Efficacy of a Single 5,000 IU Dose of HCG in Enhancing Pregnancy Outcomes During Early Gestational Period

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Submission Date : 01 May 2025
Accepted Date : 05/06/2025
Published Date : 30 September 2025
DOI: https://doi.org/10.3329/jrpmc.v10i2.85669

Abstract:

Background:
Human chorionic gonadotropin (HCG) has an important role in maintaining early pregnancy and has been studied to improve pregnancy outcomes.

Objective:
This study aimed to assess the effectiveness of a single 5,000 IU dose of HCG in improving early pregnancy outcomes for women at risk of complications.

Methods:
This prospective study was conducted at the Salauddin Specialized Hospital, Dhaka, Bangladesh, from January 2023 to January 2024 on 120 pregnant women in the early stages of pregnancy at 6 weeks without cardiac pulsation and positive β-hCG levels. They were randomly divided into two groups: the HCG group (n=60), which received 5,000 IU of intramuscular HCG, and the control group (n=60), who received standard care. The main outcomes included ongoing pregnancy rates, miscarriage rates, positive HCG levels, fetal heartbeat detection at 8 weeks, and hormone levels measured on day 5 after the injection.

Results:
The ongoing pregnancy rates were higher in the HCG group compared to the control group (86.7% vs. 70.0%, p=0.03). The miscarriage rate was lower in the HCG group (13.3% vs. 30.0%, p=0.03). Those who received HCG also had a higher chance of fetal cardiac pulsation positivity (83.3% vs. 66.7%, p=0.04) and a lower incidence of threatened abortion (10.0% vs. 23.3%, p=0.05). Biochemical analysis revealed higher levels of β-hCG (>1,500 IU/L; 91.7% vs. 71.7%, p=0.01) and progesterone (>10 ng/mL; 83.3% vs. 65.0%, p=0.02). We found weak-to-moderate correlations (r=0.25–0.34, p<0.05) linking HCG to positive outcomes, indicating its role in maintaining pregnancy.

Conclusion:
Administering a single dose of HCG significantly improved early pregnancy (at 6 weeks without cardiac pulsation and positive β-hCG levels) outcomes by providing better hormonal support and reducing complications. These results suggest that HCG supplementation may be helpful for women at risk of early pregnancy loss, though further large-scale studies are necessary.

Keywords: Human chorionic gonadotropin (HCG), Early pregnancy, Miscarriage, Hormonal supplementation.

Citation: Shapna SN, Das S, Akter S. Efficacy of a Single 5,000 IU Dose of HCG in Enhancing Pregnancy Outcomes During Early Gestational Period. J Rang Med Col. 2025 Sep;10(2):115-120. doi: https://doi.org/10.3329/jrpmc.v10i2.85669

Introduction:

Early pregnancy loss is one of the most common complications of reproductive medicine, being present in approximately 10-15% of clinically recognized pregnancies.[1]The first trimester is particularly vulnerable because it includes crucial development stages like implantation, placentation, and early organogenesis. During this

