

# Characteristics of Dysphagia in Infants with Microcephaly Caused by Congenital Zika Virus Infection, Brazil, 2015

## Technical Appendix

**Technical Appendix Table 1.** Characteristics of the children including neurological evaluation.

| No | SEX | Gestational age, weeks | Head circumference, CM | Birth weight for gestational age | Microcephallus, according to INTERGROWTH 21 <sup>ST</sup> (1) | Pregnancy rash, month | Visual fixation and pursuit | Ocular motility | Head control | Social smile | Sitting without support | Grasp                               | Asymmetric tonic neck reflex | Limbs hypertonia with pyramidal and extrapyramidal signs | Irritability | Epilepsy |
|----|-----|------------------------|------------------------|----------------------------------|---|-----------------------|-----------------------------|-----------------|--------------|--------------|-------------------------|-------------------------------------|------------------------------|--|--------------|----------|
| 1  | F   | 36                     | 27                     | Appropriate                      | 3SD   | 4                     | No                          | Nistagmus       | No           | No           | No                      | Grasping reflex                     | Yes                          | Yes  | No           | Yes      |
| 2  | M   | 38                     | 28.5                   | Appropriate                      | 3SD   | 2                     | Yes                         | Nistagmus       | No           | Yes          | No                      | Grasping reflex                     | Yes                          | Yes  | Yes          | Yes      |
| 3  | F   | 39                     | 28.5                   | Appropriate                      | 3SD   | 2                     | No                          | Nistagmus       | No           | No           | No                      | Grasping reflex                     | Yes                          | Yes  | Yes          | Yes      |
| 4  | F   | 37                     | 30                     | Appropriate                      | 2SD   | 3                     | No                          | Strabismus      | No           | No           | No                      | Grasping reflex                     | Yes                          | Yes  | Yes          | Yes      |
| 5  | M   | 38                     | 28                     | Small                            | 3SD   | 1                     | No                          | Strabismus      | No           | No           | No                      | Grasping reflex                     | Yes                          | Yes  | No           | Yes      |
| 6  | M   | 39                     | 31                     | Appropriate                      | 2SD   | 2                     | Yes                         | Normal          | Yes          | No           | No                      | Palmar grasp, pick-up large objects | No                           | Yes  | No           | No       |
| 7  | M   | 39                     | 26                     | Small                            | 3SD   | 3                     | No                          | Strabismus      | No           | No           | No                      | Grasping reflex                     | Yes                          | Yes  | Yes          | Yes      |
| 8  | F   | 40                     | 28.5                   | Appropriate                      | 3SD   | 7                     | Yes                         | Strabismus      | No           | No           | No                      | Grasping reflex                     | Yes                          | Yes  | Yes          | Yes      |
| 9  | F   | 39                     | 27                     | Small                            | 3SD   | 6                     | Yes                         | Normal          | No           | No           | No                      | Grasping reflex                     | Yes                          | Yes  | Yes          | Yes      |

**Technical Appendix Table 2.** Computerized tomography scan findings

| Patient no. | CT scan finding        |                                    |                  | Malformations of cortical development | Cortical and subcortical white mater calcifications | Basal ganglia calcifications | Cerebellum calcifications | Periventricular calcifications | Brainstem calcifications | Enlarged cisterna magna |
|-------------|------------------------|------------------------------------|------------------|---------------------------------------|---|------------------------------|---------------------------|--------------------------------|--------------------------|-------------------------|
|             | Decreased brain volume | Cerebellum or brainstem hypoplasia | Ventriculomegaly |                                       |   |                              |                           |                                |                          |                         |
| 1           | Yes                    | Yes                                | Yes              | Yes                                   | Yes   | Yes                          | No                        | No                             | No                       | No                      |
| 2           | Yes                    | No                                 | Yes              | Yes                                   | Yes   | Yes                          | No                        | Yes                            | No                       | Yes                     |
| 3           | Yes                    | Yes                                | Yes              | Yes                                   | Yes   | Yes                          | No                        | No                             | No                       | Yes                     |
| 4           | Yes                    | No                                 | Yes              | Yes                                   | Yes   | No                           | No                        | No                             | No                       | Yes                     |
| 5           | Yes                    | Yes                                | Yes              | Yes                                   | Yes   | Yes                          | No                        | Yes                            | No                       | Yes                     |
| 6           | Yes                    | No                                 | No               | No                                    | Yes   | No                           | No                        | No                             | No                       | No                      |
| 7           | Yes                    | No                                 | Yes              | Yes                                   | Yes   | Yes                          | No                        | No                             | No                       | Yes                     |
| 8           | Yes                    | No                                 | Yes              | Yes                                   | Yes   | No                           | No                        | No                             | No                       | No                      |
| 9           | Yes                    | No                                 | Yes              | Yes                                   | Yes   | No                           | No                        | No                             | No                       | No                      |

