Study of the Prognostic Value of the Pregnant Nutrition Graph (Vallop Curve) to Predict the Incidence of Low Birth Weight Infants

Anurach Kulvanitchaiyanunt, MD*

** Department of Obstetrics and Gynecology, Pranangkloa Hospital*

Objective: *To test the prognostic value of the pregnant nutrition graph (Vallop Curve).*
Design: *Prospective and comparative study.*
Setting: *Department of Obstetrics and Gynecology, Prangnangklao Hospital.*
Subject: *510 cases who attended the antenatal care clinic and delivered at Prangnangklao Hospital from January 2004 to July 2004.*
Material and Method: *Height, weight and pre-pregnancy body mass index (BMI) of the women were recorded and classified BMI of each into 3 groups, low BMI (< 19.8) normal BMI (19.8-26.0) and high BMI (26.1-29.0.) The weight of the pregnant women in each gestational week was calculated as percentage of standard BMI at 21 and plotted in a Vallop Curve. The data was analyzed by using an Anova Test and Wilson Method to find association. A p-value of < 0.05 was regarded as significant.*
Outcome evaluation: *Birth weight curve, below the 2,500 gm line and above the 2,500 gm line.*
Results: *The mean birth weight of low BMI was 2,541.70 $\pm$ 276.89 gm. The mean birth weight of normal BMI was 3,021.30 $\pm$ 318.61 gm. The mean birth weight of high BMI was 3,520.00 $\pm$ 250.65 gm. There was a significant difference in weight by the Anova Test.*
Sensitivity was 65.6%. Specificity was 87.4%. Positive predictive value was 42.9%. Negative predictive value was 94.7%. P-value was < 0.001 at 95% confident interval by the Wilson Method.
Conclusions: *The Vallop Curve may be useful to predict the incidence low birth weight infants, but in the future the Vallop Curve may be changed corresponding to change of socio-economic status and also to simplify it's method of usage.*

Keywords: *Body mass index (BMI), Pregnant nutrition graph (Vallop Curve), Low Birth weight (LBW)*

J Med Assoc Thai 2005; 88(1): 9-14
Full text. e-Journal: *http://www.medassocthai.org/journal*

Mother and child health is necessary basic health care, especially in the antenatal period. General Hospital, Community Hospital and Primary medical centers have antenatal care services, but the quality depends on different attitudes, knowledge and skill. Primary medical centers have no high technology for diagnosis of medical problems. A practictional nurse who was trained to have more knowledge and skill, was the person to screen and diagnose diseases in antenatal care clinics under the policy "Survival birth. Safety mother".

Correspondence to : Kulvanitchaiyanunt A, Department of Obstetrics and Gynecology, Pranangkloa Hospital, Nonthaburi 11000, Thailand.

The target of the mother and child health in the 9th National Economic and Social Development Plan of Thailand is the LBW, mean birth weight less than 2,500 grams[1], not more than 7% which is a socio-economic status indicator of the country[2]. In January 2004 at a meeting of the Public Health Ministry, it was reported the Permanant Secretary that LBW in Thailand was 8.58%.Therefore, these practictional nurses are important people to make the 9th National Economic and Social Development Plan more successful by giving more skill, knowledge and simple methods for screening and diagnosis in antenatal care clinics to prevent the risk of LBW

Although,current development of new high medical technology was used for screening, diagnosis and treatment of LBW, doctors must concern about their cost-benefit and prognostic value. For example, Neilson et al[3] used ultrasound to measure the biparietal (BPD) diameter of the fetus and the sensitivity was 58% and specificity was 90%. Whilst the Primary Medical Center had no ultrasound and obstetrician. When Walraven et al[4] used symphysis fundal height, its sensitivity was 26%-86% and specificity was 78%-83% to predict LBW. The Division of Nutrition, Department of Public Health Ministry, have used pregnant nutrition graphs (Vallop Curve) in antenatal care books, as a simple method to screen the risk of LBW. The BMI of pregnant women in each week of gestational age is data base. The purpose of the present study was to test the prognostic value of the Vallop Curve in predicting LBW which in a developing country, LBW was mainly caused by intrauterine growth restricted fetus. The function of the placenta in carrying nutrient and oxygen to the fetus was disturbed. This is part of the factor because of the poor health and nutritional status of the mother.

