

High flow nasal oxygen versus face mask pre-oxygenation of pregnant patients with high body mass index

- a crossover non-inferiority randomised controlled trial

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INTRODUCTION

Obesity in pregnancy confers higher risk of airway management complications[1]. Obstetric guidelines recommend best practice pre-oxygenation as target end tidal oxygen (etO₂) ≥ 90%[2]. Our prior study showed very strong evidence that high flow nasal oxygen (HFNO) was superior to face mask oxygen (FM) at achieving this threshold in pregnant patients[3]. The efficacy of HFNO & FM pre-oxygenation in pregnant patients with high body mass index (BMI), particularly obesity class II or above is uncertain.

HYPOTHESIS

That HFNO is non-inferior to FM for increasing etO₂ after pre-oxygenation of pregnant patients with BMI ≥ 30 kg/m² in late pregnancy.

METHOD

Cohort: Pregnant patients ≥ 36 weeks gestation with BMI ≥ 30 kg/m².

Eligibility: Elective caesarean delivery, antenatal clinics. Exclusion: age < 18 years, significant nasal pathology, severe systemic disease, preeclampsia, sepsis, labour/multiple pregnancy.

Intervention: Serial simulated pre-oxygenation protocols with either HFNO followed by FM (Group HFNO-FM) or vice versa (Group FM-HFNO) in the ramped position (Figure 1). HFNO via Optiflow Switch™ (maximum 70 l/min) & FM via tight-fitting face mask (10 l/min).

Measurement: EtO₂ measured at four time points: 5 min rest (baseline) followed by 3 min HFNO or FM, then 5 min rest (to confirm O₂ washout) followed by 3 min FM or HFNO.

Primary outcome: etO₂ captured via face mask (with 100% oxygen) after HFNO & after FM.

Secondary outcomes: Proportion of participants achieving etO₂ ≥ 90%, tolerance of HFNO, proportion of patients maintaining mouth closure with HFNO, correlations between primary outcome and relevant measured variables.

Analysis: Primary outcome comparison: Paired sample t-test. Comparisons between proportions: McNemar’s test for paired samples. Correlations: Pearson’s correlation coefficient.



Figure 1 Photo (with consent) depicting participant positioning (ramped, right pelvic wedge)

RESULTS

Recruitment: Seventy pregnant participants were enrolled from 629 patients assessed. Four were excluded due to withdrawal or non-tolerance.

Sample: The median [IQR] participant weight & BMI for Group HFNO-FM vs Group FM-HFNO were 97 [88-118] kg vs 107 [93-132] kg, & 37 [33-41] kg/m² vs 38 [34-46] kg/m² respectively.

Outcomes: First etO₂ after HFNO was higher than after FM pre-oxygenation; mean (SD) 90 (3.2)% vs 88 (3.3)% [mean difference 1.8 (95% CI 0.7 to 2.9) %; p-value 0.002] (Figure 2). HFNO was superior to FM in achieving etO₂ ≥ 90%; 50/66 (76%) HFNO vs 19/66 (29%) FM; p<0.001 (Table 1). 77% participants tolerated maximal (70 l/min) HFNO flow & 74% participants maintained mouth closure for the full HFNO protocol. There were no significant correlations between etO₂ & age, gestation, weight, BMI, HFNO flow rate, duration of mouth closure, respiratory rate or minute ventilation.

CONCLUSIONS

HFNO was superior to FM pre-oxygenation in pregnant patients with BMI ≥30 kg/m² under simulated conditions. After three minutes of pre-oxygenation the number of patients who achieved etO₂ ≥ 90% was 2.5-fold greater with HFNO.

