

**Differences between Early and Delayed Speech by Infants
from Birth to 24 Months**

أوجه الاختلاف بين التأخر في الكلام والكلام المبكر عند الأطفال الذين تتراوح
أعمارهم بين يوم واحد وأربعة وعشرين شهرا

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Authorization

I, **Omar Ibrahim Aljaraba'a**, authorize Middle East University to provide libraries, organizations, and individuals with copies of my thesis when required.

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Thesis Committee Decision

This thesis “**Differences between Early and Delayed Speech by Infants from Birth to 24 Months**” was discussed and certified on 13/ 1/2019.

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Dedication

First, I dedicate my thesis to my father's soul who would be very happy and proud of his son and to my mother who means everything of my life.

To all my family members, brothers, sisters, my wife, my children, Hashem, Diala and Masa who will be glad and proud of their father.

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Differences between Early and Delayed Speech by Infants from Birth to 24 months

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Abstract

This study sheds some light on an issue which may not be known to many in our society. The goal is to specify the most important causes of speech delay in infants. The researcher concentrates on two major causes: Down syndrome, its causes and effects, and hearing problems that contribute to the rise and development of delayed speech.

The researcher follows the speech milestones achieved by infants in each stage between birth and twenty four months. This reports when and how the sounds and words are produced by infants to determine what causes delay in speech. Parents' knowledge helps them test if their infants encounter a certain problem or not with the result that they have the chance to have the problems diagnosed by audiologist, speech pathologist, pediatrician or any other specialist who may intervene as early as possible to treat the problem using many suitable procedures, and training the parents and caregivers follow home procedures that are expected to develop their infants close to the normal.

This study adopts data descriptive analytic approach to identify speech milestones. It also uses the comparative method to find out the differences between early speech development and delayed speech among infants between birth and twenty-four months.

Keywords: Speech delay, Speech milestones, Down syndrome, Hearing problems, Treatment.

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الملخص

تسلط هذه الدراسة الضوء على قضية لا يعرف عنها الكثير في مجتمعنا. تهدف هذه الدراسة إلى تحديد أهم الأسباب في تأخر الأطفال عن الكلام. يركز الباحث على سببين رئيسيين وهما متلازمة الداون أسبابها وتأثيراتها وعلى المشاكل السمعية التي تساهم في تطور الكلام.

تعقب الباحث معالم الكلام التي ينجزها الأطفال في كل مرحلة عمرية بين فترة الولادة وأربع وعشرين شهراً. حيث يعرض الوقت والكيفية التي يصدر فيها الأطفال الأصوات والكلمات وذلك لتحديد أسباب التأخر في الكلام. إدراك الوالدين للمعلومة الدقيقة يساعدهما على تمييز ما إذا كان أطفالهم يواجهون مشكلة معينة أم لا ونتيجة لذلك تكون لديهم الفرصة لتشخيص المشكلة وعرض أطفالهم على أخصائي نطق أو أخصائي أطفال أو أي متخصص آخر للتدخل بأسرع وقت ممكن لعلاج تلك المشكلة باستخدام الإجراءات المناسبة كما يقدم الأخصائيون فرصة في تدريب الآباء ومقدمي الرعاية على إجراءات منزلية الأمر الذي يؤدي لتطور الكلام بشكل أفضل.

لقد تبنى الباحث المنهج الوصفي والتحليلي لتحديد معالم الكلام. كما استخدم أيضاً طريقة المقارنة لإيجاد الاختلافات بين التطور العادي للكلام والكلام المتأخر بين الأطفال منذ الولادة وحتى أربع وعشرين شهراً.

الكلمات المفتاحية: تأخر الكلام، معالم الكلام، متلازمة الداون، المشاكل السمعية، العلاج.

Chapter One

Introduction

1.0 Introduction

Language in its broad sense is used by newborn babies round the world to express their needs, emotions and feelings. In its basic verbal form, language is considered the most important means of communication in everyday life. People also depend on language in interaction with other people to read stories, newspapers and e-mails, and to learn and teach all school subjects in schools and beyond.

In recent decades, there has been an increasing amount of literature on first language acquisition, especially English. Much information has become available in the field.

It is well known that parents and caregivers talk to babies not only right after birth but even before birth. While fetuses are in their mother's womb, they hear the vibrations of their mother's voice when they speak to others. This makes infants feel comfortable hearing their mother's voice and this affects the infants' emotions for many years (Fifer & Moon, 1994). Acquisition begins in the sixteenth week of pregnancy when their hearing begins to develop. By the seventh month of pregnancy, they are able to respond to sounds such as their mother's voice or music (Neirenberg, 2017).

Babies receive verbal language much earlier than they begin to intentionally produce sounds for communication purposes. They comprehend many words beginning from about seven months and store them in their mind until they have the ability to use the organs of speech (lips, tongue, teeth. etc) to use these sounds in order to communicate. They start to babble using what specialists call consonant-vowel sounds (Clark, 2016)

Phonology is the first language component which is concerned with features of speech. In this aspect, human ears begin to work when fetuses are in the womb at about the seventh month of pregnancy. In this period, fetuses can distinguish between their mother's sound and other voices such as door banging or noises (Saxton, 2017). After birth, infants do not distinguish between similar sounds such as 'p' and 'b' and they do not connect words with objects. They may also mispronounce certain sounds such as saying *tat* when they mean *cat* and drop sounds from words such as saying *poon* when they want a *spoon* (Kula, Botma & Nasukawa, 2013).

