KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF MEDICAL SCIENCES

DEPARTMENT OF EYE, EAR, NOSE AND THROAT

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PREVALENCE OF SPEECH AND LANGUAGE DELAY/DISORDERS AT KOMFO ANOKYE TEACHING HOSPITAL

BY

RAHMAT AGYEMANG

NOVEMBER, 2019

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A THESIS SUBMITTED TO THE DEPARTMENT OF EYE, EAR, NOSE AND THROAT, KATH, COLLEGE OF HEALTH SCIENCES, SCHOOL OF MEDICAL SCIENCES, KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN SPEECH AND LANGUAGE PATHOLOGY

NOVEMBER, 2019

DECLARATION

I hereby declare that this thesis is my own work towards the award of a Master of Science Degree in Speech and Language Pathology and that, to the best of my knowledge, no part or whole of it has been submitted elsewhere or in this University for another degree except where due acknowledgment has been made in the test.

Student Name and ID

RAHMAT AGYEMANG (**PG6195416**) …… …….

Student **Signature** **Date**

Supervisor's Declaration

I hereby declare that the preparation and presentation of this thesis were supervised in accordance with guidelines on supervision of the project laid down by the Kwame Nkrumah University of Science and Technology.

Mr. Gabriel Adu ……... …….

(Supervisor) **Signature** **Date**

Certified by

Dr. Duah Mohammed Issahalq …… ……

(**Head of Department**) **Signature** **Date**

ABSTRACT

Speech and language are indispensable for sharing feelings, thoughts, and information with others and are therefore critical for human species. When communication is affected by means of speech and language disorder or delay, interaction with family and society as a whole becomes unpleasant and which may also affect both the health and educational progress of people living with such conditions. The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD, 2008) requires countries to report statistical data about children with disabilities for planning purposes including development and access to inclusive education and proper health care for children in this bracket. However, in many low and middle income countries including Ghana, credible statistical data is not readily available, making it difficult to persuade governments and donors to invest adequately in this sector.

On the basis of these, this study was conducted at Komfo Anokye Teaching Hospital (KATH) in the Kumasi metropolis, Ashanti region, which is an important and historical location in the middle belt of Ghana to determine the prevalence of speech and language delay/disorder in the last three years (2015-2017) among 439 patients between 1 and 15 years of age who attended the Hospital (KATH); so as to provide a statistical data and pattern of speech and language disorders/delay among children in this age bracket.

The study seeks to stimulate national discourse towards training of more speech and language therapists with the needed resources in major health facilities across the country. In this study, convenience sampling technique which is a type of non-probability was employed and a quantitative approach in research was adopted in the design of this work using the Records Unit of the Eye, Ear, Nose and Throat (ENT) Department of KATH as the source of data. Patients' records were perused; carefully and appropriately entered into Excel worksheet. Prevalence i.e. rate and frequency of reported cases were found to be highest in 2017; with male patients being 48% more than the female patients in all 3 year data. The highest number of cases per milestone was recorded by 3.6 – 4 yr. age group for both 2015 and 2016 while in 2017, the highest cases was recorded by 2.6 – 3 yr. age group. The prevalence rates for the three years under review were 75% and 25% for speech delay/disorder and language delay/disorder respectively.

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To my mum, husband and children I say I am much grateful for your unfailing support and continuous encouragement throughout this period.

Finally, to everyone who in one way or the other contributed towards my education. I am grateful to you all.

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DEDICATION

I dedicate this work to my mother Afua Khadija Ansah, husband Dr. Abdallah Dawood and children, Hikmah, Naa Rayann and Hanan.

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LIST OF ABBREVIATIONS/ACRONYMS

ADHD:	Attention Deficit Hyperactivity Disorder
ASD:	Autism Spectrum Disorder
ASHA:	American Speech- Language –Hearing Association
CHRPE:	Committee on Human Research, Publication and Ethics
CP:	Cerebral Palsy
CWSN:	Children with Special Needs
DB:	Decibel
DPOAE:	Distortion Product Otoacoustic Emissions
DVD:	Developmental Verbal Dyspraxia
EENT:	Eye, Ear, Nose and Throat
ENT:	Ear, Nose and Throat
GDD:	Global Development Disorder
IQ:	Intelligent Quotient
IDEA:	Individual with Disabilities Education Act
JHS:	Junior High School
KATH:	Komfo Anokye Teaching Hospital
LOCHI:	Longitudinal Outcome of Children with Hearing Impairment
NIDCD	National Institute on Deafness and Other Communication Disorders
NIPH	Norwegian Institute of Public Health.
OAE:	Otoacoustic Emissions
SES:	Socioeconomic Status
SLI:	Specific Language Impairment (SLI)
SOP:	Standard Operating Principle

SPSS:	Statistical Package for Social Sciences
UK:	United Kingdom
UNCRPD:	United Nations Convention on the Rights of Persons with Disabilities
USA:	United States of America
USPSTF:	United States Preventive Services Task Force
WHO:	World Health Organization

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CHAPTER ONE

GENERAL INTRODUCTION

1.1 Background

Language and speech are indispensable medium for sharing feelings, thoughts, and information with others and are therefore critical for human species. It is also an important medium for transferring knowledge, skill and technological knowhow. Thus, language is used to meet our social, emotional and cognitive needs. When communication is affected by means of speech and language disorder or delay, interaction with family and society as a whole becomes unpleasant. Common across cultures is also the expectation that children will learn the language of their families (Foster, 1990). Studies have shown that communication begins from the womb through the pre-linguistic stage of childhood development (Papousek, 1996). From the 12th to the 18th month, a child is expected to have gone through cooing and babbling and ready to utter one-worded speech And for most children, these communication skills are acquired effortlessly, but some experience complications in learning to comprehend and use the language they hear around them (Bishop and Leonard, 2001).

Children will naturally on their own schedules reach what is known as developmental milestones. However, there are times when a child may lag far behind the norms for which warrants a thorough evaluation. Speech and language delay or disorder is a common phenomenon among growing children which if unresolved, may cause difficulties in learning and socializing; lasting all the way into adolescence and adulthood (Bishop and Leonard, 2001). Many children may improve on their speech and language impairment without intervention, early interventions have proven a great success in many cases.

According to Schirmer et al., (2004), the development of speech and hearing in the child is a dynamic process; the causes of their dysfunctions can be varied; and the signals, either isolated or as a whole, may involve grammatical difficulties (syntax), vocabulary (semantics), rules of the linguistic system (phonology), significant word units (morphology), the social use of language (pragmatics), fluency and orofacial motricity. Knowledge of the epidemiology of these disorders offers the support needed for the implementation of organized actions to minimize their effects.

Language and speech are two independent stages of childhood development. Though they usually develop together, they are different and independent of each other and their delays are individually separate of each other. For example, a child may suffer a speech delay i.e. unable to produce intelligible speech sounds but not delayed in language. In this case, the child is capable of producing an age-appropriate amount of language even though that language would be difficult or impossible to be understood. Conversely, a child suffering a language delay would ordinarily not have the opportunity to produce speech sounds yet; it is likely to just have a delay in speech (ASHA, 2014).

It is therefore imperative for parents, professionals, policymakers and researchers who wish to understand communication disorders and optimize assessment and intervention services for these children to know and have access to the facts and figures on children with speech or language disorders (Enderby and Pickstone, 2005). A delay in speech and language simply means that the child is developing speech or language in the correct sequence but at a slower rate than expected. Speech and language disorder, however, suggests that the child's speech or language ability is qualitatively different from what is typically normal (Ellis et al., 2008).

The issue of speech and language disorders has become a matter of concern to parents, teachers, pediatricians, speech and language therapists and audiologists which has prompted several

research exploring the subject matter (Nwosu Z, 2015; Oller J. 2014). However, these studies hardly explored the subject in totality and the literature as far as Ghana is concerned is scanty. Few studies have however, investigated the prevalence of speech and language disorders in Ghana (Osei-Bagyina, 2000). He investigated the prevalence of oral communication problems in patients at KATH and his studies seems to be the only existing literature which shared similar interest as this current study, although a number of studies have been conducted on other forms of disabilities in the country. From the study by Osei-Bagyina (2000), speech problems in general constituted 16.4% and the composition was articulation 10.3%, dysfluency 3.4% and voice 2.7% out of a population size of 623 who reported for management of oral communication disorders (OseiBagyina, 2000).

A number of studies globally have explored the prevalence of speech and language disorders especially, the developed countries such as United States, Canada, United Kingdom and Australia (ASHA, 2015). Law et al. (2000) for instance in a study conducted in the United Kingdom revealed that the prevalence of speech and language disorders to be 2-25% of children with a median prevalence of 5.95%. Similarly, McLeod and Harrison's (2009) study of Australian children showed that (16-22)% of Australian five-year-old children would be identified with speech impairment on formal assessment tests. The 2011 South African Census (Statistics South Africa, 2011) also reported that 6% of South Africans have speech and language disorders.

In Nigeria, studies conducted on the prevalence of speech and language disorder pegs the prevalence rate at 8-30% of the population who presented with communication deficits. However, information on the prevalence studies on the total population with number of individuals with speech and language disorders as well as that among children within the school system is insufficient (Nwosu, 2015).

It is approximated that, about 6% of children may have speech and language difficulties (Boyle 1996), of which a substantial percentage will have primary speech and language difficulties. For preschool children, 2 to 4½years old, studies evaluating combined speech and language delay reported prevalence rates ranging from 5% to 8%, (Randall et al., 1974; Burden et al., 1996) and studies of language delay from 2.3% to 19 %.9, (Rescorla et al., 1989; Silva et al., 1983 and Richman et al., 1982).

Though the prevalent rate of speech-language delays and disorders in Ghana is seemingly on the rise, the trend together with the prevalence are not consolidated and well documented. This is further compounded by the lack of standard facilities and speech and language therapists, making it nearly impossible for early diagnosis and assessment of speech and language problems amongst children which in turn affect their overall development.

1.2 Problem Statement

Speech and language are precursors for effective communication and if there is any stopgap along the developmental milestone of the individual regarding speech and language, it goes to affect not only the individual sufferer but also affects others significantly. Nonetheless, it appears children and adults who happen to have speech and language challenges are often left to their fate as there are limited speech and language professionals in our society. Coupling with this is the fact that we do not have enough data as far as speech and language disorders/delays are concerned. The study by Osei-Bagyina (2000) for instance gave impetus for this current study as it revealed that communication disorders, some of which result from the child's inability to acquire speech and language at the appropriate age level affect all age groups and more significantly children.

Speech and language disorder amongst children is of a momentous concern due to its far reaching consequences for the children themselves, their parents and care-givers including teachers and pediatricians. It is indicated in some studies that language disorder may have adverse effects upon school achievement (Aram 1984, Bishop 1990, Catts 1993, Tallal 1997, Baker 1987) and/or associated with social, emotional and behavioural problems (Rice 1993 & 1996, Cohen 2000). Children with primary language delay or disorder can also have long-term difficulties which may persist into adolescence and beyond (Haynes, 1991; Rescorla, 1990). Therefore, prevalence of speech and language delay or disorder, have the potential to impact significantly not only on the individual or the family but also the entire society in both the short and long term in terms of human resource deficit.

On the basis of this, the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD, 2006) enjoins countries to report/present statistical data about their children with disabilities for planning purposes. Such data is crucial for budgetary and resource allocation and for developing inclusive education for children. However, credible and comprehensive statistical data are difficult to come by in many developing countries including Ghana.

Lobato et al., 2013, reported on prevalence of language disorders in children between 2 and 7 years of age ranging from 2.3% to 19%. Several other studies have shown that children below 5 yrs. with speech and language problems have increased difficulty in reading at the elementary school level whiles those above 5 yrs. have an increased incidence of attention and social difficulties.

Behavioral problems and impaired psychosocial adjustment associated with speech and language may persist from childhood into adulthood (Law et al., 2009; Cohen et al., 1998) and may lead to lower-skilled jobs and unemployment at worst.

It can also be observed that children with speech delay may tend to be aggressive or anti-social because they cannot sufficiently communicate their needs. Hence, they may develop poor social skills that can negatively affect their general performance in school.

The current study seeks to provide an understanding of the prevalence of speech and language disorders or delay mainly among children between the ages of one and fifteen years with greater interest on the milestone group (1-6 yr.). It is hoped this might stimulate national discourse towards training of more speech and language therapists with the needed resources in major health facilities across the country. This has become necessary because, in the study by Osei-Bagyina (2000), most parents and caregivers expressed their frustration about the lack of speech and language professionals, hence, leaving them to resort to the spiritualist for treatment. It is interesting to note that, a decade down the line, not much has changed in terms of the availability of professionals in the field of speech and language science.

1.3 Significance of the Study

Speech and language problems when identified early enough before children begin schooling can lead to early interventions before these problems interfere with their formal education and behavioral adjustment. In scientific terms, proper data and statistics about a problem are fundamental requirements for any form of remediation or mitigation program. Development of every nation depends on its people; their health and education being the most important socioeconomic factors. Since it is well established that speech and language problems such as articulation, fluency, receptive and expressive language disorders hinder children's development causing psycho-social problems including learning difficulties; a well-documented data and statistics about the rate or prevalence of these conditions will inform authorities about the actual figures and their distribution which will in turn inform health and educational policies on speech

and language impairment particularly amongst children. It is upon this background that this study seeks to consolidate reported cases of speech or language delay or disorder amongst children in the past three years (2015, 2016 and 2017) so as to provide a well catalogued data and a reliable statistics for all stakeholders. These period was selected for this study because, there was a challenge accessing data prior to 2015, they were almost not available.

Due to the limited knowledge and availability of data on the prevalence of speech and language disorders/delays, findings from this study will serve as a guide to authorities and key players in the health sector, particularly KATH and aid in policy formulation and implementation. Again, the research findings will stimulate the awareness of the Ghanaian people on the prevalence of Speech and language disorders/delays in the hospital. Findings from this study will also contribute to the existing few literature in Ghana as far as speech and language disorders/delays are concerned.

1.4 Research Questions

These research questions emerged from the background of the study which the current study seeks to investigate

1. How prevalent is speech and language disorders or delay amongst children below 15 years old?
2. Which gender is mostly affected by speech and language delay?
3. How do clients get to know about the speech and language therapists services available at KATH?

1.5 Conceptual Framework

Prevalence of speech and language disorders amongst children from two to fifteen years of age were recorded and classified according to their demographic factors, risk factors, conditions associated with speech and language impairment. Demographic factors and risk factors including

age, gender, positive family history, prenatal and perinatal history, and bilingualism are the major variables of emphasis to evaluate their relationship with speech and language development. Associated disorders like hearing impairment, neurological disorders and developmental disorders that present speech and language impairments will be highlighted and evaluated.

For the evaluation of speech and language disorders, the types which comprise of articulation, voice and fluency disorders and expressive and receptive language disorders were done independently. Additionally, investigations were made on the rate of referrals of patients from other hospitals and whether follow-up appointments were honored or not. Also, information on whether the school-age children were attending school or not. Such information are useful for providing both educational and health needs of the children and precisely, where policy should focus. Figure 1.1 illustrates the conceptual framework.

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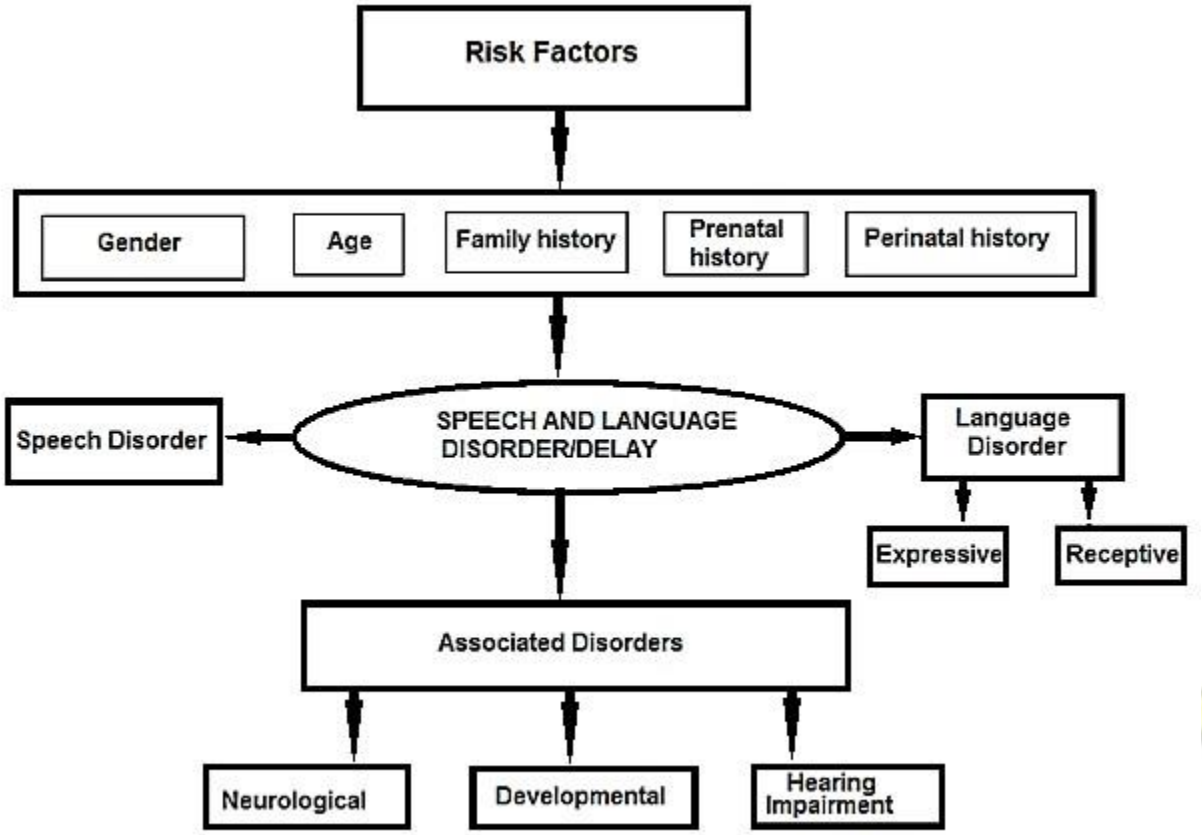
Figure 1.1: Conceptual framework chart



1.6 Objectives of the Study

General Objective

The principal aim of this study is to determine the prevalence of speech and language disorders/delays such as impaired articulation, fluency or voice impairment; receptive and expressive impairments that adversely affect a child's educational performance observed among children between ages of 1 and 15 years who attended KATH for therapeutic service in the last three years (2015-2017).

1.7 Specific Objectives

Specifically, the study seeks to achieve the following objectives

1. To find out the number of patients referred to KATH speech and language therapist from 2015-2017.
2. To establish the type of speech and language problems that clients came in with.
3. To ascertain the gender distribution of the affected individuals.
4. To establish, where possible, the causes and risk factors of speech and language disorders of the study population.
5. To determine the educational status of children with speech and language disorders.

1.8 Definition of Terms

Speech

Speech according to the Oxford Dictionary is the expression of or the ability to express thoughts and feelings by articulate sounds. In other words, it is how we say sounds and words (ASHA, 2008).Speech refers specifically to sounds produced by the oral mechanism, including the lips, tongue, vocal cords, and related structures (Caruso and Strand, 1999).

Language

Language according to Carla (2004) is the conventional code used to convey thoughts and ideas. Language refers to the words we use and how we use them to share ideas and get what we want (ASHA, 1997, 2013). It also refers to the code, or symbol system, for transforming unobservable mental events, such as thoughts and memories, into events that can be perceived by other people.

Expressive language

Expressive language is a broad term that describes how a person communicates their wants and needs. It encompasses verbal and nonverbal communication skills and how an individual uses language. Expressive language skills include: facial expressions, gestures, intentionality, vocabulary, semantics (word/sentence meaning), morphology, and syntax (grammar rules) (Pediatric Therapy Network).

Receptive language

Receptive Language is the understanding of language. Children may hear or see a word, but not be able to understand its meaning. It includes acquisition of information and meaning from what is otherwise mere visual information within the environment.

Language delay

Language delay is a failure in children to develop language abilities on the usual age appropriate rate for their developmental timetable. Language delay and disorder are sometimes used interchangeably. Characteristics of language disorders include improper use of words and their meanings, problems with sentence structure, inappropriate grammatical patterns, reduced vocabulary and inability to express ideas, or follow directions. One or a combination of these may occur in children who are affected by language-learning disabilities (such as dyslexia) or developmental language delay.

Speech delay

Speech delay also known as alalia: refers to a delay in the development or use of the mechanisms that produce speech. There may be a combination of several problems. Experiencing difficulty with some speech sounds may be a symptom of a delay, or of a hearing impairment. It can be difficult to understand what someone with a speech disorder is trying to say.