period, adequate hormonal support, predominantly from human chorionic gonadotropin (HCG) and progesterone, is required to maintain the pregnancy and fetal growth.[2] Human chorionic gonadotropin, specifically a glycoprotein hormone produced by trophoblastic cells that initially surround a growing embryo (syncytiotrophoblast), plays various physiological functions in addition to its well-known role of upholding corpus luteum function. HCG stimulates progesterone secretion, facilitates implantation, and exhibits immunomodulatory effects that can contribute to maternal-fetal tolerance.[3] Recent studies have identified that the concentration of HCG is a satisfactory marker for prognosis in pregnancy, and with adequate concentrations of β-hCG, successful pregnancy continuation and reduced rates of miscarriage are noted.[4] The clinical use of HCG supplementation at the time of early pregnancy has generated considerable interest as a potential intervention to improve pregnancy outcome, particularly with threatened abortion or recurrent miscarriage. Meta-analyses have shown that treatment with HCG can reduce miscarriage, with some reporting a number needed to treat of seven women in order not to have one subsequent loss.[5] Still, the evidence is disputed, with mixed findings concerning the best dosing, timing, and selection criteria for HCG supplementation. Recent studies have focused on examining the dynamic profiles of β-hCG levels during early pregnancy and their correlation with pregnancy outcome. Highly sensitive serum tests have demonstrated HCG doubling patterns and absolute measurements to be reliable predictors of pregnancy viability.[6] The varied functions of the hormone in supporting pregnancy, other than luteal function, involve effects on uterine immune status, cytokine expression, and vascular morphogenesis in the developing placenta. The rationale for HCG supplementation is also supported by evidence documenting its use in the prevention of threatened abortion and maintenance of pregnancies with compromised hormonal histories. Women with early pregnancy complications have decreased levels of HCG compared to women having normal pregnancies.[7] HCG supplementation has also been reported to have promise in some patient populations, for instance, women with oligomenorrhea and recurrent pregnancy loss, suggesting that patient-tailored treatment protocols can enhance therapeutic gains.[8] Despite the growing body of evidence in support of the therapeutic use of HCG, clinical practice guidelines continue to be cautious regarding the routine use of HCG. The American College of Obstetricians and Gynecologists has noted that therapies such as the use of β-hCG have not been definitively proven to avoid early pregnancy loss.[9] This indicates the need for well-designed prospective trials to yield clear evidence-based recommendations for HCG supplementation during the treatment of early pregnancy. This study was conducted with the purpose of bridging this knowledge gap by determining the efficacy of a standardized single-dose regimen of HCG to improve early pregnancy outcomes. Employing a prospective comparative design with absolute outcomes, the current study will offer valuable evidence regarding the therapeutic utility of HCG supplementation in contemporary obstetric practice.

Methods:

This prospective study was conducted at the Salauddin Specialized Hospital, Dhaka, Bangladesh, from January 2023 to January 2024. A total of 120 pregnant women in early gestation at 6 weeks without cardiac pulsation and positive HCG levels were recruited and divided equally into two groups: Group A (HCG group, n=60) and Group B (Control group, n=60). Participants were enrolled based on specific inclusion criteria relevant to early pregnancy and potential risk factors. Baseline demographic characteristics, including age distribution (20–30 years and 31–40 years), Body Mass Index (BMI <25 and BMI ≥ 25), and parity (nulliparous and multiparous), were collected for all participants to ensure comparability between the groups. Women in Group A received a single intramuscular injection of 5,000 IU HCG, while women in Group B received standard care without HCG supplementation. Hormonal responses, specifically β-hCG levels (>1,500 IU/L) and progesterone levels (>10 ng/mL), were measured on Day 5 post-injection to assess the biochemical impact of HCG administration. All collected data were subjected to appropriate statistical analyses using statistical software SPSS version 26. Baseline demographic and clinical characteristics between

Group A and Group B were compared using the Chi-square test for categorical variables and, independent t-test for continuous variables. Pregnancy outcomes and hormonal responses were compared between the two groups using Chi-square tests for categorical data. A p-value of <0.05 was considered statistically significant. Additionally, Pearson correlation coefficients were calculated to assess the strength and direction of the linear relationship between HCG use and key positive outcomes.

Results:

Table-I showed that both groups were well matched at baseline. Most participants were aged 20–30 years (63.3% in HCG vs. 58.3% in control), with a balanced BMI distribution—50% in each group had BMI <25 kg/m . Multiparity was slightly more common in both groups (58.3% HCG vs. 55.0% control), and all variables showed no statistical difference (p >0.05), confirming effective randomization.

Table-I: Baseline demographic characteristics (N=120)

Characteristic	Group A (HCG, n=60) no. (%)	Group B (Control, n=60) no. (%)	p-value
Age (20–30 yrs)	38(63.3)	35(58.3)	0.56
Age (31–40 yrs)	22(36.7)	25(41.7)	
BMI <25	30(50.0)	32(53.3)	0.71
BMI ≥ 25	30(50.0)	28(46.7)	
Nulliparous	25(41.7)	27(45.0)	0.72
Multiparous	35(58.3)	33(55.0)	

Table-II highlighted similar clinical risk profiles. Prior miscarriage occurred in 16.7% (HCG) and 20.0% (control). Spotting was noted in 13.3% and 16.7%, respectively. Progesterone <10 ng/mL was present in 25.0% (HCG) and 28.3% (control), while gestational age ≤6 weeks was seen in 53.3% vs. 50.0%. All comparisons were statistically non-significant (p>0.05).

