regulator of placental growth, it is quite possible that among the adolescents who have not completed their expected growth the uteroplacental blood flow was reduced. Although we do not know the actual mechanism, how this ocurs, it can be inferred from animal experimental studies.

2. Food intake and maternal nutrition status :-

(In this study m.n.s. refers to pre-pregnancy weight, total weight gain during pregnancy, pre-pregnancy height and height gain during pregnancy)

2.1 Maternal height

It was found that maternal height was not significantly different between adolescent and nonadolescent mothers. (P > 0.9999) However the maternal height was significantly associated with infant birthweight. (P = 0.0055)

This finding supported the previous study such as, Baird (1964), Oduntan and Ayeni (1976), Bjerre and Varedh (1975), Fedric and Adelstein (1978). They concluded that low birthweight infant (<2,500 gms.) at term was associated with low maternal height.

It is possible that most of women, who are taller, have been reared in good living conditions in higher social classes and appear to be livelier, more active and in better physical health than those reared in lower social class (semi or unskilled class), which affects pregnancy and pregnancy outcome directly.

2.2 Pre-pregnancy weight and total weight gain

It was found that pre-pregnancy weight was significantly different between adolescent and nonadolescent mothers. (P = 0.0003) And it was found that the pre-pregnancy weight was significantly associated with infant birthweight. (P = 0.0038)

This finding supported the previous studies such as Love and Knich (1965), Beal (1971), Niswander and Jackson (1974) and Gormican (1980). They showed that the heavier the mother before pregnancy, the heavier her infant ; there was a significant positive correlation between maternal preconception weight and the birthweight.

And it was found that total weight gain during pregnancy was significantly different between adolescent and nonadolescent mothers. (P <0.0001) And it was found that total weight gain during pregnancy was significantly associated with infant birthweight. (P <0.0001)

This finding was consistent with the previous studies of

Singer, Westphal and Niswander (1968), Niswander et. al. (1969), Beal (1971), Naeye et. al. (1973), Miller and Hassanein (1974), Naeye (1979), Edwards et.al. (1979) and Winikoff and Debrovner (1981). They concluded that the greater the maternal weight gain during pregnancy, the better the birthweight of infants.

It usually has been accepted that maternal height and wiehgt as well as weight gain during pregnancy are associated with infant birthweight.

3. Health practice

3.1 Antenatal care

3.1.1 Attendance

It was found that the antenatal care attendance was significantly different between adolescent and nonadolescent mothers. (P = 0.0196) And it was found that antenatal care (attending) was significantly associated with infant birthweight. (P = 0.0475)

This finding was consistent with the previous studies of Baumgartner (1962), Kane (1964), Eisner et.al. (1974), Gortmaker (1979) and Leveno et. al. (1985). They concluded that mothers who attended antenatal care units would have the infant birthweight <2,500 gms. less than mothers who had not.

3.1.2 number of visit

It was found that the number of visits to antenatal unit clinic was significantly different between adolescent and nonadolescent mothers. (P<0.0001) And the nunber of visits to antenatal clinic was significantly associated with infant birthweight. (P = 0.0169)

This finding supported the previous studies of Baumgartner (1962), Kane (1964), Eisner et.al. (1974) and Gortmaker (1979).

They concluded that mothers who recieved inadequate levels of prenatal care experienced substantially increased risks of a low birthweight infant. (<2,500 gms.)

It could be suggested that, pregnant women must have

antenatal visit's for complete medical check up, health education in the mother's class to asses the fetal growth and meternal health. In this study mothers who attended antenatal clinic <5 times had a significantly higher incidence of infant birthweight <3,000 ,gms. compared with those attended > 5 times.

The usual frequency of minimum attendance should be as follows :-

- once every 4 weeks until the 28^{th} weeks,
- once every 2 weeks from 28^{th} to 36^{th} week,
- once a week up to the onset of labour.

