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Introduction

- NICE recommend antenatal screening of expired CO levels for all parturients at booking and 36 weeks. A raised expired CO (>4ppm) triggers referral to smoking cessation[1].

Case Report

- A 19 year old, non-smoking, primigravida with Hereditary Spherocytosis (HS) was found to have persistently elevated expired CO levels throughout the antenatal period (Fig 1.)
- Her smoking status was repeatedly challenged. This led to increasing frustration and feelings of judgement throughout her antenatal journey. At personal cost and inconvenience, she followed advice and had her boiler and car checked, which were found to be safe.
- She had an induction of labour for post dates and delivered by emergency caesarean under spinal anaesthesia.
- Postnatally, she became unwell and developed haemolysis secondary to sepsis, requiring 3 units of blood. Whilst being cared for in the maternal HDU, she was noted to have raised carboxyhaemoglobin (HbCO) levels of 5.5% (on venous blood gas, normal range <2% in a non smoker), with evidence of haemolysis (Hb 50g/dL, raised reticulocyte count and bilirubin).
- A repeat expired CO level at this time was 11ppm, the highest recording during her pregnancy.

CO readings during antenatal and immediate postnatal period

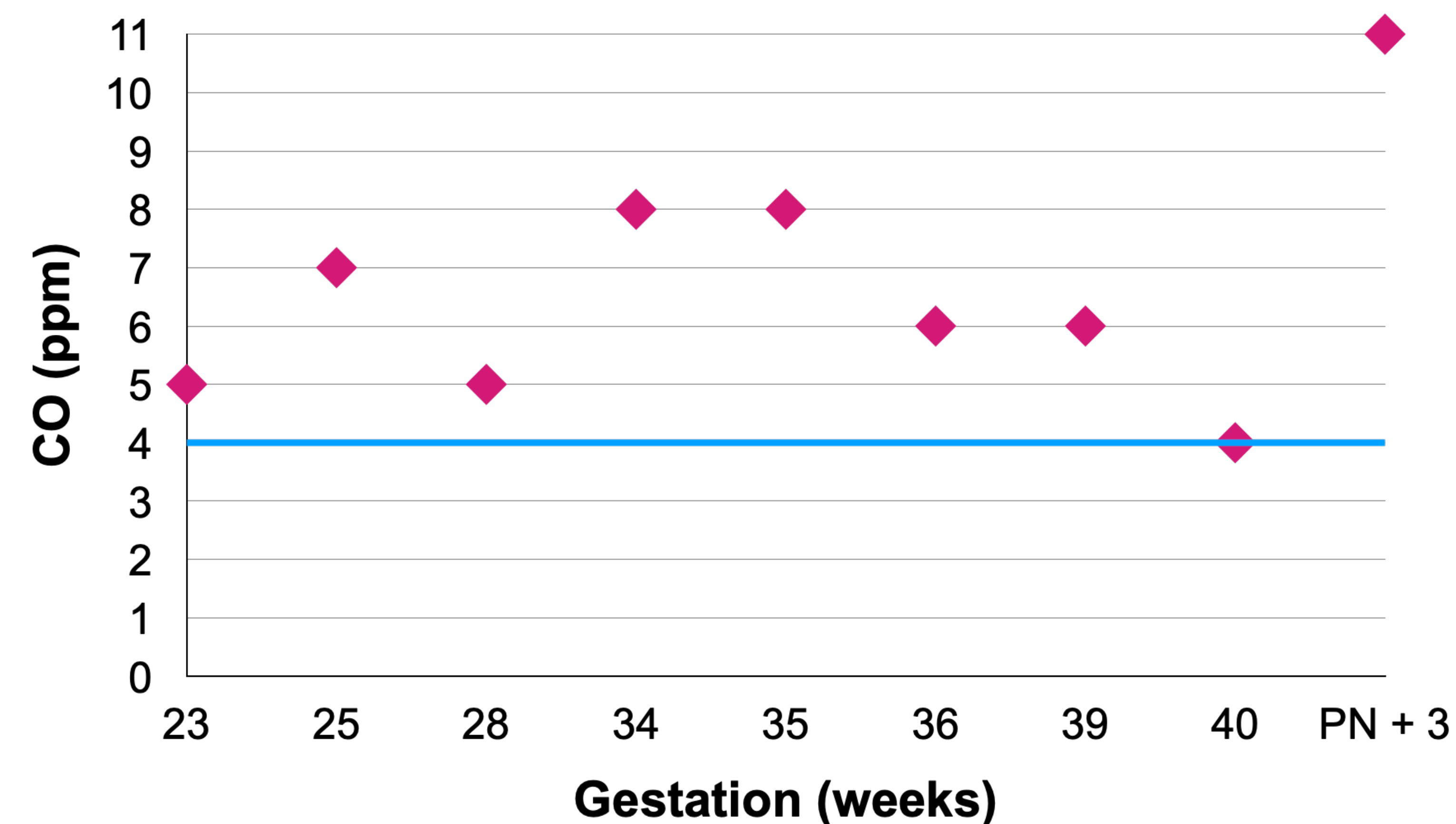


Fig 1. Patient CO readings were consistently greater than 4ppm (blue line), which is the threshold for referral to smoking cessation. (PN + 3 = 3 days postnatal)

- Her smoking history was again explored, triggering her frustration at being repeatedly challenged on this.
- The potential for haemolysis, as a cause for raised CO levels, was discussed with the on call haematologist who felt this was unrelated.
- A literature search revealed a correlation between haemolysis and increased endogenous CO production.

Discussion

- CO is a colourless, odourless, poisonous gas and exposure in pregnancy can impair oxygen carrying capacity and delivery to the mother and baby.
- An exhaled CO test is immediate, non-invasive and inexpensive.
- If a high reading is measured (>4ppm) smoking cessation support is offered as well as exploring possible exogenous causes including faulty boilers and car exhaust fumes.
- No guidance is given for management or investigation of raised CO levels in the absence of the aforementioned causes.
- CO levels increase in relation to haemolysis. During haemolysis, free Hb released by red blood cells is catabolised by haem-oxygenase 1 leading to formation of iron, biliverdin and CO.
- The CO binds to free Hb to form carboxyhaemoglobin. HbCO levels correlate with the degree of haemolysis in critically unwell patients on ECMO[2].
- The role of CO as a marker of haemolysis in at risk parturients is not yet described.
- Staff education of the rarer causes of raised CO levels in clinical practise could improve parturient experience and potentially outcome.

References

- Recommendations on treating tobacco dependence in pregnant women (2021). NICE Guideline [NG209]
- Xavier Bemtgen, Jonathan Riling, Manuel Holst et al. Carboxyhemoglobin (CO-Hb) Correlates with Hemolysis and Hospital Mortality in Extracorporeal Membrane Oxygenation: A Retrospective Registry. Diagnostics. 2022 Jul; 12(7): 1642