Prevalence

Byles (2005) referred to prevalence as the proportion of people in a defined population who have a particular condition at any one time.

1.9 Study Organization

The study was organized under six chapters. Chapter one dealt with the overview of the entire study. It comprises an introduction to the study and its background; the problem statement as well as the study's objective. It also highlighted the scope of the study as the foundation upon which the study was carried out. Chapter two dealt with the review of relevant related literature to the

prevalence of speech and language disorders as well as the conceptual framework of the study. Chapter three contains detailed explanation of the methodology employed for the study. In this chapter, the study area, research design, inclusion and exclusion criteria, ethical consideration as well as the method regarding how data was collected are what it presented. The data analysis was captured in chapter four while chapter five contains the discussion of the results. Finally, chapter six contains the findings of this study, conclusions and recommendations that were drawn based on the findings.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This Chapter presents a review of relevant literature related to speech and language disorders delay and their prevalence. In an attempt to provide a general and a holistic view of studies on the prevalence of speech disorders, the researcher relied on information from books, internet sources,

journals, articles and dissertations for the literature review. For easy reference and better understanding, the literature review was done under the following headings.

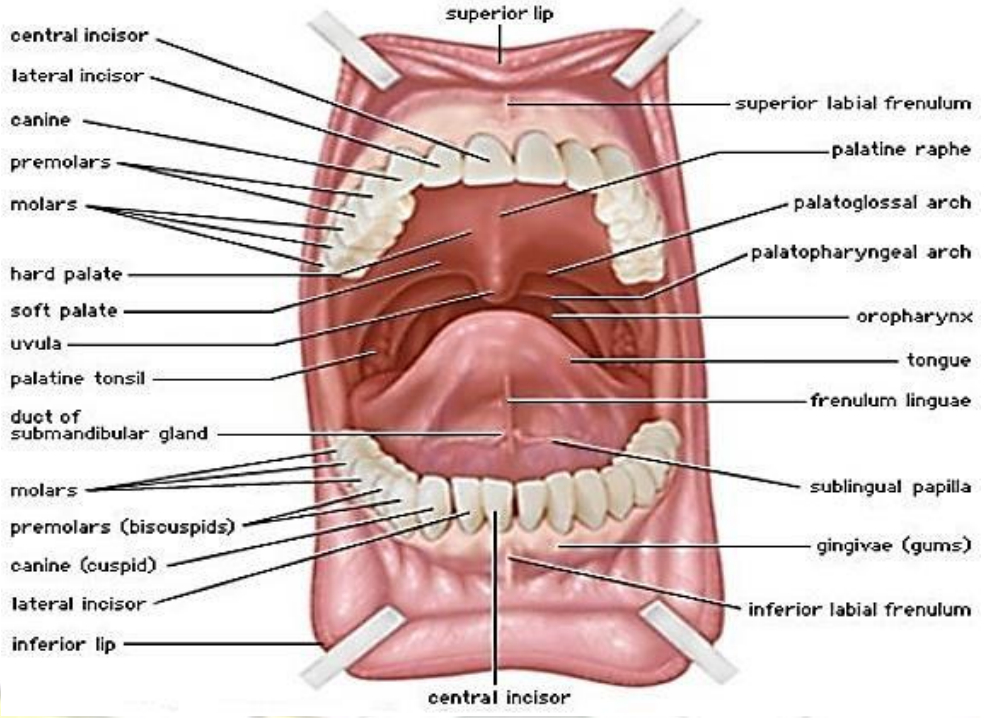
A) Speech Production and Speech Sound Mechanism
B) Speech and Language Formation
C) Overview of Speech Disorders
D) Language Disorders
E) Risk Factors of Speech and Language Disorders
F) Signs and Symptoms of Speech and Language Disorders
G) Prevalence of speech and language disorders

2.2 Speech Production and Speech Sound Mechanism

Production of speech is a highly complex motor task involving approximately 100 orofacial, laryngeal, pharyngeal and respiratory muscles (Simonyan et al., 2011; Levelt, 1989)). According to Fitch et al (1997), precise and expeditious timing of these muscles is essential for the production of temporally complex speech sounds characterized by transitions as short as 10 ms between frequency bands and an average speaking rate of approximately 15 sounds per second.

Airflow from the lungs (respiration) is a fundamental requirement in speech production. The airflow carrying the speech is phonated through the vocal folds of the larynx by a process called phonation and then resonated in the vocal cavities shaped by the jaw, soft palate, lips, tongue and other articulators as can be seen in Figure 2.1. In articulatory phonetics, the manner in which articulation is effected is through the configuration and interaction of the articulatory speech organs such as the tongue, lips, and palate when making a speech sound. Structural manner is how closely the speech organs interact with each other.

Figure 2.1: Articulatory (speech) Muscles of the Mouth



Source: Encyclopedia Britannica's Slideshare, 2003

Behrman (2013) indicated the speech transmission follows the basic principles of acoustics as it is transmitted through sound waves. For sound to exist, a source and a medium must functionally be in place.

Sound waves are produced by a vibrating body which moves in one direction and in the process,it compresses the air directly in front of it (Behrman, 2013; Hickok et al., 2011). When the vibrating body moves in the opposite direction, the pressure on the air is lessened so that an expansion or rarefaction of air molecules occurs. Acompression and a rarefaction make up one longitudinal wave. The vibrating air molecules move back and forth parallel to the direction of motion of the wave, receiving energy from adjacent molecules nearer the source and passing the energy to adjacent molecules farther from the source. Sound waves have two general characteristics: A

disturbance is in some identifiable medium in which energy is transmitted from place to place, but the medium does not travel between two places (Behrman, 2013; Hickok et al., 2011). The muscles of respiration are those muscles that contribute to inhalation and exhalation by aiding in the expansion and contraction of the thoracic cavity. The diaphragm and to a lesser extent, the intercostal muscles drive respiration during quiet breathing. Thus, the respiratory system of the body affects sound quality, movement and hearing.

2.3 Speech and Language Formation

Speech cannot completely be separated from language as it is the conversion of language into sound (Kent et al., 1989) had indicated that, speech is of great interest because of its primacy as a language modality and as a motor behavior.They further cited language as one of the most exciting facets of a speech production model.

Speech is a motor skill; the control of the temporal and spatial parameters of speech is important for obtaining perceptually accurate speech, Kent et al (1989). The fact that speech is an extremely complex phenomenon has led to speech production being modeled in various ways. Neural models, articulatory models, vocal tract models, functional models and models of motor control have been proposed to account for various and diverse aspects of the speech production process (Kent et al., 1996; 2002).

Sound formation and movement are affected by the human vocal system comprising the oral cavity, the lips, the tongue, the larynx and pharynx, the palate and the nasal cavity. Articulate speech development in children is not an innate ability; children learn certain sounds and attempt to approximate them by adaptation and dependence on a variety of senses to reach proper

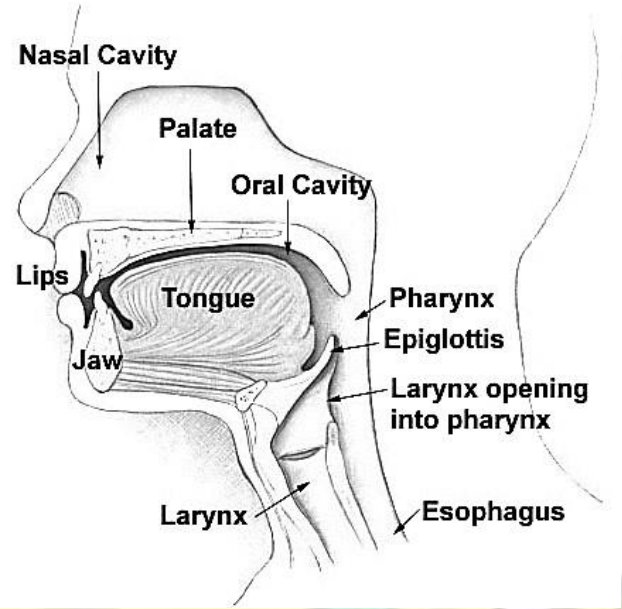
articulation and make use of the spoken words around them resulting in attempts to approximate those sounds (Kent, 2002).

Babies cooing typically begins when they are about 2 months old and by 6 months they start babbling (HealthyChildren.org; chkd.org). By their first birthday babies begin to speak gibberish, called jargon. At two, most toddlers tend to use at least 50 words and are beginning to use twoword phrases. However the age at which toddlers reach these milestones differ from one another and also among sex; female children are said to reach these milestones earlier than their male counterparts (Chen et al. 2001).

Speech and language development is considered a useful indicator of a child's overall development and cognitive ability by experts (Schuster et al., 2000) and is related to school success (Catts et al., 2002, Scarborough et al., 1990, Richman et al., 1982, Bishop et al., 2003 and Stern et al., 1995). The rate at which children reach their speech and language development milestones can vary depending on the child and the environment that surrounds them. Some children will develop certain speech and language skills quicker than others. However, despite a bit of difference between children, we expect most children to develop certain skills within a certain time-frame.
The first formal stage in the speech production process as postulated by Van der Merwe (1997) consists of the linguistic-symbolic planning of the utterance. During this stage, selection and sequencing of the phonemes take place, governed by the phonotactic rules of the language.

Persons with neurogenic communication disorders can exhibit deficits related to language and or motor processes of speech production. However, linguistic and motoric aspects cannot be completely separated in the study of speech production (Robin et al, 1998; McNeil et al., 1997).

Figure 2.2: The Human vocal tract showing parts that affect sound formation and movement



Source: pag.wikipedia.org

Speech-language development in children can be monitored following the speech development milestone from 0 to the 72nd month and beyond.

Table 2.3: Speech development milestone

0 - 12 Months	Speech Sounds: ***/b/p/m/d/*** and vowel sounds by 12 months. Speech: Babble that starts from 6 - 8 months and becomes more complex. Often the first recognisable word occurs around 12 months.
12 - 18 Months	Speech Sounds: ***/m/n/p/b/d/w/h/*** and further vowel sounds. Speech: Possibility of 10 - 20 words by 18 months, mixed with complex babble and jargon.
18 - 24 Months	Speech Sounds: ***/m/n/p/b/t/d/w/h/*** and using most vowel and diphthong sounds accurately. Speech:10-20 recognisable words with jargon. First attempts at 2 syllable words.
24- 30 Months	Speech Sounds: ***/m/n/p/b/t/d/h/w/ng/k/g/.*** Speech: Possibly up to 200 recognisable words in vocabulary by 30 months. Some 2 word combinations. Now 75% understandable to family.
30 - 36 Months	Speech Sounds: ***/m/n/p/b/t/d/w/ng/k/g/h/y/*** and starting to use ***/f/s/.*** Speech: Possibly up to 450 recognisable words by 36 months with some 3 word sentences. Becoming more understandable
36 - 48 Months	Speech Sounds: ***/m/n/p/b/t/d/w/ng/k/g/h/f/s/y/,*** with ***/j/l/r/sh/ch/z/v/sp/st/sk/sl/sm/sn/sw/tr/gr/br/pr/cr/fl/bl/pl/ gl/*** developing by 48 months. Speech:1000 recognisable words and 4-5 word sentences by 48 months.
48 - 60 Months	Speech Sounds: ***/m/n/p/b/t/d/w/ng/k/g/h/f/s/y/v/z/l/r/sh/ ch/j/th/sp/st/sk/sl/sm/sn/sw/tr/gr/br/pr/cr/fl/bl/pl/gl/.*** Speech: Vocabulary up to 1500 words, and utterances are longer and more complex.
60 - 72 Months	Speech Sounds: ***/m/n/p/b/t/d/w/ng/k/g/h/f/s/y/l/r/v/z/sh/ ch/th/sp/st/sk/sl/sm/sn/sw/tr/gr/br/pr/cr/fl/bl/pl/gl/spr/ str/scr/spl***. Speech: Fluent speech with vocabulary of 2000 words and 5-6 word sentences.

Source: National Institute on Deafness and Other Communication Disorders (NIDCD)

2.4 Overview of Speech Disorders

Speech is the verbal expression of language which includes articulation i.e. the way sounds and words are formed, fluency, voice and resonance. Speech disorder is a common developmental difficulty in childhood. It may present either as a primary or secondary difficulty. The primary speech difficulty arises when the disorder cannot be attributed to any other condition while the secondary speech difficulty arises when it is attributable to primary conditions such as: autism, hearing impairment, general developmental difficulties, behavioral or emotional difficulties or neurological impairment (Stark 1981, Plante 1998).

A delay in speech i.e. inability to produce intelligible speech sounds is distinctly different from a delay in language. Children with speech impairment in the preschool years may be at increased risk for learning disabilities once they reach school age (Bashir et al., 1992). Such children are at greatest risk for language-based learning disabilities such as difficulties in reading and writing (Raitano et al., 2004 and Shriberg et al., 2009).

Estimates of the increased risk for poor reading outcomes in grade school are 4 to 5 times greater for children with speech impairment than for children with appropriate development (Tomblin et al., 1997; Catts et al., 2002) and the risk persists into adulthood (Young et al., 2002).

The many other causes of speech disorder include bilingual children with phonological disorders, autism spectrum disorders, childhood apraxia, auditory processing disorder, prematurity, cognitive impairment and hearing loss.

2.4.1 Articulation Disorder

Disorders that impact the form of speech sounds are traditionally referred to as articulation disorders and are associated with structural defects, e.g., cleft palate and motor-based difficulties

e.g., apraxia (ASHA, 2014). Articulation problems can be caused by physical circumstances such as a cleft palate, a disease that causes difficulties producing words or sounds. According to OSLA, articulation problem may also result from hearing loss, cerebral palsy or may be related to other problems in the mouth, such as dental problems (OSLA, 2018).

2.4.2 Voice Disorder

Voice (or vocalization) is the sound produced by humans and other vertebrates using the lungs and the vocal folds in the larynx, or voice box. Voice is, however, not always produced as speech (NIDCD, 2017). Voice is as unique as one's fingerprint. It helps define your personality, mood, and health. Infants for instance babble and coo, adult humans laugh, sing and cry whilst animals bark or moo.

Voice is generated by airflow from the lungs as the vocal folds are brought close together. When air is pushed past the vocal folds with sufficient pressure, the vocal folds vibrate. If the vocal folds in the larynx do not vibrate normally, speech can only be produced as a whisper.

A voice disorder occurs when voice quality, pitch, and loudness differ or are inappropriate for an individual's age, gender, cultural background, or geographic location (Lee et al, 2004). A voice disorder is present when an individual expresses concern about having an abnormal voice that does not meet daily needs—even if others do not perceive it as different or deviant (American SpeechLanguage-Hearing Association (ASHA, 1993).

2.4.3 Fluency

In speech production or composition, fluency is the continuity, smooth-flow, clearness, rate and effortless in speech making. The most common documented fluency disorder is stuttering. It is an interrupted speech-flow, characterized mainly by repetitions of sounds, syllables, words, and

phrases and also prolongation of sounds; blocking, interjections, and revisions which affect the rate and rhythm of a good speech. These disfluencies may be accompanied by physical tension, negative reactions, secondary behaviors, and avoidance of making sounds; words or even speaking (ASHA, 1993; Yaruss, 1998a, 1998b, 1998c and 2004). Cluttering is another fluency disorder characterized by a perceived rapid and/or irregular speech rate resulting into breaking down the speech clarity and/or its fluency (St. Louis & Schulte, 2011).

2.4.4 Resonance

The quality of perceived sound during speech production and the modification of the sound that is generated from the vocal cords are together known as resonance (ASHA, 2008). Vocal resonance is the process by which the basic product of phonation is enhanced in timbre and/or intensity by the air-filled cavities in which it passes to the outside air (McKinney (1994)). In the literature, various terms relating to resonance are used. These include amplification, filtering, enrichment, enlargement, improvement, intensification, and prolongation. The size and shape of the cavities of the vocal tract (spectral balance); the pharyngeal cavity, the oral cavity and the nasal cavity determine resonance (ASHA, 2008).

2.5 Language Disorders

A language disorder according to the National Institute on Deafness and Other Communication Disorders (NIDCD, 2017) is an impairment that makes it hard for someone to find the right words and form clear sentences when speaking. It can also make it difficult to understand what another person says. A child may have difficulty understanding what others say, may struggle to put thoughts into words, or both. Language disorder is in two main forms; expressive and receptive language disorders.

Usually, all children who begin producing first words and first-word combinations late are

erroneously referred to as late talkers. According to the literature, children who demonstrate delays in the early stages of language development and whose deficits persist past the age of 4 are termed late talkers. (Rescorla & Schwartz, 1990). However, there are the late bloomers who exhibit early language delays, particularly between the ages of 12 to 24 months, and by age 4, make substantial gains in their language development such that they no longer appear to have a delay (Rescorla, 2005).

Often, children whose language difficulty in the absence of known neurological, sensory, intellectual, or emotional deficit has primary language impairment termed as Specific Language Impairment (SLI). Children with SLI may be intelligent and healthy in all regards except in the difficulty they have with language.

According to a study by the National Institutes of Health of the United States, the incidence of SLI was recently estimated to be 7.6% among 5-year-old children (ASHA 2001).

Studies have indicated that language disorder may have adverse effects upon school achievement (c.f Aram 1984, Bishop 1990, Catts 1993, Tallal 1997, Baker 1987) as well as social, emotional and behavioural problems (Huntley 1988; Rice 1993; Rutter 1992; Cohen et al, 1998; Stothard 1998).

Language problems can involve difficulty with grammar (syntax), words or vocabulary (semantics), the rules and system for speech sound production (phonology), units of word meaning (morphology) and the use of language particularly in social contexts (pragmatics). Speech problems may include stuttering or dysfluency, articulation disorders, or unusual voice quality. Language and speech problems can exist together or by themselves (ASHA, 2014).

2.5.1 Expressive Language Disorder

According to Logsdon (2007), an expressive language disorder is a communication disorder where the individual has difficulty with expressing one's self due to the inability to retrieve or recall words and organizing them in a meaningful manner. An individual with expressive language disorder is better able to understand what is being said than what being able to express ideas or thoughts Moraless (2006).

The American Speech- Language –Hearing Association (ASHA, 2008) also refers to expressive language disorder as a communication disorder in which there are difficulties with verbal and written expression. It is a specific language impairment characterized by the use of expressive spoken language that is markedly below the appropriate level for the mental age, but with a language comprehension that is within normal limits (wikipedia). Expressive language disorder can be further classified into two groups: developmental expressive language disorder and acquired expressive language disorder. Developmental expressive language disorder currently has no known cause, is first observed when a child is learning to talk, is more common in boys than girls, and is much more common than the acquired form of the disorder. Acquired expressive language disorder is caused by specific damage to the brain by a stroke, traumatic brain injury, or seizures (Speech Works, 2008).

2.5.2 Receptive Language Disorder

A child with receptive language disorder has difficulties with understanding what is said to them. The symptoms vary between children but, generally, problems with language comprehension begin before the age of three years. Children need to understand spoken language before they can use language to express themselves (ASHA, 2018). In most cases, children with a receptive

language problem also have an expressive language disorder, which means they have trouble using spoken language.

It is estimated that between three and five percent of children have a receptive or expressive language disorder, or a mixture of both. Another name for receptive language disorder is language comprehension deficit. Speech–language therapy is used to treat receptive language disorder (ASHA, accessed online, April 2018).

The condition of difficulty in understanding both written and spoken language is also known as Wernicke's aphasia or receptive aphasia (Brookshire, 1993; 2007). People with Wernicke's aphasia may demonstrate fluent speech i.e. typical speech rate, intact syntactic abilities and effortless speech output. Wernicke's aphasia is regarded as an acquired language disorder experienced in many different ways and manifest in different degrees. People diagnosed with Wernicke's aphasia show severe language comprehension deficits depending on the severity and extent of the lesion (Brookshire, 2007). The severity levels range from being unable to understand the simplest spoken and written information to missing minor details of a conversation (Brookshire, 2007). Many people diagnosed with Wernicke's aphasia also have characteristics such as repetition in words and sentences as well as memory problems (ASHA, accessed online, April 2018).

2.6 Prevalence of Speech and Language Disorders

Speech and language disorders are among the most common of childhood disabilities. According to the literature, about 5% – 8% of preschool children in developed countries are affected by speech and language disorder (King et al., 2005; Reilly et al., 2009). There is, however, limited information and little context-based research focusing on the prevalence of speech and language disorders in low-income countries (Nwanze, 2013; Olusanya, Ruben, & Parving, 2006).