Vocabulary is the second level in which infants will have a repertoire of words that they use in their language development later on (Saxton, 2017). In order to know and learn words, infants do know the sound forms of words in terms of consonants and vowels to shape words regardless the denotation; they produce sounds and combine them to make words without meaning. But they will encounter trouble in the use of these words after pronouncing them correctly. Listening to speech regularly may give them a chance to learn and know words which will be familiar to them. This can be resolved by associating the words with objects by looking at or touching the objects so they prefer to use them after retaining (Swingly, 2009).

Receptive language is a very important part of language acquisition because it is the first step of communication using language. There are many building blocks that are needed to promote receptive language. Infants initially need the skill of concentration and alertness to pass any mission using continuous effort and they need pre-linguistic skills to communicate with others using gestures, facial expressions and imitation without using words. They also need social skills by taking part in mutual interaction with close people whether verbally or nonverbally to perceive and follow social traditions and finally play skill is a very important step

for receptive language because these skills are related to entertainment and enjoyment which motive them to engage with others (Anonymous, n.d.a).

Also, infants may encounter problems or difficulties in receptive language which can be treated by parents and caregivers taking some procedures such as using simple language with them and asking them to repeat what is said to them to emphasize their recognition and perception. Also many activities in everyday can be described by parents or caregivers for infants using suitable words to these activities for example take your shoes off when they are trying to do such activity (Anonymous, n.d. a).

As a result of receptive language, expressive language appears. Also, the use of body language to convey meaning without using sounds or words such as gestures and facial expressions is considered expressive language. All of these are used by infants to express needs, emotions, attitudes, wants and emotions (Anonymous, n.d. b).

Speech production can be described as a set of universal stages during the first two years which is governed by vocal imitation. The vocal stages can be identified by: reflexive phonation between birth to two months: yells, screams, coughing, sneezing and crying predominate. The second stage is cooing from a month to four happens by the infant producing sounds that resemble vowels. This expands between three and eight months by the occurrence of clear vowels and new sounds (Kuhl & Meltzoff, 1996).

Kuhl and Meltzoff (1996) add that babbling occurs between five to ten months of age when infants start babbling consonant-vowel syllables such as ‘*mama*’ ‘*baba*’. Then they try to imitate sounds by repeating adult’s speech using new consonants and long vowels to make

real words. Between ten to eighteen months, infants start to merge both babbling and meaningful speech to produce intonated utterances.

Infants differ in the pace and rate of development of speaking and language skills although most of them go through stages which are built on each other to master the skills of language. Infants of delayed speech are those who have defects in the emergence and use of mechanisms of the sounds. The defect may be an inability to use organs of speech lungs, vocal cords, mouth, tongue and teeth (Humes & Bess, 2014).

On the other hand, late talking is the inability to develop speech or language as others for example, a baby of twenty four months but has speech and language ability of eighteen months (Agin, Geng, & Nicholl, 2004). Late talking is the ability to understand speech and language but it is the inability to use speech sounds and words by the age of eighteen months or babies who are late talkers have restricted vocabulary production (Bonfiglio, 2018)

Some late talkers are affected by a family history of language delay, or sometimes being male and born is less than normal weight but they eventually catch up with early talkers by the age of three years and in terms of grammar by schools age (Ellis & Thal, 2008). However, some infants need to be examined for assessment by pediatricians and possibly by other specialists.

Some infants have speech delay or they are late talkers but they do not have any problems with language because they are concerned with other intellectual abilities. Camarata (2015) mentions that children with Einstein syndrome are late talkers but they begin talking by the age of three years. Infants with Einstein syndrome do not have any healthy or mental problems which cause speech delay that needs to be treated by pediatricians or speech pathologist. However, they are characterized by good memory, good analytical mind, and they

always prefer to stay alone. These characteristics cause speech delay because these children's focus is not in speaking in the first years of age in which they become bright and brighter than their peers.

That is for normal infants. However, for some infants the situation is radically different. They show deficit or impairment in receptive and expressive speech. One of the deficits is physiological. Preterm infants, who are born before thirty seven weeks of pregnancy, show disorder in language development in receptive and expressive language although they achieve speech milestones like their peers by the age of two years (Cusson, 2003).

In addition, speech delay may be caused by other factors which are related to physical or genetic problems such as genetic Autism spectrum disorder or Down syndrome (Rice, Warren & Betz, 2005). Also, some infants have problems in their inner, middle or outer ear which makes it difficult to hear sounds. This may result in speech delay.

Autism spectrum disorder is another factor which causes impairment in language development (Hudry et al, 2010). Infants with autism spectrum disorder show deficits in communication skills which are specifically related to receptive and expressive language. Receptive language impairment exhibits low comprehension of simple directions, requests and directions. In terms of expressive language, they have a speech delay in the beginning of babbling and using gestures. Also they have less frequent words or word combination in the second year and to some extent their gestures are not connected to words (Lim, 2012).

There are a lot of researchers who emphasize that infants with Down syndrome have speech delay in both receptive and expressive language (Caselli et al, 1998). Down syndrome is considered as a genetic disorder caused by third copy of all or part of chromosome 21 and it is

the main cause of mental retardation (Abbeduto & Chapman, 2005). Down syndrome is another factor which causes speech delay in infants. It is one of the most common reasons that lead to mild to moderate intellectual disability with the result that it affects physical and behavioral traits (Abbeduto, Warren & Conners, 2007).

1.1 Statement of the problem

It is the Down syndrome and hearing problems of delayed speech by infants who show delay in speech development which can be challenging for them and disappointing for their parents.

This study will investigate the causes of Down syndrome and hearing problems which lead to delayed speech of some infants in the age range from birth to 24 months.

