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An audit of the Speech Therapy and Audiology Department at a district hospital in Gauteng

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A research report submitted to the Faculty of Health Science, University of Witwatersrand, Johannesburg, South Africa, in partial fulfillment of the requirements for the degree of Master of Science in Medicine (Child Health Neurodevelopment)

Johannesburg, 23 July 2024

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DECLARATION

Declaration: Student's contribution to article(s) and agreement of co-author(s)

I, **Lucie Berthe Lynda Graca**, student number **1498911**, declare that this Research Report is my own work and that I contributed adequately towards research findings published in the article stated below which are included in my Research Report .

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Agreement by co-authors: By signing this declaration, the co-authors listed below agree to the use of the article(s) by the student as part of his/her Thesis/Dissertation/Research Report. In cases where the student is not the 1st author of a published article, the primary supervisor must explain (under comments) why the student is entitled to use the paper for his/her degree purposes.

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Authors	Name	Signature	Date
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2nd author			
3rd author			

Comments by primary supervisor:

……

……

DEDICATION

To my mom, whom I started this journey with but sadly departed before I could reach the finish line. You are so dearly missed.

In loving memory of Madeleine Hoareau

1940 - 2022

ABSTRACT

Background. Children require speech and language to communicate adequately and to participate in daily activities and in society. Speech and language delays may have far-reaching consequences on a child's development.

Objectives. To audit the referrals of children less than six years of age referred to a speech therapy and audiology department at a district-level hospital in Gauteng, South Africa.

Methods. A retrospective audit of children aged below six years referred to the outpatient Speech Therapy and Audiology (STA) Department from 01st January 2021 to 30th June 2022 was conducted. Mean and standard deviation (SD) were used for normally distributed continuous variables and median and interquartile range (IQR) for skewed variables. Categorical data were analysed using the Chi-squared and Fishers exact test.

Results. One hundred and fifty outpatient referrals were reviewed, of which 94 (62.7%) were males. Speech delay was the most common reason for referral (38%). Of the children seen by the speech therapists and audiologists, 24 (20.3%) children were discharged and 58 (49.2%) defaulted follow-up. One hundred and two children had auditory screening and three children (2.5%) were identified with hearing loss. Twenty-eight children (23.7%) were referred for neurodevelopmental assessments.

Conclusions. This audit provided insight into the disease profile of children referred to a STA department at a district level one hospital. It highlighted the demographics of children referred to a district hospital, further emphasising the importance of early identification, referral and intervention of children with speech and language delay and hearing loss. The high number of children lost to follow-up motivates for more research be done to identify the reasons for these findings.

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LIST OF ABBREVIATIONS

ASD Autism Spectrum Disorder

EHDI Early Hearing Detection and Intervention

ENT Ear Nose and Throat

HL Hearing Loss

HPCSA Health Professions Council of South Africa

Hz Hertz

IQR Interquartile Range

JCIH Joint Committee on Infant Hearing

NDC Neurodevelopmental Clinic

OR Odds Ratio

PHC Primary Healthcare

RTHB Road to Health Booklet

SA South Africa

SD Standard Deviation

SRH South Rand Hospital

STA Speech Therapy and Audiology

UNIHS Universal Newborn and Infant Hearing Screening

WHO World Health Organization

MANUSCRIPT IN SUBMISSIBLE FORMAT

Background. Children require speech and language to communicate adequately and to participate in daily activities and in society. Speech and language delays may have far-reaching consequences on a child's development.

Objectives. To audit the referrals of children less than six years of age referred to a speech therapy and audiology department at a district-level hospital in Gauteng, South Africa.

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Results. One hundred and fifty outpatient referrals were reviewed, of which 94 (62.7%) were males. Speech delay was the most common reason for referral (38%). Of the children seen by the speech therapists and audiologists, 24 (20.3%) children were discharged and 58 (49.2%) defaulted follow-up. One hundred and two children had auditory screening and three children (2.5%) were identified with hearing loss. Twenty-eight children (23.7%) were referred for neurodevelopmental assessments.

Conclusions. This audit provided insight into the disease profile of children referred to a STA department at a district level one hospital. It highlighted the demographics of children referred to a district hospital, further emphasising the importance of early identification, referral and intervention of children with speech and language delay and hearing loss. The high number of children lost to follow-up motivates for more research be done to identify the reasons for these findings.

Introduction

The consequences of speech and language delays extend beyond the child's immediate environment and can persist into adulthood. Speech is the oral-motor act of sound production

and word construction. Language comprises both receptive language (the understanding of language) and expressive language (the expression of thoughts, ideas, and feelings) (1). Children require speech and language to communicate adequately and to participate in daily activities and in society, as well as for literacy (reading and writing) and numeracy skills. Hence, failure to attain speech and language competency may result in learning difficulties and scholastic failures which can then cascade into reduced educational attainment, decreased employment opportunities, low-income employment, and subsequent poverty (2,3).

Speech and language delay is diagnosed when a child is not attaining his/her speech and language abilities for his/her chronological age using standardised assessment tools.

The prevalence of speech and language delay varies among countries and is estimated to be between 3.2% and 26.2% (2,3).

Medical and non-medical risk factors have been identified in the development of speech and language delay. Hearing plays a vital role in the acquisition of language and hearing loss accounts for a significant number of cases of speech and language delay (4). The consequences of hearing loss and especially the late identification thereof, can be detrimental to the child's developmental potential. The Health Professions Council of South Africa (HPCSA) advocates for early detection and intervention of newborns and infants with hearing loss through the Early Hearing Detection and Intervention (EHDI) programme whereby newborns and infants with hearing loss are identified early, and the early intervention for the hearing loss is instituted (5). The first three years of life are a critical phase for speech and language development (3,6,7). Therefore, it is imperative that children are identified during this critical period and referred for assessment to avoid permanent and irreversible repercussions.

In South Africa (SA), the "Road to Health Booklet" (RTHB) is a readily accessible screening tool in Primary Healthcare (PHC) facilities which can be used to identify hearing impairment and speech and language delay (8). This subjective measure, which is often underutilised due to human resource constraints, involves questioning parents about their child's development and may result in some children with developmental delays being missed (8). Parents may not be aware of deficits, especially in cases of mild to moderate hearing loss which may subsequently negatively affect the child's speech and language development (4,9).

Impairments in language development can be the primary presentation in some neurodevelopmental conditions such as autism spectrum disorder (ASD) which has an

estimated prevalence rate of 27.6 per 1000 (1 in 36) children of 8 years of age according to the most recent published data (7,10).

The purpose of the study was to describe the demographics and audiological findings of children referred to the outpatient Speech Therapy and Audiology (STA) Department; to identify the presence of known risk factors in the referred children; and to describe the outcomes of the referred children.

Methodology

The audit was conducted in the STA Department at South Rand Hospital (SRH). SRH is a district level one state hospital situated in Rosettenville, south of Johannesburg. It is positioned as an intermediary between the Primary Healthcare (PHC) clinics and the specialised secondary and tertiary hospitals and thus receives referrals from the surrounding clinics. It has a total bed capacity of 314, catering for all disciplines and the hospital's paediatric bed capacity is 28. The facility serves a catchment population of approximately 700 139 people (11). The STA Department receives both in- and outpatient referrals of children under the age of six years. The STA Department is staffed with 2 dual qualified speech therapists and audiologists, one single qualified community service speech therapist and one single qualified community service audiologist attending to both paediatric and adult patients. SRH does not have any specialist or subspecialist services, however, a neurodevelopmental clinic (NDC) takes place monthly run by a neurodevelopmental paediatrician. Any child receiving therapy at SRH and suspected of having a developmental disability may be referred to the SRH NDC.

