

ARTIKEL PENELITIAN

Differences in Levels of Vitamin D, Human Placenta Lactogen (hPL) and Estradiol in Normal Pregnancy and 1st Trimester Abortion

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Abstract

Objective: This study aims to prove the differences in levels of vitamin D, levels of human Placenta Lactogen (hPL) and levels of estradiol in normal pregnancy and first trimester abortion. **Methods:** This research is a comparative analytic study with a cross sectional approach. The sample of this study amounted to 80 people who were divided into 2 groups consisting of normal pregnant women and abortions in the 1st trimester of pregnancy with consecutive sampling techniques. The research was conducted at RS.PTM Unand Padang, RS. Hermina Padang, RS. Army Reksodiwiryono Padang, Dr. RSUP. M. Djamil Padang in April 2022-June 2022. The normality test of the data was carried out using the sapiro wilk test and data analysis using the independent T test. **Results:** The results showed that the characteristics of the research subjects were; age normal pregnant women, have an abortion in the 1st trimester and most of them are in the healthy reproductive age of 20-35 years, systolic/diastolic blood pressure is in the normal range (113.98/76.22 mmHG and 114.83/77.18 mmHGF), BMI is in the normal range 18.5 – 25.0. **Conclusion:**The results of the research variables showed that the average levels of vitamin D, Estradiol, and hPL in normal pregnant women were significantly higher than pregnant women who had an abortion in the first trimester, namely (36.577 ng/mL vs 19.120 ng/mL; 626.596 pg/mL vs 246.604 pg/mL; 12.188 g/mL vs 6.786 g/mL) with a value of $p < 0.05$ for the three variables.

Keywords: 1st trimester; abortion; Vitamin D; Estradiol; human Placenta Lactogen

INTRODUCTION

Vitamin D deficiency is one of the most common health problems in the world, and one of the risk factors is during pregnancy, which occurs in about 20-40% (Urrutia-Pereira & Solé, 2015). Abortion or early pregnancy loss in the first trimester has a close relationship with vitamin D deficiency (Hou et al., 2016). The number of pregnancies that end in abortion in some countries is estimated at around 10-15% and the incidence of abortion in Indonesia every year can reach 2 million cases or 37 per 1000 women aged between 15-49 years (Rajuddin Rajuddin, 2016).

The main source of Vitamin D in the fetus is strongly influenced by vitamin D levels in the mother, so that a deficiency of Vitamin D in pregnant women will also affect the amount of Vitamin D in the fetus. Vitamin D deficiency during pregnancy can have an impact on the high risk of complications in pregnant women, one of which is spontaneous abortion. In addition to the risk of complications in pregnant women, vitamin D deficiency also has a negative impact on fetal growth (Curtis et al., 2018). The effect of Vitamin D on fetal growth is due to its role in helping the process of proliferation, differentiation, and maturation of fetal cells (Miliku et al., 2016). Vitamin D also has effects on immune system regulation and others (Wagner & Hollis, 2018; Wagner et al., 2012).

The natural form of Vitamin D in humans is cholecalciferol or Vitamin D₃ which is produced from the proteolysis of 7-dehydrocholesterol in the skin with the help of ultraviolet B radiation. Vitamin D₃ is a form of Previtamin D which is converted into an active form to carry out its functions.

Pre-vitamin D is converted to 25-hydroxyvitamin D [(25(OH)D) by the enzyme 25-vitamin D-hydroxylase in the liver. In pregnancy, the body's Vitamin D levels can be seen by measuring the levels of 25-

hydroxyvitamin D [(25(OH)D)] which is commonly found in the circulatory system (Urrutia-Pereira & Solé, 2015).