1.2 Questions of the study

This research seeks to address the following questions:

1. What are the common early stages of language acquisition by normal infants up to the age of 24 months?
2. What aspects the characterize development of language acquisition by hearing problems and Down syndrome infants showing delay in language acquisition?
3. What are the causes of such hearing problems and Down syndrome delayed speech?
4. What are the potential treatments suggested by specialists?

1.3 Objectives of the study

This study aims at

1. Establishing the stages of early language acquisition of normal infants from birth to two years of age as the benchmark, for those who experience delayed speech.
2. Obtaining data which will help to identify features of Down syndrome and hearing problems that cause speech delay.
3. Outlining the causes of speech delay in infants with Down syndrome and hearing problems.
4. Describing the methods of treatment of Down syndrome followed to bring these babies close to normal children.

1.4 The significance of the study

Many studies have been conducted in the field of first language acquisition in terms of challenges and problems. This study attempts to look into the differences in language acquisition by normal infants and delayed speech by those affected by Down syndrome and hearing problems.

1.5 Limits of the study

This study is limited to delayed speech infants as a result of Down syndrome and hearing problems between birth and twenty four months of age.

1.6 Limitation of the study

The research was completed within a limited period in 2018/2019.

1.7 Definitions of terms

Babbling is articulating consonant-vowel sounds without meaning to them or definite categories in the first stage. It is a main milestone before the development speech by infants (Masataka, 2008, p. 157).

Cooing and Gooing “are processes of sounds by infants makes in the back of the mouth as a result of the dorsum of the tongue coming in close contact with the posterior section of the hard palate or the velum” (Koch, 2018, p. 63).

Deictic word “is a word that refers to time, place or situation in which the speaker is speaking such as *here, there, this, that, now* and *then*” (Nordquist, 2018).

Hearing loss “is defined as an inability to hear specific frequencies at the appropriate intensity”. (Elzouki, Harfi, Nazer & Stapleton, 2012, p. 602).

Jargon stage “is producing sequences of syllables that seem like words but which are characterized by unintelligibility” (Levey & Polirstok, 2011, p. 118).

Language acquisition is the process by which humans trigger the capacity to perceive, comprehend, and produce language forms gradually in a supportive social environment (Lightfoot, 2010).

Late talkers are toddlers who have good understanding of language but they produce less than fifty words or they do not produce word combination between eighteen and thirty four months of age (Ellis & Thal, 2008).

Otitis Media with Effusion (OME) “is an inflammation of the middle ear with liquid collected in the middle ear space” (Rosenfeld & Bluestone, 2003, p. 121).

Reflexive phonation is the production of spontaneous sounds such as crying, coughing and sneezing (Kuhl & Meltzoff, 1996).

Sensorineural hearing loss “arises from dysfunction of an impairment resulting from cochlear sensorineural elements and/ or of the cochlear nerve” (Goroll & Mulley, 2014, p. 1378).

Vegetative sounds are the natural sounds produced by babies between birth and two months such as crying, burping, coughing and swallowing (Buckley, 2003).

Chapter Two

Review of literature

2.0 Introduction

What is known about normal infant speech is largely based on common experience and the work of the specialist which is based on studies investigating the details of how infants acquire language in the first few years of life. This chapter is divided into theoretical literature and empirical studies presenting speech milestones achieved by infants between birth and two years and the causes of speech delay including Down syndrome and hearing problems.

2.1 Theoretical literature

Human speech is the primary means of communication. Infants develop speech as well as other aspects of growth and development at different rates. Receptive language is what infants receive directly, hear, understand, and comprehend of communication in the form of words, phrases and sentences and other pragmatic aspects from the surrounding environment. They achieve this through a genetic capacity (Clark, 2016)

Before infants are born, they discriminate their mother's voice by changing in their heart rates and some other movements. This takes place by the sixth month of pregnancy when they react to sounds. Between six and seven months of pregnancy, most fetuses respond to external noise. This resembles the foundation language and speech development.

Two days after birth, infants respond using fast sucking when they hear their mother's voice in comparison with hearing stranger's voice (Voegtline, Costigan, Pater & Dipietro, 2013). Infants acquire a number of language skills and knowledge. The first and most important skill is

to recognize the differences between human sounds and other sounds, such as human speech and music. Infants first recognize speech sounds and then they use these sounds to make their vocalization using organs of speech (Clark, 2016).

Infants are born having language capacity and it is represented in their brain although the environment surrounding them and their cognitive ability play a vital part in the development of first language acquisition (Ling, 2018). This capacity is triggered and developed by means of what their parents and caregivers say to them over time again and again, and what they practice on their own from this input.

The brain of infants is characterized by the property of plasticity which is the ability of the brain to be flexible in performing processes through cooperating between both sides of the brain. Brain plasticity changes throughout life using experiences of certain aspects. For example, when infants experience new sounds and words in their environment, this experience develops and boosts their ability in speech and language development (Rowland, 2014).

The brain is divided into two hemispheres in which each has certain functions (Figure 1). In the left hemisphere of the brain, there are two areas that are responsible for production and comprehension of speech: Broca's and Wernicke's areas (Figure 2).

Broca's area (figure 2) which is located in the frontal lobe has a function related to the production of speech. It is related to the ability to produce syllable and words meaningfully arranged. When the brain cells die because of stroke or oxygen flow to a particular area or the brain is reduced or stopped, there will be a problem in this area; speech can be understood but it cannot be produced fluently by deleting sounds or words and difficulty in producing sounds and words, this is called Broca aphasia.