3.1.3 Gestational age at first attendance for antenatal care

It was found that the gestational age at first attendance of antenatal clinic was significantly different between adolescent and nonadolescent mothers. ($P<0.0001$) But the gestational age at first attendance for antenatal care was not associated with infant birthweight. ($P=0.0833$)

This finding did not support the previous study by Wiener and Miton in 1970 who found that gestational age at first attendance for antenated care was associated with infant birthweight so that the younger gestational age produced the higher birthweight. The controversial results might come from the difference method of analysis in which all mothers who never attended antenatal clinic were excluded from this analysis but in their studies mothers who never attended antenatal clinic were assigned the gestational age at first attendance for antenated clinic as the third trimester.

Theoreically, mothers who attended the antenatal clinic since early gestational age should benefit most from medical check up, abnormalities detection fetal growth assesment and health education. However number of visit after the first one should also the importance in emphasizing or readjusting the misinformation afterward. In thus stydy. In this study the majority of mothers attended the antenatal

clinic in the second and last trimester (52.7 and 29.1% respectively) which might be a little late but the frequency of visit may be enough to enable thom to take care of themselves. In addition, the late attendance reflected a lower socio-economic groups of mothers in the majority of the which might have concealed the benefits of early antenatal care attendance.

3.2 Family planning practice

3.2.1 Birth control

It was found that the birth control practice was not significantly different between adolescent and nonadolescent mothers. (P = 0.3258) And the birth control practice was not significantly associated with infant birthweight. (P>0.9999)

This finding did not support the previous study of Supphalek (1983). Because, in this study, it was especially studied in the first pregnancy and most of these mothers (57.1 percent) had not or irregularly used birth control which was not useful for spacing pregnancy or suitable for complete growth and sufficiency of the reproductive organs. Simultaneously they did not understand how to use contraceptive pills continuously in one month, so they used it intermittently, so birth control in this study had no effect on infant birthweight.

3.2.2 Duration of using birth control practice

It was found that the duration of using birth control practice was significantly different between adolescent and nonadolescent mothers. (P = 0.0218) And the duration of using birth control practice was not significantly associated with infant birthweight. (P = 0.2240)

Even though duration of using birth control was significantly different between adolescent and nonadolescent mothers but it did not effect the infant birthweight because among adolescent mothers 43.5 percent had a duration of using birth control lower than 3 months, the time of which is too short to allow mother to reach her potential

growth before getting pregnant.

Among nonadolescent mothers, most of them (72.9 percent) had a duration of using birth control $\geq$ 3 months, however these mothers had completed their growth so there was no competition of nutrients between mothers and children in these cases.

- Duration of stop using birth control practice

It was found that the duration of stop using birth control practice was significantly different between adolescent and nonadolescent mothers. ($P = 0.0003$) But the duration of stop using birth control practice was not significantly associated with infant birthweight. ($P = 0.0935$)

Even though, in this study, most of the adolescent (72.9 percent) and nonadolescent mothers (50.8 percent) had a duration of stop using birth control practice $<$ 3 months but it did not effect the infant birthweight because of a short duration of using birth control practice.

Recommendations :-

1. For general women

Women in the reproductive age should receive health education about how to take good care of their healths when they reach the adolescent perior in order to prevent pregnancy during adolescent period.

The topics of education should be focus on the following :-

1.1 For prevention

Before pregnancy ; they should be educated on reproductive health, family health education, sex education, family planning including how to use contraceptive methods.

1.2 For risk group

Adolescent pregnancy ; in addition to knowledge given in 1.1 they should be emphasize on the importance of antenatal care (proper time and food intake), factors affecting infant birthweight (maternal age, maternal height and weight and total weight gain) in order that the growth of born mother and fetus will be satisfactory.

2. For planning

2.1 Provide health education to the target group in primary school (adolescent period, pregnancy, lactating women, the family and the public).

2.2 For women who are likely to get marry or have affair in earlier age especially in the first year after menarche or in the first year after they finished elementary grade when she is still growing, they should be provided health education similarly as in 1.1 with an emphasis on :-

- The importance of family planning with proper age and time to get pregnant.