This study was a retrospective audit of paediatric outpatient referrals to the STA Department at SRH, between 01st January 2021 to 30th June 2022. Data collection took place from November 2022 to June 2023. The STA Department receives referrals from the surrounding hospitals, clinics and schools based on the geographical catchment area, as well as from other therapeutic services. All referred children have their referral details captured electronically on a Microsoft Excel spreadsheet by the speech therapist receiving the referral. The information captured from the initial referral letter includes: the name and surname of the child, the date of birth, source of referral and date of referral. Once the referral is captured electronically on the system, the child's caregiver is provided with a date for the child to be brought in for an

initial assessment by the speech therapist. The information collected on the day of the initial assessment, would be captured in the child's therapy file that is kept in the STA Department. The details recorded during the initial assessment include: home language use, pregnancy and birth history, past medical history, relevant family history, developmental milestones, speech and language assessment, and audiology results if assessed. Audiology screening is done on referrals based on the presence of risk factors. Follow-up therapy sessions, discharges, and referrals to specialised clinics are also recorded in the therapy files. Details of the neurodevelopmental assessment of the referred patients are recorded in the patient's hospital file. Data for the audit were extracted from the electronic booking database and from the child's paper therapy and medical files. De-identified data were captured in Microsoft Excel and stored securely on a password-protected device.

Descriptive statistical analysis was conducted to evaluate the characteristics of the variables collected. Normality of distribution was determined for continuous variables. Mean and standard deviation (SD) were used for normally distributed continuous variables and median and interquartile range (IQR) for skewed variables. Categorical data were analysed using the Chi-squared and Fishers exact test. A t-test was used for the comparison between two means. Statistical analysis was performed in Microsoft Excel and a p-value of <0.05 was considered significant.

Ethical Considerations

Ethical clearance was obtained from the Human Research Ethics Committee of the University of Witwatersrand (ethical clearance certificate reference number M220764) and Johannesburg District Research Committee (Ref No. GP_202208_080) prior to the commencement of the study. As this study was a retrospective audit review of medical records, informed consent from the guardian of the patients was not required. However, ethical considerations were adhered to, and confidentiality was maintained. Approvals from the Chief Executive Officer of SRH and the Head of the Department for speech therapy and audiology were also obtained prior to the commencement of the study.

Results

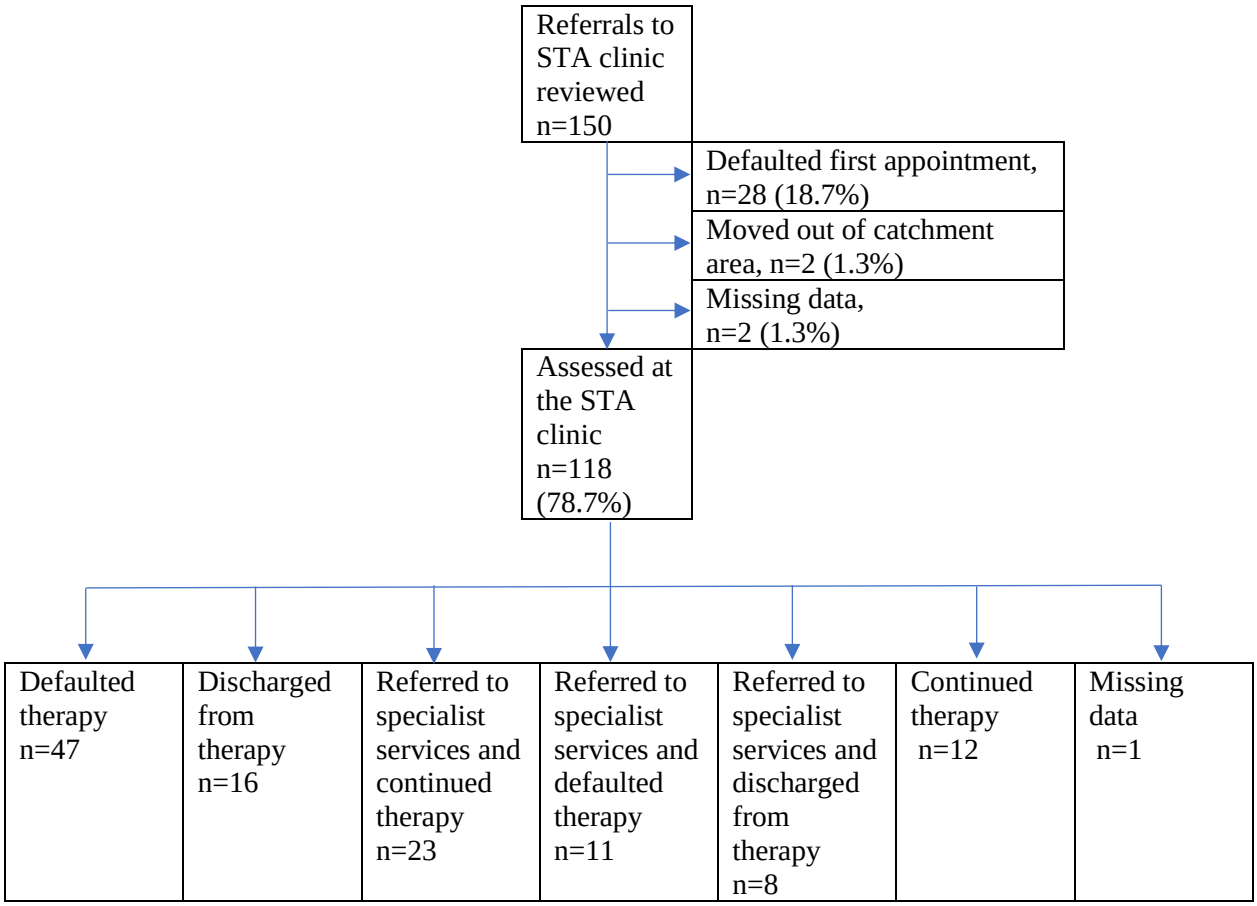
A review of 150 outpatient referrals to the SRH STA Department was conducted. Males were more commonly referred to the STA clinic (n=94, 62.7%). Younger children were referred more than older children, with decreasing frequency of referrals with increasing age – 26% (39/150) were less than 12 months old and 7.3% (11/150) between 60-72 months. The majority of the referrals were received from the paediatric outpatient clinic which receives referrals from the local PHC clinics (100/150, 66.7%), with other points of referral being: referral hospitals (23.3%), therapeutic services (8%), and schools (2%) (Table 1). The most common reason for referral was speech delay (57/150, 38%). Twenty-two (15%) children were referred for developmental delay, 10 (7%) for suspected autism spectrum disorder (ASD) and four (3%) for articulation difficulty. Only two children (1%) were referred for suspected hearing impairment. Of the children referred with speech delay (n=57), only 20 (35.1%) were referred below the age of three years.