Material and Method

Singleton uncomplicated pregnant women who attended the antenatal care clinic were selected. From 12 weeks of gestational age to deliver at Prananklao Hospital from January 2004 to July 2004 by the following:

1. Give inform the details of the study and get informed consent from the pregnant women.
2. General history, physical examination, history of the last menstual period, weight and height were taken (No smokers in the present study).
3. An obstetrician used ultrasound to confirm the gestational age from the last menstual period in every case, if it was different by more than 1 week, case was excluded.
4. Registered nurses examined the pregnant women routinely and changed the weight to be the percentage of standard body mass index, which was based on the 50th percentile of pre-pregnancy Thai women at 21 (Table 1). For example, if the height is 156 centimeters and weight is 50.1 kilograms, the percentage of standard body mass index is 98, so the number 98 was plotted in the Vallop Curve in the Y axis, corresponding to the gestational age in weeks in X axis (Fig. 1).
5. If the curve in number 4 is below the 2,500 gram line the pregnant woman is educated and advised by the nutritionist. If the curve is above the 2,500 gram line, routine advice was taken. The date of gestational age less than 28 weeks is seen every 4 weeks, between 28-36 weeks, seen every 2 weeks and more than 36 weeks, seen every week.
6. Birth weight was recorded at the labour room.
7. Beyond the 40th week of gestational age, congenital anomaly or complicated pregnancy in which early termination of pregnancy was taken, such as DM, pregnancy induced hypertension, were excluded.

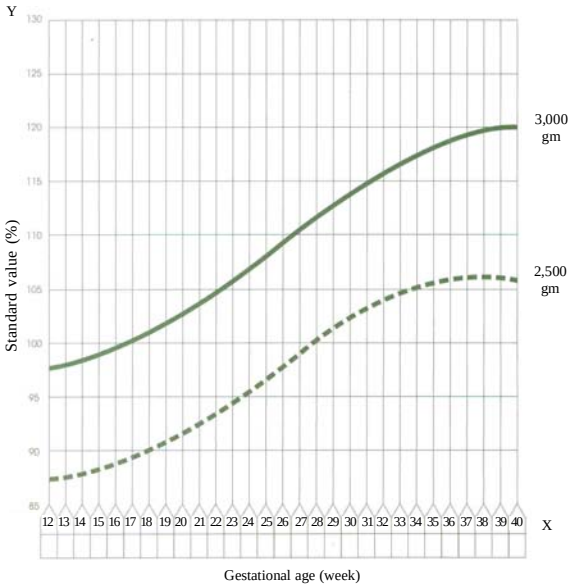

Fig. 1 Vallop Curve

Results

General data

Total sample	510	cases
Age (mean ± SD)	24.09±3.30	years
Nulliparous (%)	256	cases (50.2%)
Multiparous (%)	254	cases (49.8%)

Discussion

The Nutrition Division of the Health Department of the Public Health Ministry of Thailand have been taking the Vallop Curve for screening LBW infants since 1993. The specificity was 59.71%, the sensitivity was 61.61%[5] and currently it has been used in the antenatal care book. The Vallop Curve was tested at Pranangklao Hospital from January 2004 to July 2004, the total sample is 510 cases. Mean age was 24.09 ± 3.30 years, nulliparous was 256 cases (50.2%) and multiparous was 254 cases (49.8%). From Table 2, low BMI was 56 cases (10.98%), normal BMI was 420