- Food intake is very important especially right food habit, good nutrition (proper food intake before, during and after pregnancy), demonstrating the proper method of cooking in order to presserve food value should be established and supplementary food.

- Farctors affecting infant birthweight
- The resource services available

3. For further study

- Sample size (from Pilot study) : - It should be calculated from the overall variables then use the maximum size for studied population.

- The other interesting variable is the duration of age at marriage until first pregnancy because it may be resulted in uterine insufficiency, so this variable should be studied.

- Pre-pregnancy weight used as such, which did not reflect their nutritional status before pregnancy, so it should be transformed to % Wt/Ht.

- The result of Pearson product moment correlation coefficient, mothers who did not use birth control were inclued in the analysis of the correlation between the duration of using birth control and birthweight by assigning them as 0 month. In fact this group should be excluded from the anlysis.

CHAPTER VI

SUMMARY

The purposes of this retrospective study were to identify the significant factors associated with the infants birth weight. Study groups were post partum mothers who were admitted at the Obstetrics Department of Rajvithi Hospital during the period of December 1987, to June 1988 with the following characteristics :-

1. full term and the first pregnancy, no history of abortion
2. single birth without any congenital abnormalities on the first examination with in 24 hours after birth.
3. without severe illness or chronic diseases such as Glomerulonephritis, Hypertension, Heart disease and Diabetes mellitus.
4. no complication diseases during pregnancy
5. Health status within normal limit :-
   - Hb. is not below 10 gm%
   - blood pressure is not high above 140/90 m.m.Hg.
6. no cigarette smoking or alcohol drinking

The informations were collected by interview, studied the hospital records and measurement of the height of mothers after delivery.

Method of chi-square, Fisher exact, t-test and multiple regression analysis were utilized in this study and the significant level was 0.05.

The results revealed that, there were 482 mothers totally. It was divided into 2 groups. There were 212 primiparous adolescent (aged 13 to 18 years) were compared with 270 primiparous nonadolescent mothers (aged 19 to 33 years).

Among adolescent mothers, 168 mothers aged 16 to 18 years

(73.9 percent), 44 mothers aged less than 16 years (20.8 percent) and the 2 youngest mothers aged 13 years. (0.9 percent).

Factors which found that statistics were not significantly different between adolescent and nonadolescent mothers were education level of mother (P = 0.4566), of father (P = 0.3179), religion (P = 0.3812), marital status (P = 0.6295), occupational of mother (P = 0.1023), of father (P = 0.0787) and family income (P = 0.417).

The mean value of age among adolescent mothers was 16.623 (S.D.= 0.086) years and among nonadolescent was 21.874 (S.D. = 3.042) years.

The mean value of infant birthweight among adolescent mothers was 2870.36 gms. (S.D. = 284.73) and among nonadolescent mothers was 3203.13 gms. (S.D. = 275.30).

It was concluded that the mean value of birthweight among adolescent mothers was significantly lower than among nonadolescent mothers. (P <0.0001)

Studied variables which were significantly different between adolescent and nonadolescent mothers were duration of age at menarche until 1^{st} pregnancy (P<0.0001), pre-pregnancy weight (P = 0.0003), total weight gain (P<0.0001), antenatal care (attending) (P = 0.0196), antenatal care (number of visit) (P <0.0001) antenatal care (gestational age at first attendance) (P <0.0001) duration of using birth control (P = 0.0218) and duration of stop using birth control practice (P = 0.0003)

Studied variables which were not significantly different between adolescent and nonadolescent mothers were pre-pregnancy height (P >0.9999) and birth control. (P = 0.3258)

Factors which were significantly associated with infant birthweight were duration of age at menarche until 1st pregnancy (P <0.0001), height gain during pregnancy (P <0.0001), pre-pregnancy height (P = 0.0055), pre-pregnancy weight (P = 0.0038), total weight gain (P <0.0001), antenatal care (attending) (P = 0.0475) and antenatal care (number of visit) (P = 0.0169)

