

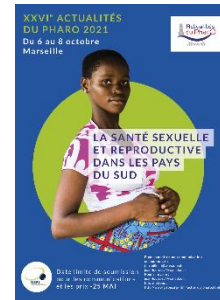
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Pregnancy and childbirth at high altitude: an adaptive advantage for certain populations - a historical perspective

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In the 16th century, when the conquistadores founded the city of Potosi at an altitude of 4,000 m, all newborns of Spanish descent died in the neonatal period. The Spanish women used to go and give birth at low altitude and only returned to Potosi when the child was one year old. It was not until 53 years after the foundation of the city, more than a generation later, that the first child of Spanish origin born in Potosi survived. Altitude hypoxia was certainly the predominant environmental factor in the inability of the immigrants to reproduce locally.

Pregnancy pathologies are more frequent at high altitudes, especially in non-acclimatised women. The main risk is pre-eclampsia, which can lead to eclampsia, retroplacental haematoma and foetal death. Altitude also exposes the mother to difficulties in neonatal adaptation.

The decrease in birth weight (BW) with altitude is linked to intrauterine growth retardation (IUGR) in the third trimester, attributed to an increase in fetal hypoxia at altitude. It is on average 100 g per 1000 m of altitude and can be observed from 1500 m. It varies according to how long populations have been established at altitude, suggesting an adaptation over the generations: more marked in Colorado and among the Han in Tibet, intermediate in the Andes, absent among the Tibetans.

Compensatory mechanisms exist in the mother and the foetus:

- Maternal hyperventilation of hormonal origin, increased at altitude, improves SaO₂ and preserves arterial oxygen content in resident women with increased Hb (Andes, Colorado). Hb concentration is not increased in Tibetan women but they have more marked vascular adaptations.
- The redistribution of pelvic blood flow to the uterine arteries increases during pregnancy, but is more marked and maintained until term in the older highland populations, whereas it decreases at the end of pregnancy in the more recent populations.
- The placental index (ratio of placental weight to PN) is increased at high altitude and the placental morphology is different: the villi are finer with a greater density of capillarisation, which improves the supply of O₂ to the foetus. In the Andes, these characteristics are more marked in women of Indian descent than in those of European descent, suggesting a genetic adaptation.
- In cord blood, there is an increase in Hb concentration as well as in the percentage of fetal Hb with increased affinity for O₂.

The advent of genomics allows us to make progress in the knowledge of different adaptations in the Andean and Tibetan populations.