In a study in Ghana, Gadagbui (2007) underscored that, 46% of 120 pupils randomly selected from Basic school 1 – 6 between the ages of 5 and 8 years had speech and/or language impairments, precisely pronunciation, spelling and reading problems. Data at the ENT Department of the Komfo Anokye Teaching Hospital indicate that, between 1994 and 1997 the department attended to 623 patients with various speech disorders (Osei-Bagyina, 2000).

2.7 Signs and Symptoms of Speech and Language Disorders

Signs of a speech sound disorder among children can well be identified at different age levels. Between 1 and 2 years, words of p, b, m, and w, are said incorrectly; between 2 and 3, k, g, f, t, d and n words are said incorrectly and produce speech that lacks clarity, even to familiar people. Language Disorder on the other hand can be noticed even at birth or much later. Signs include lack of smile or interaction with others (at birth and older), lack of babbling (4-7 months) and making only a few sounds or gestures, like pointing (7-12 months). Other signs are lack of understanding of what others say from 7 months to 2 years, can only say a few words between 12 and 18 months. Difficulty in understanding words between 18 months and 2 years; inability to put words together to form a sentence(s) between age 1.5 and 3; trouble interacting (playing and talking) with other children at age 2 to 3 years and trouble with early reading and writing skills at age 2.5 to 3 years (IDS, 1985).

2.8 Risk factors of Speech and Language Disorders

Several factors have been implicated for disorders in speech development amongst children. Notable among them as described by speech-language pathologists and pediatric experts are discussed in this section.

The United States Preventive Services Task Force (USPSTF) developed a list of specific risk factors to guide primary care providers in selective screening. Their report indicated family history

of speech and language delays, gender, and perinatal factors, such as prematurity and low birth weight as the major and most consistent risk factors that affect speech and language development (Berkman et al., 2015).

Christine et al., (2010) also stated in a study that, congenital abnormality, maternal age greater than 35 years and maternal medical history factor were associated with increased risk for speech impairment. Prematurity and very low birth-weight were significant risk factors for specific language impairment. Prenatal exposure to alcohol was a significant risk factor for speech impairment whilst low maternal education was associated with decreased risk for speech and or language impairments. These factors are discussed in detail below:

2.8.1 Gender

According to a new study using data from the Norwegian Mother and Child Cohort Study, boys are at greater risk for delayed language development than girls. The study included more than 10,000 children from week 17 of pregnancy up to five years of age. The researchers used data from questionnaires completed by the mothers who are participating in the study. The researchers classified the language difficulties at three and five years of age in three groups: persistent delayed language development (present at both times), transient delayed language development (only present at three years) and delayed language development first identified at five years old. Boys were in the majority for the groups with persistent and transient language difficulties.Ystrøm, the supervisor of the research explained that boys are biologically at greater risk for developmental disorders in utero than girls. The levels the male sex hormone (testosterone) in amniotic fluid was found to relate to the development of both autism and language disorders. The researchers found that gender was irrelevant for the third group who had language difficulties that begin sometime between three and five years of age (NIPH, 2014; Zambarna et al., 2013).

Longo et al conducted a survey of 524 children users' medical records children between 0 and 11 years of age, completed, residing in the western region of the city of São Paulo and assisted at the Speech-Language Clinic of Universidade de São Paulo in the period between 2002 and 2011. The results obtained at the end of the study which was to determine the prevalence of speech and language disorders showed that the male children representing 68.3% and those from 3 to 6 years old predominated representing 48.7% (Longo et al., 2017).

2.8.2 Birth-weight

Very low birth-weight is often considered to be a risk factor for speech and language disorders. Aram et al., 1991, compared speech and language comprehension and production between 249 very-low-birth-weight (<1.5 kg) and 363 normal birth-weights randomly sampled in a geographic area. Their result revealed that, average performance for the entire group of very low birth-weight children. When very low birth-weight children with major neurologic abnormalities were excluded, the study reported significantly lower speech-language disorders than for controls. Their study further indicated that a higher proportion of very low birth-weight children than the control children did present subnormal language associated with IQ less than 85, hearing deficits, and or major neurological impairments. They, however, concluded that specific language impairment is not more common among very low birth-weight than control children.

In a separate study by Wright et al., (1983), a group of 70 low birth weight infants and 49 matched controls were studied at 3.5 years of age for speech and language development and hearing acuity as part of an ongoing developmental study of low birth weight infants. Their results showed that the low birth weight infants were found to be significantly delayed in language expression and comprehension when compared with their controls. There was not a significant difference between the two groups in speech articulation or hearing.

2.8.3 Premature Delivery

The World Health Organization (WHO) defines prematurity as babies born before 37 weeks from the first day of the last menstrual period. Recent data indicate that >1 in 10 babies born around the world in 2010 were premature and this translates to an estimated 15 million preterm births (Blencowe et al., 2012). The numerous efforts to prevent preterm birth have had little success (Alexander et al., 1991, Copper et al., 1993, Goldenber g et al., 1994, Goldenberg et al., 1996, Goldenberg et al., 1998,). Unfortunately, many of the better-established and more-predictive risk factors are either immutable in the current pregnancy or, because of our present state of knowledge, pose significant challenges for either prevention or effective intervention.

Several studies of the developmental outcome of premature low-birth-weight infants have highlighted a series of persistent deficits in cognitive ability across the life span (Landry et al., 1997, Bhutta et al., 2002, Hack et al., 2002). Children born preterm seem to be at an increased risk for typical trajectories of cognitive development and are over-represented among those with attention problems, language difficulties, and poor school performance (Cherkes-Julkowski et al., 1998).

According to Cherkes-Julkowski et al (1998) preterm birth is likely to impact significantly on brain development since the central nervous system of the premature baby is not fully prepared to function independently outside the intra-uterine environment.

According to a recent study published in a journal for the Society of Neuroscience (eNeuro, 2017) reveals that prematurity is linked to language and speech delays in babies. In this study90 premature infants born less 30 weeks gestation weeks underwent diffusion MRI up to four times during their stay in the neonatal intensive unit at the St. Louis Children's Hospital between 2007

and 2010. They followed up with neurodevelopmental checkups at age 2. For comparison, they selected 15 full-terms that had undergone brain scans within four days of birth to show uninterrupted brain development.

Dr. Monson found a link between delayed development of the non-primary auditory cortex and common language delays seen by age two. This finding suggests that damage or disruption to this part of the brain as a result of prematurity may contribute to language and speech problems often reported in children who were premature at birth (e-Neuro, 2017).

2.8.4 Family History with Specific Language Impairment

There are several specific types of speech and language disorders that appear to be closely tied with genetics. Scientists have begun identifying specific genes that are responsible for the ways we speak and communicate (Speech Buddies, 2018).

Deficits in speech and language functions can be of numerous types, including aphasia, stuttering, articulation disorders, verbal dyspraxia, and specific language impairment; language deficits are also related to dyslexia. Most communication disorders are prominent in children, a number of these disorders have been shown to cluster in families, suggesting that genetic factors are involved, but their etiology at the molecular level is not well understood (Kang et al., 2011).

Probably the most important discovery has been the genes FOXP2, KIAA0319, CNTNAP2, ATP2C2, and CMIP. In 2001 scientists from the U.K. found that rare mutations of FOXP2 can be responsible for many members of the same family struggling with specific language impairment (SLI). This gene encodes a forkhead domain transcription factor, a finding that has led researchers to a new avenue of investigation into the substrates and mechanisms that underlie human speech development (Kang et al., 2011). Researchers have also found genetic links with other genes to

stuttering, speech-sound disorder, and developmental verbal dyspraxia (DVD), (Speech Buddies, 2018; Kang et al., 2011).

DeThorn et al., (2006) reveals that, the extent of genetic and environmental factors influencing articulation and language difficulties of children. They also revealed the phenotypes associated with such difficulties and direct assessments of reading-related skills during early school-age. Feedbacks from the parent-report survey provided converging evidence of genetic effects on children's speech and language difficulties and suggest that children with a history of speechlanguage difficulties are at risk for lower performance on early reading-related measures. The extent of the risk, however, differed across measures and appeared greatest for children who demonstrated a history of difficulties in articulation, expressive and receptive language issues.

2.8.5 Low Parental Education

One of the features of early language delay is that it is much more common in children from socially disadvantaged households, where there are fewer resources, where parental education is often lower and where the opportunities provided to children are more restricted (Roulstone et al., 2011). For example, the UK's Millennium Cohort Study of 18,000 children found that children from the most socio economically disadvantaged groups are twice as likely to experience language delay (MCH 2018). It is likely that social factors compound genetic ones across childhood, especially for children from more socially disadvantaged backgrounds (Turkheimer et al., 2003; Rowe et al., 1999; Friend et al., 2008) and the chances of a child having language delay increases where there is a family history of language delay, or reading, writing or learning difficulties (Shriberg et al., 2003; Reilly et al., 2007; Henrichs et al., 2011).

The relation of socioeconomic status and parent education on the vocabulary and language skills of children who do and do not stutter was studied (Richels et al. 2013) using the Hollingshead Four

Factor Index of Social Position (i.e., Family Socioeconomic Status, (SES)) was used to calculate SES based on a composite score consisting of weighted values for paternal and maternal education and occupation. The results show that maternal education contributed the greatest amount of variance in vocabulary and language scores for the Children with Special needs (CWSN) and for participants from both groups whose family SES was in the lowest quartile of the distribution. However, their results were generally consistent with existing literature on normal language development that indicates maternal education is a robust predictor of the vocabulary and language skills of preschool children.

2.8.6 Ineffective Speech Muscles

Effective control and co-ordination of the speech muscles especially the lips and tongue contribute to sound production. Orbicularis Oris is the sphincter muscle of the mouth, many of the other facial muscles blend in with it. Its fibers run in several directions. The intrinsic fibers extend from the incisive slips under the nose to the mental slips at the midline under the lower lip. Upon contraction, this muscle adducts the lips by drawing the lower lip up and the upper lip down; it may also pull the lips against the teeth and round the lips by its sphincter action to aid pronunciation of words. Thus lack of coordination and effective control of these muscles can affect speech development (Cichero & Murdoch, 2006).

2.8.7 Cognitive Development

Cognitive development and cognitive functioning of children have been found to correlate highly with their speech and language development. Thus, making a child's speech-language development a very good indicator of his I.Q. (Oller, 2014). Mentally alert young children usually talk early. They also understand or comprehend early what is communicated to them through

language. However, a delay in some months due to illness or other factors does not necessarily imply dullness.

2.8.8 The Environment

One important environmental factor that contributes to individual differences in early language development is the amount of language that parents direct toward their children. Language development is supported and shaped by a child's social environment (Hoffman, 1986) and any delays in development tend to persist from childhood (Conti-Ramsden, 2001), into adolescence (Johnson et al., 2011) and through adulthood (Rutter et al., 1992).Some variability in language development may be due to genetics; however, environmental factors play an integral role in this development (Hoffman, 1986; Stromswold, 2001).

Children's language skills are also specifically associated with the linguistic abilities of the parents (Hoffman, 1986). The correlations between parents' and children's language skills may reflect genetic as well as environmental inputs. The environmental inputs that effect children's language skills include sophistication of parental vocabulary (Weizman & Snow, 2001)

There is compelling evidence that children benefit from childrearing in an environment that has varied and age-appropriate educational opportunities and early intervention services if provided early in life and at the correct level of intensity prior to elementary school enrollment. An Institute of Medicine (IOM) report (2000) promoted the benefits of early environmental stimulation, stating that "the course of development can be altered in early childhood by effective interventions that change the balance between risk and protection, thereby shifting the odds in favor of more adaptive outcomes."

2.9 Hearing Loss

Hearing loss or hearing impairment can be referred to as a partial or total inability to hear (EBO, 2011). The level of hearing loss ranges from mild (25 to 40 dB), moderate (41 to 55 dB), moderatesevere (56 to70 dB), severe (71 to 90 dB) to the highest level referred to as profound (greater than 90 dB) (DHL, 2015). The condition is of three main types: conductive hearing loss, sensorineural hearing loss, and mixed hearing loss (Smith et al., 2014). Hearing loss is diagnosed when hearing testing finds that a person is unable to hear 25 decibels in at least one ear (Lasak, et al., 2014).

With the advancement of technology, today's children with hearing loss are expected to develop listening and spoken language skills and become an effective communicator. Research has shown that, "With early detection, early amplification and effective individualized therapy with parent participation, up to 80% of children born deaf can potentially be successful in mainstream education and society" (Moeller, 2000). The new millennium has brought about advancements in hearing technology, early identification, and intervention. The Universal Newborn Hearing Screening Program has led to early detection and amplification taking advantage of the "critical period" (Birth-3 years) for developing the auditory pathways. The goal for today's children identified with hearing loss is to follow a developmental model of intervention versus a remedial model (Mellon et al., 2009).

In determining an optimal hearing screening strategy for children 3 – 5 years of age, providers are advised to work with a local audiologist to determine the screening method(s) best suited to their setting and population. Since the mid-1960's, pure tone (PT) screening has been used widely to screen school-aged children for permanent hearing loss (PHL) and employed on a more limited scale with preschool children (AAATF, 2011; ASHA, 2015).

5.1 Milestone vs. Bilingualism

It is important to note that bilingualism in children is categorized into two main types; simultaneous and sequential. Whilst simultaneous bilingualism refers to the acquisition of both languages from birth, in sequential bilingualism, a second language is acquired later before the age of 3 (De Houwer, 2007). This actually implies that fundamental milestones in language development such as babbling, learning to say their first words and the emergence of word combinations are achievable at the same rate despite the fact that they have less exposure to each language compared to their monolingual counterparts.

From the records of this study, it was observed that, the Twi language which happens to be the most widely spoken language in Ghana cuts across the bi-and-multilingual children. Even though the study did not delve into finding out at what stage a second or third language was acquired, it is believed that in most cases the common and or the native language of the parents was first acquired and subsequently a second language acquired at a later time. Nonetheless, according to the experts, bilingualism whether simultaneous or sequential do not have significant impact on speech and language development. It has been gathered from recent studies that there is no scientific evidence showing that bilinguals are more prone to having speech and language disorders than monolinguals. Thirdly, bilinguals with speech and language disorders are not at a greater disadvantage than their monolingual peers, all things being equal. Children with speech and language disorders can learn two languages, as can children with Down Syndrome (Bird et al., 2005), Attention Deficit Hyperactivity Disorder (ADHD), Autism and Hearing Impairment (Waltzman et al., 2003).

Monolingual children with speech and language disorders learn language, although at a slower pace and level compared to their unaffected peers. Likewise, bilingual children with speech and

language disorders learn two languages relatively slower and perhaps not to the same level as their typically developing bilingual peers. They, however, are at par with their monolingual peers in terms of speech and language disorder, if given similar opportunities. Thus, language development can be typical or otherwise irrespective of the number of languages the child is exposed to (CruzFerreira, 2011; Kohnert, 2010). These assertions well agree with the observations of this study as there was no particular trend in relation to bilingualism with speech-language delays/disorder neither was there a trend with regards to monolingualism and speech-language delay/disorder.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

In developed countries such as United States, Canada, United Kingdom and Australia, numerous studies have investigated the prevalence of speech and language disorders or delay (ASHA, 2015). For instance, a study by Law et al. (2000) in the United Kingdom which reviewed literature related to screening for speech and language delays revealed the prevalence of speech and language disorders to be 2-25% of children with a median prevalence of 5.95%. In Ghana, however, few studies have been done on prevalence of speech and language disorder or delay. Osei-Bagyina, 2000 and Gadagbui, 2007 are among the few leading published works on speech and language impairments in Ghana.

The rational for this study is to examine the prevalence of individuals with speech and language disorders at the Komfo Anokye Teaching Hospital (KATH) and classify the problem under several factors including gender and age. As earlier stated, this chapter of the study contains description on the design of the study, the study area, source of data, the study population, the inclusion and exclusion criteria, the assumptions of the study as well as ethical consideration that was taken in order to protect the confidentiality of the study participants.

3.2 Study Design

According to Newman et al., 1998, research approaches or designs are plans and the procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis and interpretation.

Creswell 2007 also referred to a research design to be a type of inquiry that falls within qualitative, quantitative or both approaches. This has been corroborated by several other researchers. Bryman (2007), underscored that, the adoption of one or more of these common approaches in research largely depend on the data needed to answer the research questions. In order that the researcher

could obtain useful information regarding the prevalence of the speech and language disorders at KATH, the quantitative approach was adopted as the most suitable.

3.3 Study Site

The study was conducted at KATH in the Kumasi metropolis of Ghana. Kumasi is the capital city of the Ashanti Region, a very important and historical center for Ghana located in the middle belt of the country. The city is situated at elevation of 250 m with a total area of 254 km^2.The city's population and density as at 2013 were 2,069,350 and 8,100/km^2, respectively. It is a city characterized by a tropical wet and dry climate, with relatively constant temperatures throughout the course of the year. Kumasi averages around 1400 mm (55") of rain per year with two rainy seasons: a longer season from March through July and a shorter rainy season from September to November.

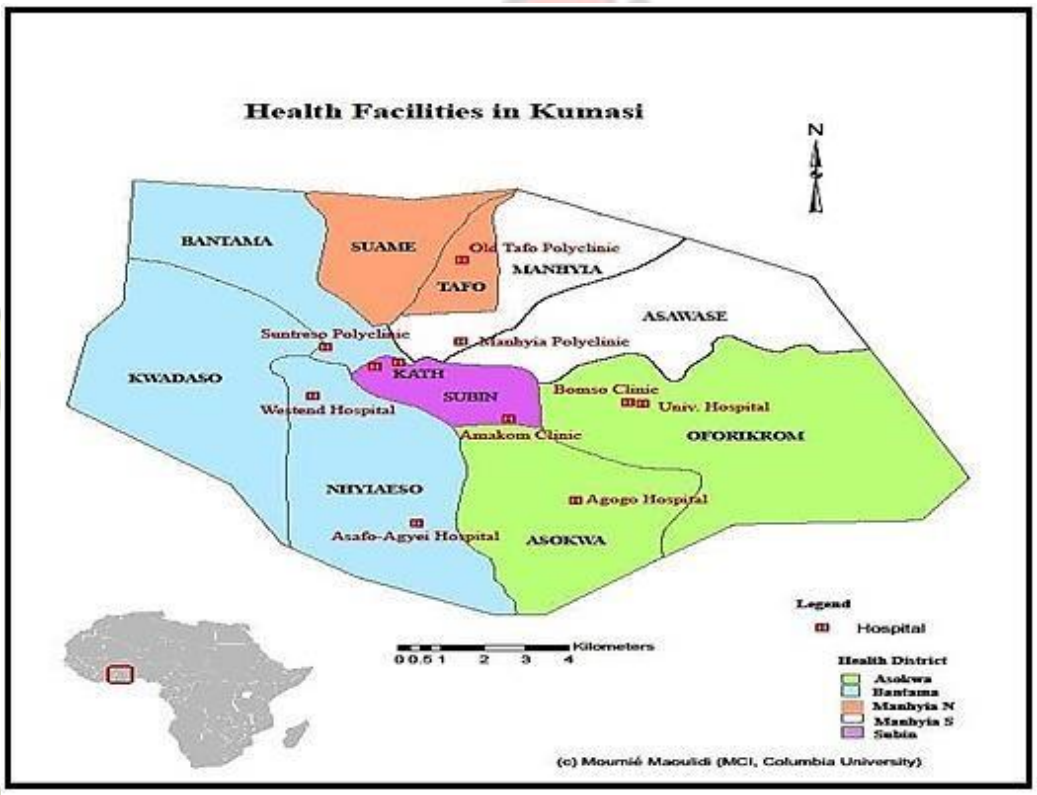
The Komfo Anokye Teaching Hospital (KATH) is the principal hospital in the Ashanti Region which serves as a referral Center. As a referral hospital, KATH takes care of the health needs of the people of the Ashanti Kingdom, the three regions of the North, Ahafo, Bono and Bono East as well as some parts of the Volta, Central, Eastern and Western regions of Ghana. This study was therefore carried out at the EENT Department of KATH where all cases of speech and language impairments are referred to.

This facility within KATH was setup in 1993 through the help of Commonwealth Society of the Deaf and by Professor G.W Brobby, the then Head of Department of Eye, Ear, Nose and Throat (EENT).

There were two major sources from which the researcher drew data for the research and they included; primary and secondary sources. The primary data was obtained by reviewing the records

of clients who visited the facility within the period under review. Secondary data was however sourced from existing literature journals, books and other statistical documents. The study therefore made use of both published and unpublished works as sources of data for the study. The researcher equally made use of search engines such as googlescholar.com to discover new information.