Factors which were not significantly associated with infant birthweight were antenatal care (gestational age at first attendance) (P = 0.0833) birth control (P >0.9999), duration of using birth control (P = 0.2240) and duration of stop using birth control. (P = 0.0935)

When multiple regression analysis was used ;

There was weak significant positive correlation between (studied variables) maternal age, total weight gain, duration of age at menarche until first pregnancy, and duration of using birth control with infant birthweight. (r= 0.376, 0.258, 0.358 and 0.130 respectively ; P <0.05) and weak significant negative correlative between height gain during pregnancy with infant birthweight. (r = -0.457 ; P <0.05)

And the coefficient of multiple correlation (R) for predict infant birthweight (by stepwise method) ; (step number one) were height gain during pregnancy (R^2 = 0.20884), (step number two) total weight gain (R^2 = 0.24979), (step number three) duration of using birth control. (R^2 = 0.25628)

The prediction equation was :-

Infant birth weight in grams = 2927.76810 - 4617.15058 (height gain in cm.) + 11.79068 (weight ain in kg.) + 59.08345 (duration in month of using birth control)

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Appendix A

Statistics used in the analysis

1. Compute for mean ($\bar{X}$)

$$\bar{X} = \frac{\Sigma X}{n}$$

where X = Arithmetic mean

$X_1, X_2, \ldots X_n$ = Observed values

ΣX = Sum of all observed values

n = Sample size

2. Compute for percentage

$$\text{percent} = \frac{100\ fi}{n}$$

where fi = Frequency of the i^{th} group

n = Σfi

i = 1,2,.....r, r = total groups

3. t-test

3.1 t-test ($\sigma_1^2 = \sigma_2^2$)

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S_{\bar{x}_1 - \bar{x}_2}}$$

$$d.f. = n_1 + n_2 - 2$$

where n_1 = Size of sample 1

n_2 = Size of sample 2

X_1 = Mean of sample 1

X_2 = Mean of sample 2

S_1 = Standard deviation of sample 1

S_2 = Standard deviation of sample 2

$$S^2_{\bar{x}_1 - \bar{x}_2} = \left(\frac{1}{n_1} + \frac{1}{n_2}\right) \frac{(n_1 - 1)\ S_1^2 + (n_2 - 1)\ S_2^2}{n_1 + n_2 - 2}$$

3.2 t-test ($\sigma_1^2 \neq \sigma_2^2$)

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

$$d.f. = \frac{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}{\frac{1}{n_1 + 1}\left(\frac{S_1}{n_1}\right)^2 + \frac{1}{n_2 + 1}\left(\frac{S_2}{n_2}\right)^2}$$

where n_1 = Size of sample 1

n_2 = Size of sample 2

X_1 = Mean of sample 1

X_2 = Mean of sample 2

S_1 = Standard deviation of sample 1

S_2 = Standard deviation of sample 2

4. The Chi-square test

4.1 2x2 table

$$X^2 = \frac{n\,(ad - bc)^2\,\frac{n}{2}}{R_1\,R_2\,C_1\,C_2}\,, \quad d.f. = 1$$

Variable 1	Variable 2		total
	1	2	
1	a	b	R_1
2	c	d	R_2
Total	c_1	c_2	n

4.2 R x 2 table (R > 2, C = 2)

$$X^2 = \frac{\frac{\xi Oi}{Ri} - \frac{C_1}{n}}{\frac{C_1}{n}\left(1 - \frac{C_1}{n}\right)} \quad \text{or} \quad \frac{\frac{\xi Oi_2}{Ri} - \frac{C_2}{n}}{\frac{C_2}{n}\left(1 - \frac{C_2}{n}\right)}$$

