
SCOPE: Maternity and Neonatal Unit**GUIDELINE: Infants of diabetic mothers- management****AUTHOR:** NNU Quality Coordinator / Dr Stanley Ng**PURPOSE:**

To provide safe and effective management for infants of diabetic mothers

DEFINITIONS: Infants of diabetic mothers include

- Infants of Types 1 and 2 insulin dependent diabetic mothers
- Infants of non-insulin dependent / gestational diabetic mothers
- Hypoglycaemia refers to a low blood glucose concentration. Infants of diabetic mothers should maintain a blood glucose concentration of 2.6mmol/L or above.

GUIDELINE

Glucose is an essential nutrient for the brain. Abnormally low levels can cause long term neurological developmental impairment.

A foetus exposed to high blood sugar in-utero will produce a high level of insulin. This will cause the baby's blood sugar to fall as soon as he is born. The baby is at greater risk of hypoglycaemia when maternal diabetic control has been poor. Infants of diabetic mothers do not respond to falling blood glucose levels with appropriate counter regulatory response that normal term infants have to prevent hypoglycaemia.

Although the greatest risk of hypoglycaemia is in the first 24 hours of life, it may take 2-4 days to establish stability.

Pre-term infants (<37 weeks gestational age) are at greater risk than term infants for neurological developmental impairment due to hypoglycaemia.

There are multiple potential complications for infants of diabetic mothers in addition to hypoglycaemia. These are macrosomia (which can contribute to shoulder dystocia, birth injuries and birth asphyxia), respiratory distress syndrome, cardiomyopathy, hypocalcaemia, hypomagnesaemia, polycythemia and hyper viscosity (which can contribute to hyperbilirubinemia).

Although macrosomia is more commonly associated with infants of diabetic mothers, maternal diabetic vascular disease leading to placental insufficiency can impair foetal growth. Small for gestational age infant of a diabetic mother may be at greater risk of adverse outcomes than a large infant because of intrauterine malnutrition.

The mother are encouraged to hand express colostrum antenatally which can be fed to the baby in the first few hours of life. The LMC/core midwife can provide appropriate advice and support with this.

CLINICAL SIGNS AND SYMPTOMS OF HYPOGLYCAEMIA

- Irritability, tremors or jitters. *Jitteriness is excessive repetitive movements of one or more limbs which are unprovoked and usually relatively fast. It is important to be sure that this movement is not simply a response to stimuli.*
- Exaggerated Moro reflex
- High pitched cry
- Lethargy, limpness, hypo tonus
- Apnoea or irregular breathing
- Cyanosis
- Hypothermia, temperature instability
- Poor or inadequate sucking reflex
- Seizures

ASSESSMENT OF THE BABY

Frequent monitoring of the baby's well-being is essential. The baby should be assessed prior to feeds and at least 3 hourly for the following:

- *Level of consciousness*
- *Tone*
- *Temperature*
- *Respirations*
- *Colour/perfusion*

Observations should be recorded on the baby's feeding chart and in the clinical notes.

MANAGEMENT OF ALL INFANTS OF DIABETIC MOTHERS

1. Skin to skin care should be encouraged at birth as this will help baby achieve early respiratory and thermal stability and will enhance successful breast feeding.
2. Maintenance of body temperature reduces energy demands that contribute to hypoglycaemia. Appropriate management for infants to avoid environmental temperature instability [temperature less than 36 degrees C or more than 37.5 degrees C] is vital.
3. Infants of diabetic mothers should have an initial feed in the first hour of life and thereafter at least 3 hourly. If the mother has expressed antenatally then harvested colostrum can be given.
4. If the infant is pre-term (less than 37 completed weeks gestation) or is small for gestational age (less than 10th centile on a Customised Birth Weight Centile (BWC) calculation), discuss the management plan with the neonatal service.
5. All infants of diabetic mothers will have observations of temperature and respirations hourly for the first 3 hours and subsequently 3 hourly and charted for at least 24 hours. Blood glucose levels and feeding are charted.
6. **Monitor blood glucose within the first hour of age. The blood glucose concentration should be 2.6mmol/L or more in all babies of diabetic mothers.** Bed side testing is performed with the Hemocue monitor. It is important to ensure that the foot is warm and the first drop of blood is wiped away prior to sampling. *If required, I-Stat machine samples are collected in capillary tubes.*

Blood glucose samples that are processed in the laboratory are collected in a gold top SST Microtainer. Blood glucose samples for laboratory testing should be labelled as urgent to ensure rapid processing.