Figure 3.4: Health facilities in Kumasi



Source: Wilkipedia (https://en.wikipedia.org/wiki/List_of_hospitals_in_the_Ashanti_Region)

3.4 Study Population

A study population refers to a group of people with common characteristics from which we draw the sample. With regards to the population for this current study, the targeted individuals were the records of both adults and children who reported at the hospital with speech and language disorders or delay from January 2015 to December 2017. This was done after the researcher had gotten an

approval from the Ethics and Publication Unit of the hospital and also an approval from the Committee on Human Research, Publication and Ethics, School of Medicine and Dentistry.

3.5 Inclusion Criteria

Only clients who visited the Speech and Language Unit with complaints of either speech or language disorders or delay or both conditions between 2015- 2017 and whose records were available were included in the study.

3.6 Exclusion Criteria

All clients who visited the facility outside the period of the study were excluded from the study. Again, patients who visited the speech and language Unit within the period under review whose records could not be traced were also excluded from the study.

3.7 Sampling Method/ Technique

According to Trochim (2006) sampling involves the process of selecting units from a population of interest so that by studying the sample, we may generalized the outcome back to the population from which samples were drawn. In this study, convenience sampling technique which is a type of non-probability was employed. Thus, the researcher chose the samples based on availability and time convenience. In that regard, only records of prospective clients which were available at the time of the data collection were what the researcher relied on. The researcher however could not determine the sample size for the study by using any statistical formula; hence the sample size was all patients who patronized the Unit within the study period.

3.8 Data Collection Instrument and Tool

Data collection tools according to Kothari (2004) refer to the instruments used in performing research operations such as the recording and processing of data. In this study, the researcher

sought firsthand information with regards to the variables of interest from the cases reported from year 2015 to 2017 on speech and language disorders/delay. Information was gathered from the Records book in the speech room by taking down their folder numbers. The folder numbers were then traced with the folders from the records unit of the ENT unit of EENT Directorate. Further information was obtained from the case history otherwise known as the assessment form for children from 0 to 5 years of age.

Collected data was organized and entered on the data collection sheet as shown in appendix. Thereafter, statistical tools such as SPSS and Microsoft Excel was used to evaluate and analyze the data.

Descriptive statistics such as the average, standard deviation, median values etc. of reported cases were determined. Distribution of the dataset was also determined to inform further statistical analysis such as t-test and p-test to determine the statistical significant difference among variables of interest. Other analysis of interest was to determine the correlation (relationship) between reported cases on one hand and age, gender and ethnicity of patients on the other hand.

3.9 Ethical Consideration

Biodata of clients especially their names were kept confidential to serve as a means of ensuring their anonymity. Codes were allocated to clients and these were only recognized and handled by the author. These codes only serve as a guide to aid the investigator in the analysis. They were not used in the final presentation whatsoever. And in an event where the investigator had to interview a client or their guardian, their consent was sought before any information was obtained from them. They were made to understand that information obtained from them was mainly for academic purposes.

3.10 Study Limitation

Although the study provided some light regarding prevalence of speech and language disorders/delay at KATH, there is however difficulty in generalizing the findings to the entire population due to the limited number of records reviewed due to limited time frame coupled to the fact that, study was conducted within a hospital.

3.11 Data Analysis

The data was analyzed using Microsoft Excel and SPSS (Statistical Package for Social Sciences) software version 23. The data was first entered into Excel and then transported to SPSS for further analysis. After the data was entered, SPSS was used to compute percentages, frequency tables, charts, and descriptive statistics.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.1 Introduction

This chapter deals with the presentation of the results of the study carried out at the Speech and Language Therapy Unit, ENT Department of the Komfo Anokye Teaching Hospital (KATH). The

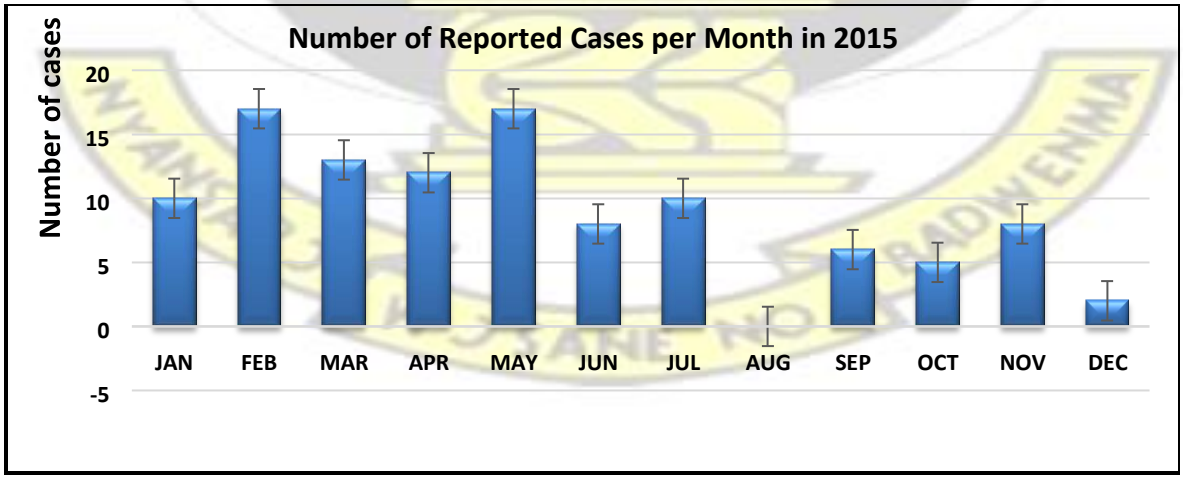
results are presented as frequency tables, bar as well as pie charts. The core of the study focused on determining the prevalence of speech and language delay or disorders among children (1-15 yr) recorded at the speech and language therapy unit at KATH over a three year period from 2015 to 2017.

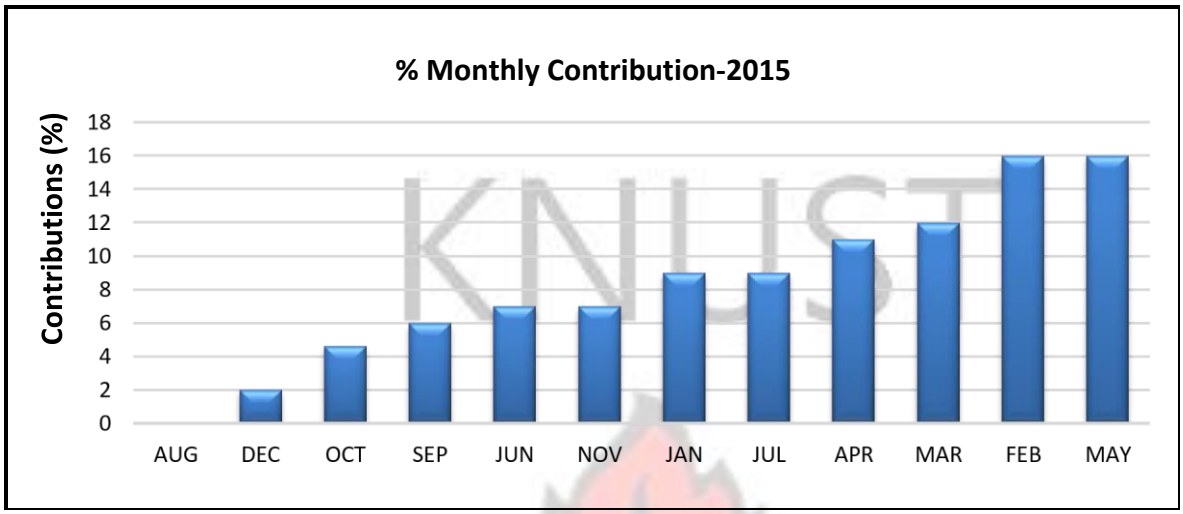
Table 4.1: Frequency of reported cases per month for the period of study: 2015, 2016 and 2017

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2015	10	17	13	12	17	8	10	0	6	5	8	2	**108**
2016	11	11	11	12	11	4	9	11	7	7	6	7	**107**
2017	17	12	18	16	16	19	14	33	19	21	29	10	**224**

The table 4.1 above contains the data of reviewed records for the period 2015 to 2017. From the records, it was observed that, a total of 108 clients sought the services of the speech and language therapy Unit in the year 2015. Similarly, a total of 107 patients visited the facility in 2016 whereas in 2017, the total number was more than double the reported cases in 2015 and 2016.

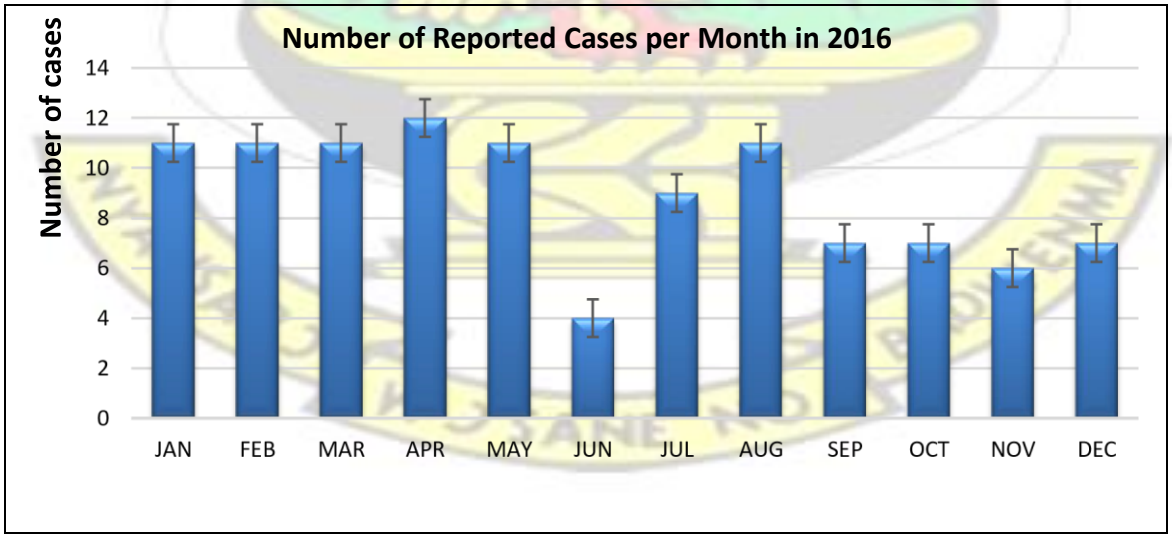
Figure 4.1: Monthly variation of cases in 2015

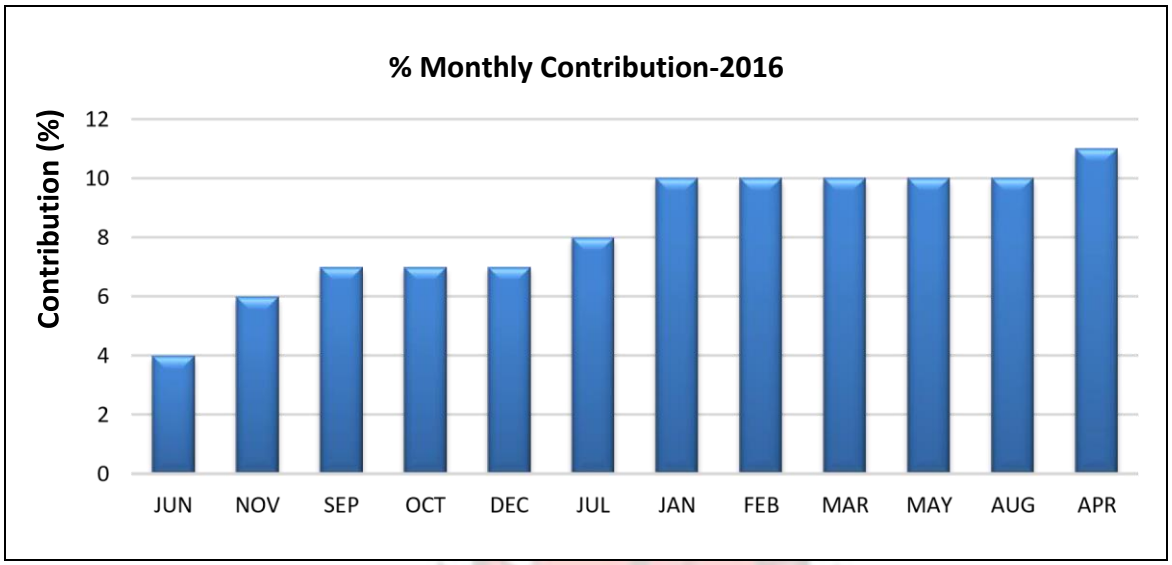




Records of year 2015 are depicted in Figure 4.1. In this year, there were no recorded cases for the month of August and this was attributed to the absence of the speech therapist. Nevertheless, of the available data, December recorded the least number of cases with only 2 (2%) while February and May recorded the highest number of cases; 17 cases apiece representing 32% cumulatively.

Figure 4.2: Monthly variation of cases in 2016





In the year 2016, the records illustrated in Figure 4.2 showed that, April recorded the highest number of cases with records of 12 cases (11%), followed by January, February, March, May and August with 11 cases each (10%).

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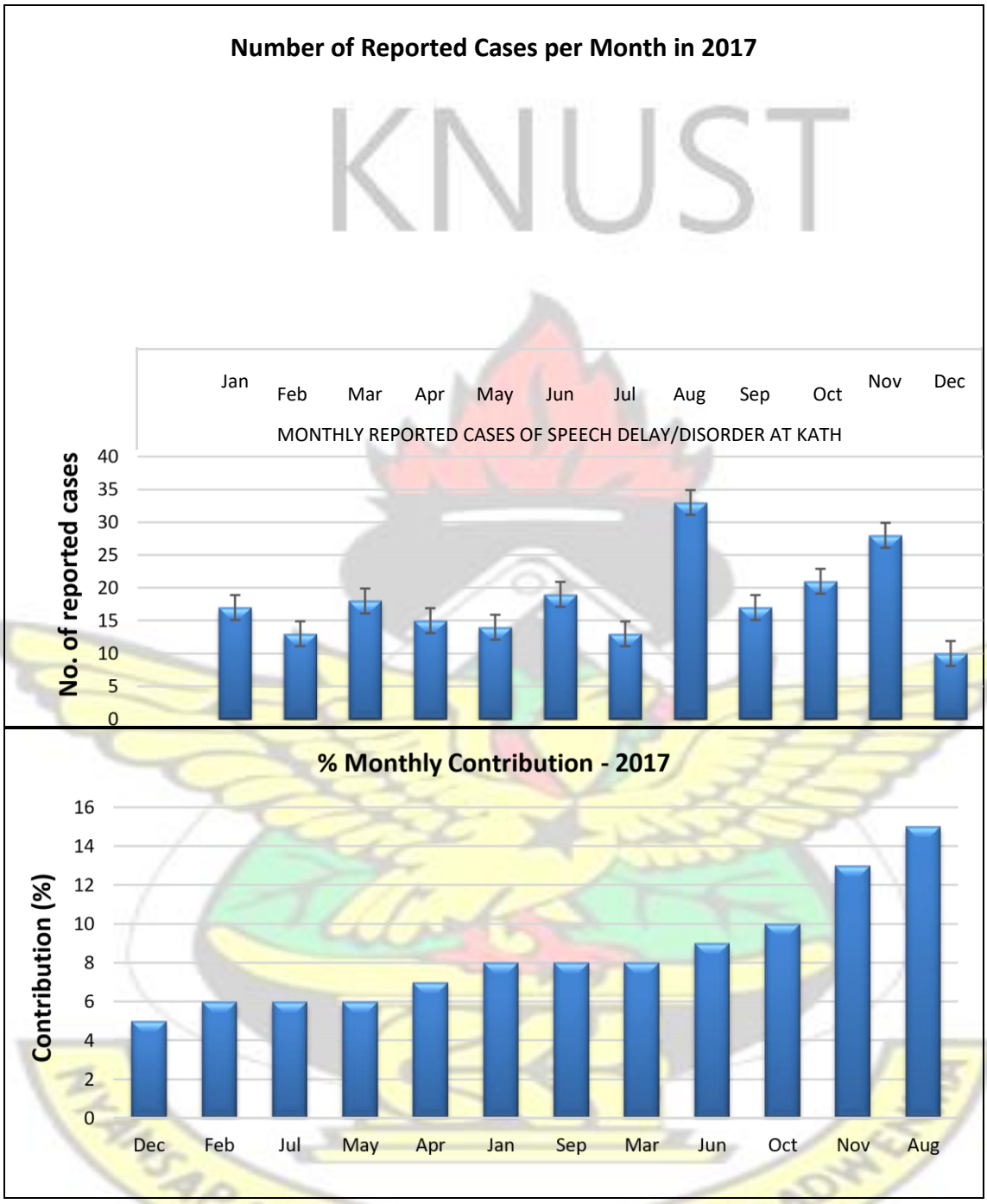
Figure 4.3: Monthly variation of cases in 2017



The data, as indicated in Figure 4.3 showed that the month of August recorded the highest number of cases; 33 cases representing 15% of the entire 2017 reviewed year. December on the other hand recorded the least number of cases; 10 cases representing 5% of recorded cases in 2017.

Table 4.2: Frequency for reported cases according to gender

	MALE	FEMALE	TOTAL
2015	78	30	108
2016	82	25	107
2017	165	59	224
TOTAL	**325**	**114**	**439**

Cumulatively, a total of 439 cases were recorded for the years (2015, 2016 and 2017) under review. Out of this number, 325 were males representing 74% while the remaining 114 (26%) were females. The year-by-year records shows that, in 2015, 78 males and 30 females reported. For 2016, the reported number of males and females were 82 and 25, respectively; and in 2017, the male and female numbers rose to 165 and 59 respectively. These data are graphically presented in Figure 4.4.

Figure 4.4: Number of cases reviewed per gender

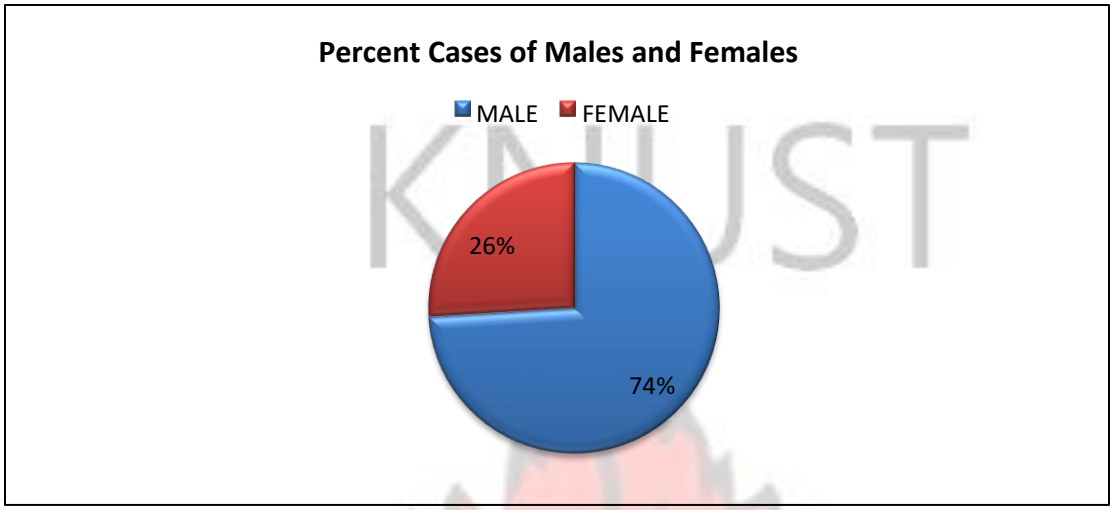
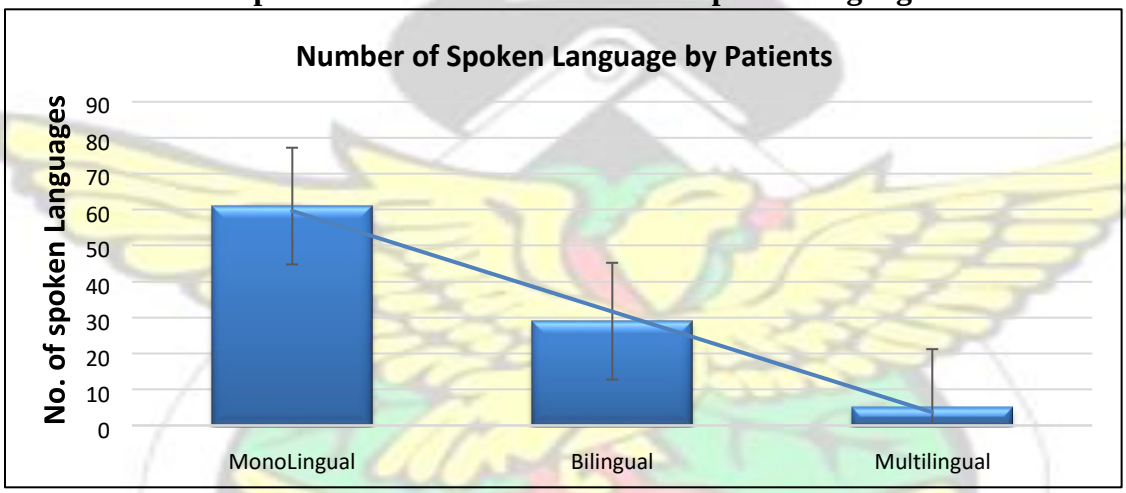


Figure 4.5: Relationships between cases and number of spoken languages



The chart above shows the languages spoken in the homes of children who visited the facility in 2017. The chart indicates that, 61 of them came from monolingual families, 29 from bilingual homes while 5 of them were from multilingual families.