$d.f. = r-1$

Variable 1	Variable 2		total
	1	2	
1	O_{11}	O_{12}	R_1
2	O_{21}	O_{22}	R_2
.	.	.	.
.	.	.	.
.	.	.	.
r	O_{r1}	O_{r2}	R_r
Total	c_1	c_2	n

i = 1,2,....., r. j = 1,2

Oij = Observed value of row i, column j

Rj = $R_1 + R_2 \ldots\ldots + R_r$

Cj = $C_1 + C_2$

n = $\mathcal{E}$ Ri = $\mathcal{E}$ Cj

5. Fisher exact test

It was used when expected value (Ei) < 5 had exceeded 20 percent of total characteristics of datas which were divided.

$$P = \frac{R_1 ! R_2 ! C_1 ! C_2 !}{n ! a ! b ! c ! d !}$$

Variable 1	Variable 2		total
	1	2	
1	a	b	R_1
2	c	d	R_2
Total	c_1	c_2	n

6. Multiple regression analysis :-

Studying correlation between dependant variable (Y) 1 sample and independant variables more than 1 sample (X_2, X_2 ....., X_{p-1})

It was calculation step by step like this :-

6.1 Calculation of correlation coefficient (r_{xy})

$$r_{xy} = \frac{S_{xy}}{S_{xx} S_{yy}}$$

when $S_{xx} = \Sigma X^2 - (\Sigma X)^2/n$

$S_{yy} = \Sigma Y^2 - (\Sigma Y)^2/n$

$S_{xy} = \Sigma XY - \Sigma X \Sigma Y/n$

6.2 Test of significant of r_{xy} by t-test

$$t = \frac{n-2}{1-r^2_{xy}} \quad ; \quad d.f. = n - 2$$

6.3 Selection the best regression equation by anylysis of multiple correlation coefficient (R)

$$R = \frac{SSR}{SST}$$

Predicted equation : $Y = b_o + b_1 + b_2 X_2 + \cdots\cdots$

$$b_o = Y - b_1 X_1 - b_2 X_2 - \cdots\cdots$$

$$b_1 = \frac{S_{1y} S_{22} - S_{2y} S_{12}}{S_{11} S_{22} - (S_{12})^2}$$

$$b_2 = \frac{S_{2y} S_{11} - S_{1y} S_{12v}}{S_{11} S_{22} - (S_{12})^2}$$

$$SST = S_{yy}$$

$$SSR = b_1 S_{1y} + b_2 S_{2y} + \ldots\ldots$$

$$SSE = SSt - SSR$$

Source	d.f.	SS	MS	F-ratio
Regression	p-1	SSR	MSR	$\frac{MSR}{MSE} = F_{(p-1,n-p)}$
Residual	n-p	SSE	MSE	
Total	n-1	SST		

Appendix B

Duration of age at menarche until first pregnancy :-

Table 9 (among adolescent mothers ; <19 Y)
Number and percentage distribution of infant birthweight classified by duration of age at menarche until first pregnancy

duration of age at menarche until 1st pregnancy (Y)	Infant birthweight (gm.)					
	< 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
0 - 2	52	37.4	33	45.2	85	40.1
⩾ 3	87	62.6	40	54.8	127	59.9
total	123	100.0	73	100.0	212	100.0

X^2 = 0.9081, d.f. = 1, P = 0.3695

Table 10 (among nonadolescent mothers ; 19-34 Y)
Number and percentage distribution of infant birthweight classified by duration of age at menarche until first pregnancy

duration of age at menarche until 1st pregnancy (Y)	Infant birthweight (gm.)					
	< 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
3 - 5	15	28.3	64	28.4	79	29.3
⩾ 6	30	54.3	161	71.6	191	70.7
total	45	100.0	225	100.0	270	100.0

X^2 = 0.2290, d.f. = 1, P = 0.6601

Height gain during pregnancy :-

Table 14 (among nonadolescent mothers ; 19-34 Y)
Number and percentage distribution of infant birthweight classified by height gain during pregnancy