The optimal level of Vitamin D is the serum 25(OH)D >30 ng/mL, and if the serum 25(OH)D is <20 ng/mL, the individual is categorized as having a Vitamin D deficiency (Prasad et al., 2018). The study by Wagener et al (Wagner & Hollis, 2018), suggested that during pregnancy, especially early in pregnancy, it is important to maintain circulating 25(OH)D levels around 100 nmol/L or 40 ng/mL. To achieve this target level, at least 4000 IU/day of Vitamin D supplements are needed during pregnancy (Wagner & Hollis, 2018).

The next process in activating the function of Vitamin D is to produce 1 α ,25dihydroxyvitamin D[1,25(OH)2D] using the enzyme 1 α -hydroxylase (CYP27B1) which generally occurs in the kidney. 1,25(OH)2D is a type of lipophilic seco steroid whose activation is mediated by the Vitamin D receptor (vitamin DR) (Evans et al., 2004). The organ that plays an important role in the expression of Vitamin D receptors is the kidney. The placenta also plays a role in the expression of Vitamin D receptors (Ganguly et al., 2018; Mulligan et al., 2010).

The placenta is one of the organs known to be able to synthesize 1,25(OH)2D through the activity of CYP27B1 (Vitamin-D activating enzyme 25-vitamin D-1 α -hydroxylase). CYP27B1 activity is primarily in the maternal decidua and fetal trophoblast components of the placenta (including the syncytiotrophoblast and invasive extravillous trophoblast). In addition to the expression of vitamin D and CYP27B1 receptors, the placenta also expresses CYP24A1 (catabolic enzyme vitamin D-24-hydroxylase) (Liu & Hewison, 2012). Levels of 1,25(OH)2D which increase in the first trimester of pregnancy indicate a special role of Vitamin D in early pregnancy, especially in the process of

fertilization, implantation, and development of the placenta. Syncytiotrophoblast is a component of the placenta that can express CYP27B1, Vitamin D receptors, and CYP24A1 which is a regulator in Vitamin D metabolism. Vitamin D functions in regulating the production of hPL (human placental lactogen) and estradiol,

Abnormalities in the placentation process can be fatal, one of which is miscarriage (miscarriage) (Ganguly et al., 2018). From the study of Chan et al. (Chan et al., 2015b), isolating human EVT by obtaining 25(OH)D and 1,25(OH)2D in the first trimester, showed that both Vitamin D metabolism could promote EVT invasion through Matrigel. Matrigel indicated by increased expression of pro MMP2 and pro MMP9, which are matrix metalloproteinases that play a role in the process of implantation and invasion. It was also reported that 1,25(OH)2D can regulate estradiol synthesis via trophoblast cells in the placenta (Barrera et al., 2007). In addition, 1,25(OH)2D has also been reported to regulate hPL (human placental lactogen), these two hormones are very important for placental development in early pregnancy.

METHODS

Univariate analysis

Table 1. Subject Characteristics

Clinical Characteristics	Normal (n = 40)			Abortion (n = 40)		
	Average	SD	95% CI	Average	SD	95% CI
Mother's Age (years)	29.63	4.118	28.31 – 30.94	29.73	4,237	28.37 – 31.08
Gestational Age	8.43	2.57	7.60 – 9.25	7.45	2.56	6.63 – 8.27
Vital Signs						
sBP (mmHg)	113.98	11.104	110.42 – 117.53	114.83	11.167	111.25 – 118.40
dBp(mmHg)	76.22	6,431	74.17 – 78.28	77.18	7,352	74.82 – 79.53
BMI (Kg/m ²)	23,381	3,423	22,287 – 24,476	23,505	3.088	22.518 – 24,493

Notes : sBP : systolic Blood Pressure, dBp : diastolic Blood Pressure, BMI : Body Mass Index

This research is a comparative analytic study with a cross sectional approach. The sample of this study amounted to 80 people who were divided into 2 groups consisting of normal pregnant women and abortions in the 1st trimester of pregnancy with consecutive sampling techniques. The research was conducted at RS.PTM Unand Padang, RS. Hermina Padang, RS. Army Reksodiwiryo Padang, Dr. RSUP. M. Djamil Padang in April 2022-June 2022. The normality test of the data was carried out using the sapiro wilk test and data analysis using the independent T test.

