Phonological Analysis of the Speech of Children Attained of Bacterial Meningitis: The Case of 09 Patients in Yaounde, Cameroon

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ABSTRACT

Bacterial meningitis is a life threatening infection that affects the membranes surrounding the brain and spinal cord often leading to neurological complications, including deficits in speech and language development in children. The main focus of this study is to analyze the phonological, syntactic and pragmatic elements of the language of children with meningitis in Yaoundé, Cameroon. It therefore gives an insight to the speech of children suffering from meningitis. This study was carried out at the National Center for the Rehabilitation of Handicap Persons (NCRHP) Etoug-Ebe, NADA Dominion Nursery and Primary School and Jumping Jack Nursery and Primary, which are all located in Yaoundé. The study involved 09 children whose ages ranged from 6 to 18 years with a history of bacterial meningitis. The research made use of the purposive sampling technique and the research design that was used was the qualitative technique. Observations, interviews and language tests were used to collect data; these observations were both active and passive. Interview sessions lasted several weeks and they were recorded using a Dictaphone and were transcribed by the researchers. These interviews were conducted in schools and in the homes of those patients. Speech samples were analysed so as to get the production fluency and accuracy. Results from the analyses revealed that patients had issues such as sound substitution, stopping, frication, devoicing. velarization, fronting, consonant insertion and deletion.

Keywords: Meningitis, Child language, African Meningitis belt, Language challenges, word structure, sound systems.

INTRODUCTION

According to Davies & Rudd (1994), Feigin & Pearlman (1998), bacterial meningitis is a severe and potentially life-threatening illness most commonly affecting infants and young children. Survival rates from meningitis were less than 10% before the advent of antibiotics. Bacterial meningitis results from the invasion of the central nervous system (CNS) by bacteria overcoming the host defense mechanisms. The bacteria disrupt the cerebrovascular and cerebrospinal fluid dynamics. By the time of diagnosis, cerebral vasculitis may be developing, associated with vascular occlusion, cranial nerve inflammation and hypoxic injury from the regional alterations of cerebral perfusion. Biochemical changes also occur and can result to focal and diffuse cortical insults (Dodge & Schwartz 1965). Feigin & Pearlman (1998), Taylor et al. (1990) reported that a decrease of concentration of glucose in cerebrospinal fluid, cellular electrolyte imbalance and inappropriate secretion of antidiuretic hormone accompany meningitis and are high risk factors of residual impairments.

Brain damage and clinical symptoms are generally short term and they subside within a few weeks for most children who survive meningitis (Feigin & Pearlman, 1998; Vienny et al., 1984). It is worth noting that the impact of the disease's disruptions is fatal sometimes or it leads to severe residual impairment. Some of the impairments include sensorineural hearing loss and other cranial nerve dysfunction, seizure disorders, hemiplegia, ataxia, hydrocephalus and visual problems (Claesson, Trollfor, Jodol & Rosenhall, 1984; Dodge et al., 1984, Feldman et al., 1982; Klein et al., 1986).

Baraff, Lee and Schriger (1993), reported in a meta-analysis involving 19 prospective studies and a total of 1602 children, that is, 4.5% of children died in the acute stages of this illness with 16.4% of survivors displaying at least one major adverse outcome (deafness, intellectual disability, epilepsy, physical impairment).

Several neurobehavioural sequelae have been identified in many meningitis survivors but the reported frequency and nature of the deficits vary across studies. Some early researchers documented pervasive impairments in cognitive functions and academic performances in post meningitis children (Sell, Webb, Pate, & Doyne, 1972; Kresky, Buchbinder & Greenberg, 1962).

Recent research works show that there is a favorable disease prognosis, which possibly reflect improvements in medical care or there is a more representative sampling technique (Feldman & Michaels, 1988; Fellick et al., 2001; Taylor et al., 1990). Mild deficits in visuomotor coordination, auditory perception and language functions are also reported.

Disorders of executive skills functions such as attentional control, planning and reasoning have rarely been studied with such skills argued to be immature and difficult to assess in young children (Anderson, 1998).

Taylor and colleagues (1990), reported that acute neurologic complications were predictive of poorer school performance and increased behavioural disturbance. Other studies by other researchers have corroborated these findings (Grimwood et al., 1995; Emmet, Jeffery, Chandler, & Dugdale, 1980). This indicates that the more severe the brain injury is, the greater the impact on cognition and behaviour.

Cameroon is a Central African country with about 30 million inhabitants. The country has experienced epidemic meningococcal meningitis as other countries of the African Meningitis Belt. Neisseria meningitis (N. m) caused epidemics in this region (Lapeyssonnie 1963; Molesworth et al., 2002). The African Meningitis Belt extends from Senegal at the West to Ethiopia at the East, including 26 countries with about 450 million inhabitants exposed to the risk of epidemics (Lapeyssonnie 1963; Molesworth et al., 2002). Cerebrospinal meningitis mainly affected four regions of Cameroon in 1992 in the Far North region with 8046 cases and 968 deaths. The North region was hit by epidemics in 1993 with 1190 cases and 136 deaths. And in 1998 there were 2054 cases and 225 deaths (Emgba, Boanga, Gake, & Mahamat, 2012), meanwhile the Adamawa region recorded 126 cases in 1990. The etiological agent identified in most cases was N. m A (Massenet, Vohod, Hamadicko, & Caugant, 2011; Massenet et al., 2013).