Height gain (cm./wk.)	Infant birthweight (gm.)					
	< 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
⩽ 0.03	44	97.8	220	97.8	264	97.8
0.04 - 0.07	1	2.2	5	2.2	6	2.2
total	45	100.0	225	100.0	270	100.0
Fisher exact ; P = 0.7375						

Pre-pregnancy height :-

Table 17 (among adolescent mothers ; <19 Y)
Number and percentage distribution of infant birthweight classified by pre-pregnancy height of mothers

Pre-pregnancy height (cm.)	Infant birthweight (gm.) < 3,000		Infant birthweight (gm.) ⩾ 3,000		Total	
	n	%	n	%	n	%
< 150	32	23.0	14	19.2	46	21.7
⩾ 150	107	77.0	59	80.8	166	78.3
total	139	100.0	225	100.0	212	100.0

X^2 = 0.2207, d.f. = 1, P = 0.6659

Table 18 (among nonadolescent mothers ; 19-34 Y)
Number and percentage distribution of infant birthweight classified by pre-pregnancy height of mothers

Pre-pregnancy height (cm.)	Infant birthweight (gm.) < 3,000		Infant birthweight (gm.) ⩾ 3,000		Total	
	n	%	n	%	n	%
< 150	20	44.4	37	16.4	57	21.1
⩾ 150	25	55.6	188	83.6	213	78.9
total	45	100.0	225	100.0	270	100.0

X^2 = 16.0119, d.f. = 1, P = <0.0001

Pre-pregnancy weight :-

Table 21 (among adolescent mothers ; <19 Y)
Number and percentage distribution of infant birthweight classified by pre-pregnancy weight

Pre-pregnancy weight (kg.)	Infant birthweight (gm.) < 3,000		Infant birthweight (gm.) ⩾ 3,000		Total	
	n	%	n	%	n	%
< 50	97	69.8	54	74.0	151	71.2
⩾ 50	42	30.2	19	26.0	61	28.8
total	139	100.0	73	100.0	212	100.0

X^2 = 0.2308, d.f. = 1, P = 0.6588

Table 22 (among nonadolescent mothers ; 19-34 Y)
Number and percentage distribution of infant birthweight classified by pre-pregnancy weight

Pre-pregnancy weight (kg.)	Infant birthweight (gm.) < 3,000		Infant birthweight (gm.) ⩾ 3,000		Total	
	n	%	n	%	n	%
< 50	132	71.7	174	58.4	306	63.5
⩾ 50	52	28.3	124	41.6	176	36.5
total	184	100.0	298	100.0	482	100.0

X^2 = 8.1794, d.f. = 1, P = 0.0038

Total weight gain :-

Table 25 (among adolescent mothers ; <19 Y)
Number and percentage distribution of infant birthweight classified by total weight gain

total weight gain (kg.)	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 12.5	117	84.2	45	61.6	162	76.4
⩾ 12.5	22	15.8	28	38.4	50	23.6
total	139	100.0	73	100.0	212	100.0

X^2 = 12.25818, d.f. = 1, P = 0.0005

Table 26 (among nonadolescent mothers ; 19-34 Y)
Number and percentage distribution of infant birthweight classified by total weight gain

total weight gain (kg.)	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 12.5	33	73.3	120	53.3	153	56.7
⩾ 12.5	12	26.7	105	46.7	117	43.3
total	45	100.0	225	100.0	270	100.0

X^2 = 5.32127, d.f. = 1, P = 0.0211

Antenatal care (Attending) :-

Table 29 (among adolescent mothers ; <19 Y)
Number and percentage distribution of infant birthweight classified by antenatal care (attending)

A.N.C. (attending)	Infant birthweight (gm.) < 3,000		≥ 3,000		Total	
	n	%	n	%	n	%
yes	122	87.8	68	93.2	190	89.6
no	17	12.2	5	6.8	22	10.4
total	139	100.0	73	100.0	212	100.0

