



Intestinal Parasitic Infections During Pregnancy

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Outline

- Background
- LIDG study assessments
 - EEG
 - MRI
- Formative assessment
- EEG implementation in LIDG
- MRI implementation in LIDG
- Takeaway messages

Child Development

- The term “neurodevelopment” broadly refers to the development of neurological pathways influencing various developmental domains, and can be measured with a wide range of tools.
- Development is a continuous process that begins from conception and continues till maturity
- Over 200 million children under the age of 5 years in LMICs do not reach their full developmental potential.
- SDG goal 4 states that all children should have the opportunity to reach their full developmental potential



Child Development

- There is strong evidence suggesting that effective early identification of developmental delays and timely early intervention can positively alter a child's long-term trajectory. (Y. Choo, 2019)
- Several tools and imaging modalities can be used to assess neurodevelopment in young children.
- Rural communities face health service delivery challenges due to gaps in local health care infrastructure including access to diagnostic imaging services.



LIDG study neurodevelopment assessments

- Objective - To assess the effects of prenatal interventions to improve maternal nutritional status and infection management on child neuro-developmental outcomes in Amhara Region, Ethiopia.

Assessment	Enrollment	Visit 2	Visit 3
	12 months (+/- 3)	18 months (+/- 3)	24 months (+/- 3)
Neurodevelopment			
HINE	X		
Eye-tracking			X
Bayley-III			X
<i>Advanced neurodevelopmental assessments:</i>			
EEG/VEP			X
MRI	X		



MRI in assessing Child Development

- Magnetic resonance imaging (MRI) is a medical imaging technique used to assess neuroanatomy.
- It can be utilized to investigate the effects of prenatal exposures on brain development by measuring brain volume during infancy, which has been associated with later neurodevelopmental outcomes
- MRI scanners use magnetic fields and radio waves to form images of the body.
- MRI is non-toxic and does not expose patients to radiation

MRI in assessing Child Development

- Despite MRI's advantages, access to these scanners is limited in LMIC.
- Typically, MRI devices tend to use strong (1.5 – 3.0 T) magnetic fields, which require specialized rooms and complex safety-oriented workflow.
- Hyperfine Research, Inc. (HRI) has developed an MRI device that is portable, and uses a very low magnetic field strength at less than 0.2 Tesla.
 - Provide clinically relevant image quality, particularly in a low-income setting
- The Hyperfine MRI device is eligible for use in Ethiopia and has been approved for use by Ethiopian FDA.



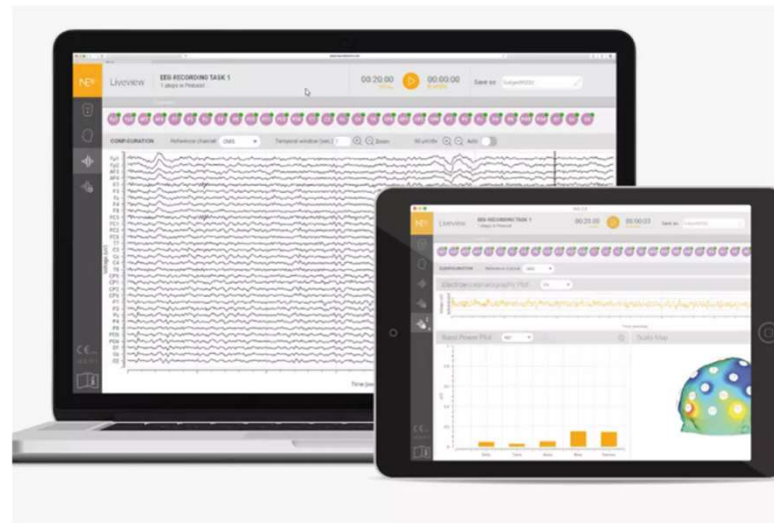
EEG in assessing Child Development

- Electroencephalography (EEG) measures electrical activity of large, synchronously firing populations of neurons in the brain with electrodes placed on the scalp.
- Provides a direct measure of brain activity that offers the potential for early identification of children who are at risk of developmental delay.
- In addition to laboratory grade equipment used in most EEG studies, low-cost, portable EEG devices have recently become available on the market.



