Pregnancy and Peripartum Care: Gitelman/Bartter Syndromes

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Successful pregnancy is the norm in Gitelman and Bartter Syndromes (GS/BS). These rare recessively inherited renal tubulopathies are characterised by hypokalemic alkalosis +/- hypomagnesemia, normal excretory renal function and high renin/aldosterone levels.[1,2] Patients will already be on high doses of oral potassium supplements (preferably KCl-MR) and likely, also oral magnesium.

Key points

- *GS/BS patients will be more prone to fatigue and muscle cramps*
- *Risks in pregnancy and labour are associated with very low magnesium and low potassium (e.g. laryngospasm, convulsions, ventricular arrhythmia, tetany). However, the chronicity of hypomagnesemia means that lower levels are better tolerated.*
- *Blood testing as indicated below should always include U/E, magnesium and calcium.*
- ***Normal levels of K and Mg are not necessary, nor usually attainable. K 3 mmol/L and Mg 0.5 mmol/L are usually safe during pregnancy in the absence of major symptoms; aim for K 3.2 and Mg 0.6 if symptomatic***
- *Hospital delivery should be the norm*
- *Risk-assess for thromboprophylaxis, including assessing volume status*
- *Avoid IV magnesium unless patient cannot take normal meds. If IV is required, give slowly. This does NOT apply to pre-eclampsia/seizure management which should be along usual lines*
- *Baby's status: obligate carrier, should not display any abnormalities. Blood test for biochemistry if clinical concerns (electrolytes and magnesium)*

1. Management of pregnancy

(a) Needs for K/Mg supplements will rise because of normal physiological changes of pregnancy (hyperfiltration, volume expansion).

(b) Tolerable K levels may be K < 3 mmol/L and Mg 0.5 mmol/L – be guided by symptoms/ECG/patient's baseline as well as current numbers

(c) There is no need to treat to a specific serum level, and normal levels should never be the guide[3]

(d) K should usually be prescribed as KCl-MR (600 mg or 8 mmol/tab) or KayCeeL syrup (1 mmol/ml, and not sando-K (12 mmol/tab but contains bicarb)

(e) Mg lactate-SR (Magnalac, MagnEss-Lac or MagTab-SR) are slow release and usually much better tolerated than other forms of oral Mg

Tablet equivalents	Mg glycerophosphate or citrate	2 tds
	Mg lactate	2 bd
	Mg aspartate	2 sachets tds[4]

(f) IV Mg should be avoided unless patients cannot tolerate oral dose increases. If this happens, give IV top-ups (e.g. 8 mmol in saline) over 8 hours each, if possible. The slow

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[1] FC Bartter, P pronove, JR Gill Jr, RC MacCardle. Hyperplasia of the juxtaglomerular complex with hyperaldosteronism and hypokalemic alkalosis. A new syndrome. Am J Med. 33:811-28, 1962

[2] HJ Gitelman, JB Graham, LG Welt. A new familial disorder characterized by hypokalemia and hypomagnesemia. Trans Assoc Am Physicians, 79:221-235, 1996

[3] A Blanchard, D Bockenhauer, et al. Gitelman syndrome: Consensus and guidance from a Kidney Disease: Improving Global Outcomes (KDIGO) controversies conference. ***Kidney Int*** 91:24-33, 2017.

[4] As bioavailability varies among Mg preparations, doses to achieve the *equivalent* of 8 mmol tds are given.

rate is designed to avoid triggering the calcium-sensing receptor, which would lower baseline Mg levels (and still could)
    - NB this does NOT apply to pre-eclampsia/seizure management, which should be under usual guidelines

(g) Monitor monthly bloods (U/E, magnesium and calcium) in the first trimester, then two monthly if all stable

(h) Early booking with obstetric services, and patients should be managed as high-risk, including hospital delivery (though usually excellent outcomes)

(i) Local Trust procedures regarding low molecular weight heparin (LMWH) in pregnancy should be followed, noting tendency to mild dehydration in GS/BS

2. Management of labour: spontaneous

(a) On admission

- Inform on-call obstetrician; anaesthetist; paediatrician; renal team
- Clarify date and time of last dose of oral K/Mg. Give usual oral meds if feasible and timely. Continue to do this as far as is possible
- A cannula should be sited immediately, even if it isn't used
- Take blood for U/E, magnesium and calcium
- Perform 12-lead ECG and ask anaesthetist to review this
- Discuss epidural for pain relief

First stage (latent and active phases)

- Manage as usual for patient regarding medications, high-salt foods (essential), and fluids
- Patients ***must*** have unlimited access to salt to add to food
- Blood test to include magnesium, U/E and calcium, 6-8 hourly or if patient says they feel unwell

Second stage

- If tired and/or having cramps, expedite delivery

Following delivery

- ➢ Recheck mother's electrolytes and magnesium
- ➢ Give oral medications
- ➢ Baby: blood test for U/E, magnesium and calcium **only** if clinical concern

First 24 hours post-partum (if staying in hospital):

- ✓ Maintain usual oral electrolyte supplements – levels usually return rapidly to pre-pregnant baseline
- ✓ Blood test every 6-8 hours
- ✓ IV fluids only required if not tolerating oral intake: 0.9% normal saline 1000 ml with 40 mmol KCl 8 hourly for up to 24 hours or till tolerating oral intake (avoid 5% dextrose due to salt needs)
- ✓ Manage magnesium levels if NBM using iv 20% magnesium sulfate 2 grams (10 ml) in 100-250 ml normal saline over 4-8 hours. This is 8 mmol Mg. Switch to oral as soon as feasible
- ✓ Safe to go home if K > 3 and Mg > 0.5

If inpatient after 24 hours:

- Manage as under caesarean delivery

3. Management of labour: Caesarean Section

Before operation

- IV access
- Administer iv 20% magnesium 2 grams (10 ml, 8 mmol) in 250 mls normal saline over 4 hours, as patient will be missing usual oral dose
- Maintain IV 0.9% normal saline 1000 ml with 40 mmol KCl every 8 hours for up to 24 hours or till tolerating oral intake. **Avoid 5% dextrose**

During operation

- Use standard fluid once managed as above, containing 40 mmol added K/litre. ***Avoid 5% dextrose*** as patients have high salt needs
- Calculate patient's daily Mg supplement dose, round up to nearest whole IV dose, and divide over periods of several hours as slow IV

After operation

- Check mother's K and Mg
- Baby: blood test for electrolytes, magnesium and calcium **only** if clinical concerns

First 24 hours:

- IV fluids: 0.9% normal saline 1000 ml with 40 mmol/L KCl every 8 hours for 24 hours or until back on usual oral meds and intake
- Manage magnesium levels as patient's daily Mg supplement dose, rounded up to nearest whole IV dose, divided over periods of several hours as slow IV if still NBM
- Aim to restore oral intake asap
- Blood test every 6-8 hours.

If in-patient after 24 hours**:**

- Blood test every 12 hours (or as clinically indicated eg unwell, with cramps/palpitations).
- If no restriction on oral intake, continue usual oral magnesium and potassium medications.

If **nil by mouth** (NBM) postoperatively

- continue potassium infusion as 0.9% normal saline 1000 ml with 40 mmol/L KCl 8 hourly for 24 hours
- if magnesium less than 0.6 mmol/L, manage as under 'before operation' with bolus, then using daily dose requirement
- if magnesium at 0.6 mmol/L or above, use patient's daily Mg supplement dose, divided over periods of several hours as slow IV