The other area is Wernicke's area (figure 2) which is located in the parietal and temporal lobe close to auditory cortex which processes the auditory information. This area has a function related to comprehending speech produced by others. Trauma is the most common cause which damages Wernicke's area. This damaged area prevents understanding and receiving speech of others and this is called Wernicke's aphasia (Kennison, 2014).

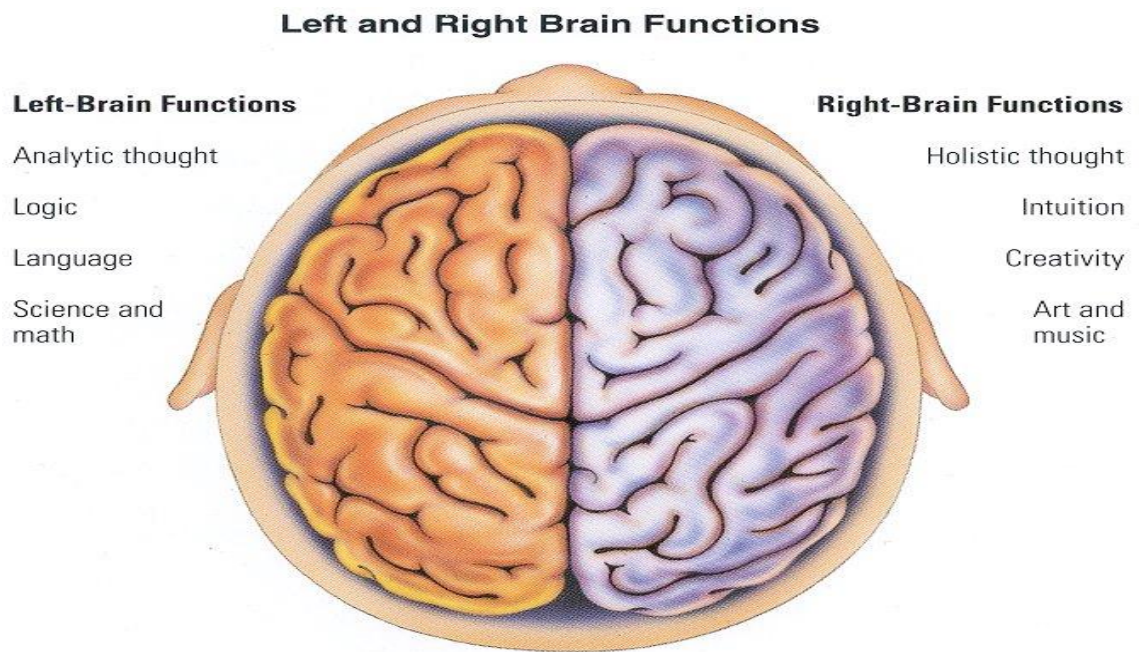


Figure 1. Left and right brain hemispheres.

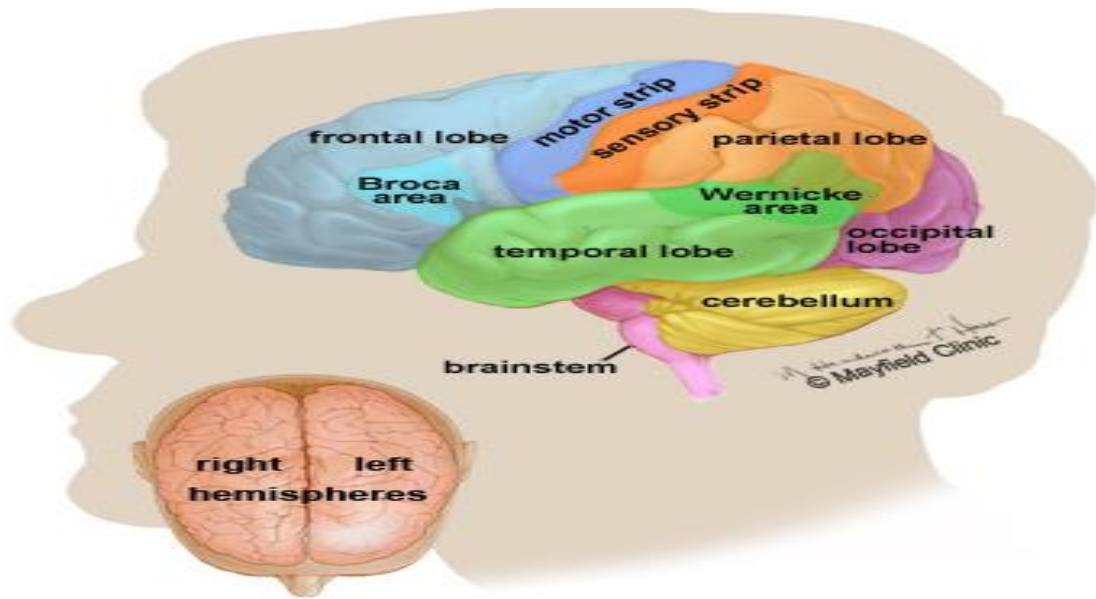


Figure 2. Broca's and Wernicke's areas.

Each hemisphere of the brain is specialized for certain functions such as the left hemisphere is responsible for the right side of the body, analytic thought and science and math in addition to language. On the other hand, the right hemisphere is responsible for the left side of the body, creativity, imagination and music awareness. The separation between the functions of the two hemispheres is called lateralization (Steinberg, Nagata, & Alien, 2014).

In addition, tracking what these people repeat in communication involves on the infant part reception, analysis and sorting out of these elements. These voices are the main data of receptive language. Parents and caregivers take pleasure while observing and monitoring the infants' development of speech and other essential physical and cognitive aspects.