Table 1. Percentage of standard BMI at 21

Height (cm) Weight	145 Kg	146 Kg	147 Kg	148 Kg	149 Kg	150 Kg	151 Kg	152 Kg	153 Kg	154 Kg	155 Kg	156 Kg	157 Kg	158 Kg	159 Kg	160 Kg	161 Kg	162 Kg	163 Kg	164 Kg	165 Kg
Standard value (%)																					
85	37.5	38.0	38.6	39.1	39.6	40.2	40.7	41.2	41.8	42.3	42.9	43.4	44.0	44.6	45.1	45.7	46.3	46.8	47.4	48.0	48.6
86	38.0	38.5	39.0	39.6	40.1	40.6	41.2	41.7	42.3	42.8	43.4	44.0	44.5	45.1	45.7	46.2	46.8	47.4	48.0	48.6	49.2
87	38.4	38.9	39.5	40.0	40.6	41.1	41.7	42.2	42.8	43.3	43.9	44.5	45.0	45.6	46.2	46.8	47.4	47.9	48.5	49.1	49.7
88	38.9	39.4	39.9	40.5	41.0	41.6	42.1	42.7	43.3	43.8	44.4	45.0	45.6	46.1	46.7	47.3	47.9	48.5	49.1	49.7	50.3
89	39.3	39.8	40.4	40.9	41.5	42.1	42.6	43.2	43.8	44.3	44.9	45.5	46.1	46.7	47.3	47.8	48.4	49.1	49.7	50.3	50.9
90	39.7	40.3	40.8	41.4	42.0	42.5	43.1	43.7	44.2	44.8	45.4	46.0	46.6	47.2	47.8	48.4	49.0	49.6	50.2	50.8	51.5
91	40.2	40.7	41.3	41.9	42.4	43.0	43.6	44.2	44.7	45.3	45.9	46.5	47.1	47.7	48.3	48.9	49.5	50.2	50.8	51.4	52.0
92	40.6	41.2	41.7	42.3	42.9	43.5	44.1	44.6	45.2	45.8	46.4	47.0	47.6	48.2	48.8	49.5	50.1	50.7	51.3	52.0	52.6
93	41.1	41.6	42.2	42.8	43.4	43.9	44.5	45.1	45.7	46.3	46.9	47.5	48.1	48.8	49.4	50.0	50.6	51.3	51.9	52.5	53.2
94	41.5	42.1	42.7	43.2	43.8	44.4	45.0	45.6	46.2	46.8	47.4	48.0	48.7	49.3	49.9	50.5	51.2	51.8	52.4	53.1	53.7
95	41.9	42.5	43.1	43.7	44.3	44.9	45.5	46.1	46.7	47.3	47.9	48.6	49.2	49.8	50.4	51.1	51.7	52.4	53.0	53.7	54.3
96	42.4	43.0	43.6	44.2	44.8	45.4	46.0	46.6	47.2	47.8	48.4	49.1	49.7	50.3	51.0	51.6	52.3	52.9	53.6	54.2	54.9
97	42.8	43.4	44.0	44.6	45.2	45.8	46.4	47.1	47.7	48.3	48.9	49.6	50.2	50.9	51.5	52.1	52.8	53.5	54.1	54.8	55.5
98	43.3	43.9	44.5	45.1	45.7	46.3	46.9	47.5	48.2	48.8	49.4	50.1	50.7	51.4	52.0	52.7	53.3	54.0	54.7	55.4	56.0
99	43.7	44.3	44.9	45.5	46.2	46.8	47.4	48.0	48.7	49.3	49.9	50.6	51.2	51.9	52.6	53.2	53.9	54.6	55.2	55.9	56.6
100	44.2	44.8	45.4	46.0	46.6	47.3	47.9	48.5	49.2	49.8	50.5	51.1	51.8	52.4	53.1	53.8	54.4	55.1	55.8	56.5	57.2
101	44.6	45.2	45.8	46.5	47.1	47.7	48.4	49.0	49.7	50.3	51.0	51.6	52.3	52.9	53.6	54.3	55.0	55.7	56.4	57.0	57.7
102	45.0	45.7	46.3	46.9	47.6	48.2	48.8	49.5	50.1	50.8	51.5	52.1	52.8	53.5	54.2	54.8	55.5	56.2	56.9	57.6	58.3
103	45.5	46.1	46.7	47.4	48.0	48.7	49.3	50.0	50.6	51.3	52.0	52.6	53.3	54.0	54.7	55.4	56.1	56.8	57.5	58.2	58.9
104	45.9	46.6	47.2	47.8	48.5	49.1	49.8	50.5	51.1	51.8	52.5	53.1	53.8	54.5	55.2	55.9	56.6	57.3	58.0	58.7	59.5
105	46.4	47.0	47.6	48.3	49.0	49.6	50.3	50.9	51.6	52.3	53.0	53.7	54.4	55.0	55.7	56.4	57.2	57.9	58.6	59.3	60.0
106	46.8	47.4	48.1	48.8	49.4	50.1	50.8	51.4	52.1	52.8	53.5	54.2	54.9	55.6	56.3	57.0	57.7	58.4	59.1	59.9	60.6
107	47.2	47.9	48.6	49.2	49.9	50.6	51.2	51.9	52.6	53.3	54.0	54.7	55.4	56.1	56.8	57.5	58.2	59.0	59.7	60.4	61.2
108	47.7	48.3	49.0	49.7	50.4	51.0	51.7	52.4	53.1	53.8	54.5	55.2	55.9	56.6	57.3	58.1	58.8	59.5	60.3	61.0	61.7
109	48.1	48.8	49.5	50.1	50.8	51.5	52.2	52.9	53.6	54.3	55.0	55.7	56.4	57.1	57.9	58.6	59.3	60.1	60.8	61.6	62.3
110	48.6	49.2	49.9	50.6	51.3	52.0	52.7	53.4	54.1	54.8	55.5	56.2	56.9	57.7	58.4	59.1	59.9	60.6	61.4	62.1	62.9
111	49.0	49.7	50.4	51.1	51.8	52.4	53.1	53.9	54.6	55.3	56.0	56.7	57.5	58.2	58.9	59.7	60.4	61.2	61.9	62.7	63.5
112	49.5	50.1	50.8	51.5	52.2	52.9	53.6	54.3	55.1	55.8	56.5	57.2	58.0	58.7	59.5	60.2	61.0	61.7	62.5	63.3	64.0
113	49.9	50.6	51.3	52.0	52.7	53.4	54.1	54.8	55.5	56.3	57.0	57.7	58.5	59.2	60.0	60.7	61.5	62.3	63.0	63.8	64.6
114	50.3	51.0	51.7	52.4	53.1	53.9	54.6	55.3	56.0	56.8	57.5	58.3	59.0	59.8	60.5	61.3	62.1	62.8	63.6	64.4	65.2
115	50.8	51.5	52.2	52.9	53.6	54.3	55.1	55.8	56.5	57.3	58.0	58.8	59.5	60.3	61.1	61.8	62.6	63.4	64.2	65.0	65.7
116	51.2	51.9	52.6	53.4	54.1	54.8	55.5	56.3	57.0	57.8	58.5	59.3	60.0	60.8	61.6	62.4	63.1	63.9	64.7	65.5	66.3
117	51.7	52.4	53.1	53.8	54.5	55.3	56.0	56.8	57.5	58.3	59.0	59.8	60.6	61.3	62.1	62.9	63.7	64.5	65.3	66.1	66.9
118	52.1	52.8	53.5	54.3	55.0	55.8	56.5	57.3	58.0	58.8	59.5	60.3	61.1	61.9	62.6	63.4	64.2	65.0	65.8	66.6	67.5

