

## Introduction

Sensorineural hearing loss (SNHL) is one of the most common long-term consequences of bacterial meningitis (BM), occurring in 17.2% of children diagnosed. In Sub-Saharan Africa, these figures are significantly higher ( $\pm 30.4\%$ ). These prevalence rates have been attributed to the HIV/AIDS epidemic in low-and middle- income countries (LMICs) as well as reduced access to adequate and equitable healthcare. The burden of disease is further exacerbated with the rise in drug-resistant bacterial strains occurring worldwide. In LMICs, babies and young infants are especially at risk for contracting meningitis due to immature immune systems, poor immunisation coverage and high poverty rates .

In some cases, post-meningitis hearing loss may also lead to cochlear ossification starting as early as 3-4 weeks after meningitis onset and can cause a progressive hearing loss. Hearing loss can influence many spheres of childhood development. In LMICs, children with hearing loss rarely receive equitable educational opportunities, with some even being at an increased risk of violence. It is evident that the impact of childhood hearing loss is far reaching, directly altering a child's developmental trajectory. However, timeous, and targeted hearing intervention can limit the impact of their hearing loss.

In a previous study conducted at Red Cross War Memorial Children's Hospital (RCWMCH) over an 18-month period, less than a quarter of children diagnosed with BM were referred for hearing assessment. Following that study, a Western Cape Bacterial Meningitis protocol was developed in collaboration with relevant Western Cape Audiology sites and approved by the Western Cape Department of Health in July 2018.

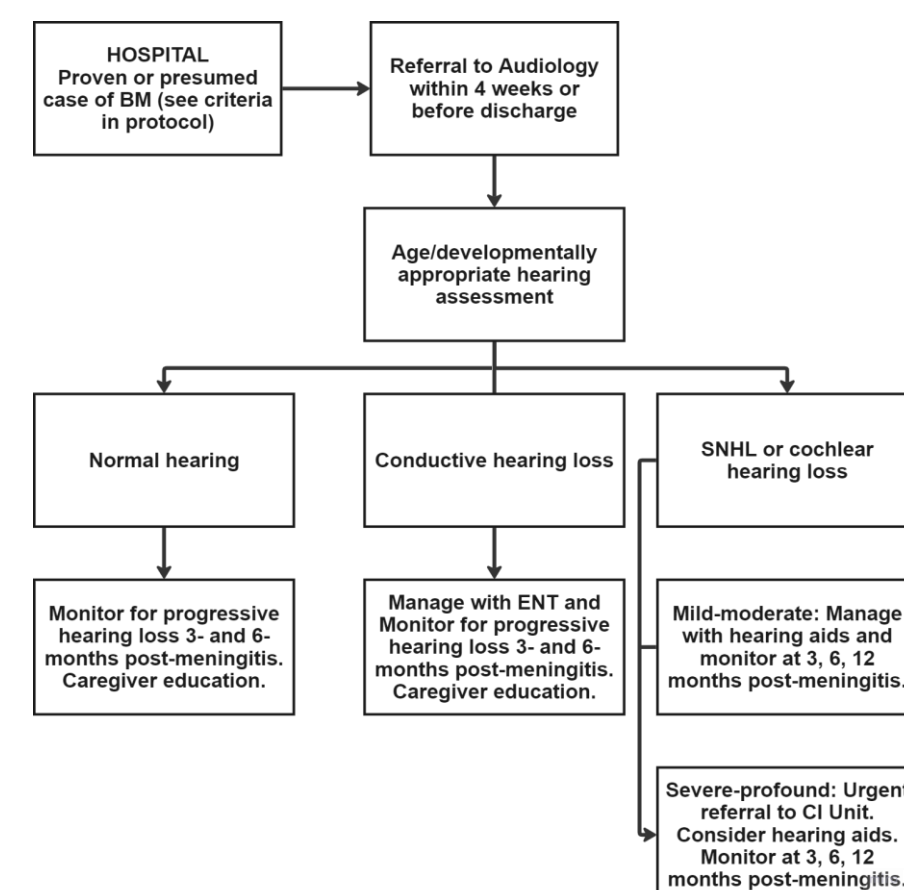


## Objectives

The current study aimed to describe and compare the audiology outcomes of children with presumed BM between July 2017 - July 2018 (pre-protocol) and August 2018 – July 2019 (post-protocol), to evaluate whether there have been improvements in the rate and time to referral for hearing assessments post-meningitis following the implementation of the Western Cape BM protocol.