Table 4.3: Correlation between number of spoken languages and reported cases

Correlations				
	Number_of_cases	Monolingual	Bilingual	Multilingual

Spearman's rho	Number_of_ cases	Correlation Coefficient	1.000	.254	.836**	.942**
		Sig. (1-tailed)	.	.213	.000	.000
		N	12	12	12	12
	Monolingual	Correlation Coefficient	.254	1.000	.507*	.093
		Sig. (1-tailed)	.213	.	.046	.387
		N	12	12	12	12
	Bilingual	Correlation Coefficient	.836**	.507*	1.000	.732**
		Sig. (1-tailed)	.000	.046	.	.003
		N	12	12	12	12
	Multilingual	Correlation Coefficient	.942**	.093	.732**	1.000
		Sig. (1-tailed)	.000	.387	.003	.
		N	12	12	12	12
**. Correlation is significant at the 0.01 level (1-tailed).						
*. Correlation is significant at the 0.05 level (1-tailed).						

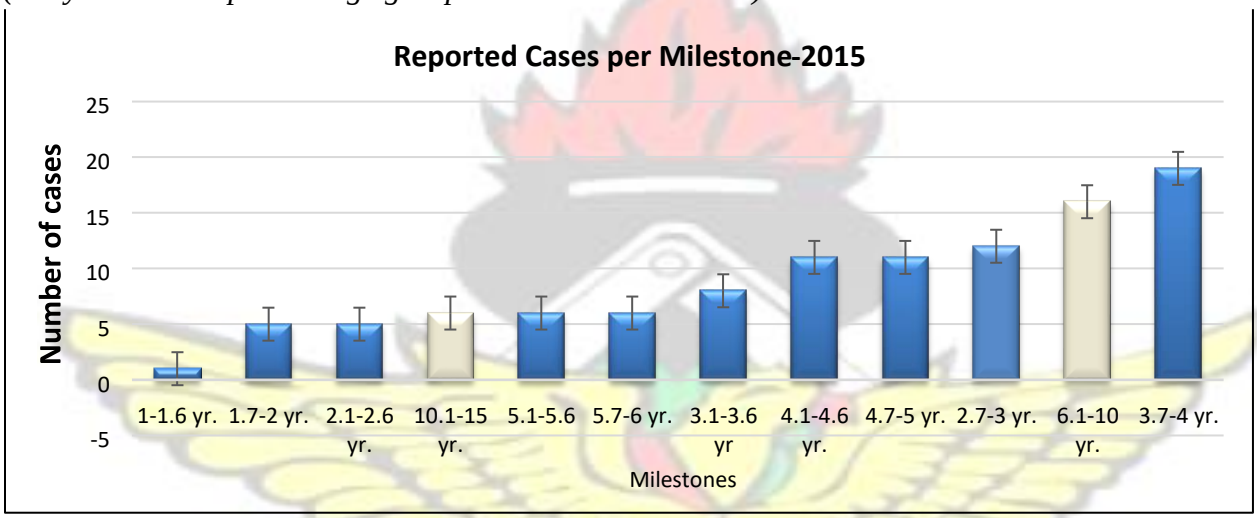
A further assessment of bilingualism was determined with SPSS by finding the correlation between number of spoken language (independent variables) and number of reported cases (dependent variables) using Spearman's correlation method at both 0.05 and 0.01 significant figures. Spearman's correlation coefficient measures the strength and direction of association between two ranked variables; either the two variables increases together or one increases as the other decreases. Spearman's correlation method was selected as opposed to Pearson's because the data were not perfectly normally distributed. Spearman's correlation method is a better choice for slightly skewed data like those of this study. Spearman's coefficient (r_s) takes values between +1 and -1; where r_s of +1indicates a perfect association of variables, r_s of zero indicates no association between variables and r_s of -1 indicates a perfect negative association of variables. The closer r_s is to zero, the weaker the association between the variables.

The correlation results as can be seen in Table 4.3 indicate a very strong positive relationship between number of cases and both bilingual and multilingual with correlation coefficients of 0.836

and 0.942, respectively. This means that the number of cases tend to increases with increase in bilinguals and multilinguals. Although there was a positive relationship between number of cases and monolingual, the relation was relatively weak with correlation coefficient of 0.254. It is important to mention that bilingual and multilingual showed moderate and very weak positive relationships with monolingual, with coefficients of 0.507 and 0.093, respectively.

Figure 4.6: Cases per milestones and cases outside the milestone bracket for 2015

(Gray columns represent age groups outside the milestone)

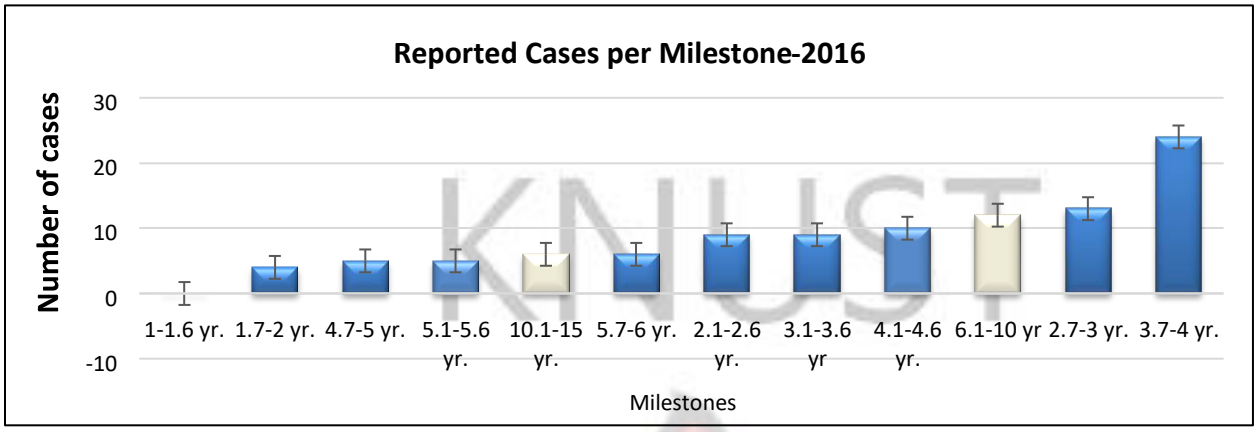


It is important to note that, age bracket for speech development milestone in the literature are right from newborn up to the age of 6 years. The work design of this study, however, considered children between ages of 1 and 15 years; it was therefore necessary to highlight (in gray columns) ages that fall outside the milestone bracket.

In year 2015, the 3.7-4yr. milestone had the highest number of 19 patients reporting while the 11½yr milestone had the least number of patients of only 1 reporting.

Figure 4.7: Cases per milestones and cases outside the milestone bracket for 2016

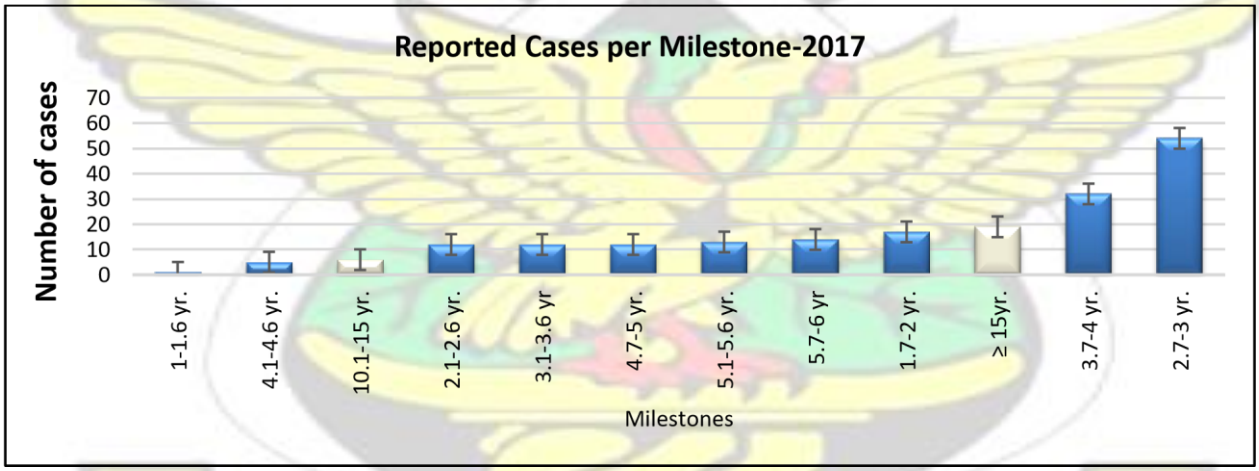
(Gray columns represent age groups outside the milestone)



For Figure 4.7, in 2016 there were no cases reported for the milestone 1-1½yr. group. The least turnout number of cases was 4 for the 1.7-2yr group whilst the highest turnout of 24 was scored by 3.7-4yr group.

Figure 4.8: Cases per milestones and cases outside the milestone bracket for 2017

(Gray columns represent age groups outside the milestone)



From the results obtained for 2017, the highest number of turnouts of 54 patients was scoredby the 2.7-3yr. group. However, only one patient showed up for the 1-1.6yr.group, representing the lowest turnout. The next lowest turnouts of 5 patients was scored by the 4.1-4.6yr group.

Table 4.4: Associated risk factors to speech-language delay/disorders recorded in the years under review

RISK FACTORS/DISORDERS	2015	2016	2017	TOTAL
1. PRETERM LABOUR*	1	1	8	10
2. PROLONGED LABOUR*	1	3	9	13
3. BLEEDING DURING PREGNANCY*	-	2	3	5
4. SEVERE MALARIA PREGNANCY*	2	2	3	7
5. HIGH BP/ECLAMPSIA*	-	1	4	5
6. THREATENED ABORTION*	-	1	-	1
7. BREECH*	-	1	-	1
8. TRAUMA DURING PREGNANCY*	-	-	1	1
9. VACUUM EXTRACTION*	-	-	2	2

Table 4.4 Cont.': Associated risk factors to speech-language delay/disorders recorded in the years under review

RISK FACTORS/DISORDERS	2015	2016	2017	TOTAL
10. INDUCED LABOUR*	-	1		1
11. NEONATAL JAUNDICE**	2	4	16	22
12. MICROCEPHALY**	-	-	2	2
13. ASPHYXIA**	3	3	10	16
14. OTITIS MEDIA	-	-	3	3
15. TONGUE-TIE	3	1	1	5
16. OPERATED TONGUE-TIE	-	-	1	1
17. ADENOIDECTOMY	1	-	2	3
18. ADENOTONSILECTOMY	-	-	1	1
19. EPILEPSY/SEIZURE DISORDER	6	7	22	35
20. ADHD	1	2	3	6
21. CP-CEREBRAL PALSY	9	13	19	41
22. GDD-GLOBAL DEVELOPMENTAL DELAY	9	9	11	29
23. ASD-AUTISM SPECTRUM DISORDER	2	2	7	11
24. DOWN'S SYNDROME	2	1	-	3
25. MENINGITIS**	3	-	-	3
26. EYE DEFECTS	2	-	-	2
27. DROOLING	1	3	-	4
28. INTELLECTUAL DISABILITY	1	1	-	2

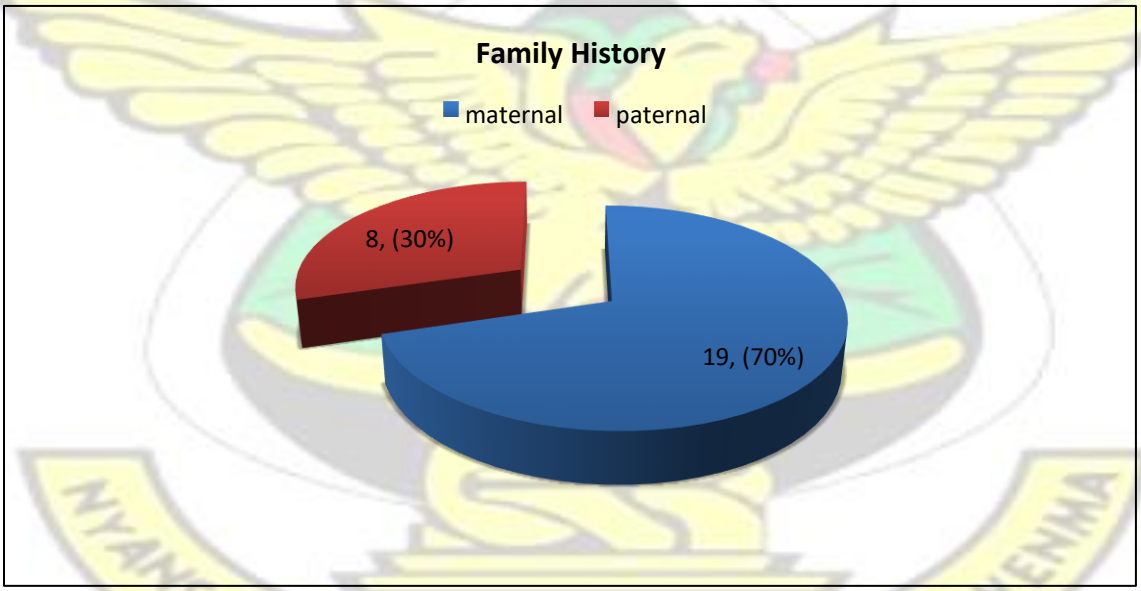
29. HEARING LOSS	5	9	14	28
30. RUBELLA*	3	-	-	3
31. LOW BIRTH WEIGHT**	1	-	-	1
32. POST CLEFT SURGERY	1	-	-	1
33. CRANIOTOMY	-	1	-	1
Total	**50**	**56**	**128**	**234**

*NOTE: *Prenatal risk factor **Perinatal risk factors*

Table 4.4 gives the overview of the observed risk factors associated with speech-language delay/disorder recorded during pre-and-post natal diagnostic sessions attended by mothers at KATH or from referred diagnostic facilities.

From the above (Table 4.4), there were33types of risk factors including 5 similar ones recorded over the years under review. However, the leading risk factors were cerebral palsy, seizure disorder, global developmental delay and hearing loss, which recorded 41, 35, 29 and 28 respectively with others recording low numbers ranging from 1 to 3 cases.

Figure 4.9: Positive family history for communication disorders in 2017



From the data obtained in 2017, 27 of the patients had a history of communication disorders. Seventy percent of these were attributed to maternal family whiles 30% represented the risk factors from the paternal side of the family.

Figure 4.10a: Educational status of the patients for 2017

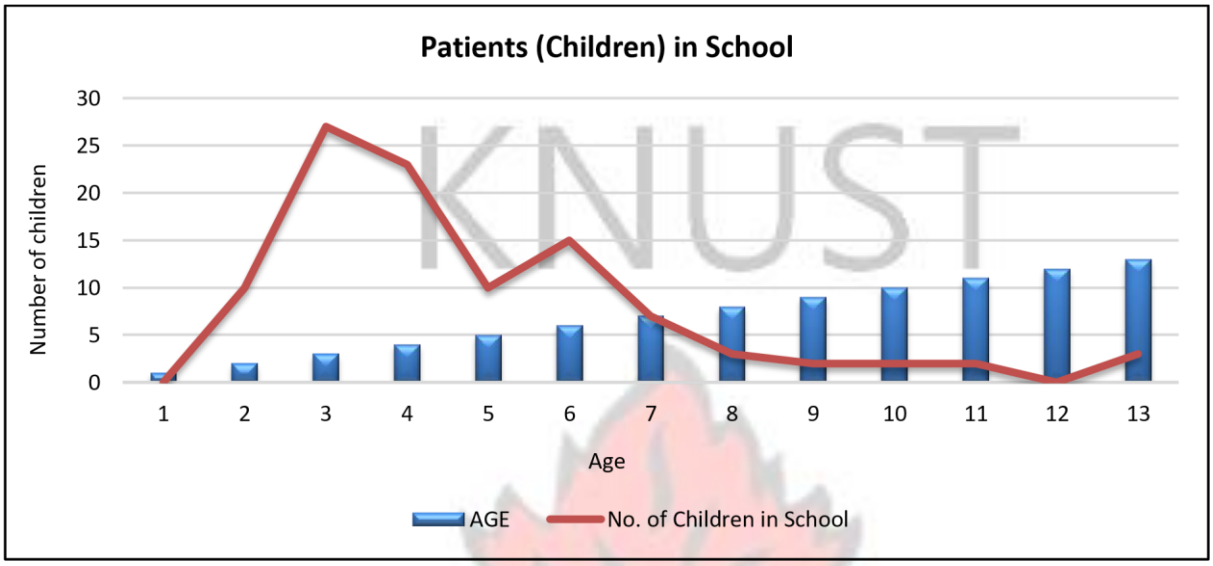
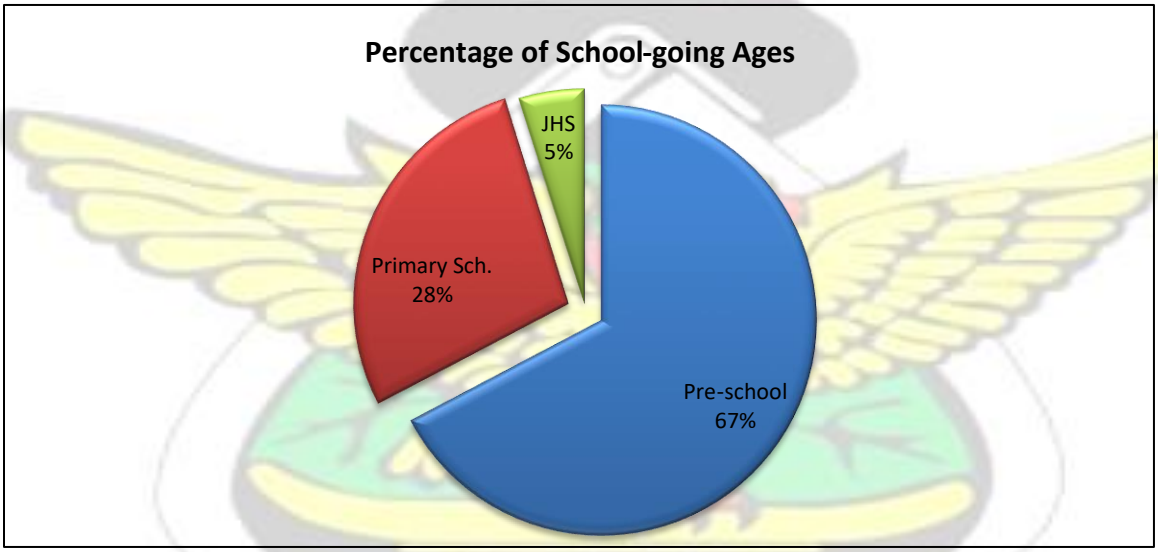


Figure 4.10b: Educational status of the patients for 2017



From the figures 4.10a and 4.10b above, a total of 104 out 224 patients in 2017 attend school. Greater number of this were those in pre-school, 28% in primary school and 5% in JHS.