Table-II: Clinical features at baseline (N=120)

Clinical feature	Group A n=60) no. (%)	Group B (n=60) no. (%)	p-value
History of miscarriage	10(16.7)	12(20.0)	0.64
Spotting in early weeks	8(13.3)	10(16.7)	0.61
Progesterone <10 ng/mL	15(25.0)	17(28.3)	0.69
Gestational age ≤6 wks	32(53.3)	30(50.0)	0.72

Table-III showed the primary effectiveness outcomes, indicating significant improvements in pregnancy rates were higher (86.7% vs. 70.0%, p=0.03), and miscarriage rates were lower (13.3% vs. 30.0%, p=0.03). Fetal heart beat at 8 weeks was detected more frequently in the HCG group (83.3% vs. 66.7%, p=0.04). Threatened abortion occurred less often (10.0% vs. 23.3%, p=0.05).

Table-III: Pregnancy outcomes (N=120)

Outcome	Group A n=60) no. (%)	Group B (n=60) no. (%)	p-value
Ongoing pregnancy	52(86.7)	42(70.0)	0.03
Miscarriage	8(13.3)	18(30.0)	
Fetal heart beat at 8 weeks	50(83.3)	40(66.7)	0.04
Threatened abortion	6(10.0)	14(23.3)	0.05

Table-IV showed better hormonal outcomes in the HCG group. β-hCG >1,500 IU/L was achieved in 91.7% vs. 71.7% (p=0.01), and progesterone >10 ng/mL in 83.3% vs. 65.0% (p=0.02). These results indicate enhanced luteal support following HCG administration.

Table-IV: Hormonal response after HCG administration (Day 5 post injection) (N=120)

Hormone Level	Group A n=60) no. (%)	Group B (n=60) no. (%)	p-value
β-hCG >1,500 IU/L	55(91.7%)	43(71.7%)	0.01
Progesterone >10 ng/mL	50(83.3%)	39(65.0%)	0.02

Table-V: Correlation between HCG use and positive outcome

Outcome variable	Pearson r	p-value	Interpretation
Ongoing pregnancy (1=Yes)	0.28	0.002	Weak positive correlation (statistically significant)
Fetal heart beat at 8 weeks (1=Yes)	0.26	0.005	Weak positive correlation (statistically significant)
Miscarriage (1=Yes)	-0.25	0.006	Weak negative correlation (statistically significant)
Live birth at term (1=Yes)	0.30	0.001	Moderate positive correlation (statistically significant)
Progesterone level (ng/mL)	0.34	<0.001	Moderate positive correlation (statistically significant)

Table-VI: Efficacy of a single 5,000 IU dose of HCG in enhancing early pregnancy outcomes (N=120)

Outcome	HCG Group (n=60)	Control Group (n=60)	p-value	Interpretation
Ongoing pregnancy	52(86.7%)	42(70.0%)	0.03	HCG significantly improves continuation
Miscarriage	8(13.3%)	18(30.0%)	0.03	Lower miscarriage rate with HCG
Fetal heart beat (8 weeks)	50(83.3%)	40(66.7%)	0.04	HCG increases fetal viability
Threatened abortion	6(10.0%)	14(23.3%)	0.05	Reduced complications in the HCG group
Live birth (Follow-up)	47(78.3%)	36(60.0%)	0.03	HCG improves the live birth rate

Table-V revealed statistically significant correlations between HCG and pregnancy outcomes. Ongoing pregnancy (r=0.28, p=0.002) and fetal heartbeat at 8 weeks (r=0.26, p=0.005) had weak but significant positive correlations. Live birth at term had a moderate correlation (r=0.30, p=0.001), while progesterone levels showed the strongest link (r=0.34, p<0.001). Miscarriage was inversely correlated (r=–0.25, p=0.006).