cases (82.35%) and high BMI was 34 cases (6.67%). Most of them were normal BMI based on the same normal BMI at 21 in the hypothesis of the Vallop Curve. When birth weights were compared 2541.7 ± 276.89 gram in low BMI, 3021 ± 318.64 gram in normal BMI and 3520.0 ± 250.65 gram in high BMI, they were significantly different by the Anova Test. They were the same as in the study of Bolzan et al[6], Ogunyme et al[7], Ehrenberg et al[8] and Thame et al[9],who said that smaller infants were associated with low BMI mother, and low weight gain during pregnancy was associated with an intrauterine growth restricted infant in double times. But Rorenberg et al[10] said that BMI must be equal or lower than 18.5 to make LBW significant. While Cogswell et al[11] said that low BMI was associated with LBW and survival rate, but high BMI was associated with the mortality rate of an infant because in low BMI, most of the mothers were smokers, but in the present study there were no smokers and high BMI was associated with DM, multiparity and genetic. In another study, Neufeld et al[12] reported that the weight gain in all trimesters was associated with LBW, especially in low BMI which was less than 18.5 and low weight gain was in the 3rd trimester, the LBW was more than those whose low weight gain was in the 1st and the 2nd trimester. But Hickey et al[13] and Abrams et al[14] did not agree; they said that low weight gain in low BMI in the 2nd trimester was associated more with LBW than low weight gain was, in the 1st and the 3rd trimester. The study of Schieve et al[15] and Hickey et al[16] found that low weight gain in low BMI was associated with preterm labour. Seiga et al[17] and Hickey et al[18] said that if weight gain was less than 0.37 kg/wk in normal BMI and less than 0.38 kg/wk in low BMI in the 3rd trimester, it was associated with preterm labour. While Siega et al[19] could not conclude that low BMI was associated with preterm labour, rather than nutrients and more weight gain must be advised in the 3rd trimester to prevent preterm labour. However, these were no studies about the association of preterm labour and low BMI and low weight gain in the present study. Copper et al[20] said that in low BMI they had a positive attitude towards weight gain, but it had minimal effect to increase birth weight, although there was a nutrition promoting program, advised in the present study.