RESULTS AND DISCUSSION

This study was conducted on normal pregnant women who had an abortion in the first trimester. Blood samples were taken from the polyclinic of Obstetrics and Gynecology and Emergency Room at Dr M Djamil hospital and Andalas University Hospital for examination of vitamin D, hPL and estradiol will be tested at the Biomedical Laboratory of the Faculty of Medicine, Anadala University. The samples studied were 80 subjects, consisting of 40 pregnant women with normal first trimester pregnancies, and 40 pregnant women with first trimester abortions.

Table 1. shows that normal age pregnant women who had an abortion in the first trimester most of them are in healthy reproductive age, namely 20-35 years, gestational age in the first trimester (≤ 12

weeks), systolic/diastolic blood pressure is lower than normal (113.98/76.22 and 114.83/77.18) , BMI is in the normal range of 18.5 – 25.0 Kg/m².

Bivariate Analysis

Tabel 2. Comparison of Average Vitamin D, Estradiol, Human Placental Lactogen (HPL) Between Normal Pregnancy and 1st Trimester Abortion

Vitamin D

Pregnancy Status	Average (ng/mL)	SD (ng/mL)	p value	Average Difference	95% CI
Normal (n = 40)	36,577	6,643	<0.05	17,457	20,044 – 14,869
Abortion (n = 40)	19,120	4,818			

Estradiol

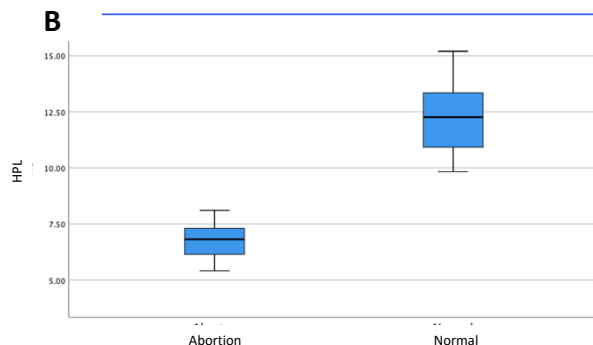
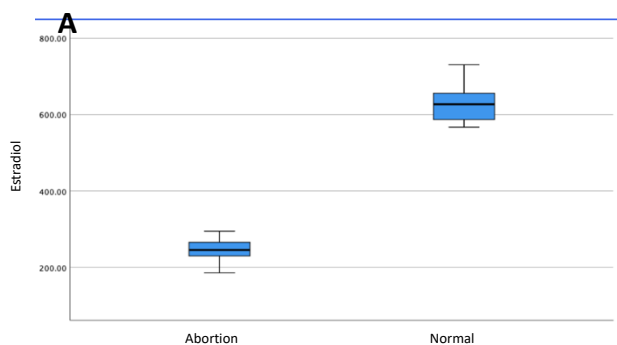
Normal (n = 40)	626,596	40,369	<0.05	379.992	394,698 – 365,286
Abortion (n = 40)	246,604	23,137			

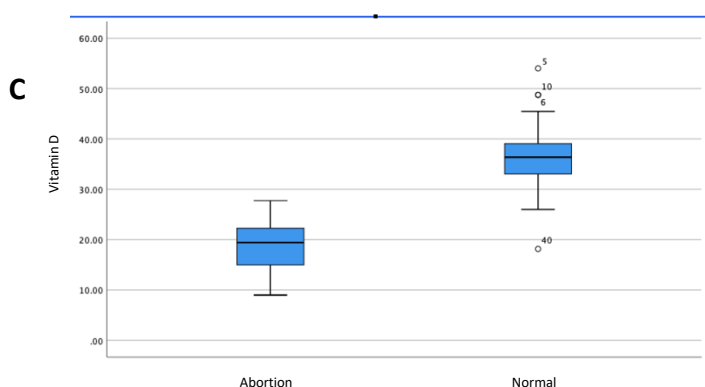
HPL

Normal (n = 40)	12,188	1,477	<0.05	5.403	5,920 – 4,885
Abortion (n = 40)	6.786	0.697			

