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The burden imposed by twin pregnancies on a high-risk pregnancy unit: A retrospective cohort study in Greece

Ioannis Tsakiridis, Georgios Kapetanios, Kyriaki Chatzilazarou, Georgios Michos, Apostolos Mamopoulos, Apostolos Athanasiadis, Themistoklis Dagklis

Third Department of Obstetrics and Gynaecology, School of Medicine, Faculty of Health Sciences, Aristotle University of Thessaloniki, Greece

Corresponding Author

Tsakiridis Ioannis, Konstantinoupoleos 49, 54642, Thessaloniki, Greece, Tel.: +30 2313312120, Fax: +30 2310 992950, e-mail: igtsakir@auth.gr

Abstract

Introduction: Twin pregnancies are associated with several pregnancy complications often necessitating admission for close surveillance. The present study aimed to investigate the burden imposed by twin pregnancies on a high-risk pregnancy unit (HRPU) of a tertiary hospital.

Materials and Methods: This was a retrospective cohort study conducted between January 2017 and December 2022 in the Third Department of Obstetrics and Gynecology, School of Medicine, Aristotle University of Thessaloniki, Greece. All women with twin pregnancies admitted in the HRPU were eligible to participate. The duration of hospitalization and the outcome of the pregnancy were the main outcomes of the study. Secondary outcomes were the associations between the duration and the pregnancy outcome and several maternal and obstetrical parameters.

Results: From a total of 1,351 women hospitalized in the HRPU during the study period, 154 (11.4%) women were carrying twins. The mean duration of hospitalization was 6.1 days (± 6), the main indication for admission was threatened preterm labor (TPTL) (37%) and most cases ended up in delivery (64.9%). Advancing maternal age (OR: 1.066; 95% CI: 1.010-1.126; $p=0.02$), early gestational age on admission (OR: 0.807; 95% CI: 0.718-0.907; $p<0.001$) and fetal growth restriction (FGR) (OR: 2.728; 95% CI: 1.035-7.189; $p=0.042$) were identified as independent risk factors for longer stay at the HRPU. With regards to pregnancy outcome, advancing gestational age on admission (OR: 1.158; 95% CI: 1.044-1.285; $p=0.006$) and preterm prelabor rupture of membranes (PPROM) (OR: 6.239; 95% CI: 1.712-22.741; $p=0.006$) were identified as independent risk factors for delivery, instead of discharge.

Conclusions: About one out of nine hospitalized high-risk pregnancies were twins, thus, imposing a high

burden for the HRP, while one third of them had symptoms of TPTL. Close antenatal care is required for twin pregnancies to early detect possible complications and thus, improve perinatal outcomes.

Key words: Twin pregnancies, high-risk pregnancy unit, complications, outcomes, hospitalization

Introduction

The incidence of twin pregnancies has increased significantly in the last decades, mainly due to the increasing use of assisted reproductive technologies (ART)¹. In 2014, about 1 in 29 pregnancies were twins, while this rate declined to 1 in 32 in 2019 after the recommended strategies to control the rate of multiple embryos transferred per IVF cycle¹. Monozygotic twins are about 30 percent of all twins². The rate of dizygotic twins differs between populations and is affected by several factors, including use of ART enhancing treatments, maternal age, geographic area, parity, family history, maternal weight and height and diet³. In contrast, the prevalence of monozygotic is quite stable worldwide at 3 to 5 per 1,000 births and is not influenced by specific factors⁴.

It is known that twin pregnancies are associated with higher risk of perinatal mortality and morbidity compared to singletons⁵. Vanishing twin is an early spontaneous reduction from twin to singleton pregnancy at early stages of gestation⁶. Moreover, twins have a higher risk for congenital anomalies, fetal growth restriction (FGR) and preterm delivery⁷. Especially in monochorionic twins, the most common complications are the twin-twin transfusion syndrome (TTTS), twin anemia polycythemia sequence (TAPS), selective fetal growth restriction (sFGR) and twin reversed arterial perfusion sequence (TRAP)⁸⁻¹⁰. In addition, twin pregnancies are associated with maternal complications; the most common are gestational hypertension and preeclampsia, gestational diabetes, intrahepatic cholestasis of pregnancy, anemia and hyperemesis¹¹. Therefore, twin pregnancies should be monitored

by specialized antenatal care clinics, although it has not been proven that these units improve birth outcomes¹².