Due to the evolution of climate change, the North West region that was not part of the belt has now been included to it. Insufficiently documented epidemics occurred in these regions of Cameroon. Epidemics hit the North West region in 2001 and 2004, the North in 2004 and 2011 and Far North in 2007, 2009 and 2011 (Emgba, Boanga, Gake, & Mahamat, 2012).

Linguistic communication is made up of seven phases and four factors. The factors include; *Speaker, Listener, Code and Context*. These phases include *Conception and Encoding, Motor Nervous Impulse, Articulation, Transmission, Audition, Sensory Nervous Impulse and Decoding and Interpretation* (Fossung, 2020). It is clear at this point that meningitis is a disease caused by the inflammation of the protective membranes covering the central nervous system and the spinal cord known as the meninges. The damage caused by meningitis affects language related organs such as the brain, the nervous system and the articulators. These articulators include; the tongue, lungs, mouth etc. As such, the consequences of meningitis will be felt in phases 1, 2 and 3 for the speaker and phases 5, 6 and 7 for the listener. Meningitis can affect 6 out of the 7 phases of the communication chain.

Problem Statement

As linguists, we cannot be indifferent to meningitis, and the linguistic and behavioural effects it has on children. After some observations it was noticed that meningitis is a disease that could affect language production. These effects could be noticed at the level of the phonology, morphosyntax and the lexis of patients. Children or people attained of meningitis have difficulties communicating with their peers and this disease also affects their academic and behavioural output. It is worrisome to find children who find it difficult

to acquire language normally and who eventually have issues communicating with their families and friends. A person without a language or a person who cannot adequately communicate tends to be isolated. We are therefore trying to bring forth the linguistic effects meningitis has on children and how it affects their day to day activities.

Objective of the study

The objective of this study is to establish the linguistic behaviour of persons attained of meningitis. We set out to bring forth the various linguistic deviations in the language of meningitis patients.

The following research question will help to meet our objective:

RQ: What are the linguistic manifestations of meningitis on child language?

LITERATURE REVIEW

Rofes and colleagues (2022), published a paper on Language impairments and CNS infections: a review. The aim of their study was to review published reports of CNS infections that trigger or relate to difficulties with language tasks, to highlight the most common infectious agents and to provide further grounds to study the topic.

The methods these authors used involved the search for studies of CNS infection and language both in adult and pediatric populations. Records of PubMed, Medline, Google and Web of Science were used by the researchers. Results of the study showed that 41 articles met the inclusion criteria of the review. All the articles were published over the last 45 years with only two of the articles published in 1893 and 1901 respectively. 18 infectious agents were detected as triggering or related to difficulties with language tasks. Six infectious agents were found under meningitis; three bacterial and three viral. Seven infectious agents were found under encephalitis; three bacteria, two viral and two parasitical. Half of the study were single case studies and the other half were group studies.

In many publications, more than one language task was administered. Full aphasia batteries were used in six reports and caregiver questionnaires were used in two. A total of 72 tasks were most commonly used. The most commonly used task was naming, followed by letter fluency and category fluency. Tasks such as spontaneous speech, repetition, word reading, lexical decision, semantic judgment, reciting the alphabet and comprehension of spoken instructions were less frequently used.

Also, Anderson, Anderson, Grimwood & Nolan (2004), published a paper titled *Cognitive and Executive Function of 12 Years after Childhood Bacterial Meningitis: Effect of Acute Neurologic Complications and Age of One whose* objective was to investigate long-term neurobehavioural outcome from childhood bacterial meningitis with special emphasis on the influence of acute neurologic complications and age at illness.

As far as the method is concerned, a prospective cohort of all children aged between 3 months and 14 years admitted in hospital with bacterial meningitis was established during a three year period. Results of the study suggested that 12 years post-illness children with a history of meningitis experienced neurobehavioural sequelae. Impairments were not generally severe in this study. Mean group scores were within the average range with a consistent decrease of approximately one third of a standard deviation for meningitis survivors across IQ and educational measures. There was a greater representation of children post meningitis in lower IQ ranges (48-136). Children post meningitis were more than twice as likely as controls to require special educational assistance (27.0 vs. 12.5%). This suggested that the impact of performance differences is of clinical significance.

In the domain of executive function, children with a history of meningitis were consistently less efficient than their peers. They took a longer time to complete tasks, they made more errors, were less organized and struggled with problem-solving situations within both verbal and spatial domains. Despite the fact that performances were not severely impaired, they however fell below developmental expectations.

No significant evidence was provided for a sustained adverse effect due to acute neurologic complications. No differences were identified between children with and without complications and no consistent trends for lower performances were evident, with the two groups performing similarly across domains.

For age at illness, it continues to be important for long-term outcome. For intellectual and academic scores, those contracting meningitis prior to 12 months of age performed more poorly with greatest difficulties in vowel/consonant and reading abilities. For executive functions, younger age and illness was associated with poorer attentional control and less efficient higher-level language skills, less accurate performances, slower generation of verbal responses, poorer interpretation of complex verbal and visual materials, and reduced goal-setting abilities.

The results of this study showed that while the overall impact of meningitis may be relatively mild, age at illness appears to be relatively general and mild. Age at illness seems to be particularly relevant for linguistic and executive functions which are developing rapidly in infancy and early childhood. It can be concluded from this study that generalized cerebral insult/injury may have a greater impact on the less mature CNS.