**Technical Appendix Table 3.** Dysphagia: assessment results using FEES, VFSS and SOMA in nine children with CZS microcephaly

| Patient no. | Age, mo, FEES/VFSS | FEES/VFSS          |                                   |   |  |                       |                            |                  | SOMA                          |                                    |
|-------------|--------------------|--------------------|-----------------------------------|---|--|-----------------------|----------------------------|------------------|-------------------------------|------------------------------------|
|             |                    | Premature spillage | Delay in initiation of swallowing | Residue of the bolus in the oropharynx after swallowing | Residue of the bolus in the hypopharynx after swallowing | Laryngeal penetration | Laryngotracheal aspiration | Rosenbeck score* | Oral motor dysfunction, puree | Oral motor dysfunction, semi-solid |
| 1           | 09/10              | +/+                | +/+                               | +/+   | -/-  | +/-                   | +/-                        | 8/1              | +                             | +                                  |
| 2           | 08/10              | +/+                | +/-                               | +/+   | +/+  | +/+                   | -/+                        | 5/8              | +                             | +                                  |
| 3           | 09/10              | +/+                | +/+                               | +/+   | +/+  | +/+                   | +/+                        | 7/8              | +                             | +                                  |
| 4           | 09/09              | +/+                | +/+                               | +/+   | -/-  | +/-                   | +/-                        | 7/1              | +                             | +                                  |
| 5           | 16/11              | +/+                | +/+                               | +/+   | +/+  | +/+                   | +/+                        | 7/6              | +                             | +                                  |
| 6           | 12/11              | +/+                | +/+                               | -/-   | -/-  | +/-                   | -/-                        | 5/1              | +                             | -                                  |
| 7           | 09/09              | +/+                | +/+                               | +/+   | -/-  | +/-                   | +/-                        | 7/1              | +                             | †                                  |
| 8           | 09/09              | +/+                | +/+                               | +/+   | +/-  | +/-                   | -/-                        | 5/1              | +                             | +                                  |
| 9           | 08/12              | +/+                | -/+                               | +/+   | -/-  | -/+                   | -/-                        | 1/5              | +                             | +                                  |

FEES: Fiberoptic endoscopic evaluation of swallowing; VFSS: Videofluoroscopic Swallowing Study; SOMA: Schedule for Oral Motor Assessment.

\*Rosenbek score (2): 1- Material does not enter the airway; 2- Laryngeal penetration (material enters the airway, remains above the vocal folds, and is ejected from the airway; 3- Material enters the airway, remains above the vocal folds, and is not ejected from the airway; 4- Material enters the airway, contacts the vocal folds, and is ejected from the airway; 5- Material enters the airway, contacts the vocal folds, and is not ejected from the airway); 6-Laryngotracheal aspiration (material enters the airway, passes below the vocal folds and is ejected into the larynx or out of the airway; 7- Material enters the airway, passes below the vocal folds, and is not ejected from the trachea despite effort, 8-Material enters the airway, passes below the vocal folds, and no effort is made to eject).

†The child refused semi-solid food.

## References

- Villar J, Cheikh Ismail L, Victora CG, Ohuma EO, Bertino E, Altman DG, et al.; International Fetal and Newborn Growth Consortium for the 21st Century (INTERGROWTH-21st). International standards for newborn weight, length, and head circumference by gestational age and sex: the Newborn Cross-Sectional Study of the INTERGROWTH-21st Project. *Lancet*. 2014;384:857–68. [PubMed http://dx.doi.org/10.1016/S0140-6736\(14\)60932-6](http://dx.doi.org/10.1016/S0140-6736(14)60932-6)
- Rosenbek JC, Robbins JA, Roecker EB, Coyle JL, Wood JL. A penetration–aspiration scale. *Dysphagia*. 1996;11:93–8. [PubMed http://dx.doi.org/10.1007/BF00417897](http://dx.doi.org/10.1007/BF00417897)