Table 4.5: Hearing test and status of patients between 2015 and 2017

	Passed	Failed	Total Patients
2015	49	4	53
2016	37	8	45
2017	85	14	99
TOTAL	171	26	**197**

Figure 4.11: Hearing test and status of patients between 2015 and 2017

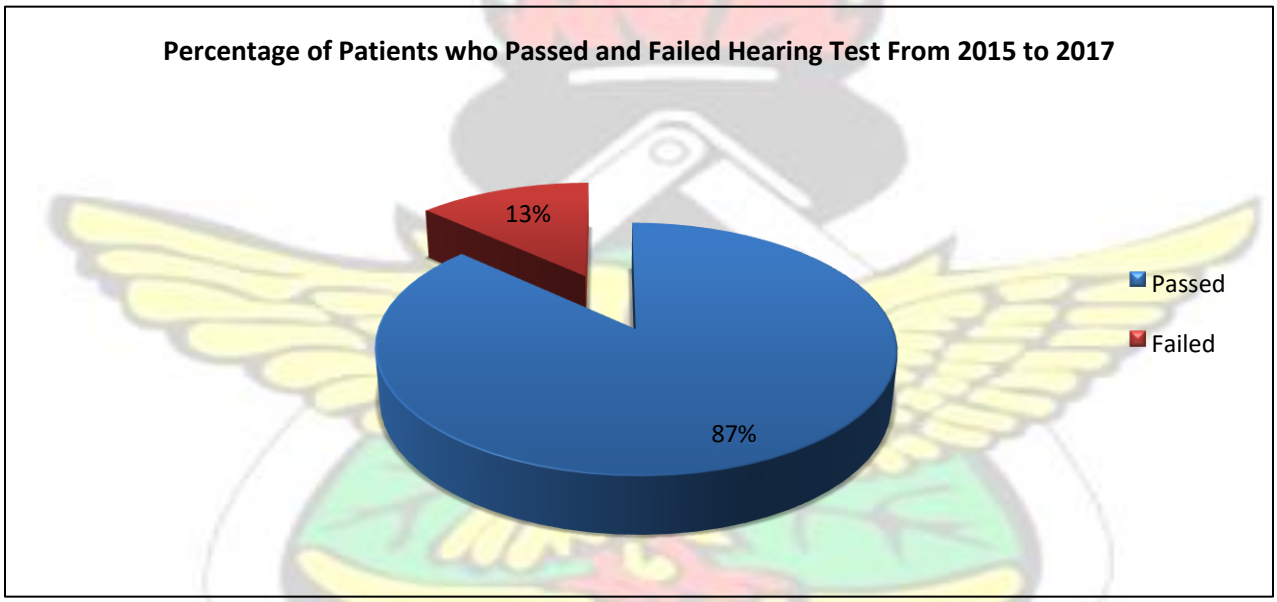


Figure 4.11 shows the results for clients who underwent hearing tests between 2015 and 2017. The assessment results were based on whether the client passed the otoacoustic emissions test or not. A total of 197 patients who had their hearing tests for the years under review, out of which 171 representing 83% passed the test and the remaining 26 which translates to 13% failed the test. It should however be noted that, a pass in otoacoustic test alone does not guarantee hearing because

it is not a conclusive method to test for hearing as there may be presence of emissions from a healthy cochlea although there might be a retrocochlear hearing loss.

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Table 4.6: Referrals received over the period under review

NUMBER OF REFERRALS				
Year	**KATH**	**Ashanti**	**Other Regions**	**Total Number of Cases**
2015	26	11	9	46
2016	36	14	11	61
2017	46	37	18	101
Total	**108**	**62**	**38**	**208**

Figure 4.12a: Total number of cases recorded from Ashanti and other regions for 2015-17

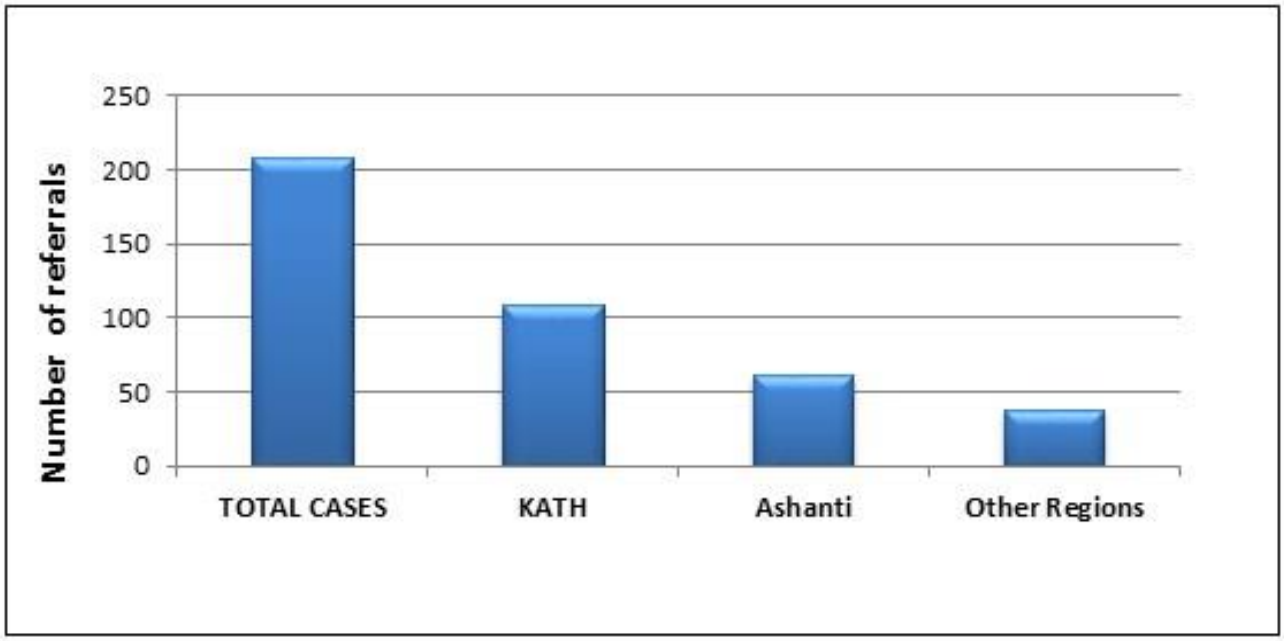

Figure 4.12b: Percentage of referral cases from Ashanti and other regions for 2015, 2016 and 2017

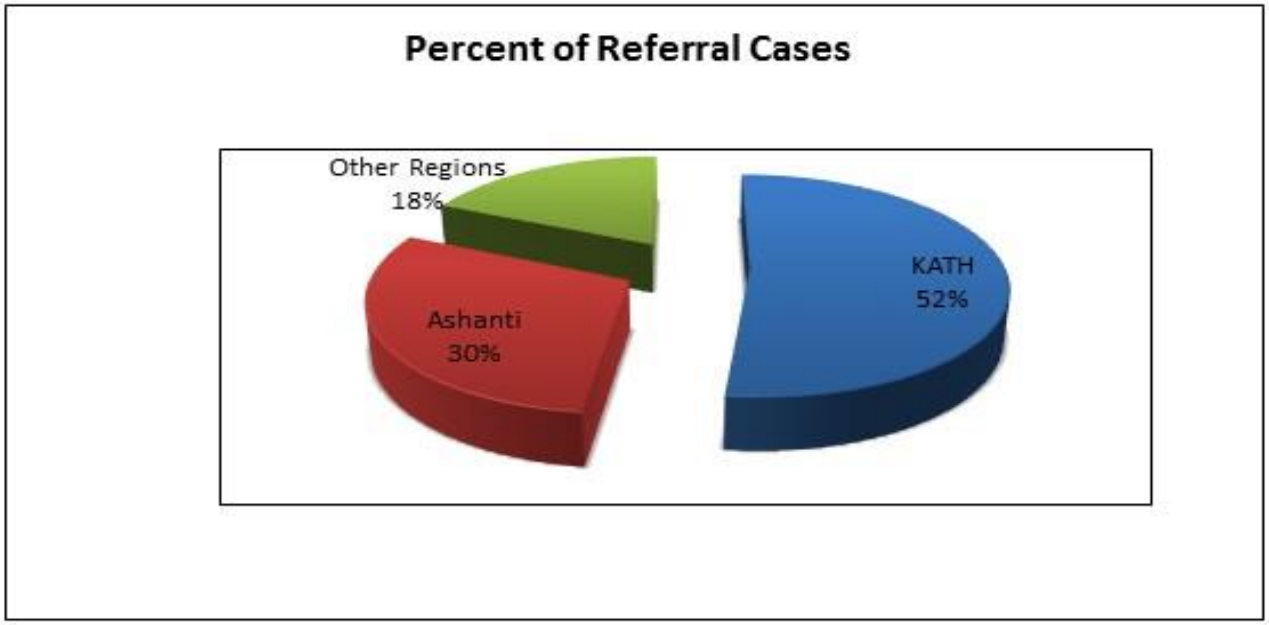

Table 4.6 above reveals the number of referral cases that were received from 2015 to 2017. The following were the number of referral cases; 46, 61 and 101 representing the years 2015, 2016 and 2017 respectively. These cases were grouped into three categories comprised of those received

through internal consult from other departments within KATH, within Ashanti Region and from outside the Ashanti Region. Hence, the total number of referred cases for the three-year record was 208. Figure 4.12b shows a total percentage from 2015 to 2017 of referrals from KATH which had 52%, Ashanti region had 30% and other regions had 18%, of cases reported.

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4.2 Types of Speech and Language Delay/Disorders

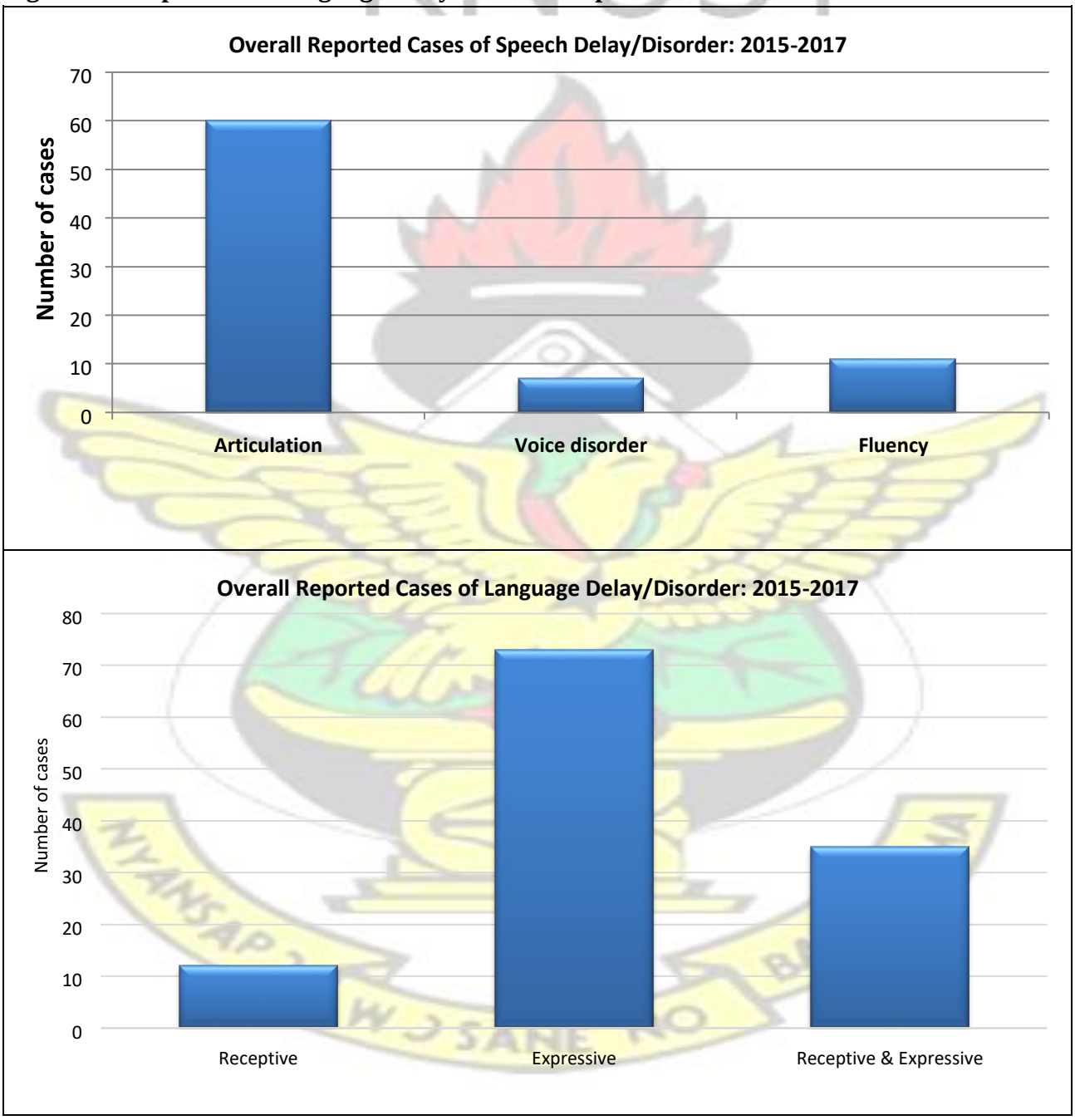
Within the scope of this study an objective was to unravel and highlight specific speech and language problems associated with the cases reported and assessed at the speech/language therapy department of KATH. Based on this, the three-year reported cases (2015 to 2017) were thoroughly and carefully investigated and finally classified as presented in Table 4.7. The cases were classified into two main categories; speech and language.

Table 4.7: Types of speech and language problems diagnosed at KATH between 2015 and 2017

SPEECH DISORDER				
TYPE OF PROBLEM	NUMBER OF CASES			
	2015	2016	2017	TOTAL
Articulation	14	11	25	50
Voice disorder	2	1	4	7
Fluency	2	3	6	11
LANGUAGE DELAY/DISORDER				
TYPE OF PROBLEM	NUMBER OF CASES			
	2015	2016	2017	TOTAL

Receptive	1	2	5	8
Expressive	15	19	37	71
Receptive & Expressive	5	8	18	31

Figure 4.13: Speech and language delays/disorder reported between 2015 and 2017 at KATH



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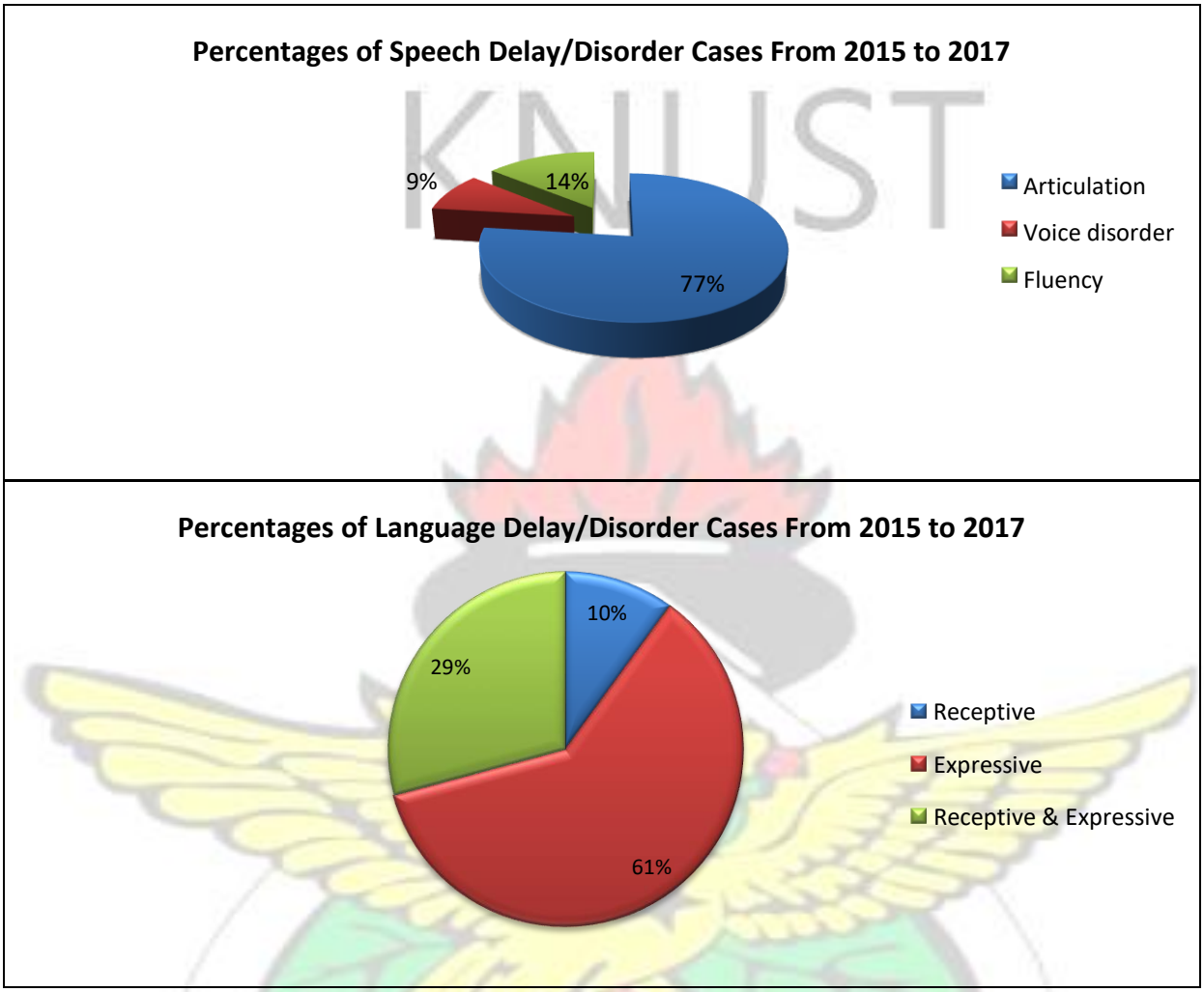
14: Percentage of reported speech and language delays/disorder between 2015 and 2017 at KATH



Speech disorders:

In the speech category, observed specific cases include articulation, voice disorder and fluency. Articulation was found to be the dominant reported case across the three reviewed years. Over 90% of the speech problems were related to articulation. In 2015, a total of 18 speech cases were recorded, 14 of which were articulatory problem. In 2016, the number dropped from 18 to 15, of which 11 cases were articulatory and in 2017, the number shot up to 35, of which 25 cases were articulatory problems. For the three successive years under review, total number of cases recorded

Figure 4.

for articulation, voice disorder and fluency are 50, 7 and 11 respectively. In general, speech delay/disorder cases at KATH increased in the order 2017>2016>2015. The prevalence rate of speech delay/disorder calculated for the three years under review was 75% and that for the language delay was 25%.

Language delay/disorders:

In the language category, two main types of the disorder were observed which included receptive and expressive. A third type disorder was a combination of receptive and expressive disorders. Fifteen cases out of 23 reported language problems in 2015 were related to expressive; 20 out of 32 in 2016 and 37 out of 65 in 2017. In total, receptive and expressive language cases recorded 12 and 73 respectively for the three years under review. The combination of receptive and expressive condition also recorded a total of 35 cases with 6, 9 and 20as the records for the study years, respectively. In the same vein as observed with the speech category, language delay/disorder cases generally increased in the order 2017>2016>2015. The year by year as well as the overall three year cases of speech-language delays/disorders at KATH are illustrated in Figure 4.15.