The aim of this study was to investigate the burden imposed by twin pregnancies in a high-risk pregnancy unit (HRPU) of a tertiary hospital.

Methods

This was a retrospective cohort study conducted between January 2017 and December 2022 in the Third Department of Obstetrics and Gynecology, School of Medicine, Faculty of Health Sciences, Aristotle University of Thessaloniki, Greece. All women with twin pregnancies admitted in the HRP were eligible for the study. The estimated date of delivery was calculated based on the crown rump length at the first trimester scan, in case of spontaneous or based on the embryo-transfer, in case of ART.

A research midwife collected all the available data regarding the medical and obstetric history, as well as the duration of hospitalization and the outcome of the pregnancy (delivery suite or discharge), which were the main outcomes of the study. Secondary outcomes were the associations between the duration and the pregnancy outcome and several parameters, including maternal age, gestational age on admission, body mass index (BMI), smoking during pregnancy, method of conception, type of twins (MCDA, DCDA; no MCMA twins were hospitalized during the study period) and main indication for admission (threatened preterm labor - TPTL, FGR, preeclampsia, PPROM and other). All relevant data were routinely recorded in a local database (Astrai software gmbh, Munich, Germany).

The women consented for the anonymity of their data and the possible use for research purpose, while no incentives were provided. Following standard policy for observational studies that do not involve any intervention or modification on the routine care of the patients (<https://www.hra.nhs.uk/approvals-amendments/what-approvals-do-i-need/>), no institutional board review was required for the study¹³.

Continuous variables are presented as mean (standard deviation), while all the categorical variables are expressed as n (%). Indication of admission was dummy coded as a binary variable to estimate the independent effect of each indication. Moreover, for some statistical analyses, the variable “duration of hospitalization” was converted into a categorical one, using the mean as a cutoff. Additionally, using a multivariate logistic regression (backward elimination-conditional), we evaluated the association of the duration of hospitalization and the pregnancy outcome with all the possible parameters previously mentioned. Odds ratios (ORs) and 95% confidence intervals (95% CI) were calculated, while significance was set at 5%. All the analyses were performed by SPSS software v.25.0.

Results

From a total of 1,351 women hospitalized in the HRP during the study period, 154 (11.4%) women were carrying twins and were eligible to participate in the study. The mean maternal age was 34.7 years (± 7.1), the mean duration of hospitalization was 6.1 days (± 6), the main indication for admission was TPTL (37%) and most cases ended up in delivery (64.9%) (Table 1).

Following multivariate logistic regression analysis, by using the mean “duration of hospitalization” as a dependent categorical variable (cutoff: 6.1), advancing maternal age (OR: 1.066; 95% CI: 1.010-1.126; $p=0.02$), early gestational age on admission

Table 1. Baseline characteristics of the participants (n=154).

CHARACTERISTICS	MEAN (SD) OR N (%)
Maternal age (years)	34.7 (7.1)
Gestational age on admission (weeks)	31.1 (3.4)
Duration of hospitalization (days)	6.1 (6.0)
BMI (kg/m ²)	25.6 (3.7)
Method of conception	
Spontaneous	30 (19.5)
ART	124 (80.5)
Type of twins	
DCDA	143 (92.9)
MCDA	11 (7.1)
Smoking	
Yes	22 (14.3)
No	132 (85.7)
Indication for admission	
TPTL	57 (37.0)
FGR	26 (16.9)
Preeclampsia	12 (7.8)
PPROM	27 (17.5)
Other	32 (20.8)
Pregnancy outcome	
Delivery suite	100 (64.9)
Discharge	54 (35.1)

BMI: body mass index; ART: assisted reproductive technology; DCDA: dichorionic diamniotic; MCDA: monochorionic diamniotic; TPTL: threatened preterm labor; FGR: fetal growth restriction; PPROM: preterm prelabor rupture of membranes

(OR: 0.807; 95% CI: 0.718-0.907; $p<0.001$) and FGR (OR: 2.728; 95% CI: 1.035-7.189; $p=0.042$) were identified as independent risk factors for longer stay at the HRP. None of the following parameters were associated with the duration of hospitalization: BMI, method of conception, type of twin pregnancy, smoking and indication for admission other than FGR.

With regards to pregnancy outcome, following multivariate logistic regression, advancing gestational age on admission (OR: 1.158; 95% CI: 1.044-1.285; $p=0.006$) and PPROM (OR: 6.239; 95% CI: 1.712-22.741; $p=0.006$) were identified as independent risk factors for delivery, instead of discharge.