The existence of parents with their babies makes a difference so that they may play a vital part in speech and language development. Parents use many ways to reinforce their infants' speech and language. They may simply point to things while they are talking to draw the

attention of their infants with the result that they will root these things with the words used. Parents use gestures with the words they pronounce so that infants can imitate the gesture to express that word. Also, while parents are talking and using words about what they are doing, infants expect what to do next time and then learn these words (Luckenbill, n.d.)

Also, living with parents or caregivers is not enough to acquire language unless infants are exposed to language permanently. Infants like to hear their parents' voice so the more parents talk to them, the more they keep trying to talk and imitate the sounds and words produced by their parents. Strictly speaking, infants who are exposed to language have the chance to acquire and develop their speech and language better than infants who are not exposed to language early (Rowland, 2014).

Infants produce sound on their own or in response to some external stimulus. This action is called vocalization. Infant vocalizations are innate and environmental. In addition, infants can determine whether these sounds are similar or different sounds and they try to develop frequent speech sounds by repeating but they may not produce the same identical sounds (Ingram, 1991).

The first weeks and months of infant communication development carry features which are commonly described as prelinguistic and prespeech vocalization. Language development depends on two main areas including receptive language in which infants understand language ‘‘input’’ and expressive language which is the production of language by infants ‘‘output’’ (Fleming, 2017).

According to Ingram (1991), these two areas are called infant's speech perception in which infants are able to recognize speech before they can determine that speech conveys

meaning. The other aspect is infant speech production which is the use of speech-like sounds by infants before they have linguistic meaning.

Infants begin to acquire language after birth by listening. They show preference to listen to human speech with the result that infants may adapt more easily with their mother tongue and this facilitates the processes of acquisition and learning (Vouloumanos & Werker, 2007). They are used to the sounds and voices from closest people around them especially parents and caregivers. Moreover, listening to these sounds and voices makes them feel relieved (Bowen, 1998).

Parents actually appear to welcome almost every vocalization that they think is pleasure for the infant. When infants vocalize, they may simply babble in response to adult comments and questions. This can be described as engaging in active communication as partners in dialogue. So the presence of parents with their infants spending as much time as possible helps infants to acquire language (Clark, 2017).

Infants go through stages of language acquisition which are called milestones. The way of communication used by infants in the first month is crying which has different types for comfort, discomfort, pain, loneliness and hunger. These types of cries can be learned quickly by parents to know the meanings of these different sounds. This makes it easy to fulfill infant's needs and wants (Reece, n.d.)

Infants in the vocalization or phonation stage from birth to two months make different reflexive sounds which are considered behaviors such as crying, coughing, sneezing, burping and types of grunting. These behaviors by infants are related to physical and biological conditions and movements. Vegetative sounds contain sounds related to feeding such as grunt, sighs and

tongue clicks. Some vocalizations used by infants during this stage are similar to vowels. These vocalizations are called protophones which are results of infant breathing in or out. Their lips are not close to each other and the tongue has a neutral position (Oller, 2012 & Koch, 2018).

Vocalization appears in different stages of a baby's life beginning from birth to four months. The first is crying as a means of expressing need for something such as *ooh*, *aah*. This stage is called cooing and gooing by the second month. In the stage that begins from the second month to the fourth, infants actually use these sounds in response to other sounds and voices especially parents' and caregivers' voices. Infants in this stage use vocalization in attempt to exhibit themselves and they use other prespeech sounds like squealing and gurgling sounds for emotional access. They also pay attention to the repeated sounds from people in their environment. The most important feature in this stage is their contentment feeling in their sounds. These sounds may be velar and nasal (Mersch, 2017, Attard, 2016, Koch, 2018 & Petty, 2016).

Vocalizations in this stage are called coos and goos that refer to sounds made by infants toward the back of the mouth as a result of the back of the tongue coming in close contact with the position section of the hard palate or the velum. Cooing and gooing are result of velar sounds or back sounds that infants make from vegetative sounds (Oller, 2012).

Oller (2012) adds that the second stage is primitive articulation which begins from the first month and extends to the fourth month. During this stage, infants produce new sounds such as squealing and growling. These sounds may be similar to vowels and may also contain consonant sounds. These protophones are characterized with different periods, unequal pauses and different loudness levels.

Infants continue cooing at the ages of four to five months, and by the age of six months infants try to imitate sounds they hear in the environment (Judith & Ronald, 1998). Vocal play is considered by Koch as another stage which takes place between four to six months so the demonstration of cooing sounds happens in this stage with the result that they can produce vocalization with longer vowels using different tongue position. Infants also attempt to produce more pitch and loudness variations (Koch, 2018).

Babbling is a new stage which is used by infants by the age of six months to express enjoyment and displeasure of sounds, noise or strange movements around them using tone (Fleming, 2017)

Between four and seven months, infants go through other milestones such as cooing, babbling and vocal play which are suggested by many researchers. Babies start to use their lips which help them produce consonant sounds with short vowels such as (ba, ma) making them look like speech sounds.

From four to seven months, according to Bowen (1998), infants respond to the word “no”, react with shift in tone and focus on single sounds. Towards the end of this period, babies are able to control their repertoire of sounds more than producing new ones. This can be shown by combining different sounds and using more long and complex series of sounds than the previous stage. During this stage, facial skeleton is grown with the result that it allows the tongue to have more area to move which help increasing variety of sounds (Hoff, 2014).