Table 1. Demographics, source of referrals and reason for referrals included in the audit of the Speech Therapy and Audiology Department at South Rand Hospital (n=150)

Variables	n (%)
Gender	
Male	94 (62.7)
Female	56 (37.3)
Age (months)	
0 - <12	39 (26.0)
12 - < 24	24 (16.0)
24 - < 36	30 (20.0)
36 - < 48	28 (18.7)
48 - < 60	18 (12.0)
60 - < 72	11 (7.3)
Source of referrals	
Paediatric outpatient clinic	100 (66.7)
Hospitals	35 (23.3)
Therapeutic services	12 (8.0)
Schools	3 (2.0)
Reason for referrals	
Speech delay	57 (38.0)
Developmental delay	22 (14.7)
Suspected ASD	10 (6.7)
Articulation difficulty	4 (2.7)
Suspected hearing impairment	2 (1.3)
Other	55 (36.7)
Other reasons for referrals (n=55)	
High risk neonatal	28
Genetic	12
Neurological	10
Infections	3
Gastro-oesophageal reflux	1
Failure to thrive	1

ASD – autism spectrum disorder

Only 78.7% (118/150) of the referred children were assessed by the speech therapists and audiologists. Initial appointments were not honoured by 28 (18.7%) patients who were therefore not assessed, two patients changed their residence to outside the hospital's catchment area and were referred to the relevant STA clinics, and two files were excluded due to extensive missing data (Figure 1).



STA – Speech Therapy and Audiology

Figure 1. Flow Diagram depicting the flow of patients prior to and after the initial assessment conducted in the Speech Therapy and Audiology Clinic

After the initial assessment of the 118 children, 20.3% (n=24) were discharged from further follow-up, 35.6% (n=42) referred for further assessment by relevant specialised services, and no follow-up data was available for 49.2% (n=58) as follow-up was defaulted after the initial assessment (Figure 1).

Most of the children (n=92, 78%) had their initial assessment within 100 days of referral with a mean waiting period of 73.06 (SD 70.98) days, and no association was found between a

waiting period of >90 days from the referral being made to the initial assessment and defaulting subsequent follow-up (OR 1.35 p=0.49). One child was seen 384 days after referral due to defaulting on the initial assessment and returning at a later date.

Primary home language data was recorded in 70 files. Of these, English was recorded as being the main home language of use in 61.4% (43/70), 17.1% used isiZulu, 5.7% Afrikaans, and 15.7% used one of the other official South African languages and non-South African languages such as Lingala, Shona and French. Home language was undocumented in 40.7% of reviewed records. Most (87.1%) of the children were recorded as being bilingual (Table 2). Children from a bilingual household were not more likely to present with a receptive or expressive language delay of greater than 12 months (OR 0.35 p=0.21 and OR 0.31, p=0.15 respectively).

Table 2. Children assessed at the Speech Therapy and Audiology Clinic (n=118)

Variables	**n (%)**
Age	
<12 months	28 (23.7)
12 - <24	18 (15.2)
24 - <36	21 (17.8)
36 - <48	24 (20.3)
48 - <60	17 (14.4)
60 - <72	10 (8.5)
Gender	
Male	76 (64.4)
Female	42 (35.6)
Documented Home Language (n=70)	
English	43 (61.4)
isiZulu	12 (17.1)
Afrikaans	4 (5.7)
Other	11 (15.7)
Documented Home Language Use (n=70)	
Monolingual	9 (12.9)
Bilingual	61 (87.1)
Pregnancy	
Normal	58 (49.2)
Maternal comorbidity in pregnancy	46 (39.0)
Unknown / Not documented / Records incomplete	14 (11.9)
Maternal Comorbidity in pregnancy (n=46)	
HIV positive	19 (41.3)
Antepartum haemorrhage	2 (4.3)
HIV positive and Antepartum haemorrhage	1 (2.2)
Gestational hypertension	11 (23.9)
*Multiple pregnancy	6 (13.0)
Prenatal alcohol exposure	1 (2.2)
Prenatal drug exposure	1 (2.2)
Other	5 (10.9)
Gestation	
Term	82 (69.5)
Preterm	22 (18.6)
Unknown / Not documented / Records incomplete	14 (11.9)

Variables (continued)	n (%) (continued)
Preterm Gestational Age (n=22)	
<28/40	4 (18.2)
29-32/40	6 (27.3)
32-36/40	12(54.5)
Mode of Delivery	
Normal Vaginal Delivery	58 (49.2)
Caesarean Section	45 (38.1)
Unknown / Not documented / Records incomplete	15 (12.7)
Apgar Score at 1min	
0 - 3	5 (4.2)
4 – 6	12 (10.2)
7 – 10	68 (57.6)
Born Before Arrival	3 (2.5)
Unknown	30 (25.4)
Apgar Score at 5min	
0 – 3	2 (1.7)
4 – 6	4 (3.4)
7 - 10	78 (66.1)
Born Before Arrival	3 (2.5)
Unknown	31 (26.3)
Birth Weight	
<999g	3 (2.5)
1000 – 1499g	4 (3.4)
1500g – 2499g	20 (16.9)
2500 – 3999g	73 (61.9)
>4000g	5 (4.2)
Unknown	13 (11.0)
Documented complications at delivery (n=102)	
Yes	44 (43.1)
No	58 (56.9)
Referred and assessed at the Neurodevelopmental Clinic (n=25)	25
Diagnosis: Autism Spectrum Disorder	13 (52.0)
Global Developmental Delay	6 (24.0)
Developmental Language Delay	3 (12.0)
Other	3 (12.0)
Defaulted neurodevelopmental assessment (n=3)	3

HIV-Human Immunodeficiency Virus

*3 mothers with multiple pregnancy had dual pathology

Details of complications experienced at the time of delivery were recorded in 102 (86.4%) files (Table 2). Of these, 44 (43.1%) children had delivery complications – 29.5% (13) were classified as respiratory complications, 29.5% (13) as prematurity and 11.4% (5) as neonatal encephalopathy.

Audiology screening assessments, using distortion product otoacoustic emissions (DPOAEs) at 500, 1000, 2000 and 4000 Hz and pure tone Audiometry when indicated were performed on 102 children, of which 90 (88.2%) had normal hearing whilst nine (8.8%) had inconclusive results (Table 3). Three children were confirmed with hearing loss and were thus referred. Fifteen children (12.7%) did not receive audiology screening as it was not indicated (n=7) or they defaulted their audiology appointment (n=8).

Table 3. Audiology screening of children assessed at the Speech Therapy and Audiology Clinic (n=118)

Audiology screening	**n (%)**
Audiology screening done (n=102)	
Normal	90 (88.2)
Hearing loss	3 (2.9)
Inconclusive	9 (8.8)
Audiology screening not done (n=15)	
Defaulted audiology screening	8 (53.3)
Audiology screening not indicated	7 (46.7)
Unknown / Missing records (n=1)	1

The children diagnosed with hearing loss were all born at term. One child had an identified risk factor of neonatal jaundice and was referred for audiology assessment at four years of age. The second child with hearing loss, had craniofacial dysplasia and was referred at the age of one year. The third child had no identified risk factors and was referred at age two years eleven months with delayed speech and suspected hearing impairment.