X^2 = 0.9677, d.f. = 1, P = 0.3526

Table 30 (among nonadolescent mothers ; 19-34 Y)
Number and percentage distribution of infant birthweight classified by antenatal care (attending)

A.N.C. (attending)	Infant birthweight (gm.) < 3,000		≥ 3,000		Total	
	n	%	n	%	n	%
yes	166	83.6	284	95.3	450	93.4
no	18	11.4	14	4.7	32	6.6
total	184	100.0	298	100.0	482	100.0

X^2 = 3.9601, d.f. = 1, P = 0.0475

Antenatal care (Number of visit) :-

Table 33 (among adolescent mothers ; <19 Y)
Number and percentage distribution of infant birthweight classified by number of visits to antenatal care

A.N.C. (number of visits)	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 5	72	59.0	41	60.3	113	59.5
⩾ 5	50	41.0	27	39.7	77	40.5
total	122	100.0	68	100.0	212	100.0

X^2 = 0.0032, d.f. = 1, P > 0.9999

Table 34 (among nonadolescent mothers ; 19-34 Y)
Number and percentage distribution of infant birthweight classified by number of visits to antenatal care

A.N.C. (number of visit)	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 5	15	34.1	73	33.8	88	33.8
⩾ 5	29	65.9	143	66.2	172	66.2
total	44	100.0	298	100.0	260	100.0

X^2 = 0.0188, d.f. = 1, P = 0.8948

Antenatal care (gestational age at first attendance) :-

Table 37 (among adolescent mothers ; <19 Y)

Number and percentage distribution of infant birthweight classified by gestational age at first attendance for antenatal care

Gestational age at 1st attendance of A.N.C.	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
1st trimester	13	10.7	5	7.4	18	9.5
2nd trimester	63	51.6	43	63.2	106	55.8
3rd trimester	46	37.7	20	29.4	66	34.7
total	122	100.0	68	100.0	190	100.0

X^2 = 2.4198, d.f. = 2, P = 0.3133

Table 38 (among nonadolescent mothers ; 19-34 Y)

Number and percentage distribution of infant birthweight classified by gestational age at first attendance for antenatal care

Gestational age at 1st attendance of A.N.C.	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
1st trimester	9	20.5	55	25.5	64	24.6
2nd trimester	26	59.0	105	48.6	131	50.4
3rd trimester	9	20.5	56	25.9	65	25.0
total	44	100.0	216	100.0	260	100.0

X^2 = 0.6224, d.f. = 2, P = 0.7354

Birth control practice :-

Table 41 (among adolescent mothers ; <19 Y)
Number and percentage distribution of infant birth weight classified by birth control practice

Birth control practice	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
used	59	42.4	26	35.6	85	40.1
irregularly and unused	80	57.6	47	64.4	127	59.9
total	139	100.0	73	100.0	212	100.0

X^2 = 0.669, d.f. = 1, P = 0.4398

Table 42 (among nonadolescent mothers ; 19-34 Y)
Number and percentage distribution of infant birthweight classified by birth control practice

Birth control practice	Infant birthweight (gm.) < 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
used	19	42.2	103	45.8	122	45.2
irregularly and unused	26	57.8	122	54.2	148	54.8
total	45	100.0	225	100.0	260	100.0

X^2 = 0.0747, d.f. = 1, P = 0.7975

Duration of using birth control practice :-

Table 45 (among adolescent mothers ; <19 Y)
Number and percentage distribution of infant birthweight classified by duration of using birth control practice

duration of using birth control practice (mo.)	Infant birthweight (gm.)					
	< 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 3	25	42.4	12	46.2	37	43.5
⩾ 3	34	57.6	14	53.8	48	56.6
total	59	100.0	26	100.0	85	100.0