From Table 3, sensitivity was 53.4%-76.1% (65.5%), specificity was 84.0%-90.2% (87.4%), positive predictive value was 33.5%-52.7%(43.9%)and negative predictive value was 92.0%-94.6% (94.7%), p value < 0.001 at 95% confident interval by the Wilson Method. This means the Vallop Curve may be useful to screen LBW. However, the current Thai women's BMI may be changed, then at 50th percentile, they may be changed from 21 too. They made the prognostic value different from the first report in 1993. The wrong height, wrong weight and wrongly calculated BMI were the factors that made the curve deviate from the fact. Finally, regarding to gestational age; although the mother could date her last menstual period exactly, it may not be the same as the gestational age. In the present study, every case was examined by ultrasound to confirm the gestational age. Every data made the practictional nurse use the time to correct it. So, knowledge and skill needs to be given to the practictional nurse without excessive work load.

Table 2. Pre-pregnancy BMI and Birth Weight (BW)

	No. (cases)	%	BW (gm)
Low BMI (< 19.8)	56	10.98	2541.7±276.89
Normal BMI (19.8-26.0)	420	82.35	3021.3±318.61
High BMI (26.1-29.0)	34	6.67	3520.0±250.65
Total	510	100.00	p < 0.05

(By Anova test)

Table 3. Prognostic value

Vallop Curve	BW		Total
	< 2,500 gm	> 2,500 gm	
Below 2,500 gm line	42	56	98
Above 2,500 gm Line	22	390	412
Total	64	446	510

Confidence interval	95%	(Wilson method)
Sensitivity	0.656	(0.534-0.761)
Specificity	0.874	(0.840-0.902)
Positive predictive value	0.429	(0.35-0.527)
Negative predictive value	0.947	(0.920-0.964)

P < 0.001

Conclusions

LBW is still a mother and child health problem in the developing country, many factors making a cause. One factor or one method cannot be corrected, they must be solved together. The Vallop Curve was only a trial method to alert recognition in the practictional nurse and a pregnant woman herself, to correct nutritional status in antenatal care clinic to prevent LBW. In the future, the Vallop Curve may be changed corresponding to the changes of socio-economic status. It must be simple to use as well as understand,

and lastly, the graph for low BMI and high BMI should be modified.