Added to the above, Keith Grimwood et al., (2000), worked on *Twelve year outcomes following bacterial meningitis: further evidence for persisting effects.* The aim of their study was to determine whether intellectual and cognitive impairments observed seven years following early childhood bacterial meningitis persist into adolescence.

A prospective cohort of 158 children aged 3 months to 14 years who survived from bacterial meningitis were used in the study. The blinded neuropsychological, auditory and behaviour assessments were conducted on 109 patients from the original cohort of 158 children, seven and 12 years after their meningitis, and in 96 controls.

Results revealed that the children assessed 7 and 12 years after meningitis remain at significant risk of neurological and auditory abnormalities. Difficulties with language-based tasks remained despite the fact that central auditory functions improved. It was concluded that many of the deficits identified at the seventh year follow up persist twelfth years after an episode of bacterial meningitis.

An in-depth perusal of the above reviewed works revealed that the researchers were concerned with issues such as neurological and auditory abnormalities. They equally paid attention to the academic performances and executive functions of the patients. Some of the studies dealt with the behaviours of the patients in general. We did not find enough evidence of studies that treated the linguistic effects of meningitis on children. Our study therefore comes in to fill the gap by providing data on the effects of meningitis on the *phonology* of children affected by meningitis.

Finally, Patricia Eadie, Laura Conway, Birgit Hallenstein, Fiona Mensah, Cristina McKean & Sheena Reilly (2018) carried out a study on *Quality of life in children with developmental language disorder*. Developmental language disorder (DLD) is common in children, but little is known about its association with quality of life (QoL) in middle childhood. QoL is a complex construct, aligning with an individual's sense of well-being and is related to functional limitations associated with DLD. Biopsychosocial models of disability account for both the extent and functional limitations of the impairment; however, the DLD literature rarely reports on both aspects. The aim of the study was to investigate the association between DLD, identified at 4 years and persisting at 7 years, and QoL over 4, 7 and 9 years; to compare QoL for children whose DLD was mild to moderate and severe at 7 years; and to investigate how variables known to impact on language development; for example maternal vocabulary, as well as social–emotional behaviours at 4 and 7 years contribute to QoL at 9 years.

Analyses of the study included 872 children who participated in the 4-, 7- and 9-year data collection of the Early Language in Victoria Study (ELVS). The authors compared the parent-reported QoL profiles at 4, 7 and 9 years for children with and without DLD, and those with mild to moderate and severe DLD using the Pediatric Quality of Life Inventory (PedsQL). Regression analyses were conducted to estimate how child, family and environmental factors predicted QoL at 9 years, including social–emotional behaviours measured using the Strengths & Difficulties Questionnaire (SDQ) at 4 and 7 years.

Results showed that children with DLD (n = 70) had lower parent-reported QoL at 9 years than typically developing children (n = 802), with mean scores of 74.9 and 83.9 respectively. There was no evidence of differences in QoL between those with severe (n = 14) or mild to moderate (n = 56) DLD. In contrast to their peers, children with DLD had a profile of declining QoL between 4 and 9 years. For all children, language skills at 7 years predicted QoL at 9 years. For children with DLD, emotional symptoms and peer problems at 4 years plus SDQ Total Difficulties at 7 years were predictive of lower QoL at 9 years. It was concluded that children with DLD had a lower QoL than their typical peers at 9 years and, contrary to previous studies, differences in QoL were not observed with DLD severity.

This study is different from our current study because it dealt with the quality of life of patiets while our study focused more on linguistic aspects (phonology).

Theories

The Behaviourism and Mentalism theories were used in this study. Language is an activity we all engage in every day we are blessed to live in this world. We get involved in activities such as reading of text messages, making phone calls, watching television, listening to radio, reading newspapers or magazines or articles and talking with others.

Mentalism and Behaviourism are two main schools of thought related to language acquisition, learning and teaching. Each school of thought has a different approach towards language acquisition.

Behaviourism holds that nothing exists but matter. One version of materialism is behaviour. It denies the existence of the mind. Behaviourists insist that everything is described as the product of simple physical process. They restrict the subject matter of psychology to human behaviour and set out to explain all kinds of behaviour including speech and language (Lyons, 1981:242).

Skinner (1957), and his followers believed that a child acquires language as it is exposed to adult speech. As the child listens to adult speak, he/she imitates the exact utterances of the adults. The adult can react then by giving the child food, making the child comfortable or answering the child's question. In some situations, the reaction of the adult would be negative such as refusing to give the child food, saying no to the child's response, correcting what the child has said. Adults' reactions of this type constitute what skinner called "The Reward". If the reward is positive, such as answering "yes" to the child's question, providing what the child requested or appreciating the correctness of the child's utterance, then the child realizes that what he said is correct and appropriate and therefore, internalizes rewards from the adult by repeating the actor utterance. That utterance eventually becomes part of the child's linguistic repertoire. This manner of learning became known as the "Stimulus-Response Paradigm" in which a child receives a stimulus for example hunger, discomfort and so says anything in reaction to that stimulus. With constant repetition and use of new expressions, the child gradually acquires the entire language of the community.

In contrast, Mentalism spearheaded by Chomsky (1959) comes as a reaction against the tenets of behaviorism. To the mentalist, a child is born with a "biological pre-disposition to language". The biological pre-disposition is technically called: - the Language Acquisition Device (LAD).