Receptive and expressive language assessment scores were available for 96 children. Receptive language abilities were delayed between 12-48 months and 59.4% (57/96) of those assessed were delayed more than 12 months. There was no significant association between children with receptive language delay of more than 12 months of age and the presence of maternal comorbidities during pregnancy (OR 1.28, p=0.43). A greater number of children – 67.7%, 65/96 – were assessed as having expressive language delay; range of delay 12-49 months. There was also no significant association between children with expressive language delay of more than 12 months of age and the presence of maternal comorbidities during pregnancy (OR 1.71, p=0.23).

Specialist referrals after the speech therapists and audiologists' assessment were mainly to the neurodevelopmental clinic (NDC) (n=28, 66.7%) (Table 2). Two children required hearing assistive devices, and other referrals included the Ear Nose and Throat (ENT) clinic, audio processing unit, craniofacial unit, and plastic surgery unit.

Of those referred to the NDC, three defaulted their appointment. Over half (n=14, 56%) of the children were assessed at the NDC within six months of the referral with a mean waiting time for all referrals of 167.9 (SD 81.7) days.

The commonest diagnosis made by the NDC doctors was that of autism spectrum disorder (ASD) (n=13, 52%) (Table 2). Global developmental delay was diagnosed in six children and developmental language delay in three children. Other diagnoses included significant

language delay and learning disability, mixed cerebral palsy, and moderate intellectual disability. Four children were found to be syndromic. Genetic syndromes were confirmed in two ASD patients, with one child diagnosed with Fragile X Syndrome. Atypical Rett syndrome was confirmed in one of the two females diagnosed with ASD.

Half (n=7, 53.8%) of the children diagnosed with ASD had been referred to the STA clinic with a presumptive diagnosis of ASD. Speech delay (n=3) and developmental delay (n=3) were other presenting features prompting STA clinic referrals. The majority of those diagnosed with ASD were male (84.6%) (female to male ratio of 1:5.5), delivered at term (92.3%) with no family history of language delay (84.6%). There was no association found between a family history of language delay and having a diagnosis of autism (p=0.64).

Discussion

In this audit, we reviewed records of children referred to the STA Department at a district level one hospital in Johannesburg. We describe the demographics, referral patterns and outcomes post referral.

Almost 20% of children referred to the STA clinic and provided with an appointment date defaulted initial attendance. Referrals included in this audit took place during the time of the COVID-19 pandemic. The pandemic had been declared in March 2020 in South Africa (SA), and multiple levels of lockdown were experienced until 4th April 2022 (12). During this global heightened state of anxiety, services which were considered non-essential such as outpatient speech therapy and audiology, were temporarily halted to minimise the possibility of the spread of infections (13). Apprehension regarding the contagious nature of the COVID-19 infections, lead to the avoidance of hospital visits and defaulting of scheduled appointments (13). This may have been a contributing factor to the high rate of defaulting seen in this audit. A study conducted in the Kingdom of Saudi Arabia, where the frequency of hospital visits for children less than 14 years during the COVID-19 pandemic was analysed, found that 51.6% of parents interviewed stated that fear of contracting COVID-19 was the reason for reduced hospital visits (14). Other contributing factors such as the socioeconomic status of the family of children requiring speech therapy services, compounded by the COVID-19 pandemic, may have played a role in the high number of children defaulting appointments (15). In Uganda, parents of children with disabilities were consulted through

telephonic interviews in the months of May and July of 2020 on the impact of the COVID-19 pandemic. All stated that they had difficulties accessing healthcare and rehabilitative services due to lockdown restrictions, increased transport costs, and financial constraints caused by lack of income during the COVID-19 pandemic (15).

Prior to the COVID-19 pandemic, a local study in a township in the Tshwane district in SA explored reasons for defaulting therapy in a cohort of children referred for developmental delay after developmental screening (16). The parents of the children who defaulted therapy were interviewed and 87% were not perturbed about their child's developmental progress. Furthermore, 43% were unaware of the reasons for referrals. Factors such as work, transport and forgetting appointment dates were some of the reasons stated for defaulting therapy. It was noted in that study that parents prioritised the physical well-being of their child over the developmental milestones (16). Parents play a pivotal role in their children's early childhood development; however, they may not always be aware that providing a stimulating, safe and nurturing environment assists their children to achieve their full developmental potential (17). Parents need to be informed of the importance of early diagnosis and timely intervention of children with possible developmental delays (3,16).

Reminders of appointments and providing therapy closer to the patient's place of residence could be employed to mitigate patients defaulting scheduled appointments as logistic difficulties of travelling with a disabled child may be a factor in defaulting follow-up (16, 18, 19).

The majority of the children seen by the speech therapists and audiologists had their initial appointment within 100 days of referral. However, human resource constraints are a major factor contributing to a prolonged waiting time and also impact the frequency of therapy to less than ideal, contradicting the recommended management (20,21). The determination of the frequency of therapy for a child is based on individual assessments. However, the norm for frequency of speech and language therapy practice in high-income countries is once a week, with a direct correlation between intensity of speech therapy and improved vocabulary output being shown (20). Teletherapy or a hybrid method of both teletherapy and face-to-face therapy have been proven a success in some centres and can thus be utilised (13).

Almost two thirds of the children referred to the STA clinic were below the age of three years. This is promising as early identification and intervention of children with speech and

language disorders is important for better outcomes in terms of their cognitive, scholastic, and social development (3,6,7,16).

South Africa is a multi-ethnic, multilingual country having 11 official languages with sign language being an additional 12th official language (22). In this audit, English was the predominant language used, contrasting the Statistics South Africa's published data of the use of English by only 8.7% of South Africa's population and by 9.2% of the population residing in Gauteng province (22). Other non-South African languages such as Lingala and Shona were also found to be prevalent in the cohort indicative of the migrant population that SRH serves. In SA with its diversity of cultures, a multilingual family is common (22,23); and the majority of children in this study were bilingual. Neurotypical children, with appropriate speech and language development who are exposed to multilingualism, are not impacted in their speech and language abilities (21). However, for a child having delayed acquisition of speech and language, multilingualism can have an additive negative impact on the existing language delay in the early years (21). McLeod et al reported children aged 4 to 5 years with speech and language impairment who were assessed for school readiness, fared worse in the multilingual group than the monolingual, however, when re-assessed by age 6 to 7 years and 8 to 9 years, there was no difference between the multilingual and monolingual groups (21).

Hearing loss (HL), often referred to as the silent epidemic, is a major medical cause of speech and language delay (24). In 2018, the World Health Organization (WHO) estimated that 466 million individuals globally were living with disabling hearing loss, with Sub-Saharan Africa identified as one of the most affected areas (25). Furthermore, a worrisome 34 million of these individuals were children (25).

The HPCSA promotes Universal Newborn and Infant Hearing Screening (UNIHS) for timeous identification and intervention of children with congenital hearing loss which has a reported prevalence of 3-6 per 1000 live births in SA (26). Although Universal Newborn Hearing Screening is currently not feasible in the South African healthcare sector due to resource constraints, the Joint Committee on Infant Hearing (JCIH) recommends risk-based audiology screening and the HPCSA has provided a high-risk registry based on the South African disease burden (27). However, a significant number of infants and children with hearing loss do not have any identified risk factors and remain unidentified until a significant delay has occurred impacting their developmental outcomes (25,26). This was evident in our

study with one of the three children who did not have any identifiable risk factors, being diagnosed late with hearing loss.