X^2 = 0.0074, d.f. = 1, P > 0.9999

Table 46 (among nonadolescent mothers ; 19-34 Y)
Number and percentage distribution of infant birthweight classified by duration of using birth control practice

duration of using birth control practice (mo.)	Infant birthweight (gm.)					
	< 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 3	6	31.6	27	2.2	33	27.1
⩾ 3	13	68.4	76	73.8	89	72.9
total	19	100.0	103	100.0	122	100.0

X^2 = .0411, d.f. = 1, P = 0.8560

Duration of stop using birth control practice :-

Table 49 (among adolescent mothers ; <19 Y)
Number and percentage distribution of infant birthweight classified by duration of stop using birth control practice

duration of stop using birth control practice (mo.)	Infant birthweight (gm.)					
	< 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 3	41	69.5	21	80.8	62	72.9
⩾ 3	18	30.5	5	19.2	23	27.1
total	59	100.0	26	100.0	85	100.0

X^2 = 0.6618, d.f. = 1, P = 0.4404

Table 50 (among nonadolescent mothers ; 19-34 Y)
Number and percentage distribution of infant birthweight classified by duration of stop using birth control practice

duration of stop using birth control practice (mo.)	Infant birthweight (gm.)					
	< 3,000		⩾ 3,000		Total	
	n	%	n	%	n	%
< 3	12	63.2	50	48.5	62	50.8
⩾ 3	7	36.8	53	51.5	60	49.2
total	19	100.0	103	100.0	122	100.0

X^2 = 0.8484, d.f. = 1, P = 0.3867

Appendix C

Questionaire

Factors affecting infant birthweight in the first pregnancy

No.....

Date of interview.....

Name.....

Address.....

.....

Section 1 History of infant

1.1 Sex.....

1.2 Weight..... gram.

1.3 Date of birth....., Gestational age.....week

Section 2 History of family

2.1 Date of birth....., Age.....year.....month

2.2 Religion.....

2.3 Residence with (now)

( ) Husband ( ) Separate

( ) Parents ( ) Relative ( ) Other.....

2.4 Education level

Husband	Herself
( ) None	( ) None
( ) Primary grade	( ) Primary grade
( ) Secondary grade	( ) Secondary grade
( ) University diploma or above	( ) University diploma or above

2.5 Occupation

Husband.....

Herself.....

2.6 Income

Husband.....baht

Herself.....baht

2.7 Family income per month.....baht.

Section 3 Date implicate with pregnancy and delivery

3.1 Menarcheal age.....year, age at first pregnancy .....year

3.2 Duration of age at menarche until pregnancy.....year

3.4 Thinking of abortion

( ) Yes ( ) No

3.5 Using birth control before pregnancy

( ) Yes ( ) No ( ) Irregular

3.6 Duration of using birth control.....month

3.7 Duration of stop using birth control before pregnancy ..... month.

3.8 Antenatal care (attending)

( ) Yes ( ) No

3.9 Gestational age at first attendance for antenatal care .....week., number of visiting.....time.

place of antenatal care

( ) Clinic ( ) Hospital

( ) Station of health ( ) Other

3.10 Morning sickness

( ) None ( ) A little ( ) Hyperemesis gravidarum

3.11 Bleeding per Vagina

( ) None ( ) Yes ; at gestational age.....month

Section 4 Maternal nutritional status

4.1 Pre-pregnancy height.....cm., height after delivery .....cm.

4.2 Height gain.....cm./wk.

4.3 Hct.....%, Blood pressure.....m.m.Hg.

4.4 Pre-pregnancy weight.....kg.

4.5 Weight during pregancy

Weight.....kg. gestational age..... week

.....kg. gestational age..... week

.....kg. gestational age..... week

.....kg. gestational age..... week

.....kg. gestational age..... week

.....kg. gestational age..... week

.....kg. gestational age..... week

.....kg. gestational age..... week

.....kg. gestational age..... week

.....kg. gestational age..... week

Weight before delivery.....kg.

4.6 Total weight gain.....kg.

4.7 Alcohol drinking or cigarette smoking

( ) Yes ( ) No ( ) Once in a while