References

1. Cunningham FG, MacDonald PC, Gant NF, Leveno KJ, Gilstrap LC 3d, Hankins GDV, et al. Williams Obstetrics. 21st ed. Connecticut: Appleton & Lange, 2001: 689-727.
2. Nondasuta A, Chaturachinda K, Wathana-Kasetr S. Birth weight distribution: a baseline data and a socio-economic indicator for development for Thailand. Report submitted to South East Asia Regional World Health Organization, 1986.
3. Neilson JP, Whitfield CR, Aitchison TC. Screening for SGA, a two stage ultrasound exam schedule. BM J 1980; 280: 1203-6.
4. Walraven GEL, Mkanje JB, van Rosmalen J, van Dongen PWJ, van Asten HAGH, Doman WMV. Single pre-delivery symphysis-fundal height measurement as a predictor of birthweight and multiple pregnancy. Br J Obstet Gynaecol 1995; 102: 525-9.
5. Vallop T, Wanicha K, Vinunt V. Prevention of low birthweight using pregnan-t nutrition graph (Vallop curve).Thailand Journal of Health and Environment 1991; 14: 86-99.
6. Bolzan AG, Guimarey LM. Relationships between body mass index during pregnancy in adolescent and adult woman, anthropometric indicators of fetal growth and intrauterine growth retardation. La costa, Argentina,1999. Arch Latinoam Nutr 2001; 51: 145-50.
7. Ogunyemi D, Hullett S, Leeper J, Risk A. Prepregnancy body mass index, weight gain during pregnancy, and perinatal outcome in a rural black population. J Matern Fetal Med 1998; 7: 190-3.
8. Ehrenberg HM, Dierker L, Milluzzi C, Mercer BM. Low maternal weight, failure to thrive in pregnancy, and adverse pregnancy outcomes. Am J Obstet Gynecol 2003; 189: 1726-30.
9. Thame M, Wilks RJ, McFarlane-Anderson N, Bennett FI, Forrester TE. Relationship between maternal nutritional status and infant's weight and body proportions at birth. Eur J Clin Nutr 1997; 51: 134-8.
10. Ronnenberg AG, Wang X, Xing H, Chen C, Chen D, Guang W, et al. Low preconception body mass index is associated with birth outcome in a prospective cohort of Chinese woman. J Nutr 2003; 133: 3449-55.
11. Cogswell ME, Yip R. The influence of fetal and maternal factors on the distribution of birthweight. Semin Perinatol 1995; 19: 222-40.
12. Neufeld L, Pelletier DL, Haas JD. The timing of maternal weight gain during pregnancy and fetal growth. AM J Human Biol 1999; 11: 627-37.
13. Hickey CA, Cliver SP, McNeal SF, Hoffman HJ, Goldenberg RL. Prenatal weight gain patterns and weight among nonobese black and white woman. Obstet Gynecol 1996; 88: 490-6.
14. Abrams B, Selvin S.Maternal weight gain and birth weight. Obstet Gynecol 1995; 86: 163-9.
15. Schieve LA, Cogswell ME, Scanlon KS, Perry G, Ferre C, Blackmore-Prince C, et al. Prepregnancy body mass index and pregnancy weight gain: associations with preterm delivery. The NMIHS Collaborative Study Group. Obstet Gynecol 2000; 96: 194-200.
16. Hickey CA, Cliver SP, McNeal SF, Goldenberg RL.Low pregravid body mass index as a risk factor for preterm birth: variation by ethnic group. Obstet Gynecol 1997; 89: 206-12.
17. Siega-Riz AM, Adair LS, Hobel CJ. Institute of Medicine maternal weight gain recommendations and pregnancy outcome in a predominantly Hispanic population.Obstet Gynecol 1994; 84: 565-73.
18. Hickey CA, Cliver SP, McNeal SF, Goldenberg RL. Prenatal weight gain patterns and spontaneous preterm birth among nonobese black and white woman. Obstet Gynecol 1995; 85: 909-14.
19. Siega-Riz AM, Adair LS, Hobel CJ. Maternal underweight status and inadequate rate of weight gain during the third trimester of pregnancy increases the risk of preterm delivery. J Nutr 1996; 126; 146-53.
20. Copper RL, DcBard MB Goldenberg RL, Oweis AI. The relationship of maternal attitude toward weight gain to weight gain during pregnancy and low birth weight. Obstet Gynecol 1995; 85: 590-5.