According to the mentalists, the LAD is hard-wired from birth with general and universal information about language. When the child is exposed to any language, the LAD is activated. That is to say, as soon as the child listen's to adult speech, the language part of the brain is activated and the child can react to universal properties of language such as intonation. As the child continues to listen to adult speech, he/she begins to develop parameters of the language in question. That is he/she begins to form specific rules that account for the child's listening to language. With time, the child is able to speak pretty much like adults.

Although both Behaviourism and Mentalism believe in exposure to language as a prerequisite to acquisition, the theories differ significantly. While behaviorism believes in repetition, mentalism favour creativity. If children were to learn by simple repetition we will not be able to explain how children come to use sentences which they have never heard before.

Finally, we also used ***Specific Language Impairement theory***. Specific language impairment (SLI) is a communication disorder that interferes with the development of language skills in children who have no hearing loss. SLI can affect a child's speaking, listening, reading, and writing. SLI is also called developmental language disorder, language delay, or developmental dysphasia. It is one of the most common developmental disorders, affecting approximately 7 to 10 percent of children in kindergarten. Of those children with language impairment, approximately 2 to 3 percent also have an existing medical condition and/or intellectual disability. The impact of SLI usually persists into adulthood. The cause of SLI is unknown, but recent discoveries suggest that it has a strong genetic link. Children with SLI are more likely than those without SLI to have parents and siblings who have also had difficulties and delays in speaking. In fact, 50 to 70 percent of children with SLI have at least one family member with the disorder. Learning more than one language at a time does not cause SLI. The disorder can, however, affect both multilingual children and children who speak only one language.

A child with SLI often has a history of being a late talker (reaching spoken language milestones later than peers). Preschool-aged children with SLI may:

- Be late to put words together into sentences.
- Struggle to learn new words and make conversation.
- Have difficulty following directions, not because they are stubborn, but because they do not fully understand the words spoken to them.
- Make frequent grammatical errors when speaking.

Although we cannot affirm that our patients also had SLI, it is worth nothing that some of the patients demonstrated some charateristics of the elements described herein.

METHODOLOGY

The qualitative research design was used in this study. It was carried out in the National Center for the Rehabilitation of Handicap Persons (NCRHP) Etoug-Ebe, Yaoundé. The creation of the National Center for the Rehabilitation of Handicap Persons came as a result of decree nº 78/056 of 23 February 1978. The center was created by Emile Paul Léger, a Canadian cardinal. In 1967 cardinal Léger stepped down as Archbishop of Montreal and became a missionary in Yaoundé. The reason for the creation of the NCRHP was to help poor Cameroonians who could not have access to medical facilities. Some of the activities of the center include consultation, diagnosis and treatment, physiotherapy, education, evangelization among others. Apart from the NCRHP, the study was also conducted in two primary schools namely NADA Dominion and Jumping Lack Nursery and Primary Schools (all situated in Yaoundé). These centers were chosen because they provided us with the type of patients we were looking for.

This study made use of the purposive sampling technique; this technique permitted the researchers to conveniently collect and analyse data.

Clearance to work with the patients was obtained from the authorities of the various institutions and from their parents. We were able to work with these patients at home and in their various institutions**.** It is worth noting that the data for this study is both in the English and French languages because we worked with children from both the Anglophone and Francophone backgrounds.

Observations, interviews and language tests were used to collect data. Observations were both active and passive. Interview sessions lasted several weeks and they were recorded with the help of a Dictaphone, and were later transcribed by the researchers, with the help of some Francophone colleagues. The population of this study was made up of 09 children suffering from meningitis (seven males and two females). Their ages ranged from 6 to 18 years.

This study is important in the sense that it will help Cameroonians understand what meningitis is all about and especially the negative effects it has on the phonology (language) of patients.

Ethical Considerations

Clearance was obtained from our university administration to carry out this study. Also, authorization to work with the patients was granted by the authorities of the institutions we worked with. We equally obtained the consent of the parents of the patients. Finally, we promised to protect the identity of our patients and we did that by using special codes to identify them.

RESULTS AND DISCUSSIONS

In this section we look at data presentation, results and discussions.

Synoptic Presentation of Identification, Environmental and Speech Data

We presented a synthesis of the various deviations of this study in this segment of the work. The patients and the different deviations they suffered from are also presented here.

Synthetic presentation of Identification Data

Identification data treated the personal information of each patient. Information was provided by the patients and their parents.

Table 1: Synthetic Presentation of Identification Data

Patient Feature	**F01**	**F02**	**F03**	**F04**	**F05**	**F06**	**F07**	**F08**	**F09**
Age	9yrs	6yrs	10yrs	14yrs	16yrs	16yrs	16yrs	18yrs	15yrs
Gender	Male	Male	Male	Male	Male	Male	Female	Female	Male
School	JNPS	JNPS	NDPS	NCRHP	NCRHP	NCRHP	NCRHP	NCRHP	NCRHP
Class	1	N2	SIL	CE1	CM II	CM II	CM II	CM II	CM II
Birth Rank	1st	1st	8th	2nd	2nd	2nd	1st	2nd	2nd
Residence	Chapelle Obili	Rondpoint Express	Texaco Obili	Tudong Bar, Obili	Centre	Mendong	Mvog Beti	Etoudi	Melen
L1	English	English	French	French	French	French	French	French	French
Pathology	Meningitis Bronchitis Jaundice	Meningitis	Meningitis Eye problems	Meningitis	Meningitis Painful hand	Meningitis Paralyzed hand Ear problems	Meningitis	Meningitis	Meningitis
Family Status	Parents work	Parents work	Dad works	Parents work	DEAD	Mum works	Parents work	Mum works	Mum works