Risk-based audiology screening is performed at PHC clinics when vaccinations are given from six weeks of age. The clinics are primarily managed by PHC nurses who are thus expected to identify the infants with risk factors and refer them for audiology screening. In a survey conducted in hospitals in KwaZulu Natal, SA, only 5.2% of the healthcare practitioners interviewed thought that the PHC nurses knew the high-risk factors for hearing loss (28). Petrocchi-Bartal and Khoza-Shangase evaluated 15 clinics in Gauteng province and 15 clinics in Northwest province in SA for newborn and infant hearing screening, and none of the clinics were following the HPCSA guidelines on audiology screening and only 9 clinics overall (30%) were using the RTHB milestones to identify possible hearing impairment (29). Empowering healthcare practitioners at the PHC level with knowledge and resources will improve the identification and referral of developmentally at-risk infants and children.

Mild HL, which may go unnoticed in a child, can have adverse effects on a child's scholastic performance, social interaction, and self-esteem (4). Results from primary school children aged 4 to 10 years in Nigeria, reported 30.1% of the children who had audiology screening as having some degree of hearing loss; of which 80.6% had mild to moderate HL (30). In Limpopo province, SA, audiology screening results of grade 1 school children were retrospectively reviewed and found that 51% of the children had an abnormal otoscopy examination; of which 36% had impacted wax (31). Ongoing periodic hearing screening of infants and children should be done to identify late-onset temporary or permanent HL and to identify mild to moderate HL for timeous intervention.

Speech and language delays are the most common deficits identified by parents of children with ASD prompting consultation. Autism Spectrum Disorder (ASD) a neurodevelopmental condition is characterized by deficits in social communications, repetitive behaviours, and or restrictive interests, with a hierarchy level of severity (32,34). Though the cause is not known, genetic and environmental factors have been implicated in ASD (32,34). The prevalence of ASD is continually rising due to increased awareness by both healthcare practitioners and the community (34). This was evident in this study as the majority of the children referred to SRH with suspected ASD as a cause of speech delay were ultimately diagnosed with ASD by the NDC subspecialist. The female to male ratio of the cohort of children diagnosed with ASD is in keeping with the known ASD female to male ratio of 1:4-5 (34).

Given the increasing prevalence of ASD, more efforts should be made for early diagnosis and intervention of children with ASD to ensure improvement in language development and cognition. ASD can be diagnosed as early as 18 to 24 months, however, the mean age at diagnosis is estimated at 60.48 months (33). The American Academy of Paediatrics advises on developmental and autism-specific screening at various stages until 30 months of age and beyond and a referral for an assessment if screened positive (32). However, in SA with limited resources for therapeutic services, developmental paediatricians and neurodevelopmental clinics, diagnosis of ASD is still occurring later than recommended (35). There is improvement though in age at referrals and diagnosis of ASD as was identified in a retrospective file review of referrals to the NDC at Tygerberg Hospital, SA, in 2008/2009 and 2016 (35). The median age at the initial consult improved from 62 months in the 2008/2009 cohort to 53 months in the 2016 cohort. The study further highlighted the increase in referrals at the NDC further emphasising the need for allocation of resources to accommodate the global rise in ASD and other developmental conditions.

The findings of this audit contribute to the understanding of the referral system to the speech therapy facility at district-level hospital and provide guidance to the development of effective utilisation of these services. A child referred with a speech delay may have an underlying aetiology that requires more urgent assessment and intervention including children on the autism spectrum and children with hearing difficulties. The speech therapist is often the first healthcare practitioner to assess these children with more complex diagnoses, and proactive referrals for further investigations which are essential for early diagnoses and early intervention.

Study limitations

Access to records was a limitation as not all records could be located. Furthermore, there was incomplete information in the patient's records, and it was unclear if the information was not requested, or they were not available as no details had been documented. As it was a retrospective data review of the therapeutic records, information that may have contributed to the high rate of defaulting follow-up, including the sociodemographic factors such as income levels and employment of the caregivers, had not been documented in the files.

Conclusions

This study provided insight into the demographics and follow-up care of children referred to a STA department at a district level one hospital. The research highlighted the demographics of children referred to a district hospital, further emphasising the importance of early identification, referral and intervention of children with speech and language delay and hearing loss. More research is required to address the high defaulting rate that was seen prior to the initial assessment as well as during therapy. The reasons for defaulting appointments should be explored so that measures can be implemented to rectify this high defaulting rate. The defaulting of assessment and therapy compromises these voiceless children's potential for a prosperous future. The reason for the long waiting period for initial speech and language assessment and the less-than-ideal frequency of therapy should be explored. Furthermore, the provision of therapy closer to the patient's residence at the PHC facilities is another measure that can be used to promote adherence to treatment. Further studies are suggested to assess the burden of developmental disabilities in SA, so that appropriate resources can be channelled accordingly to mitigate the deficiencies in the service given to children with developmental disability.

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APPENDICES

Appendix A: Ethics clearance certificates

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R49 Dr LBL Graca

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M220764

NAME: (Principal Investigator)	Dr LBL Graca
DEPARTMENT:	School of Clinical Medicine Department of Paediatrics and Child Health Medical School University
PROJECT TITLE:	*An audit of the Speech Therapy and Audiology Department at a district hospital in Gauteng*
DATE CONSIDERED:	2022/07/29
DECISION:	Approved unconditionally
CONDITIONS:	
NOTE:	If contact information regarding student study participants is required, please contact the Registrar's office - <Nicoleen.Potgieter@wits.ac.za>
SUPERVISOR:	Dr JK Bezuidenhout
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2022/10/10

This Clearance Certificate is valid for 5 years from the date of approval. An extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office secretariat on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **July** and therefore reports and re-certification will be due in the month of **July** each year. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator — Date: 26/10/2022

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Joburg
a world class African city

Research Committee of Johannesburg Health District

Enquiries: Prof S. Moosa | 0824466825 (WhatsApp) | shabir@profmoosa.com

DATE: 5th November 2022

ATT: Dr Lucie Berthe Lynda Graca

EMAIL: graca@mweb.co.za

Dear Sir/Madam

STUDY TITLE: An audit of the Speech Therapy and Audiology Department at a district hospital in Gauteng

NHRD REF. NO.: GP_202208_080

OFFICIAL APPROVAL

The District Research Committee has reviewed your application. This letter serves as a final approval letter for this study.

The following conditions must be observed:

- The facilities in which the research will be conducted are listed below
- These facilities will be visited from: 2022/11/05 to 2027/10/09
- Participants' rights and confidentiality will be maintained all the time.
- Neither the District nor the facility will incur any additional cost for this study.
- No resources (Financial, material and human resources) from the above facilities will be used for the study.
- The study will comply with Publicly Financed Research and Development Act, 2008 (Act 51 of 2008) and its related Regulations.
- You will submit a copy (electronic and hard copy) of your final report. In addition, you will submit an annual progress report to the District Research Committee.
- If this is academic research then your supervisor and the University will ensure that these reports are being submitted timeously to the District Research Committee.
- The District must be acknowledged in all the reports/publications generated from the research and a copy of these reports/publications must be submitted to the District Research Committee.
- You will liaise with the manager/s listed below as relevant before initiating the study.