EEG in assessing Child Development

- Resting EEG and visual evoked potentials (EEG/VEP) are recorded using a portable EEG system (Enobio-32, Neuroelectrics, Barcelona, Spain) that has been used in a large-scale, infant study
- For resting EEG, children watch a short video, akin to a screen saver, while they sit on their mother's lap. Children watch a pattern-reversal checkerboard as part of the VEP paradigm.



Formative assessment

- In-depth interview was conducted with 24 mothers, fathers and community leaders.
- To assess the acceptability of MRI and EEG in the study area

Acceptability

- Community members were willing to have their children undergo EEG and MRI to learn about their children's brain development.
- Concerns raised helped to refine procedures and study introductory videos (MRI & EEG).

Community concerns- EEG

- Negative impacts during a power outage on the child since it uses electricity?
- What would happen if they touched the electrode during testing?
- Does the child need to wear the cap all the time?
- What are the dot-like things? Does it cause any wounds?
- Possible side effects?
- Result announcement?
- Does it affect their mind?

Community concerns - MRI

- Radiation
- Sound
- Will it suck my child blood; make my child slim, maybe it is something in their mind that they say.
- If the baby wakes up during the procedures, does the equipment slides away or not?
- does the child get the imaging while separated from his mother, in a separate bed or...? Or is it done with the mother together
- Transportation and lodging
- Does the husband accompany

Formative Learnings

- Husbands/ father's decision-making power
- Community sensitization
- Engaging health care providers
- Refining introductory videos to add more information
- Logistical planning - to allow husbands/ family members to accompany mothers and babies while traveling for the MRI visit
- Preferred place of assessment for EEG - the participants preferred having all assessments conducted in the health centers
- Covering the EEG caps/ electrodes with other caps was suggested not to scare the parents and to improve acceptability

EEG implementation – Field staff training

- ❑ The training was conducted from July 18th – 28th, 2023 at ACIPH Addis Ababa campus due to the security issue in Bahir Dar.
- ❑ The training was provided for five study nurses with practical and standardization sessions.



EEG implementation – Piloting

- The procedure was piloted in Anbessamie Health center among 11 babies.
- Lessons learned
 - Calming baby requires a longer time
 - Kids were not screen-friendly
 - Videos were changed to grab the kids' attention

EEG Implementation Challenges

- Repeated change in EEG testing protocols and software
 - Frequent retraining of study nurses
- Poor quality EEG recordings irrespective of refresher trainings and software updates
 - Laptop capacity issues
 - Children's frequent movement and irritability
 - Noise & electronic devices interference (generator)
- Unavailability of maintenance stations in the country
- Not having backup equipment
- Electric power outage
- Security issues and internet blockage

Implication - Extended study period

MRI implementation – Field staff training

- Training of trainers on the Hyperfine MRI was conducted at the University of Cape Town in August 2022.
- Training on Hyperfine Swoop was provided to the hospital staff in November 2022 at FHCSH.



Setting up the MRI at Felegehiwot Hospital



Setting up the MRI at Felegehiwot Hospital



LIDG study participant during MRI scanning



MRI implementation challenges

- ❑ Difficulty to initiate and maintain sleep
- ❑ Families wanted to return on the same day before the completion of the procedure
- ❑ Security challenges
- ❑ Since it's a new procedure some parents associated it with later child sickness
- ❑ High demand for incentives
- ❑ Radiologists not comfortable with the quality of the machine
- ❑ Readings not real-time
- ❑ Software updating issues

Take away message

- ❑ Conducting formative assessment to understand the culture and level of awareness of local communities when implementing new procedures
- ❑ Consider the proximity of study sites to regional hospitals
 - For logistics, referral and improve acceptability
- ❑ Providing sufficient information on new devices and procedures
 - **Community sensitization**, videos, posters, flyers
- ❑ Equipment must be checked for functionality before importing in the country, during training, and deploying to the field
- ❑ Engaging and training healthcare providers for reassurance of safety.
- ❑ Considering applications that do not require frequent software updates are advised to use in areas with limited internet access
- ❑ Considering importation of study equipment through ACIPH



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