7. If the level is 2.6mmol/L or higher and baby is well, repeat blood glucose testing 3 hourly prior to feeds.
8. Continue to monitor the blood sugar until the level is greater than 2.6mmol/L AND the baby is asymptomatic and feeding. Blood glucose testing should be repeated every 3 hours prior to feeding until the baby is 12 hours old. If the level remains 2.6mmol/L or higher then repeat blood glucose testing every 6 hours until the baby is 24 hours old.
9. If the level is less than 2.6mmol/L at any stage see management below.
10. If the baby is unwell or has any clinical sign and symptoms of hypoglycaemia, the blood glucose should be measured immediately and the baby referred to the neonatal service.
11. Breast milk is the safest and most nutritionally appropriate food for infants of diabetic mothers. If the baby is not interested in feeding, be proactive, keep baby warm and encourage skin to skin contact and expressing. EBM can be given to the baby.
12. If the mother has chosen to formula feed, the baby should be formula fed in the first hour of life and thereafter 3 hourly approximately 40-60 /kg/day with her choice of formula (see formula feeding guideline).
13. Infants of diabetic mothers should **not** be discharged within 24 hours of birth and thereafter not until they are feeding well and their condition is stable.

MANAGEMENT OF INFANTS OF DIABETIC MOTHERS WITH BLOOD GLUCOSE LESS THAN 2.6mmol/L

1. The management of hypoglycaemia will depend on the clinical condition of the baby and the severity of the hypoglycaemia
2. If the baby is unwell or has symptoms of hypoglycaemia, blood glucose should be measured urgently and the baby referred immediately to the neonatal service for further management
3. **Very low blood sugar levels below 1.2mmol/L require immediate referral** to the neonatal service and may require treatment with IV Glucose infusion aimed at raising blood glucose levels to 2.6mmol/L. 40% Dextrose Gel may also be given while waiting for medical review. A laboratory sample or I-Stat sample may be taken but instigation of treatment will not be delayed whilst awaiting results

