



# **A COMPARATIVE STUDY OF MEAN PI OF UTERINE ARTERIES IN SINGLETON AND TWIN BIRTHS OF MOTHERS REFERRED TO IMAM KHOMEINI HOSPITAL IN AHVAZ IN 2021**

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## **Abstract**

**Objective(s):** Unfavorable perinatal and postnatal outcomes can be predicted using Doppler ultrasound evaluation. However, there are disagreements in different studies in this regard. The present study investigates the PI of uterine arteries, pregnancy data, and some maternal and fetal complications in singleton and twin pregnancies.

**Materials and Methods:** The present retrospective study is based on hospital and clinic data. The statistical population of the study included all singleton and twin pregnant mothers who were in 2021. The checklist included information such as age, number of pregnancies, weight, body mass index, the weight of the neonate at birth, and history of any underlying chronic diseases (kidney diseases, heart failure, autoimmune diseases, hypertension, and type 1 and 2 diabetes) and diseases during pregnancy (preeclampsia and gestational diabetes). Additionally, uterine artery Doppler results such as PI were examined and recorded in both singleton and twin mothers.

**Results:** According to the results of the present study, no statistically significant difference was observed between the two groups of mothers regarding gestational age, mean body mass, mean weight of the neonate, and the frequency of drugs used ( $p>0.05$ ). However, and the mean PI of the uterine artery in twin pregnancies was significantly lower than in singleton pregnancies ( $p<0.05$ ).

**Conclusion:** Uterine artery PI can be effective in predicting pregnancy outcome and other maternal and fetal outcomes. However, studies with a larger sample size are needed to investigate the relationship between these complications of twin and singleton pregnancies and its their on pregnancy outcomes in both groups.

**Keywords:** Pregnancy outcome, Twin pregnancy, PI of uterine arteries, Singleton pregnancy

## **Key Messages**

In the first and second trimesters of pregnancy, the risk of high blood pressure, early pregnancy convulsions, restriction of uterine growth, placental abruption and stillbirth is high. This study aims to compare uterine artery PI in singleton and twin births of mothers referred to Imam Khomeini Hospital in Ahvaz in 1400

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## Introduction

The invasion of trophoblasts into the decidua (the most superficial layer of the endometrium) and the decidua vessels are vital for placenta formation. Blood circulation in the mother's uterine artery is favorable for a healthy intrauterine environment and for maintaining the function of the placenta, which ensures the fetus's growth for two reasons. First, the mother's blood brings the nutrients and removes the residues. Second, blood circulation in the uterine artery affects the oxygen delivered to the mother-fetus interface (1). The formation of placental uterine blood vessels goes through two main stages. In the first stage, which occurs 12 weeks after fertilization, the spiral arteries invade the border between the decidua and the myometrium. The second stage occurs from 12 to 16 weeks of pregnancy when the spiral arteries invade inside the myometrium. Accordingly, the two-stage remodeling process transforms the narrow myometrial spiral arteries into low-resistance placental vessels. Placental defects are due to preeclampsia (PE), fetal growth restriction (FGR), and small for gestational age (SGA). Significant vascular events can be predicted during pregnancy through uterine artery Doppler (UAD). Detecting changes in the blood vessels of the uterus and placenta from the implantation to the end of pregnancy can be an appropriate diagnostic tool for pregnancy complications. Quantitative parameters can identify abnormal uterine artery remodeling, reduced uterine artery blood circulation, and high-risk pregnant women who are likely to experience unfavorable pregnancy outcomes (2). The impedance of placental vessels decreases gradually during angiogenesis and is stabilized after 24 weeks of pregnancy. Reduced placental blood perfusion may occur again in successive pregnancies. PI index, RI index, systolic/diastolic ratio (S/D), and early diastolic notch are commonly-used indices to evaluate uterine artery blood circulation. Some studies have indicated that abnormal blood circulation in the uterine artery is associated with the onset of pregnancy complications.