Key

JNPS	:	Jumping Jack Nursery and Primary School
NDPS	:	Nada Dominion Primary School
NCRHP	:	National Center for the Rehabilitation of Handicap Persons
NS	:	Nursery Two
CEI	:	Cour Elémentaire Un
CM II	:	Cour Moyen Deux
L1	:	First Language

Synthetic Presentation of Speech Data

Speech data have to do with the way a patient speaks. They answer questions such as: how does a patient speak? What is the facial reaction of a patient? Etc. They were gotten through direct and indirect observations. These data were important because they helped us to understand certain deviations.

Table 2: Synthetic Presentation of Speech Data

Patient Phenomenon	**F01**	**F02**	**F03**	**F04**	**F05**	**F06**	**F07**	**F08**	**F09**
State of agitation	++	_	_	_	_	+	_	_	_
Friendliness	+	_	+	+	+	+	+	+	+
Rapidity to answer	_	_	_	+	_	_	_	_	++
Gesticulation	+	+	+	+	+	+	+	+	+
Spontaneity of words	±	±	±	+	±	_	±	±	+
Speed	+	_	_	+	_	_	_	_	+
Availability of words	+	_	±	+	±	±	+	±	+
Recognition of people	+	_	+	+	+	+	+	+	+
Blockage	+	_	_	+	+	+	+	+	_
Smile	+	_	+	+	+	+	+	+	+
Silence	_	+	+	_	+	+	_	+	_
Calm	_	+	+	+	+	+	+	+	+
Semi autism	_	+	_	_	_	_	_	_	_
Hesitation	_	+	_	_	+	+	+	+	_
Out of topic	±	_	_	_	+	+	_	_	+
Comprehension	+	+	+	+	±	_	±	±	+
Articulation problems	++	-+	++	++	++	++	++	++	_
Perception	+	+	+	+	+	±	±	±	+
Aggressiveness	_	_	_	_	_	_	_	_	_

Key

++: Very present

+: Present

±: Not very

- : Absent

Synthetic Presentation of Language Data

Language data have to do with what a patient says. They were gotten through language tests. As such, in the language of patients, we were able to group the phonological deviations we observed.

a- Synthetic Presentation of Phonological Deviations

The table presents the different phonological deviations of each patient. It is important to mention here that phonology also involves phonetics. As such, phonological deviations are also phonetic.

Table 3: Synthetic Presentation of Phonological Deviations

Patient Deviations	F01	F02	F03	F04	F05	F06	F07	F08	F09
Consonant deletion	+	+	_	+	+	+	+	+	_
Consonant insertion	_	_	_	+	_	_	+	+	_
Consonant change	+	+	+	+	+	+	+	+	+
Vowel deletion	_	+	_	+	+	_	+	_	_
Vowel insertion	_	_	_	+	_	_	_	_	_
Vowel change	+	+	+	+	+	_	+	+	_

Key

\+ : Present
_ : Absent

Synthetic Presentation of Environmental Data

Environmental data was concerned with the entourage of patients. It was mostly concerned with the family background of patients.

Table 4: Synthetic Presentation of Environmental Data

Patient Characteristics	F01	F02	F03	F04	F05	F06	F07	F08	F09
Parents live	++	++	++	++	++	_	++	++	++
Parents live together	+	+	+	+	+	_	_	+	_
Parents married	+	+	+	+	+	+	_	+	_
Know parents	++	++	++	++	++	++	+	++	+
Good health	_	+	+	+	_	_	+	_	+
Sickness is natural	+	+	+	+	+	+	+	+	+
Interaction	+	_	_	+	+	+	+	+	+
Parents work	++	++	+	++	+	_	+	++	+
Follow treatment	+	_	_	_	_	_	_	_	_
Reeducation	_	_	_	_	_	_	_	_	_

Key

++: both parents live, work, knows both parents
+: parents live together, married, are in good health, and interact.
-: poor health, parents are dead

Assessments and Explanations

In this section we treated assessments and discussions of data collected. As such, we carried out assessments and discussions on the linguistic symptoms of meningitis.

Linguistic Symptoms

Linguistic symptoms dealt with the most striking symptoms that occurred to our patients. We first of all carried out an assessment of speech data. An assessment was also done on phonological deviations.

Assessment of Speech Data

Speech data presented the way a patient spoke. It sought to find out how a patient behaved. The data were collected through passive and active observations on the behaviour and the manner of speaking of patients. Language tests helped in observing certain features found in table 2 above.