Discussion

Main findings

We found that i) twin pregnancies imposed a high burden (11.4% of admissions) in the HRP, ii) the main indication for admission was TPTL, iii) advancing maternal age, early gestational age on admission and FGR were identified as independent predictors for longer duration of hospitalization and iv) advancing gestational age on admission and PPROM were associated with delivery instead of discharge.

Interpretation of the findings

According to our findings, about one out of nine hospitalized high-risk pregnancies were twins. Considering that the prevalence of twins is about 3 in 100, then the high burden imposed by twin pregnancies in a HRP is obvious¹⁴. Moreover, the mean maternal age of the participants was 34.7 years, which is in accordance with the existing literature; it is known that the prevalence of twins increases with advancing maternal age¹⁵⁻¹⁷. Furthermore, the increased use of ART affects the prevalence of twin pregnancies and especially the dizygotic ones¹⁸⁻¹⁹. This was also confirmed by our results; 80.5% of cases reported conception via ART and 92.9% of them were DCDA twins.

Published data have reported a higher risk of maternal complications in twins compared to singletons, including hypertensive disorders, gestational diabetes and intrahepatic cholestasis of pregnancy¹¹. In our study, the main indication for admission was TPTL. According to the literature, the main cause of perinatal morbidity in both singletons and twins is preterm delivery²⁰. With regards to pathophysiology, the increased myometrial distension can lead to more frequent and greater myometrial contractility compared with singletons^{20,21}.

Of note, routine use of tocolytics, cerclage or supplemental progesterone in twin pregnancies does not reduce the risk of hospitalization and

preterm birth²². According to data from a meta-analysis regarding the impact of maternal age on perinatal outcomes in twin pregnancies, the researchers concluded that women >40 years are at high-risk of adverse maternal and neonatal outcomes and those >35 years have increased risk of maternal complications²³. These findings are in accordance with our own; we found that advancing maternal age is associated with increased duration of hospitalization. Another meta-analysis found that twin pregnancies complicated by fetal growth discordance were at increased risk of stillbirth, especially when one fetus was small-for-gestational age²⁴. That is also in accordance with our findings where FGR and especially those diagnosed before 32 weeks, were identified as independent predictors for longer duration of hospitalization. FGR is a condition that needs careful monitoring and, in severe cases, hospitalization because of its association with preeclampsia and gestational diabetes and fetal death²⁵.

In several studies of twin pregnancies with PPROM, the median latency period was shorter in twins compared with singletons²⁶⁻²⁷. These findings agree with our findings as PPROM was most associated with delivery, instead of discharge.

Conclusions

During the study period, about one out of nine hospitalized high-risk pregnancies were twins, thus, imposing a high burden for the HRP. Moreover, the main indication for admission was TPTL and the duration of hospitalization was longer in women of advancing maternal age, early gestational age on admission and FGR. As for the outcome, about two thirds of the cases delivered. Therefore, twin pregnancies need close antenatal monitoring from maternal-fetal medicine specialists, to early detect pregnancy complications and minimize the duration of hospitalization.

Disclosure of conflicts of interest

The authors report no conflicts of interest.