We reserve our right to withdraw our approval, if you breach any of the conditions mentioned above. Please feel free to contact us, if you have any further queries.

On behalf of the District Research Committee, we would like to thank you for choosing our District to conduct such an important study.

Regards,

Prof S. Moosa
Chairperson: District Research Committee
Johannesburg Health District
As delegated by Mrs M.L. Morewane, Chief Director, Johannesburg Health District, and Mr. Frans Moseane, Acting ED Health, City of Johannesburg

List of Facilities Approved

- South Rand Hospital

List of Managers

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ABCEF	Ms Lombuso Matlala	011 440 1259	082 307 0267	Lombuso.Matlala@gauteng.gov.za
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CoJ G	Ms Olga Kruger	011 211 8936	083 286 0388	olgak@joburg.org.za

Appendix B: Approved research protocol

An audit of the Speech Therapy and Audiology Department at a district hospital in Gauteng

Research proposal

Lucie Berthe Lynda Graca

Student Number: 1498911

Degree: Master of Science in Medicine (Child Health Neurodevelopment)

Supervisors: 1) Dr Jacqueline Kim Bezuidenhout, Department of Paediatrics, School of Clinical Medicine University of Witwatersrand. MBCHB(UP), DCH(SA), FCPaed(SA), Cert of Development, Msc Neurodevelopment.

2) Dr Renate Strehlau, Deputy Director, VIDA Nkanyezi Research Unit, Department of Paediatrics and Child Health, Rahima Moosa Mother and Child Hospital. MBBCh, MSc Neurodevelopment, PhD (Wits), DCH, Dip HIV Man.

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1.0 INTRODUCTION

Speech is the oral-motor act of sound production and word construction. Language comprises both receptive language (the understanding of language) and expressive language (the expression of thoughts, ideas, and feelings) (1). Speech and language delay is diagnosed when a child on a norm referenced measure performs below the expected mean for children of the same chronological age. The prevalence of speech and language delay varies transnationally among countries and is estimated to be between 3.2 and 26.2% (2,3). Among children aged two to seven years, the estimated prevalence of language delay globally is 2.3 to 19% (1,4). In South Africa, studies investigating communication delays have been conducted in three Tshwane districts on children aged 6-12 months, and the prevalence rate was reported as 13.4% (2).

Medical and non-medical risk factors have been identified in speech and language delay. Hearing plays a vital role in the acquisition of language and hearing loss accounts for a significant number of cases of speech and language delay (5). In the South African context, the rate of hearing loss in newborn and infants is estimated at 4-6 per 1000 live births (5,6). The consequences of hearing loss and especially the late identification thereof, can be detrimental to the child's developmental potential. The first three years of life are a critical phase for speech and language development (3). Therefore, it is imperative that children are identified during this critical period and referred for assessment to avoid permanent and irreversible repercussions.

2.0 LITERATURE REVIEW

The purpose of the literature review is to emphasise the significance of the proposed study.

2.1 The development of speech and language

The development of speech and language begins in utero. By 23-25 weeks, the organs required for hearing have developed, thus allowing the foetus to respond to sound stimuli (7). From 30 weeks gestation, the foetus can discriminate various speech phonemes (7). Environmental and maternal sounds are transmitted via the amniotic fluid to the foetal auditory apparatus whereby sound waves of low frequencies are transmitted to the middle ear via bone conduction (due to the fluid-filled external ear canal) and then to the auditory cortex for processing (7,8). Studies have shown enhancement of the frontotemporal network in preterm neonates from a gestational age of 25-32 weeks in response to maternal speech, indicating auditory stimulation from an early age (9). The prenatal exposure of the foetus to maternal speech lays the foundation for future speech and language development.

From birth, speech and language development is sequential and follows a continuum pattern, with expectant milestones to be achieved by a certain age irrespective of language or culture (10). However, the pace of development varies among children and is influenced by both environmental and genetic factors (11).

2.2 Risk factors in speech and language delay

Risk factors for speech and language delay can be classified as non-medical and medical risk factors. Non-medical risk factors are sub-classified into family-based and environmental risks (12). The occurrence of concomitant risk factors produces a cumulative effect on the disability.

Medical or biological risk factors for speech and language delay include genetic abnormalities, male sex, recurrent middle ear infections, hearing loss, convulsions, oropharyngeal abnormalities, and pre, peri and post-natal factors (4,12).

Prenatal risk factors include congenital infections and prenatal exposure to alcohol whereas perinatal risk factors encompass birth complications and prematurity. Postnatal hyperbilirubinaemia poses a risk for speech and language delay (13).

In childhood, recurrent or chronic middle ear infections may predispose a child to acquired hearing loss, thus causing a communication disability (5,14).

Hearing loss, often referred to as the silent epidemic, is a major medical cause of speech and language delay (12). It is estimated worldwide that hearing loss affects about 466 million individuals of which 34 million are children, with over 80% living in low- and middle-income states such as South Africa (14). For children aged 5 to 14 years living in sub-Saharan Africa, it is estimated that the prevalence for hearing loss is 1.2-3.0%, this compares to 0.3-0.6% for their peers living in the high-income countries (15). However, the prevalence in sub-Saharan Africa may be much higher than is reported due to the limited research and testing in the region. Congenital hearing loss on the other hand affects 2-4 babies per 1000 live births in high-income countries as opposed to 6 per 1000 live births in South Africa (6). The public health sector caters for approximately 85% of the South African population but, it is estimated

that only about 7.5% of hospitals are conducting audiological screening and almost none are carrying out universal screening (13,16). Some of the reasons for this incomplete screening of newborn hearing, have been attributed to costs and limited resources such as human resources and equipment (6,16).

Non-medical family-based factors such as a positive family history of speech and language delay, multilingualism, and parental education have been implicated in speech and language delay (12). Family history of speech and language delay is a strong predictor for possible communication delays in the offspring (4). Parental education plays a role in language acquisition with the better educated parents being more interactive and using complex sentences with their children thus stimulating language development (4,12). In South Africa with its diverse culture, a multilingual family is common. In neurotypical children with speech and language developing as expected exposure to multilingualism does not affect speech and language abilities. However, in a child with delayed acquisition of speech and language, multilingualism can have an additive negative impact on the existing problem (17).

Other non-medical risk factors include environmental risk factors such as low socio-economic conditions, trauma, and screen time with inadequate stimulation. In South Africa, poverty and poor access to medical care put children at an increased risk for communication delays (2,18).

Primary prevention through identification and elimination of risk factors for speech and language delays are measures that could mitigate the disabling effect of communication delays. Furthermore, secondary prevention could be employed for early identification and intervention of speech and language delays to minimise the disabling effect of communication delays (19).