As indicated in table 2, speech analyses revealed that all nine patients (100%) used a lot of gestures. They used a lot of actions and body movements to express themselves. Eight of the patients (88.9%) smiled when they are asked questions. We also had 88.9% of patients who were friendly, who recognized people and who were very calm in the presence of people. Articulation disorder was present in seven patients (76.9%). Six patients (66.7%) suffered from blockage and perception problems. Five patients (55.5%) suffered from the following phenomena: silence, hesitation and poor comprehension. They remained silent most of the time when they were asked questions and they hesitated at times to answer questions as if they doubted what to say. They also faced problems in understanding conversations or questions. Words were readily available in four patients (44.4%). We also realized that three of the patients (33.3%) talked with a lot of speed, which made it difficult for people to understand them. Three patients went out of topic from time to time. Two patients (22.2%) were agitated, answered questions fast and had spontaneous words. Only one patient (11.1%) suffered from semi autism (F02). He did not talk to anybody, except his mother. We noticed from table 2 that no patient was aggressive.

Assessment of Phonological Data

The assessment of phonological deviations was done following table 3 above. Deviations such as consonant deletion, consonant insertion, consonant change, vowel deletion, vowel insertion and vowel change were discovered.

Consonant deletion affected 7 patients (76.9%). Consonant insertion was seen in three patients (33.3%) while consonant change affected all nine patients (100%). They were manifested through palatization, devoicing, velarization etc. Vowel deletion affected 4 patients (14.4%), vowel insertion was seen in 01 patient (11.1%) while 07 patients (76.6%) suffered from vowel change.

Discussions

Discussions here were based on articulatory (phonological) disorders.

Explanation of Articulatory Disorders

Transformations and changes involving linguistic units such as phonemes were realized in the speech of patients. In the different utterances, consonant deletion, consonant insertion and consonant change were observed. Vowel deletion, vowel insertion and vowel change (substitution) were also observed. These transformations are described as abnormalities in the articulatory realization of phonemes. During the phonological assessment of articulatory deviations, we studied phenomena such as: consonant and vowel change or substitution (palatization, stopping, frication, fronting, highering, rounding etc.), deletion as well as insertion.

As such, we explained the transformations in the language of patients. Each error is explained with examples taken from the language of patients.

There are patients who presented more disorders than others. For example, when a patient talked a lot like patients F01 and F04, it permitted us to get a lot of information from them (a variety of errors) while it was not possible to get enough information from someone who rarely spoke like F02. The production of a word or the pronunciation of a group of elements occurred very fast for some patients, especially one who did not realize that he/she had a problem. As such, in the speech of patient F09, we realized that in almost every word **/t/** changed to **/k/** and **/d/** changed to **/g/**. Other forms of consonant errors occurred in the speech of patient F08. In this patient's language /s/ changed to **/ʃ/**. In the language of patient F06, we noticed that the patient changed **/p/** to **/f/**. These errors seem to be automatic because most of the patients seemed to be unconscious that they are

making these errors. Some of the errors appeared to occur due of poor execution. It was noticed that when patients were called upon to make long sentences, they made a lot of errors.

The greatest number of deviations were found in consonant substitution (change) which affected all the patients (100%) and vowel change which affected seven of the patients (76.9%). Consonant change was seen in the form of palatization, frication, devoicing, stopping, etc. Substitutions were analyzed according to their contexts of apparition. We were also interested in the frequency of appearance so as to understand the rules of phonological transformation; hence from the speech of patients, we had the following corpus, followed by a summary concluding each case.

The first case under substitution was palatization where **/s/** changed to **[ʃ]**, **/1/** changed to **/j/** and **/r/** changed to **/j/**.

N°	Target word	Child production	Gloss
1	/spu:n/	/ʃpu:/	"Spoon"
2	/sɛ̃k/	/ʃɛ̃k/	"cinq, five"
3.	/sɛt/	/ʃɛt/	"set"
4.	/sɔ̃/	/ʃɔ̃/	"son, sound"
5.	/lœ̃di /	/jœ̃di/	"lundi, Monday"
6.	/là/	/jà/	"la, the''
7.	/rɛd/	/jɛd/	"red''

+cont		+cont	
-syll	⟶	-syll	/ # ___
+front		-front	

It was noticed that patients (F01, F04, and F08) had the tendency of changing alveolar sounds to palatals at initial positions. Palatization is provoked by the passage of air through the sides of the tongue between the teeth and jaws; with the tip of the tongue coming in contact with the palate behind the teeth. **/s/** is an alveolar fricative meanwhile **/ʃ/** is a palatal fricative (post alveolar). As such from a strictly articulatory point of view, these sounds differ from the place of articulation. **/ʃ/** is produced a little behind the palatal vault. The place of articulation of **/ʃ/** palatal is in opposition to **/s/** which is an alveolar sound.

We generally observed the propulsion of the lips during the production of **/ʃ/**, while the lips are retracted during the production of **/s/**. This means that /ʃ /is more difficult to produce than **/s/**, but we noticed a systematic replacement of a more simple sound by a difficult one. This can be explained phonologically by the place of apparition of **/s/**. It is systematically replaced by **/ʃ/** when it appears at initial positions or when it is followed by a vowel. We can find examples with number 1,2,3 and 4 above.

Stopping was the second case.

Number	Target word	Child production	Gloss
1	/sevn/	/tevn/	"seven''
2	/sʌks/	/tʌks/	"sucks"
3.	/flæg/	/tæg/	"flag"
4.	/sa/	/kRa/	"sa, his/her"
5.	/osi/	/oti/	"aussi, too"
6.	/Razwa/	/Radwa/	"rasoir, razor "

+cont		+cont	
-syll	⟶	-syll	/ # ___
-voice		-voice	
Fric.		Stop	

It was realized that voiceless fricatives were changed to voiceless stops. The sounds involved here were all dentals, but one set (fricatives) is produced with the free flow of air while the other set (stops) is produced with blockage of air, whereby the tongue comes in contact with the teeth and the alveolar ridge. It is generally easy to produce fricatives than stops but we realized that the patients systematically replaced fricatives with stops mostly at initial position, though we could find **/z/** changing to **/d/** at intervocalic position.