การศึกษาค่าความแม่นยำของกราฟแสดงภาวะโภชนาการหญิงมีครรภ์(วัลลภกราฟ) ในการคาดคะเนอุบัติการณ์ของทารกแรกคลอดน้ำหนักน้อย

อนุราช กุลวานิชไชยนันท์

วัตถุประสงค์*: เพื่อทดสอบค่าความแม่นยำของกราฟแสดงภาวะโภชนาการหญิงมีครรภ์ (วัลลภกราฟ)*
วิธีการศึกษา*: เป็นการศึกษาเชิงเปรียบเทียบไปข้างหน้า*
สถานที่*: กลุ่มงานสูติ นรีเวชกรรมและวางแผนครอบครัว โรงพยาบาลพระนั่งเกล้า*
กลุ่มเป้าหมาย*: หญิงมีครรภ์จำนวน 510 รายที่มาฝากครรภ์และคลอดที่ โรงพยาบาลพระนั่งเกล้า*
วัตถุดิบและวิธีการ*: ความสูง น้ำหนัก และค่าดัชนีมวลกายก่อนการตั้งครรภ์ของหญิงมีครรภ์ถูกแบ่งออกเป็น 3 กลุ่ม คือดัชนีมวลกายน้อย (< 19.8) ดัชนีมวลกายปกติ (19.8-26.0) และกลุ่มดัชนีมวลกายมาก (26.1-29.0) น้ำหนักของหญิงมีครรภ์ในแต่ละสัปดาห์อายุครรภ์ ถูกเปลี่ยนเป็นร้อยละของดัชนีมวลกายมาตรฐานที่ 21 และนำไปบันทึกในวัลลภกราฟ ข้อมูลทั้งหมดถูกวิเคราะห์โดยแบบทดสอบของ Anova และวิธีการของ Wilson เพื่อหาความสัมพันธ์ โดยค่าความเชื่อมั่นอย่างมีนัยสำคัญที่ $p < 0.05$*
ข้อมูลที่วัด*: ค่าน้ำหนักทารกแรกคลอด ผลของกราฟที่ต่ำและสูงกว่าเส้น 2,500 กรัม*
ผลการศึกษา*: น้ำหนักทารกแรกคลอดเฉลี่ยของกลุ่มดัชนีมวลกายน้อย เป็น 2,541.70 $\pm$ 276.89 กรัม น้ำหนักทารกแรกคลอดเฉลี่ยของกลุ่มดัชนีมวลกายปกติ เป็น3,021.30 $\pm$ 318.61 กรัม น้ำหนักทารกแรกคลอดเฉลี่ยของกลุ่มดัชนีมวลกายมาก เป็น 3,520.00 $\pm$ 250.65 กรัม ซึ่งมีความแตกต่างกันอย่างมีนัยสำคัญ โดยแบบทดสอบของ Anova และมีค่าความไวที่ร้อยละ 65.6 ความจำเพาะที่ร้อยละ 87.4 ค่า Positive predictive value ที่ร้อยละ 42.9 Negative predictive value ที่ร้อยละ 94.7 ค่า $P < 0.001$ ที่ค่าความเชื่อมั่นร้อยละ 95 โดยวิธีของ Wilson*
สรุป*: วัลลภกราฟน่าจะยังมีประโยชน์ในการคัดกรองทำนายทารกแรกคลอดน้ำหนักน้อย แต่ในอนาคตอาจจะต้องมีการเปลี่ยนแปลงไปตามสถานะของเศรษฐกิจ และสังคมและทำอย่างไรที่จะสามารถปฏิบัติได้ง่ายขึ้น*