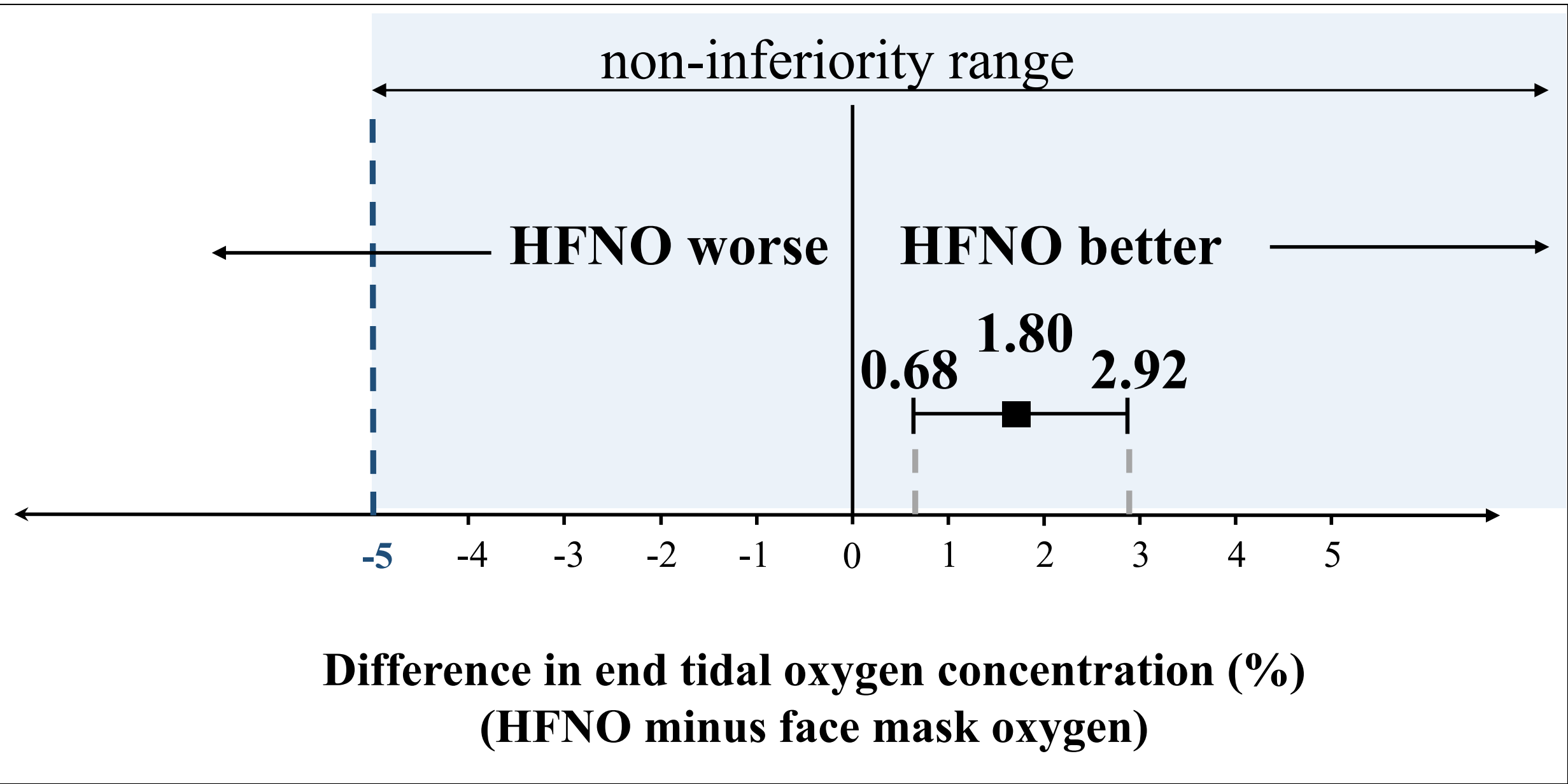


Figure 2 Primary outcome, presented within the framework of the CONSORT extension statement of non-inferiority studies, with mean difference and 95% confidence interval values above the distribution error bar plot. HFNO = high flow nasal oxygen

Table 1 Number of participants who achieved 90% and 80% end-tidal oxygen concentration after high flow nasal oxygen and face mask pre-oxygenation.

Pre-oxygenation target	HFNO pre-oxygenation n = 66	FM pre-oxygenation n = 66	p-value
≥ 90% end-tidal oxygen concentration, number (%)	50 (76%)	19 (29%)	<0.001
≥ 80% end-tidal oxygen concentration, number (%)	66 (100%)	64 (97%)	0.500

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CONFLICTS OF INTEREST

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