The third case was frication where stops were changed to fricatives.

Number	Target word	Child production	Gloss
1	/bjɛR/	/vjɛR/	"bière, beer"
2	/bjɛ̃/	/vjɛ̃/	bien, good
3.	/papje/	/fafje/	"papier, paper"
4.	/pɔrt/	/fɔrt/	"porte, door"
5.	/paR/	/faR/	''par, by"
6.	/ɔpital/	/ɔfital/	"hôpital, hospital"
7.	/ʃã.pjɔ̃/	/ʃã.fjɔ̃/	"champion, champion"

$$\begin{bmatrix} +\text{stop} \\ -\text{syll} \\ \pm\text{voice} \end{bmatrix} \longrightarrow [+\text{cont}] \,/\, \#\ \_\_$$

The general tendency here was that most of the sounds affected involved the sounds found at initial position. The patients had problems producing bilabial plosives; as a result they tended to replace them with easier sounds. But it is important to note that with patient F06 the change did not take place only at the initial position. A close look at numbers 6 and 7, showed that he changed **/p/** to **/f/** between sounds.

The next case we treated was devoicing. Devoicing is when a voiced sound becomes voiceless.

Number	Target word	Child production	Gloss
1.	/ʃoz/	/ʃos/	''chose, thing''
2.	/ʃəmiz/	/ʃemis/	''chemise, shirt''
3.	/duz/	/dus/	''douze, twelve''
4.	/bæg/	/bæk/	''bag''
5.	/vilaʒ/	/vilas/	''village, village''

$$\begin{bmatrix} +\text{cont} \\ -\text{syll} \\ +\text{voice} \end{bmatrix} \longrightarrow \begin{bmatrix} +\text{cont} \\ -\text{syll} \\ -\text{voice} \end{bmatrix} \,/\, \_\_\_\ \#$$

Patients F02, F05 and F08 had the tendency of changing voiced sounds to voiceless sounds at the final position. This could be explained by the fact that their vocal cords were damaged when they were sick.

Another case was velarization. This can be seen with patients F08 and F09.

Number	Target word	Child production	Gloss
1.	/tʀwa/	/kʀwa/	"trois, three"
2.	/tʀɛz/	/kʀɛz/	"treize, thirteen'
3.	/tʀavaj/	/kravaj/	"travail, work"
4.	/tʀyk/	/kʀyk/	"truc, object"
5.	/dʀapo/	/gʀapo/	"drapeau, flag"
6.	/dimãʃ/	/gimãʃ/	"dimanche, Sunday"

+stop → +stop / # ___
-syll → -syll
+front → +front
Alveo. → Velar

In this case, alveolar sounds are changed to velar sounds. Alveolar sounds are generally easier to produce than velar sounds. With alveolar sounds there is no stress because one does not have to take the tongue right to the back of the mouth. It is easier to produce alveolar sounds than velar sounds, however, the contrary was the case with some of the patients. They found it easier to produce velar sounds than alveolar sounds.

Fronting was also among the deviations and it affected 44.4% of the patients.

Number	Target word	Child production	Gloss
1.	/tʃɛə/	/tɛə/	''chair''
2.	/ʃosyr/	/sosyʀ/	"chaussure, shoe"
3.	/ʃez/	/sez/	"chaise, chair"
4.	/babuʃ/	/babus/	"babouche, slippers"
5.	/vilaʒ/	/vilas/	village

+cons
-syll → [-back] / #
+back

Most of the cases occurred at word initial positions, but we also had cases in which changes occurred at the final position (number 5 and 6). The logical explanation is that it is easier to produce front sounds than sounds that are produced at the back part of the mouth.

Other changes involved uvularization in which **/1/** changed to **/R/** (patients F06, F05), lateralization (patient F08) in which **/R/** changed to **/1/**, **/v/** to **/1/** and finally labialization (patient F08) in which **/1/** changed to **/w/** and **/g/** to **/b/**.

On a less serious note, we could find consonant insertion among the disorders. This concerned patients F04, F07 and F08. Examples of insertion are given below:

1) /abi/ → /babi/ Ø → +stop ''habit''

2) /sa/ → /kʀa/ ''ça''

In the first case, **/k/** was inserted at initial position; **/R/** was also inserted between **/k/** and **/a/**.

Apart from consonant change (substitution) and insertion, consonant deletion was treated below.

The first case that involved deletion was the deletion of stops and it affected 6 patients (66.7%).

Number	Target word	Child production	Gloss
1.	/dɔg/	/dɔ/	"dog"
2.	/bæg/	/ba/	''bag''
3.	/kʌp/	/kʌ/	''cup''
4.	/sak/	/ta/	''sac, bag''
5.	/menɛ̃ʒit/	/menɛ̃gi/	''Méningite, Meningitis''
6.	/bik/	/bi/	''bic, pen''
7.	/alymɛt/	/alymɛ/	'allumette, matchstick'
8.	/sɛ̃/	/sɛ/	''sein, breast''

+stop

-syll ⟶ Ø / ___ #

±voice

Stops were deleted at word final position. This is due to the fact that the patients were trying to minimize effort.