Table 2. showed that statistically mean vitamin D levels significantly higher on normal pregnant women (36.577 ng/mL) compared to pregnant women who had an abortion (19.120 ng/mL) in the first trimester (p value < 0.05; mean difference = 17.457; 95% CI = 20.044 – 14.869). The mean statistically mean estradiol level significantly higher on normal pregnant women (626.596 pg/mL) compared to pregnant women who

had an abortion (246.604 pg/mL) in the 1st trimester (p value < 0.05; mean difference = 379.992; 95% CI = 394.698 – 365.286). As well Vitamin D dan estradiol, statistically hPL levels significantly higher on normal pregnant women (12,188g/mL) compared to pregnant women who had an abortion (6,786g/mL) in the 1st trimester (p value < 0.05; mean difference = 5,403; 95% CI = 5,920 – 4,885).





Normalitas data berdasarkan gambaran histogram untuk variabel vitamin D, Estradiol dan HPL terdistribusi normal.

Figure 1. Histogram of Vitamin D, Estradiol, Human Placental Lactogen (HPL) Between Normal Pregnancy and 1st Trimester Abortion

In this study, researchers conducted a study on differences in levels of Vitamin D, hPL and estradiol in early pregnancy (trimester 1), by comparing normal early pregnancy and early pregnancy with spontaneous abortion. The purpose of this study was to determine the difference in the mean levels of Vitamin D, hPL and estradiol in early pregnancy (trimester 1) between the normal pregnancy group and the aborted pregnancy group.

This research is an observational comparative analytic study with a cross sectional approach. Sampling of the research subjects was carried out at the hospital. Unand Padang, RS. Hermina Padang, RS. Army Reksodiwiryono Padang, and RSUP M. Djamil Padang in February 2022-June 2022. The sample of this study amounted to 80 people, each group amounted to 40 people. Both groups met the inclusion and exclusion criteria. The sampling technique was consecutive sampling. Test the normality of the data using the Shapiro Wilk test. The results of the normality test showed that the levels of vitamin D, hPL and estradiol were

normally distributed with $p > 0.05$, so for the bivariate analysis, parametric test was performed, namely the independent T test.

The results showed that the characteristics of the research subjects were; Maternal age in the normal pregnancy group and the group who experienced abortion in the 1st trimester were mostly in healthy reproductive age, namely 20-35 years, systolic/diastolic blood pressure was in the normal range (113.98/76.22 mmHg and 114 mmHg). .83/77.18 mmHg), BMI is in the normal range of 18.5 – 25.0. The results of the research variables showed that the average levels of vitamin D, estradiol, and hPL in pregnant women in the normal pregnancy group were significantly higher than pregnant women who had an abortion in the 1st trimester, namely (36.577 ng/mL vs 19.120 ng/mL; 626.596 pg/mL vs 246,604 pg/mL; 12,188 g/mL vs 6,786 g/mL) with p value < 0.05 for all three variables.

Suggestions in preparing for a pregnancy is that it is necessary to pay attention to the adequacy of Vitamin D before pregnancy which is needed in early

pregnancy, especially the role of Vitamin D in regulating the regulation of estradiol and hPL which is expressed in placental trophoblasts. Maternal vitamin D adequacy before pregnancy can guarantee adequate vitamin D adequacy in early pregnancy to

provide good outcomes for both mother and fetus.

CONCLUSION

The results of the research variables showed that the average levels of vitamin D, Estradiol, and hPL in normal pregnant women were significantly higher than pregnant women who had an abortion in the first trimester.

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