2.3 Identification of children with speech and language delay

In South Africa, the “Road to Health Booklet” is a readily accessible screening tool in primary health care facilities which can be used to identify hearing impairment and speech and language delay. This subjective measure, involving parent questioning about their child’s development, may result in some children with developmental delay being missed. Parents may not be aware of deficits, especially in cases of mild to moderate hearing loss which may subsequently negatively affect the child’s speech and language development (20). Evaluation of speech and language delay may be done through informal and formal testing. Informal testing involves the observation of play and interaction of the children with their parents or caregivers, whilst formalised testing involves standardised testing and speech sampling.

2.4 Impact of speech and language delay:

Children require speech and language to communicate adequately and to participate in daily activities and in society (3). The impact of speech and language delays extends beyond the child’s immediate environment and beyond childhood.

Speech and language abilities are required for literacy (reading and writing) and numeracy skills. Hence, failure to attain speech and language competency results in learning difficulties and scholastic failures which can then cascade into reduced educational attainment, decreased employment opportunities, low-income employment, and subsequent poverty (18).

Difficulties to communicate with peers lead to decreased social interactions, withdrawals, and stigmatisation which can result in social isolation with psychological

consequences and depression (18,21). The breakdown in communication results in frustrations with behavioural outbursts (18,21).

The literature review revealed the importance of early identification and intervention of children with speech and language delays and as a result the proposed study aims to highlight the importance of early identification and intervention of children with communication delays thereby reducing the impact on the developing child. The research will draw attention to the number of children referred to a district hospital, further emphasising the importance of capacitating the lower-level clinical centres with qualified personnel for timeous identification and intervention of children with speech and language delay.

3.0 AIM

The proposed study aims to audit the referrals of all children less than 6 years of age, with respect to demographics, risk factors, audiological findings, and outcomes, referred to a Speech Therapy and Audiology Department at a district-level hospital in Gauteng, South Africa.

3.1 STUDY OBJECTIVES

Objectives

1. To describe the demographics of children referred to the Speech Therapy and Audiology department.
2. To identify the presence of known risk factors in the referred children.

3. To describe the audiological findings of the referred children.
4. To describe the outcomes of the referred children.

4.0 METHODOLOGY

4.1 Research Question

What are the audit findings with respect to demographics, risk factors, audiological findings and outcomes of children referred to the Speech Therapy and Audiology Department at a district hospital in Gauteng, South Africa?

4.2 Study design

The proposed study will be a retrospective audit of referrals of all children received by the Speech Therapy and Audiology Department. The analysis will involve reviewing previously documented information in the patient's medical records. Retrospective studies have the advantage of being cost-effective and saving time yet still yielding results for further prospective research studies. The disadvantage though is that the researcher must rely on a predefined set of patient records which may impact on the planned sample size, and records may be incomplete which will affect capturing of data variables. The retrospective audit will take place in the Speech Therapy and Audiology Department at South Rand Hospital (SRH), which is a district state hospital situated in Rosettenville, south of Johannesburg. SRH is a District level 1 hospital with a total bed capacity of 314 catering for all disciplines, the hospital's paediatric bed capacity is 25. The facility serves a catchment population of approximately 450,000 people (22). The Speech Therapy and Audiology Department receives both in- and out-patient's referrals of children under the age of six years. Children over the age of

six years, who still require therapy, are attended to by speech therapists and audiologists from the department of education at the special schools at which they are placed. The department is managed by a chief speech therapist with two production level dual-qualified speech therapists and audiologists, one single qualified speech therapist, one community service speech therapist and one community service audiologist.

4.3 Study Participants

The study sample will consist of all children less than six years of age referred to the Speech Therapy and Audiology Department at SRH, during the period of 01st January 2021 to 30th June 2022.

The anticipated sample size is 150 patient files as the Speech Therapy and Audiology Department receives on average 8-12 referrals per month as per personal communication with acting Head of Department for Speech Therapy and Audiology at SRH (Anastasiou J. 2022, oral communication. 8th April).

Inclusion criteria

All referrals of children aged less than six years referred to the SRH's Speech Therapy and Audiology Department during the period of study.

Exclusion criteria

None

4.4 Data Collection

Data will be collected using a paper-based data collection sheet (Appendix A) which will then be transferred onto an Excel spreadsheet.

The data variables will include:

- The patient's demographic details (this will include age and gender).
- Referral details (which will include the date and source of referral, the reason for referral and date seen by the therapist).
- Home language used.
- Perinatal history (this will include pregnancy, birth history namely mode of delivery and gestational age at delivery, apgar scores, birth weight, head circumference, and any complications during delivery).
- Relevant past medical history (which will include relevant medical histories such as meningitis, neonatal jaundice, seizures or otitis media, exposure to ototoxic medications as well as family history of speech and language delay).
- Developmental milestones (those will be specific to speech and language developmental milestones i.e., babbling, first words and combining words).
- Speech and language assessments (the receptive and expressive language delays expressed in months will be captured as well as audiological results if normal, inconclusive, hearing loss or middle ear pathology present).
- Outcome of the referrals (outcomes to be captured will be defaulted, discharged, and referred. Date of discharge or date of referral and further referrals to, namely ENT, neurodevelopmental clinic or for assistive hearing devices or any other referrals will also be captured).

- Neurodevelopmental clinic assessment (if referred to the neurodevelopmental clinic, the capturing data will include date of assessment, diagnosis, the presence of any syndromes and any investigations that were done).

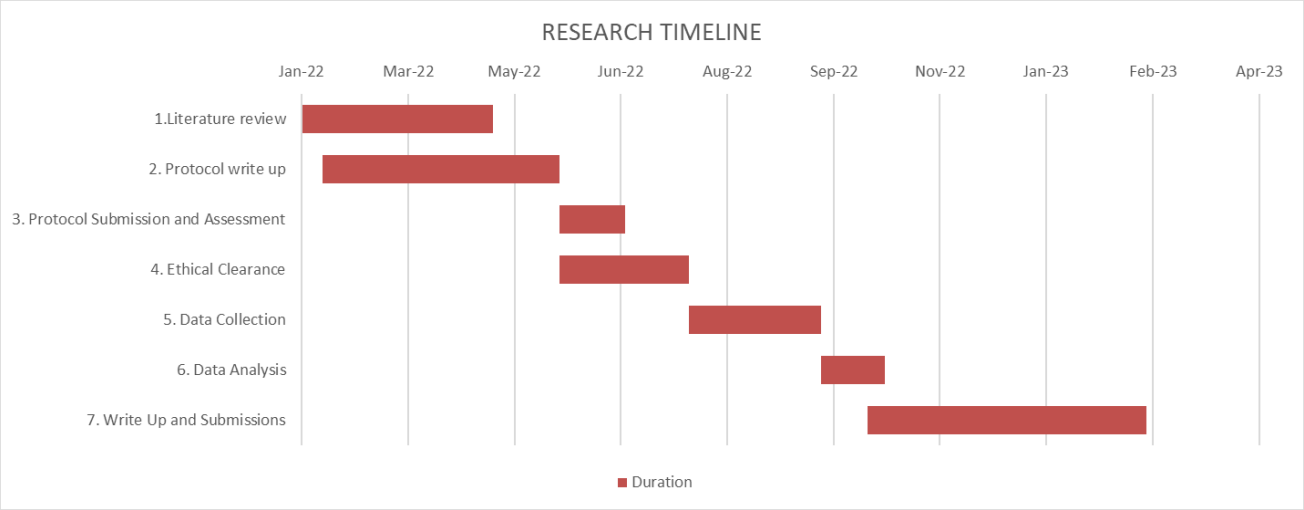
The age of the patient at presentation will also be considered and will thus be captured and documented. A numbering system will be used as a unique identifier for patient identification. This will be done to ensure that patient confidentiality is maintained as outlined by the Department of Health of South Africa (www. Health.gov/za/privacy-statement). The data will be secured on a password protected Excel document stored on a password protected computer to which only the researcher will have access. The anonymised data will also be accessible by a statistician for the data analysis.