There was equally fricative deletion as shown below:

Number	Target word	Child production	Gloss
1.	/gla:s/	/gla:/	"glass"
2.	/ðis/	/ði/	"this"
3.	/pli:z/	/pli/	''please'
4.	/gɪv/	/gi/	''give''

+cons

-syll ⟶ Ø / ___ #

±voice

Again, it was realized that sounds were deleted at the final position. It still goes to explain the fact that these children were trying to minimize effort.

Finally, it was realized that nasals were also deleted, and it affected patients F01 and F02.

Number	Target word	Child production	Gloss
1.	/fəun/	/fəu/	''phone''
2.	/spu:n/	/ʃpu:/	''spoon''
3.	/ru:m/	/ru:/	''room''
4.	/əupen/	/əupu/	''open''

Deletion also took place at final position. The simplest explanation here is that the patients always tried to minimize effort.

In the lines that follow, we discussed about deviations that involved vowels. These deviations involved: vowel insertion, vowel change and vowel deletion. It was important to state that the most striking deviation was vowel deletion.

Number	Target word	Child production	Gloss
1.	/irəize/	/rəizə/	'erase'
2.	/aRdwaz/	/dwaj/	''ardoise, slate''
3.	/kalãdRije/	/kadile/	''calendrier, calendar''
4.	/ekRaze/	/kRaze/	''ecraser, crush''

Four patients (F01, F02, F03, and F04) deleted vowels. This was because they tried to simplify syllables. With number 1 we noticed that vcvcv was changed to cvcv, while with number 3 cvcvccvc was changed to cvcvcv. With number 4, vccvcv was changed to ccvcv. Another case was vowel insertion which involved patient F04. He inserted **/e/** at the beginning of words.

Example: /bik/ ⟶ /ebik/ ''bic, pen''

/livR/ ⟶ /elivR/ ''livre, book''

/tennis/ ⟶ /etinnis/ ''tennis''

There was equally vowel change which did not have a fixed manner of occurrence.

1) Backing

+ant

+syll ⟶ [-ant] / c- c

+son

It can be seen in words such as:

/pylɔvœR/which is produced by the child as [polovœR]

/teny/ which is produced by the child as [tuny]

Front vowels /y/ and /e/ are changed to back vowels /o/ and /u/.

2) Highering

+son

+syll → [hi] / c-c.

+lo

It can be seen in the words below:

/tennis/which was produced as [tinnis]

/fɔ:r/ which was produced as [fo:r]

/hospitl/ which was produced as [hospito]

/gɔblɛ / which was produced as [bublɛ]

/e/ and /ɔ/ which are low vowels are changed to [i, o, u] which are high vowels.

3) Spreading

/paly/	→	[pali]	+son		‘‘palu, malaria’’
/teny/	→	-[təni]	+syll	[-rd] / ___#	‘‘tenu, uniform’’
/veny/	→	[veni]	+rd		‘‘venu, came’’

The round vowel [y] was changed to the unrounded vowel [i]. This wss the most striking issue involving vowels.

To conclude the explanation on the articulatory disorders, it is important to note that consonants are more affected than vowels. Consonants and vowels change as well as consonant deletion are the most affected elements.

As it was earlier explained, deletion mostly occurred because patients tried to minimize efforts and consonants change occurred because some organs of speech or articulators were affected. Meningitis is a disease that affects the CNS (the brain inclusive), if any organ of speech is affected or poorly used there will be poor articulation and poor speech. This was due to the fact that the brain was attained, as such, there was poor transmission of orders to different elements which come in play for speech production or because articulators were poorly used due to fatigue or impatience.

Discussion

Meningitis and some other illnesses are at the origin of language disorders. They attack patients bit by bit until they get hold and destroy the human system. Meningitis can be very deadly and when it doesn't kill it leaves the person half damaged especially the language of those affected. It also affects the behaviours of some patients and leaves them abnormal at times.

Meningitis attacks make the brain and especially the nerves not to give necessary commands to the language organs.

Cameroon falls, under the African meningitis belt (zone of high prevalence of meningitis), which means that new born babies are at high risk of meningitis attack if they are not vaccinated.

The way these linguistic factors interact with each other affected how much a child struggles with these language skills. However, some children may face bigger challenges due to these influences, while others might do better. This shows that each child’s situation is different and unique. Some may require more help with specific linguistic areas, such as understanding word structures or sounds, while others might excel in social interactions. Because each child has unique needs, understanding these various factors is essential for providing appropriate support to each child’s needs. As a result, more research should be done to find effective ways to help children improve their linguistic skills based on their individual circumstances.

CONCLUSION

Bacterial meningitis is a life threatening infection that affects the membranes surrounding the brain and spinal cord often leading to neurological complications, including deficits in speech and language development in children. The main focus of this study was to analyse the phonological elements of the language of children with meningitis in Yaoundé, Cameroon. The study was carried out in some private institutions in Yaoundé. The study involved 09 children who suffered from bacterial meningitis. The research made use of the

purposive sampling technique and the research design that was used in this study was the qualitative technique. Results from the analyses revealed that patients had issues with their phonology. These phonological deviations rendered their communication complicated for people understand.

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