4. If the Hemocue_{blood} glucose level is 1.2-2.6mmol/L and the baby is asymptomatic, give the baby 0.5ml/kg 40% Dextrose Gel and proactively support feeding and recheck in 30 minutes as per Appendix 2 *Infant of a diabetic mother flow chart 2019*). If the baby remains asymptomatic and blood glucose improves to 2.6mmol/L or more, observe the baby closely and recheck blood glucose prior to next feed/in 3 hours. **(n.b. Dextrose Gel is a short-term treatment for hypoglycaemia until a definitive plan for feeding +/- supplementation is established).**
 - a. If a baby's blood sugar is <2.6mmol/L requiring 2 doses of Dextrose Gel despite attempts at feeding, it shows a need to escalate feeding to ensure adequate caloric intake even if baby is asymptomatic.
 - b. A **Feeding Chart** should be started to record time at the breast and/or amounts of supplementation and Dextrose Gel given.
 - c. Breast feeding infants who require Dextrose Gel should receive usual care and support to optimise feeding. But supplemental feeding with expressed breastmilk/colostrum should still be considered. If there is no expressed milk available, caregivers should be consulted regarding a short period of formula supplementation while baby is at risk of further hypoglycaemia before breastfeeding has been established.
 - d. Similarly if baby's blood sugar is <2.6mmol/L despite receiving supplemental expressed breastmilk/colostrum, caregivers should be consulted regarding use of formula as a bridging measure to ensure normoglycaemia before breastfeeding is established.
5. If the blood glucose 1.2 – 2.6mmol/L and has not improved 30 minutes after appropriate management, repeat the administration of 0.5ml/kg Dextrose Gel and encourage feeding and **recheck the BSL in 30minutes**
6. If the BSL improves to 2.6mmol/L or more continue routine care and repeat BSL 3 hourly prior to feeds. Continue to monitor 3 hourly until the baby has had 3 consecutive pre-feed BSL >2.6mmol/L. Then monitor 6 hourly until the baby is 24 hour old and blood sugars remain stable.
7. If the blood glucose is **2.0-2.5mmol/L after the second treatment** with oral dextrose gel, the baby should be given supplementary feeding of EBM or Formula (medically indicated) and following consultation and informed verbal consent from the mother or assessed by the neonatal service. Blood glucose level should be rechecked after 1 hour.
8. If a baby has had 2 doses of Dextose Gel and blood glucose is less than 2.0mM refer to paediatrician and consider a further dose of Dextose gel while arranging admission
9. When baby's pre-feed blood sugars are stable (>2.6mmol/L) for three consecutive feeds then no further blood sugar checks need to be done provided the feeding regimen remains the same. If the feeding regimen is altered (e.g. reduction or stopping of top-ups) then blood sugar monitoring should be restarted and should continue until three satisfactory levels are obtained. With any subsequent change in the feeding regimen blood sugar levels should be rechecked.
10. Infant formula may be given if medically indicated and following consultation and informed verbal consent from the mother see *Acceptable medical reasons for use of breast milk substitute*
11. Management of hypoglycaemia may include IV Glucose 10% as prescribed. A bolus of 1-2mls/kg may be ordered if blood glucose <1.2mmol/L. Blood glucose will be rechecked an hour after instigating IV management with a goal of increasing the level to 2.6mmol/L or above and monitored until the blood glucose is stable and IV infusion has ceased.
12. Medical review is necessary if **4** doses of oral dextrose gel are required in 48 hours.

Glucose screening

It is important to note that bedside monitoring using the Hemocue acts as a rapid screening method. It is essential that an appropriate technique is used for neonatal blood samples and that the site is cleaned and dried before lancing and the first drop of blood is wiped away. (See procedure)

Weaning baby from supplementary feeding

When baby's pre-feed blood sugars are stable (>2.6mmol/L) for three consecutive feeds then no further blood sugar checks need to be done provided the feeding regimen remains the same. If the feeding regimen is altered (e.g. reduction or stopping of any feeds) then blood sugar monitoring should be restarted and should continue until three satisfactory levels are obtained. With any subsequent change in the feeding regimen blood sugar levels should be rechecked.

ASSOCIATED DOCUMENTS

Women Child and Youth Guideline – Formula Feeding

Women, Child and Youth Guideline -Referral of inpatient neonates to paediatric service

Women Child and Youth Guideline - Supplementing the BF infant

Organisational Policy – Breastfeeding

Procedure - Heel stick blood sampling for blood glucose testing

APPENDICES

1. Standing order for 40% Oral Dextrose gel
2. Infant of a diabetic mother flow chart

REFERENCES

Infant of a Diabetic mother literature review May 2019 www.utdol.com

Hypoglycaemia in the Neonate Starship guideline <https://www.starship.org.nz/for-health-professionals/newborn-services-clinical-guidelines/h/hypoglycaemia-in-the-neonate/> downloaded 26/03/2019

Acceptable medical reasons for use of breast milk supplements.

https://www.who.int/nutrition/publications/infantfeeding/WHO_NMH_NHD_09.01/en/

Approved By

Consultant Paediatrician

**Clinical Care Manager
Woman, Child and Youth**

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APPENDIX 1**STANDING ORDER FOR 40% DEXTROSE GEL FOR TREATMENT OF NEONATAL HYPOGLYCAEMIA**

Oral 40% Dextrose Gel dose 0.5 ml/kg may be given in accordance with this guideline by nurses and midwives at Gisborne Maternity Unit.

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FLOW CHART_INFANT OF DIABETIC MOTHER 2019