4.5 Data Analysis

Results will be analysed based on the study objectives. Descriptive statistics (mean, median) will be utilised for data analysis of the quantitative data. The categorical variables of the demographic profiles will be presented as percentages and thus tabulated or displayed in graphical forms. Graphical displays will be in the form of histograms and pie charts. Non-categorical or continuous variables will be analysed using mean, median or standard deviation. The expertise of a biostatistician will be utilised in the data analysis.

5.0 TIMELINES

The proposed study is to be done according to the timelines on the Gantt chart.



6.0 ETHICAL CONSIDERATIONS

Ethical clearance will be obtained from the Human Research Ethics Committee of the University of Witwatersrand prior to commencement of the study. As this study is a retrospective audit review of medical records, informed consent from the guardian of the patients will therefore not be necessary. However, ethical considerations will be adhered to according to the World Medical Association Declaration of Helsinki (23).

Approval from the CEO of the hospital (Appendix B) and the Head of the Department for Speech Therapy and Audiology (Appendix C) will be sourced prior to the commencement of the study.

7.0 LIMITATIONS

Information bias may occur as a result of the study being retrospective, meaning that information has already been collected and important information may either be captured and recorded incorrectly or omitted or be indiscernible. The data to be collected is paper based, therefore, illegible handwriting may result in difficulty in data extraction. However, consultation with the relevant staff in the department will be done to ensure correct data is captured. Missing data may create bias in the results. The

advantage though, is the use of a single study site, thus allowing some uniformity in the data that is captured. Another limitation is that the Speech Therapy and Audiology Department caters for children up to the age of six years which excludes children who are diagnosed with speech and language delay after the age of six. The current COVID-19 pandemic will pose a limitation on the study sample size due to the suspension of therapeutic services during the COVID-19 case surges.

8.0 FUNDING

The cost of the research which will involve mainly stationary will be self-funded, so no extra funding will be required for the proposed study.

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APPENDICES

Appendix A - Data capturing sheet

Background Information								
Number								
Date of birth				Age (years/months) at referral				
Gender	Male			Female				
Referral to speech therapist	Date of referral			Date seen by therapist				
	Referred from	Clinic		Self		Hospital		
Previously diagnosed and transferred from								
Reason for referral	Speech delay		Articulation difficulty		Suspected hearing impairment			
	GDD		Suspected ASD		Other			
Case history information								
Home Language			Second Language					
Birth History								
Pregnancy	Normal		Abnormal		Describe if abnormal			
Gestation at delivery	Term		Preterm		GA (weeks) if preterm			
Mode of Delivery	NVD		Assisted delivery		C/S			
Apgar Scores	One Minute			Five Minutes				
Birth Parameters	Birth weight			Head Circumference				
Complications at delivery	No		Yes		If yes describe complications			

Medical History												
Illness(es)	Meningitis		Neonatal jaundice		Seizures							
	Otitis media		Other									
Exposure to ototoxic Medication(s)	Yes			No								
Family history of language delay	Yes		No		Not documented							
Developmental History												
Milestones (age)	Babbling		First word		Combine words							
Speech and Language assessment												
Speech and Language Assessment Results	Receptive language delay in months			Expressive language delay in months								
Audiology Results	Normal/HWNL			Hearing loss								
	Inconclusive			Middle/External Ear Pathology								
Outcome												
Defaulted	Yes		No		Referred	Yes		No				
Discharged	Yes		No		Date of discharge							
Referred to	Neurodevelopmental Clinic			ENT								
	For hearing assistive device			Other								
Neurodevelopmental Clinic												
Neurodevelopmental Clinic Assessment	Date of assessment		Diagnosis									
	Syndrome	Yes			No							
	If Yes, State syndrome											
	Investigation(s)											
Comments												

Appendix B - Permission letter to Acting Chief Executive Officer

To: Acting Chief Executive Officer, South Rand Hospital

Re: Permission to conduct a retrospective audit of the Department of Speech Therapy and Audiology

Dear Dr Letwaba,

My name is Lucie Berthe Lynda Graca. I am a part-time student with the University of Witwatersrand and an employee of South Rand Hospital as a grade 3 medical officer. I am studying for a Master of Science in Medicine (Child Health Neurodevelopment) degree.

As part of my study, I am required to conduct a research project in the field of my studies. My research topic is “An audit of the Speech Therapy and Audiology Department at a district hospital in Gauteng”.

I chose South Rand Hospital’s Speech Therapy and Audiology Department as my study site.

My research will be a retrospective audit of the medical records of patients aged less than six years that are referred to the Speech Therapy and Audiology Department at South Rand Hospital. I will require two months to collect the required data. The data will include the patient's demographic details, perinatal history, case history as well as medical and developmental history. The outcome of the referred patients will be documented as part of the objectives of the study. The patient's name will be de-identified using a number system to maintain the patient's confidentiality.

Ethical clearance will be sourced prior to the commencement of the study.

I am therefore requesting permission to conduct my proposed study, should I receive ethical clearance.

Should there be any queries, please do not hesitate to contact me.

Yours Sincerely,

Lucie Berthe Lynda Graca

Contact number: 0823510271

Email address: graca@mweb.co.za

Appendix C – Permission letter to Acting Chief Speech Therapist and Audiologist

To: Acting Chief Speech Therapist and Audiologist, South Rand Hospital

Re: Permission to conduct a retrospective audit of the Department of Speech Therapy and Audiology

Dear Mrs. Julia Anastasiou,

My name is Lucie Berthe Lynda Graca. I am a part-time student with the University of Witwatersrand and an employee of South Rand Hospital as a grade 3 medical officer. I am studying for a Master of Science in Medicine (Child Health Neurodevelopment) degree.

As part of my study, I am required to conduct a research project in the field of my studies. My research topic is “An audit of the Speech Therapy and Audiology Department at a district hospital in Gauteng”.

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My research will be a retrospective audit of the medical records of patients aged less than six years that are referred to the Speech Therapy and Audiology Department at South Rand Hospital. I will require two months to collect the required data. The data will include the patient's demographic details, perinatal history, case history as well as medical and developmental history. The outcome of the referred patients will be documented as part of the objectives of the study. The patient's name will be de-identified using a number system to maintain the patient's confidentiality.

Ethical clearance will be sourced prior to the commencement of the study.

I am therefore requesting permission to conduct my proposed study, should I receive ethical clearance.

Should there be any queries, please do not hesitate to contact me.

Yours Sincerely,

Lucie Berthe Lynda Graca

Contact number: 0823510271

Email address: graca@mweb.co.za

Appendix C: Turnitin report

An audit of the Speech Therapy and Audiology Department at a district hospital in Gauteng; LBL Graca; 1498911.pdf

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