The phonological development between three and eight months is considered the expansion stage. Vocal play has an important role in speech development because it leads to expansion of speech sounds and vocalization. There are characteristics of this stage such as pitch,

duration and quality. Pitch is the major recurrence of articulations and the predominant sounds that are pronounced by infants. Duration is the extent of consistent speech syllable which lead to providing a sort of concentration for comprehension. Also, other sounds such as squealing, growls and yelling become more repetitive and obvious than the former stage. These series of sounds at the end of this stage called marginal babbling. Marginal babbling also has many features e.g. rhythm, timing and loudness (Oller, 2012).

In terms of receptive skills, the stage between six and nine months is very important. Infants pay attention to the speakers when names of the babies themselves are mentioned. Also, they can recognize the names of popular things such as names of people round them and things that have frequent usage e.g. *car, bed room, phone* (Bowen, 1998).

Babbling develops between six to nine months because infants insert and reduplicate consonant sounds e.g. *baba, mama*. Infants use these sounds in attempt to give their parents and caregivers an idea about what they want or if they are in pain. Also, they try to imitate speech sound and intonation as well as repeat syllables (Fleming, 2017). They begin to reduplicate babbling using more consonants between vowels such as “*baba, mama and dada*”. Moreover, they use exclamations “*oh-oh*” to express their emotions (Mersch, 2017).

Babbling is the fourth stage which runs between six months and nine months. It is also called canonical babbling including two forms; reduplicated and nonreduplicated babbling. Reduplicated syllables are the use of similar vowel and consonant sounds and although vowels change slightly, consonants will stay the same e.g. “*mamama*”. Nonreduplicated babbling (variegated babbling) has changes in the vowels and consonants of utterance e.g. “*badonano*”. During this stage, infants acquire skills in the area of motor coordination which helps the

transition between sounds to be smoother. Babbling and vocal play at the end of this stage may be observed in speech. Moreover, mimic babbling can be noted in an exchange between infants and caregivers which is a sign of achieving an important milestone (Koch, 2018).

Oller (2012) adds that the last stage is canonical babbling which takes place between five to ten months. Speech-like sounds become more dominant in this stage when infants have the ability to develop and coordinate the movements of vocal tract which leads to canonical babbling. The production of vowel-like sounds which has the characteristics of adult-like speech does not have a direct meaning during this stage. Then they produce reduplicated syllables containing the same consonant-vowel sounds for example, “baba” and “mama” which sometimes means true words observed by parents and caregivers. Later, infants begin to produce different consonant-vowel sounds e.g. “badido” and “botadi” which is another form of babbling called “variegated babbling”.

Infants sometimes give up producing babbling sounds for short time, specifically while walking, before producing their first word and they focus on the phonological dissimilarity (Clark, 2016).

Jargon stage begins from ten months. This stage is considered to be an extension to the babbling stage but the two stages are different from each other in a way that jargon stage has a complication in the strings of the babbled utterances i.e. it has longer strings characterized by intonation patterns, rhythms and pauses. In addition, infants may use facial expressions and gestures leading to function and communicative intention to the utterance without using true words (Koch, 2018)

Infants actually use their first spontaneous word between nine to twelve months of age by the time they receive many other words (Hudry et al, 2010). They vocalize their first word in this stage as a result of people's commands and questions round them and this vocalization starts to have distinctive sounds of their mother tongue.

Infants between nine and twelve months produce certain sounds related to special actions and things such as cookie, shoe (Petty, 2016). Reaching the age twelve months, infants respond to speech from adults around them using one word but they have the ability in receptive language better than expressive language at this stage (Judith & Ronald, 1998, Barret, 1999 & Mersch, 2017).

The first year of an infant's life is the starting point of the acquisition and production of language elements (Clark, 2016). During the first year of life, babies go through stages and achieve several milestones which are the foundations of their language acquisition. They understand many words especially from the environment around them and continue to store new words. In this stage, they make vocal contact with parents and caregivers using gestures and word intonation to pay attention to what they need. By the end of this year, babies begin using the first meaningful words (Peccei, 1999 & Clark, 2016).

Between twelve and fifteen months, infants tend to point out objects around them using gestures to pay attention or ask for something to discover the name of that object. This enriches their ability to store knowledge and to use the appropriate word later on (Boysson-Bardies & DeBevoise, 2001).

Infants continue in the first word stage until the age of eighteen months. Infants of fifteen months have approximately fifteen words and these words are characterized with the production

of the whole unit unlike the previous stage in which most of them are sequences of sounds. Also, they increase their vocabulary rapidly at this time of development and they develop an organized relation with adult speech pattern and infant's pronunciation (Singleton & Shulman, 2009). Between the ages twelve to fifteen months, infants use about six to twelve words that are comprehensible for their parents and caregivers and they use jargon as a response to verbal commands (Buckley, 2003).

Between fifteen and eighteen months, infants are able to associate articles with nouns and can use pronouns with verbs. Infants use ten to twenty words most of which are nouns between fifteen to eighteen months and which are characterized by intelligibility. They also use words in question intonation and statement intonation (Kail, & Hickmann, 2010).

By the end of eighteen months, infants use about twenty words. These words are speech-like sounds which sometimes seem like the sounds of animals or cars, names of people round them, kinds of food, parts of body and certain verbs. This process is called approximation (Cardamone, 2016). Infants of eighteen months of age use about ten to twenty words and they point to the body parts such as nose, head, mouth...etc when this is asked from them. Also, they use some words to express their needs and wants (Buckley, 2003).

Between eighteen and twenty four months, infants produce two words and these combined words are considered as mini sentence. At this stage, they use these words in an appropriate order characterized with the sensitivity of structure. Because infants develop their abilities in language, their parents tend to change their infants' behavior. At this stage, infants develop their repertoire of vocabulary approximately ten new words a day. These words seem to

be available in their environment then they begin to find out the function of the acquired words (Johnston, 2015).