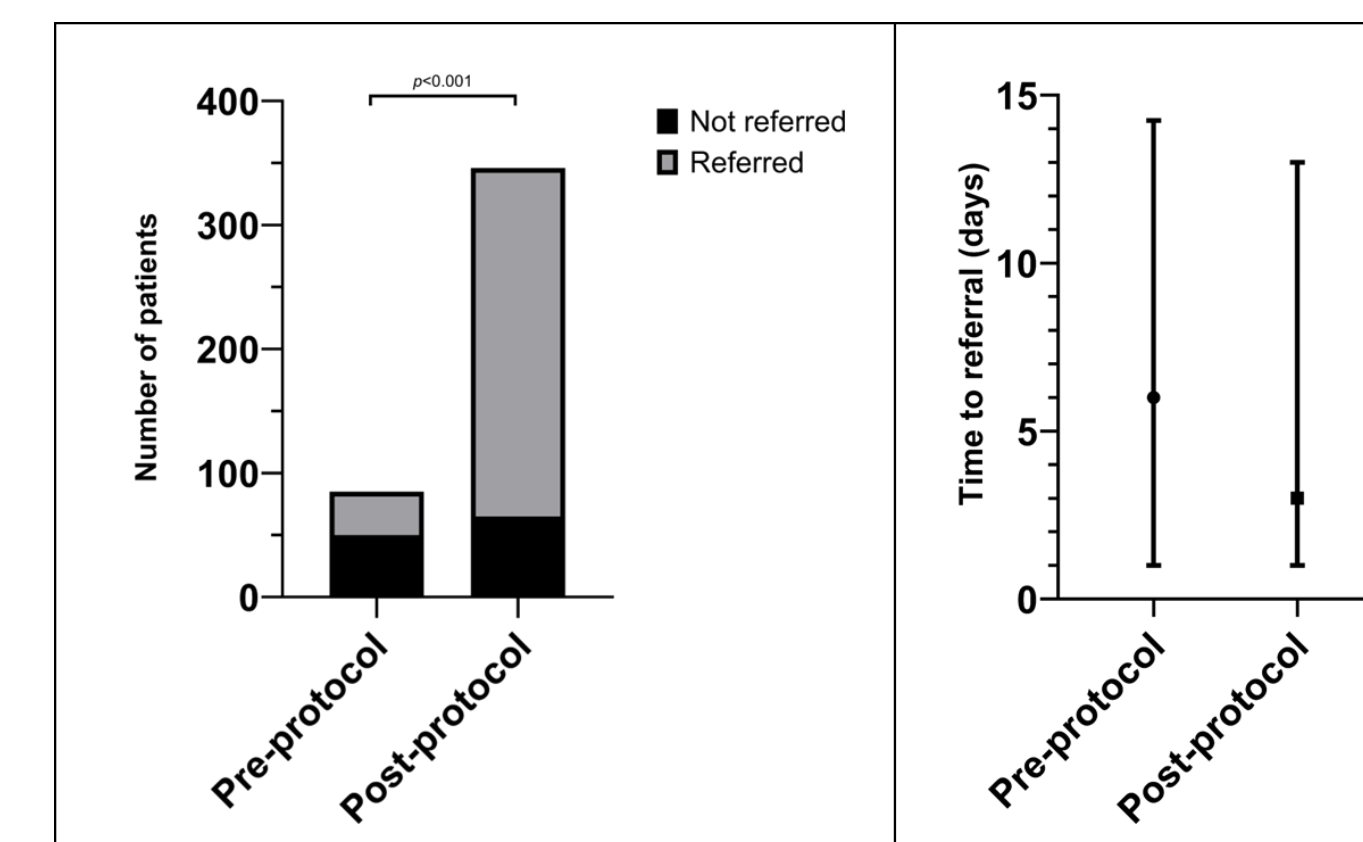
## Methods and Materials

- Retrospective comparative review of the Audiology departmental database, the main hospital clinical database, and patient hospital folders at RCWMCH between July 2017 - July 2018 (pre-protocol) and August 2018 - July 2019 (post-protocol). Non-probability purposive sampling was used to extract and organize data from the databases and patient folders.
- This study included and compared data of all children aged 0-13 years old at RCWMCH, who were referred to Audiology with presumed BM during two time periods.
- A hospital database which is updated daily by clinicians was used to identify all children with presumed BM at RCWMCH during the two study periods, regardless of referral to Audiology.
- This flowchart summarizes the referral and hearing assessment protocol.
- Data were analysed descriptively. Furthermore, categorical variables were compared using  $\chi^2$  test or Fisher's exact test, whereas continuous variables were compared using Student's t test (parametric data) or the Mann-Whitney test (non-parametric data). A  $p$ -value of  $<0.05$  was considered significant.



## Results

- During the study period, 431 children had presumed bacterial meningitis at RCWMCH (115/431 [26.7%] pre-protocol and 316/431 [73.3%] post-protocol implementation). A total of 346/431 (80.3%) children were referred to the Audiology department and included in the analysis (65/346 [18.8%] pre-protocol and 281/346 [81.2%] post-protocol).
- The median (IQR) age in months at diagnosis was 3 (1-20) and most participants were male (187/346 [54.0%]).
- The figure below depicts the proportion and time to referral pre- and post-protocol implementation. A significantly higher proportion of patients were referred to the Audiology department post-protocol implementation (65/115 [56.5%] versus 281/316 [88.9%],  $p < 0.001$ ). Data for the time to referral to the Audiology department was available in 278/346 (80.3%) patients. The median time to referral in days (IQR) was 3 (1-13). There was a decrease in time to referral post-protocol implementation, however, this was not significant (6 [1-14] versus 3 [1-13],  $p = 0.138$ ).
- Most patients had normal hearing at initial screening (290/346 [83.8%]). Of the few patients with hearing loss, 2/56 (3.6%) and 3/56 (5.4%) were conductive and sensorineural, respectively.



## Conclusion

The significant improvement in proportion of referrals to Audiology highlight the protocol's potential to serve as a model for improving pediatric hearing healthcare in low-resourced settings. The study's findings contribute to the growing evidence supporting the integration of systematic referral protocols into pediatric healthcare frameworks to enhance early detection and intervention for hearing loss post-meningitis.

## References

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