15: Year by year speech and language cases recorded at KATH

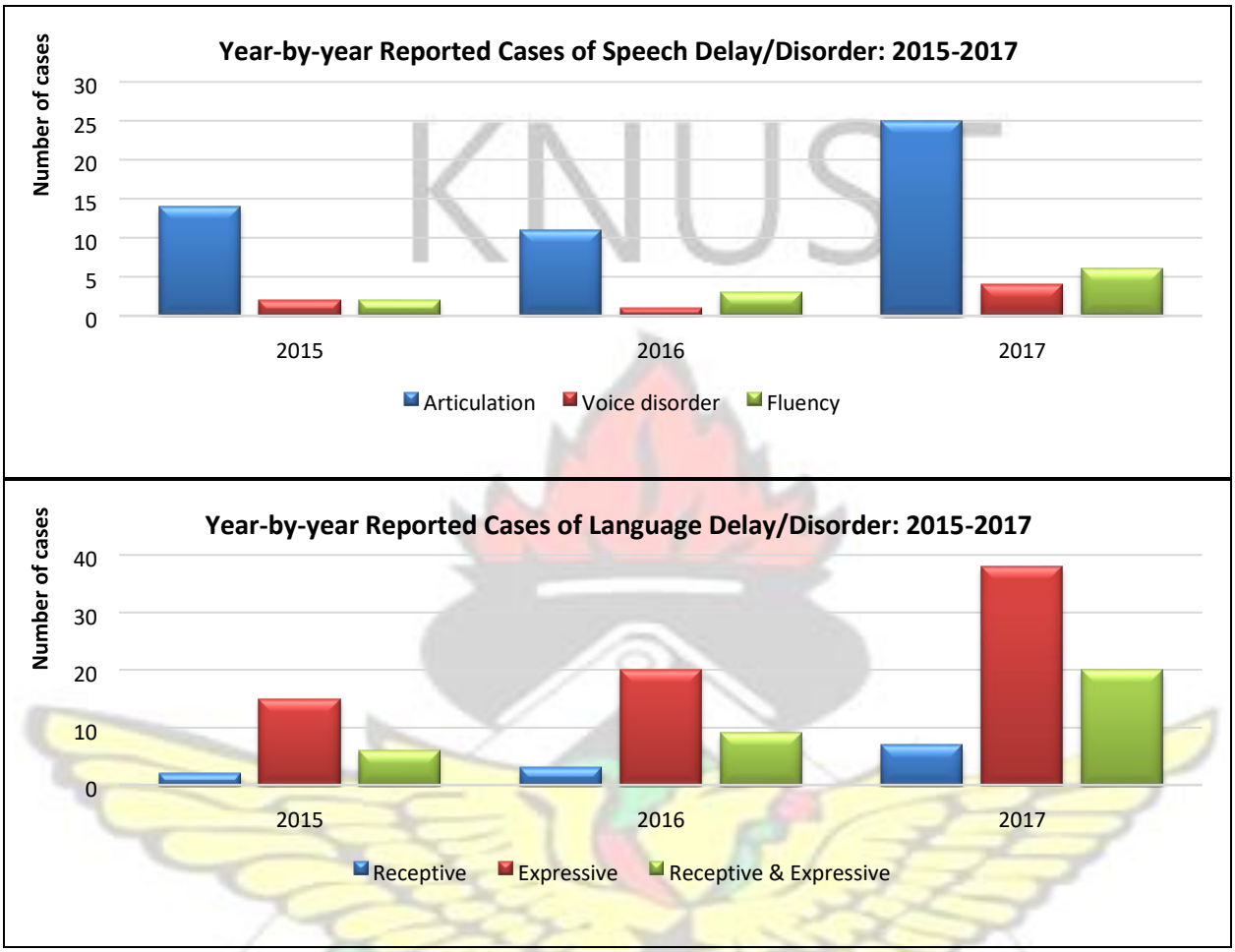


Table 4.8: Gender variation of speech and language delay/disorders

SPEECH DELAY/DISORDER								
TYPE OF PROBLEM	NUMBER OF CASES							
	2015		2016		2017		TOTAL	
	Male	Female	Male	Female	Male	Female	Male	Female
Articulation	12	3	7	5	11	9	30	17
Voice disorder	2	0	1	0	0	4	3	4
Fluency	2	0	2	1	7	0	11	1
LANGUAGE DELAY/DISORDER								
TYPE OF PROBLEM	NUMBER OF CASES							
	2015		2016		2017		TOTAL	
	Male	Female	Male	Female	Male	Female	Male	Female

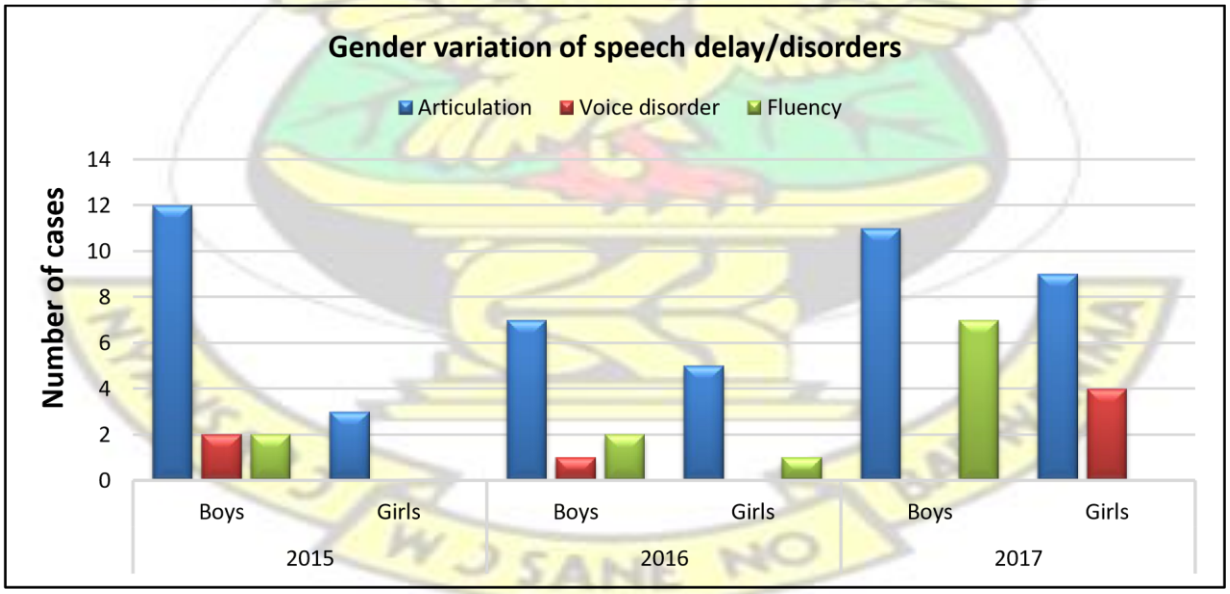
Figure 4.

Receptive	1	0	2	0	3	2	6	2
Expressive	12	3	14	5	28	9	54	17
Receptive & Expressive	4	1	7	1	13	5	24	7

Table 4.8 above and its illustrations in Figures 4.16 and 4.17 below show how speech and language delays/disorders varied between male and female patients. Again, males dominated with higher number of cases reported than in females for most speech and language problems except for voice disorder where the female recorded4 cases and 3 cases for males. However, there were no cases of voice disorder reported by the females for the years 2015 and 2016. For the other two cases of speech delay/disorders, articulation and fluency disorders were reported in a higher number of males than females.

For language delay/disorders, the number of cases reported by males was more than by females in all the three categories namely; receptive, expressive and the combination of receptive and expressive for the years under review.

Figure 4.16: How speech problems varied between the two sexes



17: How language problems varied between the two sexes

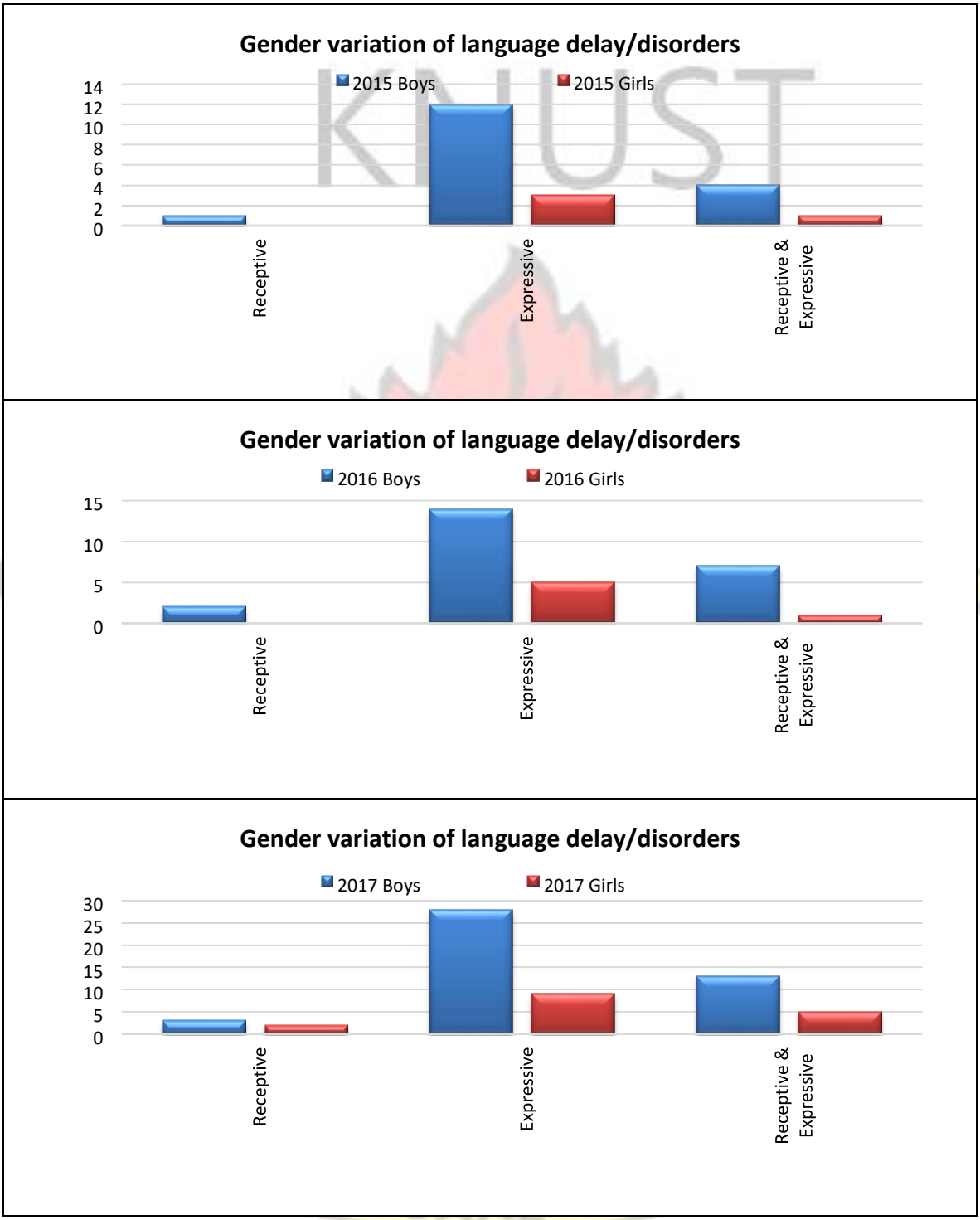


Figure 4.

Table 4.9: Variation of speech and language disorder with age

SPEECH DELAY/DISORDER				
Age	**No. of Cases-2015**	**No. of Cases-2016**	**No. of Cases-2017**	**TOTAL**
1	10	12	11	33
2	20	21	36	77
3	26	28	59	113
4	9	10	5	24
5	12	0	1	13
6	1	2	4	7
7	6	0	5	11
8	1	3	1	5
9	6	1	2	9
10	2	0	2	4
11	3	0	2	5
12	3	1	0	4
13	0	1	3	4
14	2	2	2	6
A15	2	0	0	2
LANGUAGE DELAY/DISORDER				
Age	**No. of Cases-2015**	**No. of Cases-2016**	**No. of Cases-2017**	**TOTAL**
1	0	4	0	4
2	0	6	2	8
3	5	8	11	24
4	5	7	19	31
5	8	5	14	27
6	1	0	10	11
7	3	0	3	6
8	0	0	2	2

Cases of speech and language disorders recorded for different age groups are presented in Table 4.9. Based on the reported cases for the three years under review, age variation for speech disorder was between 1 and 14 whilst for language disorder, the age variation was between 1 and 8. The highest number of speech disorder cases were 26, 28 and 59 representing the years 2015, 2016 and

2017, respectively. Age group with highest number of speech disorder was 1 to 5 year group for 2015, 1 to 4 year group for 2016 and 1 to 3 year group for 2017. For language disorders the dominant age group was 3-5 for the year 2015, 1-5 for 2016 and 3-6 for 2017

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CHAPTER FIVE

DISCUSSION

5.1Introduction

Proper healthcare record keeping is an essential component of every aspect of healthcare delivery or research. The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD, 2008) requires countries to report statistical data about children with disabilities for planning purposes including development and access to inclusive education and proper health care for children in this bracket. However, in many low and middle income countries including Ghana, credible statistical data is not readily available making it difficult to persuade governments and donors to invest adequately in this sector (WHO, 2007).

Komfo Anokye Teaching Hospital (KATH) is strategically located to deliver health services not only to the people of the Ashanti Region of Ghana but also to receive referrals from the Middle and the Northern Regions of the country. This makes KATH a central healthcare delivery facility. Furthermore, it is a Teaching Hospital and therefore expected to maintain certain standards and as a source of information to the central government as far as healthcare policies, needed infrastructure, human resource and consumables are concerned.

On the basis of this background, this study sought to investigate the status of care in one of the segments of society that is neglected, under resourced and lacking proper attention as far as healthcare services in Ghana is concerned – i.e. Speech Language Pathology. The study specifically put into proper perspective speech-language delay/disorder amongst children and few adults who reported at KATH during the period of the study. Cases

including referrals of three consecutive years; 2015, 2016 and 2017 were reviewed. The outcome of the study was discussed based on ten main observations as follows:

i. Monthly variation of cases ii.
   Gender variation iii.
   Bilingualism iv.
   Milestones
v. Associated risk factors
vi. Family history vii.
   Educational status viii.
   Hearing status ix.
   Referrals
x. Speech and language disorders/delay with variations in age and gender

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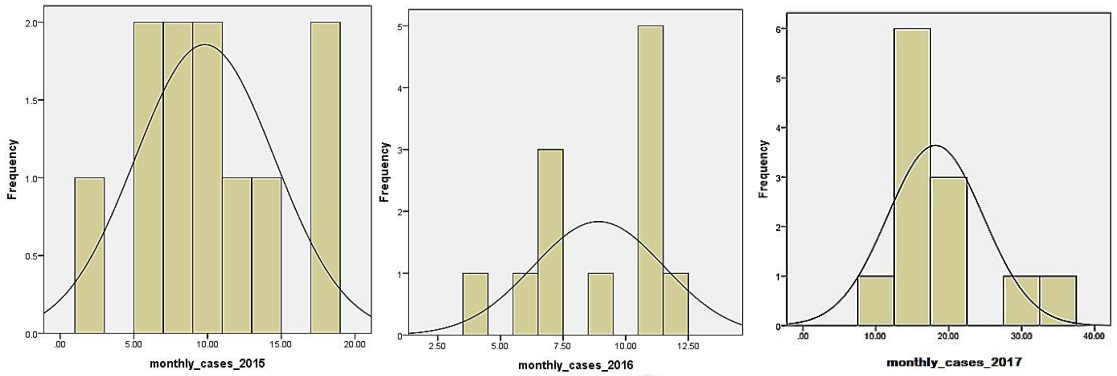
5.2 Distribution of the Data

The orientation of the datasets i.e. whether they were normally distributed or skewed was determined using statistical tool, SPSS. This is an important step as it allows or informs what statistical analysis should be conducted on the data.

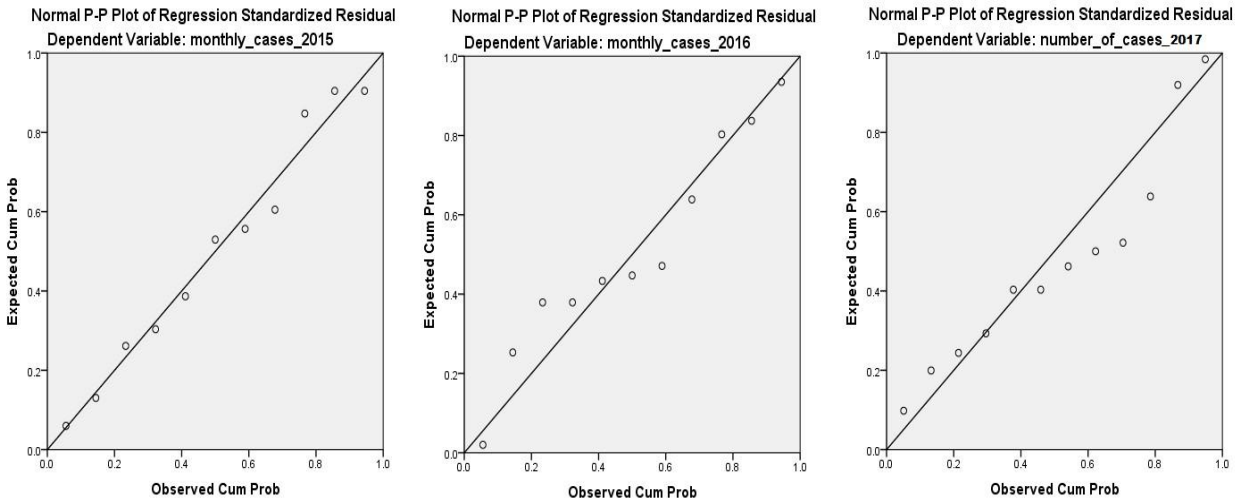
Data distribution was determined for total number of cases recorded, cases for boys and girls. As can be seen in the distribution charts given in Figure 4.1, even though there were outliers in each dataset of recorded cases for 2015, 2016 and 2017, their distributions were normal with skewness approximately zero. Observed skewness for the 3 reviewed years were 0.08, 0.06 and 0.04, respectively.

Figure5.1: Distribution of datasets for 2015, 2016 and 2017 monthly records



Normality of the datasets were further asserted by doing normal probability plots of the residuals. As can be seen also in Figure 5.2, the theoretical percentiles of the normal distribution against the observed samples percentiles was approximately linear – signifying the error terms and hence the datasets are normally distributed. For normally-distributed data, arithmetic mean along with the standard deviation is usually used for statistical analysis and description of the data. It is on the basis of this output that Spearman's correlation method was selected for the correlation analysis rather than Pearson's method.

Figure 5.2: Theoretical versus observed regression plots of residuals



5.3 Monthly Variation of Cases

A total of 108, 107 and 224 cases were recorded in 2015, 2016 and 2017 respectively. The number of cases reported in each month of the years in review and the percentage per month contributions of cases in each year are summarized in Table 4.1.

The data, as can be seen in Figure 4.3 indicates that the month of August recorded the highest number of cases; 33 cases representing 15% of the entire cases in 2017. Almost all the schools in Ghana are on the long vacation break during this period. This may account for the high turnout for the month of August. Also, August is a typical summer month in Europe and North America in which experts from those regions through bilateral cooperation and other arrangements visit KATH to render free services; influencing the turnout in this period. December on the other hand recorded the least number of cases; 10 cases representing 5% of recorded cases in 2017. This may be attributable to the low visitation period in December due to Christmas festivities.

5.4 Gender Variation of Patients

According to a study carried in the University of Maryland School of Medicine, a gene called FOXP2 (forkhead box protein P2) which plays an important role in speech development in humans are more present in girls than boys. This building block FOXP2 protein is located at the left hemisphere of humans (Sandle 2013).

According to the literature (Beitchman et al, 1986) boys are more susceptible to speechlanguage delays or disorders than their girl counterparts. In a recent study conducted by Longo et al., 2017, in the western region of São Paulo, they underscored male-children dominance (68.3%) in speech-language disorders. This study was therefore interested to know the situation in Ghana and the Kumasi Metropolitan area in particular. As can be seen in Figure 4.4, out of the 439 reviewed cases for the study period, 325 representing

74% were males while 114 cases representing 26% were females. These figures imply the prevalence of speech-language disorder amongst boys is almost 3 times the cases among girls. The data in table 4.4 also illustrates yearly records between the two genders and a similar trend was observed for 2015, 2016 and 2017 with the male gender recording higher numbers than female gender. This statistics goes to support the Dunedin studies (Silva et al. 1987), where it was found that girls began to talk, on average, a month earlier than boys and also score higher on language test than boys.

5.5 Bilingualism

Research on bilingualism reveals that learning two or more languages at a go is not a disadvantage but rather associated with multiple benefits including higher educational achievement (Multilingual Britain, 2013), improved social use of language and enhanced cognitive flexibility, symbolic representation, and other forms of executive control (Bialystok et al., 2009), as long as the child has sufficient support to maintain all of his or her languages (Uljarević et al., 2016). What is yet to be well researched into is the association between bilingualism and speech and language disorders amongst children. There is however, a general belief that if learning one language can be hard for a child, then two or more languages will be even more difficult to master (Ozge, 2016)

In recording and organizing the data for this study, effort was made to obtain and record along with the type and number of spoken languages by each case. Monolinguals i.e. children speaking only one language dominated the cases with 61 records. Bilinguals and multilingual i.e. children speaking 2 and 3 or more languages respectively recorded 29 and 5 cases. In Figure 4.5, the relationships between cases and number of spoken languages were graphically illustrated.

Correlation analysis is a method used to statistically demonstrate/explain the relationship between two variables i.e. how the variables change or vary under same conditions. As

indicated earlier, the Spearman's correlation method was applied for this purpose due to the slightly skewed nature of the dataset of this study. From the Spearman's correlation analysis, it can be said that, despite the high number of cases recorded by monolinguals, they appear to have the weakest relationship with cases of speech-language delay or disorder compared to the bi-and-multilingual counterparts. Essentially, all three variables showed positive relationship among themselves. This implies they vary or change together under same conditions pointing to the same direction and therefore, the fact that one relation is stronger than the other does not make it a risk factor. This is so because, for mono, bi and multi-lingualism to have effect on speech-language development, at least one of these parameters should correlate negatively with speech-language delay/disorder. Thus, based on Pearson correlation conducted by this study, it can be concluded that speaking more than one language does not have negative impact on speech and language delay/disorder.