Infants combine at least two words to make word-like sentences by the end of twenty four months like ‘all-done’ ‘love-you’. In addition to the above, infants can say about fifty words by the end of twenty four months (Cardamone, 2016).

By the age of twenty four months, babies know about fifty words. They also recognize body parts when they are named and use phrases of two or three words. They can use phrases containing two words together by the end of two years (Fleming, 2017 & Judith, Ronald, 1998). Most of their spoken words are recognizable by others in this stage and because of their ability to understand is expanded; their production is better (Cusson, 2003).

All the previous studies show that infants go through the stages that include specific milestones. Researchers sometimes disagree about the specific age in which infants produce sounds or words in accordance with their sample or the type of language or even these researchers are linguists or pediatricians. But all of them agree that infants begin to use their first word by the end of the first year and produce two words together by the end of two years. In addition to this, researchers agree those infants’ receptive language starts from birth and later affect their expressive language.

Infants begin to acquire communication skills from birth which are the foundation of their future language development. They develop these skills differently and at different rates. Some of them do not achieve the general milestones of speech and language development timely, which gives parents possible indication whether their infants normal speech delay or other problems in development. This delay may be in comprehension (receptive language skills) of

sounds, words or trouble in expressive language using gestures, producing sounds, and word-like utterances.

The first two years of an infant's life is crucial because the production of sounds, words and word combination is during this stage so they achieve speech milestones which are the foundation of language development in the following years. On the other hand, any lag in this period is considered speech delay which can be in the form of the absence of certain aspects. Parents may indicate them to their family doctors or pediatricians. The pediatrician advises them to the course of action fit for the case, e.g. to a speech pathologist.

There are many signs that make parents worry if their infants have a speech delay. Language development essentially depends on social interaction, so if infants do not pay attention to parents or caregivers, respond to sounds, in the environment and music, this may be a warning sign of speech delay. If these signs appear in speech and language development infants should be diagnosed by a specialist as early as possible to get on track with their peers.

Speech pathologists are specialists in determining the speech disorders that infants have such as problems in articulation, phonological disorders or apraxia of speech because of any potential problems related to brain or hearing. They help parents how infants produce sounds and put sounds together into words. Finally, their mission is to treat infants' speech problems as early as possible.

There can be a speech problem if the following signs appear:

Firstly, most newborns' hearing is checked immediately after birth to find out if there is any problem. In this period, if newborns do not startle in response to loud sounds, they do not

follow an object with their eyes or they do not look at their parents while talking, this is considered as a sign of hearing problem that leads to speech and language delay (Rebis, n.d.).

Secondly, between three and four months, infants do not turn their heads to sounds. They do not look at faces of people while talking. They look unusually quiet and cooing sounds do not appear at this stage. They do not use different cries for different needs and they do not use their voice to pay attention of others (Goss, 2015).

Thirdly, Infants genetically want to acquire human speech using human faces initially to interact. So if they do not pay attention to the speaker's faces and eyes while talking or they also do not vocalize or show attention while communicating by the age of six months, these are warning signs of speech delay (Gardephe, n.d. & Attard, 2016)

Fourthly, babbling which begins approximately between four to six months and extends to nine months is considered the most important milestone of speech stages. However, babbling without consonants vowel sounds by the age of nine months is an indication of delayed speech that needs to be checked for those points to some hearing problems (Gardephe, n.d., DiProperzio, 2015 & Attard, 2016).

Fifth, between the age nine and twelve months, the sounds used by infants sound like obvious consonants and vowels. Infants also can respond and react to the word *no* at this stage and try to imitate new sounds (Rebis, n.d.).

Sixth, by the end of the first year, infants use their voice to connect to their environment. At this stage, babbling sounds are produced by infants and they join sounds together making tone of speech. They also produce one word such as *mama* and *dada* and recognize names of common objects (Komisaruk, n.d.). So if they do not achieve these milestones, this may be a sign of

speech delay. By the end of first year, they also do not have vocabulary of fifty words and they are less interested in social interaction than previously (Shook, 2015).

Seventh, reaching the age of fifteen and eighteen months without producing any word and not distinguishing between common objects such as *car*, *shoes*, *cookie* is considered a sign of speech delay. Infants of this group cannot identify body parts and do not use two words to make speech-like sentence. They also have a repertoire of vocabulary which is less than 25 words (Attard, 2016).

Eighth, by the age of twenty months, these infants do not produce at least six consonant sounds especially (p, b, m, n, w, h) and they do not follow simple directions (Shook, 2018)

Ninth, infants who have speech delay by the age of twenty four months do not form two words together and they do not use words to identify pictures anywhere. Furthermore, they do not know the names body parts such as *nose*, *mouth* and *ear*, the names of animals or animal sounds such ‘‘moo’’ for cow (Ryan, 2018).

Speech and language delay is a kind of communication disorder. Infants have a speech delay when they do not attain specific milestones of their age in comparison with their peers. They sometimes have a difficulty in communication. Their language abilities may be developing slower than their peers. This means that they may have problems either in receptive or expressive language or both. The delay may be affected by many aspects including Down syndrome and hearing problems (Minis, 2016).