## Materials and Methods

The present retrospective study was conducted based on hospital and clinic data. The statistical population of the study included all singleton and twin pregnant mothers who were referred to Imam Khomeini Hospital in Ahvaz City in 2021. In this study, mothers were selected using a convenience random sampling method. This study was conducted on 100 pregnant women, including 79 singletons and 22 twins. The inclusion criteria of the study included a willingness to participate in the study and all singleton and twin pregnant women with any disease or absence of uterine artery Doppler disease. The exclusion criteria included the patient's lack of consent to participate in the study. The patients' information was collected by the checklist. At first, the basic information of the pregnant women was extracted from their medical records and collected in the checklist. The checklist included information such as age, number of pregnancies, weight, body mass index, the weight of the neonate at birth, and history of any underlying chronic diseases (kidney diseases, heart failure, autoimmune diseases, hypertension, and type 1 and 2 diabetes) and diseases during pregnancy (preeclampsia and gestational diabetes) (3).

Abdominal Doppler sonography was performed at 30-40 weeks of pregnancy. Sonographic examination in all subjects was performed by a single radiologist in the supine position. The radiologist performing sonography was unaware of the presence of preeclampsia in pregnant women. Medison sono Ace X8 sonography device was used to perform sonography. Uterine arteries were examined via abdominal sonography. Uterine artery Doppler results such as PI were examined and recorded in all singleton and twin mothers. The collected data were analyzed in SPSS 26 software using descriptive statistics methods (percentage and frequency distribution were used to describe qualitative data and mean and standard deviation were used to describe quantitative data). The chi-square test was used to compare nominal variables, the Kolmogorov-Smirnov test was used to examine the normality of the distribution of quantitative data, and the independent t-test was used to compare quantitative variables.

## Results

The mean gestational age was  $32.8 \pm 4.4$  in singleton mothers and  $31.5 \pm 3.5$  in twin mothers. This difference was not statistically significant ( $p=0.46$ ). The mean body mass was  $29.8 \pm 4.4$  in singleton pregnant mothers and  $27.06 \pm 3.5$  in twin pregnant mothers. This difference was not statistically significant ( $p=0.59$ ). The mean neonatal weight was  $3100 \pm 384$  g in singleton mothers and  $2150 \pm 541$  g in twin mothers. This difference was statistically significant ( $p=0.04$ ).

Table 1 presents the singleton and twin fetal complications. In singleton pregnancies, 32 people (40.5%) have no fetal complications, 3 people (3.8%) have IUGR, 2 people (3.8%)

have neonatal apnea, and 3 people (3.8%) have respiratory diseases. In twin pregnancies, 11 people (52.4%) have no fetal complications, 2 people (9.5%) have IUGR, 2 people (9.5%) have neonatal apnea, 4 people (19%) have respiratory disease, and 2 people (9.5%) have jaundice. In singleton pregnancies, 9 people had a history of preeclampsia and 11 people had gestational diabetes. In twin pregnancies, 3 people have preeclampsia and 4 people have gestational diabetes. Table 2 shows the mean PI of uterine arteries in singleton and twin pregnant mothers. The independent t-test showed a significant difference between the two groups in terms of PI of uterine arteries ( $p=0.01$ ).

**Table 1.** Prevalence of fetal complications and pregnancy diseases in singleton and twin pregnant mothers.

Fetal complications	Singleton		Twin		P-value
	Frequency	Percentage of frequency	Frequency	Percentage of frequency	
No	32	40.5	11	52.4	0.004
IUGR	3	3.8	2	9.5	
Neonatal apnea	2	2.5	2	9.5	
respiratory diseases	3	3.8	4	19	
Jaundice	39	49.4	2	9.5	
Preeclampsia	9	11	3	15	
Gestational Diabetes	11	13	4	19	

The table above shows the frequency of fetal complications in singleton and twin pregnant mothers. The chi-square test was used to

examine this correlation. As shown, there is a significant relationship between fetal complications in singletons and twins ( $p=0.004$ ).

**Table 2.** Mean PI of uterine arteries in singleton and twin pregnant mothers.

Variable	Twin	Singleton	P-value
	MEAN $\pm$ SD	MEAN $\pm$ SD	
PI	0.1 $\pm$ 0.70	0.24 $\pm$ 0.92	0.001