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References

1. Kulkarni AD, Jamieson DJ, Jones HW Jr, et al. Fertility treatments and multiple births in the United States. *N Engl J Med* 2013; 369:2218.
2. Adashi EY. Seeing double: a nation of twins from sea to shining sea. *Am J Obstet Gynecol* 2016; 214:311.
3. Steinman G. Can the chance of having twins be modified by diet? *Lancet* 2006; 367:1461.
4. Osterman MJK, Hamilton BE, Martin JA, et al. Births: Final Data for 2021. *Natl Vital Stat Rep* 2023; 72:1.
5. Practice Committee of American Society for Reproductive Medicine. Multiple gestation associated with infertility therapy: an American Society for Reproductive Medicine Practice Committee opinion. *Fertil Steril* 2012; 97:825.
6. Romanski PA, Carusi DA, Farland LV, et al. Perinatal and Peripartum Outcomes in Vanishing Twin Pregnancies Achieved by In Vitro Fertilization. *Obstet Gynecol* 2018; 131:1011.
7. Chauhan SP, Scardo JA, Hayes E, et al. Twins: prevalence, problems, and preterm births. *Am J Obstet Gynecol* 2010; 203:305.
8. Mackie FL, Hall MJ, Morris RK, Kilby MD. Early prognostic factors of outcomes in monochorionic twin pregnancy: systematic review and meta-analysis. *Am J Obstet Gynecol* 2018; 219:436.
9. Sebire NJ, D'Ercole C, Soares W, et al. Intertwin disparity in fetal size in monochorionic and dichorionic pregnancies. *Obstet Gynecol* 1998; 91:82.
10. Lee YM, Wylie BJ, Simpson LL, D'Alton ME. Twin chorionicity and the risk of stillbirth. *Obstet Gynecol* 2008; 111:301.
11. Campbell DM, Templeton A. Maternal complications of twin pregnancy. *Int J Gynaecol Obstet* 2004; 84:71.
12. Mackenzie TC, Crombleholme TM, Johnson MP, et al. The natural history of prenatally diagnosed conjoined twins. *J Pediatr Surg* 2002; 37:303.
13. Wade DT. Ethics, audit, and research: all shades of grey. *BMJ*. 2005;330(7489):468-71.
14. Tsakiridis I, Giouleka S, Mamopoulos A, Athanasiadis A, Dagklis T. Management of Twin Pregnancies: A Comparative Review of National and International Guidelines. *Obstet Gynecol Surv.* 2020 Jul;75(7):419-430
15. Lisonkova S, Joseph KS, Bell R, Glinianaia SV. Effect of advanced maternal age on perinatal outcomes in twins: the impact of chorionicity. *Ann Epidemiol* 2013; 23:428.
16. Kathiresan AS, Roca LE 2nd, Istwan N, et al. The influence of maternal age on pregnancy outcome in nulliparous women with twin gestation. *Am J Perinatol* 2011; 28:355.
17. McLennan AS, Gyamfi-Bannerman C, Ananth CV, et al. The role of maternal age in twin pregnancy outcomes. *Am J Obstet Gynecol* 2017; 217:80.e1.
18. Cameron AH, Edwards JH, Derom R, et al. The value of twin surveys in the study of malformations. *Eur J Obstet Gynecol Reprod Biol* 1983; 14:347.
19. Adashi EY. Seeing double: a nation of twins from sea to shining sea. *Am J Obstet Gynecol* 2016; 214:311.
20. Turton P, Arrowsmith S, Prescott J, et al. A comparison of the contractile properties of myometrium from singleton and twin pregnancies. *PLoS One* 2013; 8:e63800.
21. Lyall F, Lye S, Teoh T, et al. Expression of Gs alpha, connexin-43, connexin-26, and EP1, 3, and 4 receptors in myometrium of prelabor singleton versus multiple gestations and the effects of mechanical stretch and steroids on Gs alpha. *J Soc Gynecol Invest* 2002; 9:299.
22. Giouleka S, Tsakiridis I, Kostakis N, et al. Pre-

- term Labor: A Comprehensive Review of Guidelines on Diagnosis, Management, Prediction and Prevention. *Obstetrical & gynecological survey*. 2022;77(5):302-17.
23. Xiong QF, Yu ZH, Zhang AL, Zhu XH. Impact of maternal age on perinatal outcomes in twin pregnancies: a systematic review and meta-analysis. *Eur Rev Med Pharmacol Sci*. 2022 Jan;26(1):99-109.
24. D'Antonio F, Odibo AO, Prefumo F, Khalil A, Buca D, Flacco ME, Liberati M, Manzoli L, Acharya G. Weight discordance and perinatal mortality in twin pregnancy: systematic review and meta-analysis. *Ultrasound Obstet Gynecol*. 2018 Jul;52(1):11-23
25. Joo EH, Kim YR, Kim N, Jung JE, Han SH, Cho HY. Effect of Endogenic and Exogenic Oxidative Stress Triggers on Adverse Pregnancy Outcomes: Pre-eclampsia, Fetal Growth Restriction, Gestational Diabetes Mellitus and Preterm Birth. *Int J Mol Sci*. 2021 Sep 19;22(18):10122
26. Bianco AT, Stone J, Lapinski R, et al. The clinical outcome of preterm premature rupture of membranes in twin versus singleton pregnancies. *Am J Perinatol* 1996; 13:135.
27. Fishel Bartal M, Ugwu LG, Grobman WA, et al. Outcomes in Twins Compared With Singletons Subsequent to Preterm Prelabor Rupture of Membranes. *Obstet Gynecol* 2021; 138:725.

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