Table-VI consolidated outcome data, confirming consistent HCG benefits. Ongoing pregnancy was higher in the HCG group (86.7% vs. 70.0%, p=0.03), miscarriage was lower (13.3% vs. 30.0%, p=0.03), and fetal heartbeat detection improved (83.3% vs. 66.7%, p=0.04). Threatened abortion decreased (10.0% vs. 23.3%, p=0.05), and live birth rate was significantly higher (78.3% vs. 60.0%, p=0.03).

Discussion:

This study demonstrated significant improvements in early pregnancy outcomes following administration of a single 5,000 IU dose of HCG, validating the therapeutic efficacy of hormonal supplementation in high-risk early pregnancy. These findings aligned with recent meta-analyses by Morley et al, which suggested benefits of HCG supplementation, while providing current evidence from a rigorously controlled prospective study.[10] The 16.7% absolute reduction in miscarriage rates (13.3% vs. 30.0%) represented a clinically meaningful benefit, comparable to the number needed to treat reported in earlier meta-analyses.[10] The large effect size indicated that HCG supplementation may be especially advantageous in populations predisposed to early pregnancy loss. The protective mechanism likely involves dual actions: preservation of the corpus luteum and direct luteal support via increased progesterone secretion. This was supported by the significant elevations in both β-hCG and progesterone observed in treated patients. Notably, 91.7% of HCG recipients achieved therapeutic β-hCG levels above 1,500 IU/L, compared to 71.7% in controls. This aligned with Raya et al., who identified early β-hCG as a strong predictor of pregnancy outcome.[11] Concurrently, progesterone levels exceeding 10 ng/mL were

achieved by 83.3% of treated women versus 65.0% in controls, reinforcing established evidence that HCG's primary therapeutic role involves luteal support essential for pregnancy continuation. Our results challenged some conservative clinical guidelines that question the efficacy of HCG supplementation in preventing early pregnancy loss.[12] However, consistent statistical significance across multiple outcome measures, coupled with an absence of adverse effects, supports a favorable risk-benefit ratio for HCG use in appropriately selected patients. Correlation analyses further substantiate these findings, demonstrating significant associations between HCG treatment and improvements in several clinical parameters. Fetal cardiac pulsation positivity at eight weeks, a critical indicator of pregnancy viability, was significantly higher in the HCG group (83.3% vs. 66.7%), suggesting that supplementation may positively influence early embryonic development beyond mere pregnancy maintenance. This effect may be mediated through improved implantation quality and placental development.[13] Moreover, the reduction in threatened abortion rates (10.0% vs. 23.3%) highlighted HCG's stabilizing influence during early gestation. The prospective design and balanced baseline characteristics mitigate major confounders that had hampered prior research. Unlike retrospective studies or those with uneven baseline variables, our design allowed confident attribution of outcome differences to the intervention. The single-dose protocol addresses practical concerns related to treatment adherence and cost-effectiveness while delivering sustained clinical benefits. Quenby et al emphasized the necessity of personalized HCG supplementation approaches, noting greater efficacy in specific populations such as women with oligomenorrhea or recurrent pregnancy loss.[14] Our inclusive approach, encompassing a broad range of risk factors including miscarriage history and gestational complications, ensured both wide applicability and statistical power to detect clinically relevant effects. The correlation between HCG use and live birth outcome (r=0.30, p=0.001) extended the clinical significance beyond early pregnancy maintenance to ultimate reproductive success. This filled an important gap left by Scott et al, who focused solely on short-term outcomes without addressing pregnancy completion rates.[15] The moderate but robust association suggested early HCG intervention may yield lasting benefits, potentially by enhancing placental function and the maternal-fetal interface throughout gestation.

Limitations:

The study was done in one private hospital, limiting its generalizability. A small sample size of 120 participants may miss subtle effects or rare events. Long-term data on neonatal outcomes were not collected, so we cannot assess any potential long-term impacts of HCG supplementation.

Conclusion:

A single 5,000 IU dose of HCG improved early pregnancy outcomes in women without cardiac pulsation but with positive β-hCG. It reduced miscarriage by 16.7% and increased ongoing pregnancies to 86.7%. These findings support HCG as a beneficial treatment in early high-risk pregnancies.Larger trials are needed for validation, and future research should explore dosing and combination therapies.

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