## Discussion

Uterine artery PI decreases progressively during the luteal phase as well as during the implantation process. An increase in PI, even if it occurs only in the uterine artery of one side, can cause an increase in spontaneous abortion. The results of the present study showed that the average PI of the uterine arteries in singleton pregnancies is significantly higher than that of twin pregnancies, which with the findings of the

study by Sharbaf and his colleagues (2018) in the second trimester of pregnancy showed that the average The PI of uterine arteries in singleton pregnancies is significantly higher than in twin pregnancies. Also, they showed that the mean PI of the uterine artery in both singleton and twin pregnancies was not significantly different between the groups with and without complications. (4) In another study consistent with the results of the present study, Rizzo et al. (2014) reported a higher mean uterine artery PI in

singleton pregnancies than twin pregnancies (1 vs. 0.8). On the other hand, this index was higher in complicated pregnancies (5) Klein and colleagues showed lower uterine artery PI in twin pregnancies compared to singletons (6) Jamal and colleagues showed that the mean PI of singleton pregnancies In the second trimester, it was 1.03 and this index was significantly higher in the group with complications than in the group without complications (1.27 vs. 0.99,  $p=0.003$ ) (7)

By evaluating singleton pregnancies, Farkakteh and colleagues showed that the average PI was 1.1 in normal pregnancies and 1.5 in complicated cases. The difference in the rate of perinatal complications between the singleton and twin groups in the results of different studies can be due to the different sample size and the difference in examining the number of perinatal complications with different prevalence (8).

In the present study, the mean body mass of twin mothers was higher than that of singleton mothers, which was not statistically significant. Also, although the number of pregnant mothers with twins included in the study was less than mothers with singletons, the percentage of pregnancy outcomes such as preeclampsia and gestational diabetes was higher in mothers with twins than mothers with singletons. In the study of Maya Ram and her colleagues, the comparison of average body mass index and pregnancy outcomes (including preeclampsia, gestational diabetes and cesarean delivery) of singleton and twin mothers after controlling for confounders showed that (regardless of mother's BMI), the relationship These complications and maternal BMI differ significantly between twin and singleton pregnancies. In contrast, in twin pregnancies, low birth weight women are at the highest risk of preterm delivery due to an increased risk of spontaneous preterm delivery, while high BMI is not associated with an increased risk of preterm delivery. In general, it seems that in twin pregnancies, the effect of high BMI is less than in singleton pregnancies, and underweight in twin pregnancies has a more negative effect compared to singleton pregnancies. The weaker association between high maternal BMI and GDM, preeclampsia and cesarean delivery may be due to the fact that the effects of maternal obesity in twins are partly masked by the higher risk of history of these complications in twins (9-20). In the present study, the mean The gestational age in twin pregnancies was higher

than in singletons, while the average week of pregnancy in singleton mothers was more than twins, but no statistically significant difference was observed in both cases. Past studies have shown that the increase in maternal age and fertility is strongly related to the increase in the incidence of twins (22, 21).

Most studies have shown that the incidence of twins increases with the age of the mother up to 35 years and then decreases (24).

In the present study, in general, the percentage of preeclampsia and gestational diabetes in twin pregnancies was higher than that of singletons, which was statistically significant. Gestational diabetes (GDM) increases the risk of preterm delivery, and twin pregnancies with GDM are associated with higher incidence of adverse pregnancy outcomes such as gestational hypertension, preeclampsia, premature rupture of membranes and adverse neonatal outcomes such as SGA, low birth injuries, hypoglycemia, hypothermia, Respiratory complications, and NICU admissions are related (25). Preeclampsia, gestational diabetes, preterm birth, fetal growth restriction (IUGR), and other perinatal complications are more common in women with twins compared to singletons. Preeclampsia was slightly higher in twin pregnancies than in singleton pregnancies. Preeclampsia in dizygotic twins was 3.50 times higher than monozygotic twins and 2.61 times in monozygotic twins. In addition, twins are two to three times more likely to develop severe hypertension than singletons (26). Preeclampsia in twin pregnancies occurs earlier in gestational age and its incidence rate is significantly higher than in singleton pregnancies (27). This study has limitations including not examining all pregnancy and fetal complications, conducting the study only in a hospital center with a low sample size, , not examining mortality between pregnancies. There are twins and singletons.

## **Conclusion**

The results show that pregnancy characteristics such as fetal complications, preeclampsia in singleton pregnancies are lower than in twins and the uterine artery PI level in twin pregnancies is significantly lower than in singleton pregnancies. Therefore, you can predict pregnancy outcomes and other maternal and fetal outcomes in two medical groups. However, studies with larger sample sizes are needed to investigate the relationship between these factors

## Ethical

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**Conflict of interest:** The authors declare that they have no conflict of interest.

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