5.6 Milestones

As babies grow, they begin to sort out the speech sounds that compose the words of their language. By 6 months of age, most babies recognize the basic sounds of their native language (NIDCD, Accessed online). Children vary in their development of speech and language skills. They however, follow a natural progression or timetable for mastering the skills of language. Normal speech development milestone for children from birth to age 5 was given in Table 2.3. The milestones along with ages outside the milestone bracket recorded in this study have been presented in the appendix for 2017 data. Within the milestone brackets, the highest and lowest cases were observed in the 2.7 – 3 yr. and 1 – 1.6 yr. age groups respectively. The next highest for the 2017 data was scored by the 3.74 yr. group. The trend was similar for 2015 and 2016 datasets. This observation is quite normal and expected as speech and language problem among children begin to manifest in

this age bracket. The observation is also similar to reported cases in the literature. Longo et al., 2017, reported that, 3 – 5 yr. age group predominated the speech-language disorders among children living in the western region of São Paulo. How the milestones and ages outside it fared with respect to speech-language delay/ disorder in this study is depicted in Figures 4.6, 4.7 and 4.8 for the 2015, 2016 and 2017 data respectively.

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5.7 Associated Risk Factors

It has long been established that the commonest condition associated with language delay is intellectual handicap. Deafness, cerebral palsy and development disorders are known to be responsible for mild to moderate language delay (MacKeith and Rutter, 1972).

The researcher thus explored such risk factors that were presented in the records or folders of patients. Table 4.4 gives the overview of the observed risk factors associated with speech-language delay or disorder recorded during pre-and-post natal diagnostic sessions attended by mothers at KATH or from referred diagnostic facilities among all the age groups as well as gender. Though the results showed that more boys than girls had speechlanguage disorders, the risks factors were common across both genders. These included but not limited to prolonged labor, preterm delivery, neonatal jaundice, hearing impairment, cerebral palsy, global developmental delay, autism spectrum disorder, seizure disorder etc. Among these were disorders commonly linked to speech and language delay/disorders as a secondary disorder. Some of these primary disorders include global developmental delay (GDD), cerebral palsy (CP), autism spectrum disorder (ASD), seizure disorder, down syndrome, attention deficit hyperactivity disorder (ADHD), hearing impairment etc. From the data obtained for the years under review, seizure, cerebral palsy and global developmental delay recorded the highest number of cases for 2017, 2016 and 2015 respectively.

Children with seizure disorder or epilepsy have difficulty in acquiring communication skills at a rate and in a manner that is similar to what are witnessed in most children. The patterns of the brain particularly the left hemisphere where the speech Centre is located may be out of the ordinary coupled with the emergence of developmental difficulties (Epilepsy foundation, 2014).Many studies have focused on the psychosocial challenges faced in childhood. Recent comparison studies demonstrate that children and adolescents with epilepsy have relatively more social problems than children and youth who do not. Caplan et al. identified a number of other variables associated with social problems in children with epilepsy, including lower IQ, externalizing behavior problems, racial/ethnic minority status, and impaired social communication skills (Caplan et al., 2005).

Neuropsychological impairment including cognition and language is a significant comborbidity of epilepsy, and affects up to 82% of children with epilepsy (Widjaja et al., 2013). Again, about 20% of seizures in children are associated with cerebral palsy and other neurological abnormalities. It can also be associated with other developmental disorders like autism and Down syndrome (Prath, 2016).

It is estimated that 20% of children diagnosed with cerebral palsy have severe communication impairments (Pickstone C, Goldbart J, Marshall J, 2009).

In another study of 27 children with cerebral palsy between the ages of 24 to 30 months, 85% of them had clinical speech and/or language delays relative to age expectations. This comprised 44% who were not yet talking and 41% who had emerging talking abilities and 15% were established talkers (Hustad et al, 2013).

When a child shows delays in several areas of development, and this has continued for at least six months, it is termed as Global developmental delay (GDD). These delays generally manifest in these developmental milestones of speech, language, fine and gross motor skills (cerebralpalsy.org).

Bilirubin encephalopathy, kernicterus and neonatal jaundice are related perinatal conditions associated with newborns that ultimately cause brain damage in infants. Neonatal jaundice occurs when babies build up too much of a chemical called bilirubin in their blood. In this study, the three conditions were put together making them the fifth highest risk factor for speech-language disorder with 22 out of the 234 recorded cases over the period of study. Other risk factors quite common at KATH are Asphyxia and prolonged labour with records of 16 and 13 respectively.

Asphyxia occurs when the airways is physically blocked by a foreign object or due to a medical condition. Prominent effects of Asphyxia include: weak breathing, poor muscle tone and seizure among babies. Ultimately, Asphyxia affects smooth development of the baby including their speech and language development.

For first-time mothers, labour is regarded prolonged if it lasts for about 20 hours, and about 14 hours for those who had previously given birth. Prolonged labour causes fetal distress due to lack oxygen; long-term risks of the baby developing cerebral palsy and speech and language disorders.

5.8 Family History

From the assessment forms, patients were asked of any history of communication disorder in their families. Those who answered in the affirmative gave a brief description. For 2017, 27 patients representing 12% of the total number of cases responded in affirmation of a family history of communication disorder, 19 were from the maternal and the remaining 8 from the paternal family.

A history of developmental speech-language disorder in a first-degree relative has been linked to speech delay and in a study conducted on 3 year olds on risk factors for speech

delay, 25% out of a sample size of 439 had a positive family history, therefore, it is considered as a significant factor (Shriberg et al, 2003, 2009).

5.9 Educational Status of Patients

As stated in the specific objective of this study, the educational status of the children with speech and language delay/disorders was to be determined. Unfortunately, there was not sufficient information regarding whether the children were in school or not for 2015 and 2016. As mentioned earlier, the 2017 data was more comprehensive compared to the other years under review, therefore the data for 2017 was used. Out of a total of 224, 104 were pupils in school with a greater number of them i.e. 70 being in pre-school; 29 of them in primary school and 5 of them in the Junior High School (JHS).

Speech and language delay or disorder is a common developmental difficulty which, if unresolved, can cause difficulties in both learning and socialization lasting into adolescence and adulthood (Bishop and Leonard, 2001).

Nursery and infant teachers play an important part in the identification and remediation of speech and language problems in children. This is because they have experience which enables them to compare the development of children; their day-to-day contact with children means that they can collect samples of what a child can say and appear to understand (Gadagbui, 2007). Therefore, it is good to note that early identification and possibly intervention is being carried out in KATH speech therapy session at their early ages.

5.10 Hearing Status of Patients

Hearing in humans is essential for speech acquisition and development as there is a suggested relationship between hearing and speech development. Thus, an individual who is hearing impaired at birth might not be able to acquire normal speech depending on the severity of the loss.

The hearing ability of the patients was thus assessed during diagnostic sessions at the hearing assessment department of the KATH. However, it is important to note that not all the patients went through this session. The children tested for the presence of Otoacoustic emissions and response to white noise and Otoscopic evaluations were also done. It is also worth noting that, a fail in Otoacoustic test does necessarily imply a hearing loss. Likewise, a pass in OAE test is not a conclusive method of determining hearing status of patients because there may be presence of emissions from a healthy cochlea but one might be having retrocochlear hearing loss.

According to the European Commission, children who suffer severe to profound hearing loss on onset during their developmental stages will likely suffer some language and speech deviation (Martini 1996) problems. Hearing status of patients over the year under review is depicted in Figure 4.11. Costa et al. (1996) describe hearing loss as a kind of sensory deficit that is characterized by an abnormal response to sound stimulus.

The researcher decided to explore the suggested relationship between hearing impairment and speech and language delay amongst the clients who visited the facility during the period under review. Clients who underwent OAE tests had their results presented in their hospital folders indicating whether they passed or failed the test. The primary purpose of otoacoustic emission (OAE) tests is to determine cochlear status, specifically hair cell function. One of the uses of information is to screen hearing (particularly in neonates, infants, or individuals with developmental disabilities). OAEs cannot give full description of one's auditory thresholds, however, pure tone audiometry (PTA) can. The hearing threshold levels of the patients would give information on the degree, type and configuration of hearing loss.

5.11 Referrals Received Over the Period under Review

Table 4.6 shows the number of referral cases that were received between 2015 and 2017. The data showed that, overall, 208 referral cases were received over the period under study. Specifically, 46, 61 and 101 cases were recorded in 2015, 2016 and 2017 respectively indicating an upwards trend in the figures. This is particularly due to the fact that the speech and language unit is relatively young and awareness about the availability of such services keeps growing as the years go by. It was also evident that, most of these referrals were through internal consult mainly from the Child health (e-Neuro, 2017), Family medicine, Physiotherapy and Psychiatry units representing 52% as revealed in the data. Speech therapy is a multidiscipline practice that is required in the habilitation or rehabilitation services together with other disciplines in the specialized healthcare delivery.

5.12 Classification of Speech and Language Delay/Disorders

From the scope of the study, speech disorders were categorized into 4 types; articulation, fluency, voice and resonance disorders. However, there was no reported case for resonance. With reference to Table 4.8, Articulation disorder was the most reported type of speech disorder. However, it is imperative to note that most of the cases reported on speech were diagnosed as speech delay. These cases could not be categorized because from their assessment form it could be inferred that there were delays with regards to their speech development. Some of these patients were still in the process of attaining prelinguistic skills whiles others had limited vocabulary. Therefore, Table 4.9 is a presentation of all speech problems without distinction whereas that of Table 4.8 specifically gives data on the type of speech disorder diagnosed.

Language delay/disorders were grouped into two types; receptive and expressive.

However, a few of the cases were diagnosed with both receptive and expressive disorder. Expressive language disorder had the highest number of cases recorded with an increasing

number of cases from year to year in the order 2017>2016>2015 with number of cases as 37, 20 and 15 respectively.

5.13 Gender Variation of Speech and Language Delay/Disorders

Classification of both speech and language cases with respect to gender was conducted to determine which gender is more susceptible or prone to one problem or the other and to at least know the gender variation of cases encountered at KATH. From the records, it was generally observed that, more boys than girls were susceptible to both speech and language problems. Specifically in 2015, 12 boys as against 3 girls were diagnosed with articulatory problem. In 2016 and 2017, 18 boys as against 14 girls were diagnosed with articulatory problems. Only few cases were related to voice disorder and fluency; boys were still dominant over girls in these conditions too. These results are in consistent with Shriberg et al., 2003, in which 100 three-year-old children assessed for speech delay showed that 70% of them were males and 30% were females with a boy-to-girl ratio of 2.3: 1.

5.14 Variation of Speech and Language Problems with Age

The study further classified both speech and language disorder cases with respect to age of patients. This classification gives an insight into which age group were speech and language delays/disorders more predominant. It was observed generally across the years under review that, both speech and language delays/disorders were most commonly diagnosed amongst the 3-4 year age group. This observation quite agrees with the milestones analysis earlier discussed in which the 3.7-4 yr. group recorded the highest number of speech and language delay/disorder cases.

Similar observations can be found in the literature; Longo et al., 2017 and Zambarna et al., 2013. With regards to Zambarna et al, a longitudinal cohort study for children from 18 months to 5 years was conducted. Their investigations on developmental trajectories of

language delay from 3 to 5 years using an integrative risk model implicated the male gender, poor communication skills and family history. Summary of speech and language delay/disorder with respect to age as found by this study have been presented in Table 4.9 and graphically in Figure 4.18.

It has been observed based on this and other studies elsewhere that, speech and language delay/disorder is prevalent in the 3-5 year age bracket and that the conditions are more common among boys than girls. The study also observed that; expressive challenge is the most common language delay/disorder problem while articulation is the most common speech delay/disorder problem at KATH. It is important to note that the ten factors based upon which the findings of this study has been discussed are collectively the most common factors associated with the prevalence of speech-language delay/disorder globally. This also implies that, their intervention and diagnostic strategies are also global in nature. Therefore knowledge and technology transfer and adequate human resource development are imminent and can be a turning point for speech-language therapy at KATH.

CHAPTER SIX

SUMMARY OF KEY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The study was motivated by the lack of proper statistical records on speech and language delay/disorder which in turn forms the basis for proper budgetary allocation for both human and infrastructural resource development for speech and language therapy in Ghana. The study compiled a three year attendance records of speech and language impaired patients between the ages of one and fifteen with particular attention on those within the milestone

bracket. A total of 439 cases (of which 325 and 114 were males and females respectively) were assessed based on a number of parameters such as age, gender, family history and number of spoken languages among other factors. The study revealed monthly rate and frequency of attendance, gender variation and dominant milestone of speech and language delay/disorder recorded at KATH over the three years under review. Another revelation by the study was the number of patients in school and at what level of the school ladder they are in. In this regard, those in pre-school were the highest (67%) followed by primary school (28%) and the least was those in the JHS (5%).

In this Chapter, key findings of the study have been summarized by reviewing the research objectives in relation to the findings so as to establish whether or not the objectives have been achieved and to what extent.

6.2 Review of Research Objectives

There were four main objectives set out by this study, i.e. the prevalence of speech disorders/delay and also language disorders/delay amongst children between the age of 1 and 15;which gender is mostly affected by speech and language disorder/delay and how do clients get to know about the speech and language therapy services available at KATH.

The following subsections discuss the review of the research objectives.

6.2.1 Review of Objective One

The first objective of the study was to find out the prevalent rate of speech and language delay/disorder reported at KATH between the years 2015 and 2017. The finding of this study indicate that the prevalence of speech and language delay/disorders is on an upward trend; rising from 108 reported cases in 2015 to 224 cases in 2017.It was also found that majority of the referrals, about 30% came in from facilities in the Ashanti Region whilst 18% were referred from other regions. It is also important to indicate that, 52% of the

assessed patients were non-referred patients i.e. direct attendants at KATH. For the three years under review, the prevalence rate of speech delay disorder was 75% and the language delay/disorder was 25%.

6.2.2 Review of Objective Two

Objective two was to establish the type of speech and language problems that clients presented. From the results, it was established that, clients came in with various speech and language problems. Chiefly amongst the language disorders that were presented included: Articulation, Voice and Fluency disorders. Language disorder cases that were also recorded includes, Receptive, Expressive and Receptive-Expressive combined.

6.2.3 Review of Objective Three

The next objective of the study was to ascertain the gender distribution of the affected individuals with regards to speech and language delay or disorder. It is observed that, speech and language disorder cases were recorded for both sexes with prevalence higher amongst the male population.

6.2.4 Review of Objective Four

The fourth objective was to establish the possible causes and risk factors of speech and language disorders of the study population. The key finding with regards to this objective is that, the risks factors were common across both genders. These included but not limited to prolonged labour, preterm delivery, neonatal jaundice, hearing impairment, cerebral palsy, global developmental delay, autism spectrum disorder, seizure disorder etc.

6.2.5 Review of Objective Five

Based on study objective five, the study determined the educational status i.e. whether the children with speech and language disorders attend school or not and at what level of the educational ladder they are mostly found in school. The findings show a greater percentage (67%) of the pupils were in preschool.

6.3 Recommendations

Based on the findings of this study, the researcher hereby recommends the following to key stakeholders:

- There should be regular public education by stakeholder to create awareness of speech and language impairments and availability of Speech-Language Therapy services at KATH.
- KATH should invest and resource the Speech Center to be able to assist patients who report to the center with speech and language disorders.
- The ENT Department at KATH should conduct on regular basis, neonatal screening (neonatal hearing screening) as well as speech screening at the age appropriate for preschool children.
- KATH should keep track of all children born at the hospital with the various risks factors that predispose an individual to speech and language disorders.
- Authorities at KATH should include the Speech Therapist on its multidisciplinary team to identify and evaluate potential cases which need speech therapy for early diagnosis and intervention.
- Government should establish Speech Therapy Centers across the country to meet the speech development needs of the citizens. This will help save the cost that most of these clients have to incur over the long distances in traveling to seek for such services at KATH.
- Maternal healthcare issues within the Kumasi Metropolis should be taken seriously to ensure early detection and treatment of maternal complications

so as to minimize pre-natal and peri-natal causes of speech and language disorders.

- KATH needs to employ a full time speech Therapist as the hospital currently rely on a volunteer Speech Therapist who only visit on weekly basis.
- Authorities at KATH should make a conscious effort to monitor the incidence and prevalence of speech and language disorders within itscatchment areas and also adopt appropriate measures for prevention, better treatment and rehabilitation of such individuals.
- The determination of the hearing threshold levels of patients which is a prerequisite procedure should be assessed with the pure tone audiometry instead of the otoacoustic emission test. This will enable both the audiologist and speech therapist to recommend appropriate therapy based on the hearing threshold levels obtained.

6.4 Suggestions for Future Research

The study sought to give a statistical data on the prevalence of speech and language disorders at KATH. Due to lack of comprehensive record keeping at the speech and language therapy unit, the sample size was a bit challenged, thus, affecting the establishment of the true situation in study population. Further work needs to be done in record keeping to enable a more representative statistical results that will give a true reflection of speech and language therapy at KATH. In future, studies should be carried out in human resource and infrastructural deficit in the speech and language unit of KATH.

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APPENDIX

DATA COLLECTION SHEET

CASE (CS)	REPORTED DATE	GENDER	AGE	ETHNICITY	ATTENDS SCHOOL(Y/N)	CONDITION/PROBLEM TYPE	FOLLOW UP	REFERRAL
CS1								
CS2								
CS3								
CS4								

YEAR2015	Speech Delay	Speech Disorder	LanguageDisorder	**YEAR2016**	**Speech delay**	**Speech disorder**	**Language disorders**	**YEAR2017**	
January				January				January	
February				February				February	
March				March				March	
April				April				April	
May				May				May	
June				June				June	
July				July				July	
August				August				August	
September				September				September	
October				October				October	
November				November				November	
December				December				December	

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Observed milestones and cases outside the milestone bracket at KATH in 2017

1-1.6 yr.	1.7-2 yr.	2.1-2.6 yr.	2.7-3 yr.	3.1-3.6 yr	3.7-4 yr.	4.1-4.6 yr.	4.7-5 yr.	5.1-5.6 yr.	5.7-10 yr.	10.1-15 yr.
1.5	IY 9 M	2Y3M	2Y6M	3Y 4M	3Y10M	4Y5M	4Y6M	6Y0M	11Y0M	45
	SY0M	2Y2M	2Y9M	3Y3M	3Y6M	4Y1M	4Y7M	10Y0M	15Y0M	20
	2Y0M	2Y4N	3Y0M	3Y6M	3Y9M	4Y4M	5Y0M	7Y0M	13Y0M	81
	1Y7M	2Y4M	2Y8M	3Y0M	4Y0M	4Y4M	4Y 9M	7Y0M	13Y0M	18
	1Y6M	2Y5M	2Y9M	3Y0M	3Y6M	4Y5M	5Y0M	6Y0M	13Y0M	50
	2Y0M	2Y1M	2Y7M	3Y1M	3Y9M		5Y0M	6Y0M	11Y0M	65
	2Y0M	2Y3M	2Y8M	3Y4M	4Y0M		5Y0M	6Y6M		36
	1Y11M	2Y1M	3Y0M	3Y6M	4Y0M		5Y0M	8Y4M		22
	2YOM	2Y4M	3Y0M	3Y1M	4Y0M		5Y0M	7Y0M		63
	2Y0M	2Y2MM	2Y9M	3Y1M	4Y0M		5Y0M	7Y0M		43
	2Y0M	2Y4M	3Y0M	3Y2M	4Y0M		4Y6M	9Y0M		43
	1Y8M	2Y4M	3Y0M	3Y3M	4Y0M		4Y6M	9Y0M		43
	2Y0M		2Y7M		3Y7M			6Y0M		41
	1Y6M		3Y0M		3Y9M			6Y0M		42
	1Y11M		2Y6M		3Y8M			8Y0M		55
	2Y0M		3Y0M		4Y0M			5Y8M		63
	1Y5M		2Y10M		4Y0M			5Y11M		35
			3Y0M		4Y0M			8Y0M		43
			2Y10M		3Y10M			6Y0M		68
			3Y0M		3Y9M			7Y0M		
			3Y0M		3Y10M			6Y10M		
1-1.5 yr.	**1.6-2 yr.**	**2.1-2.5 yr.**	**2.6-3 yr.**	**3.1-3.5 yr**	**3.6-4 yr.**	**4.1-4.5 yr.**	**4.6-5 yr.**	**5.1-10 yr.**	**10.1-15 yr.**	**≥ 16 yr.**
1 case	**17 cases**	**12 cases**	**54 cases**	**12 cases**	**23 cases**	**5 cases**	**12 cases**	**32 cases**	**6 cases**	**19 cases**

WJ SANE NO

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Y = year | M = month: represent exact age of sampled patients