2.1.1 Down Syndrome (DS)

DS is caused by change in chromosomes, mainly Trisomy 21, which is the existence of an additional copy or part of human chromosome 21 with the result that there will be changes in most genes. Translocation (Figure 3), which refers to the attachment of chromosome 21 to another chromosome, is another cause of DS. Mosacism, the last and least cause of DS, happens because of the failure of separation of chromosome 21 that sets an additional copy of the chromosome in some cells (Abbeduto & Chapman, 2005)

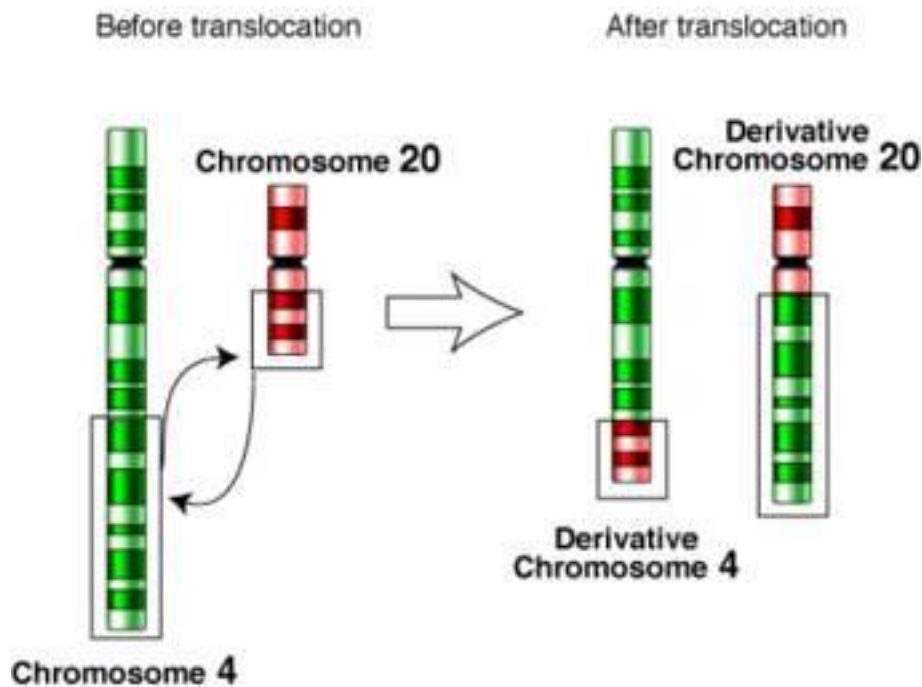


Figure 3. Translocation.

Roizon and Patterson (2003) mention that this leads to chromosome 21 being responsible for the developmental and physical features related to DS. Consequently, infants with DS are affected by differences in the physiological features leading to difficulties in producing sounds and words. The sources are variations in the vocal folds which have impact on the voice quality,

the structure of oral cavity and the size of the tongue (Figure 4) leading to difficulty in producing tongue consonants. The differences also include the weakness of facial muscles which restrict the lips movement influencing expression of labial consonants with the result that the effects of these differences lead to delay in the speech and language development (Stoel-Gammon, 1997).



Figure 4. Big size of the tongue.

DS presents problems to the development of language abilities and acquisition difficulty in producing vocalizations and words, including delay in the production of the first word until babies are two years old. Moreover, they sometimes have problems in receptive language but at the same time they always try to communicate with other people using gesture to compensate for the inability to produce sounds and words using gestures (Damico, Muller & Ball, 2013).

Infants with DS encounter problems in both receptive and expressive language. They make phonological errors during the development of speech and they use fewer consonants

correctly. Other factors such as apraxia of speech and voice quality have an impact on speech intelligibility which affects expressive language performance (Martin, Klusek, Estigarribia & Roberts, 2009).

DS involves moderate to profound mental retardation, low muscle tone (hypotonic), which leaves infant's muscles feeling relaxed. Infants with low muscle tone seem floppy when they are held (Figure 5) and one of its symptoms is speech delay. Also, there are some cardiovascular problems that are present in children with DS and special characteristics of physiological features (New & Cohran, 2007)



Figure 5. Ds infant's low muscle tone (hypotonic)

Newborn infants with DS show response while hearing loud sounds shaking their arms and raising their legs and this is normal response for a newborn. Also young babies give up any movement that is common while their parents talk to them. Before DS infants reach the age of six months, they use different cries to communicate in which these cries are understood by their parents. Between six months and by the end of first year, they continue to use and develop

babbling. On the other hand, the problem in infants with DS appears to be in the production of the first word which takes place by the end of the second birthday (Selikowitz, 2008).

Infants with DS have the ability to communicate and interact with people using gestures and speech but their speech may be hard to be understood because sometimes it is not so obvious so it can be challenging for them.

Infants with DS have a problem with expressive language which is the actual use of language, although they have better ability in receptive language than expressive language. They have the ability to learn the meanings of new words better than they can produce those (Roberts, Price & Malkin, 2007).

According to Stoel-Gammon (1997), there is a difference in the beginning of canonical babbling, which is the production of vowel-like sounds, in infants with DS who are late about two months from normal infants. Infants with DS continue to babble into the second year and last longer than normal infants do. So the difference between infants with DS and normal infants may appear in the development of phonology.

Otitis Media (OM) and hearing and oral motor skills are the two main areas influencing language development in infants with DS. Hearing is an important for infants to acquire language but infants with DS are affected by hearing loss which results from conductive or sensorineural hearing loss. This loss is affected by OM which has many causes in infants with DS such as narrow auditory canals (Figure 6) cranial facial differences and subtle immune deficiencies. Infants with DS are also exposed to language complexities such as difficulty in hearing speech sounds and slow vocabulary development because of Otitis Media with effusion

OME (Figure 7) resulting from the fluid in the middle ear related to hearing loss (Roberts, Price & Malkin, 2007).

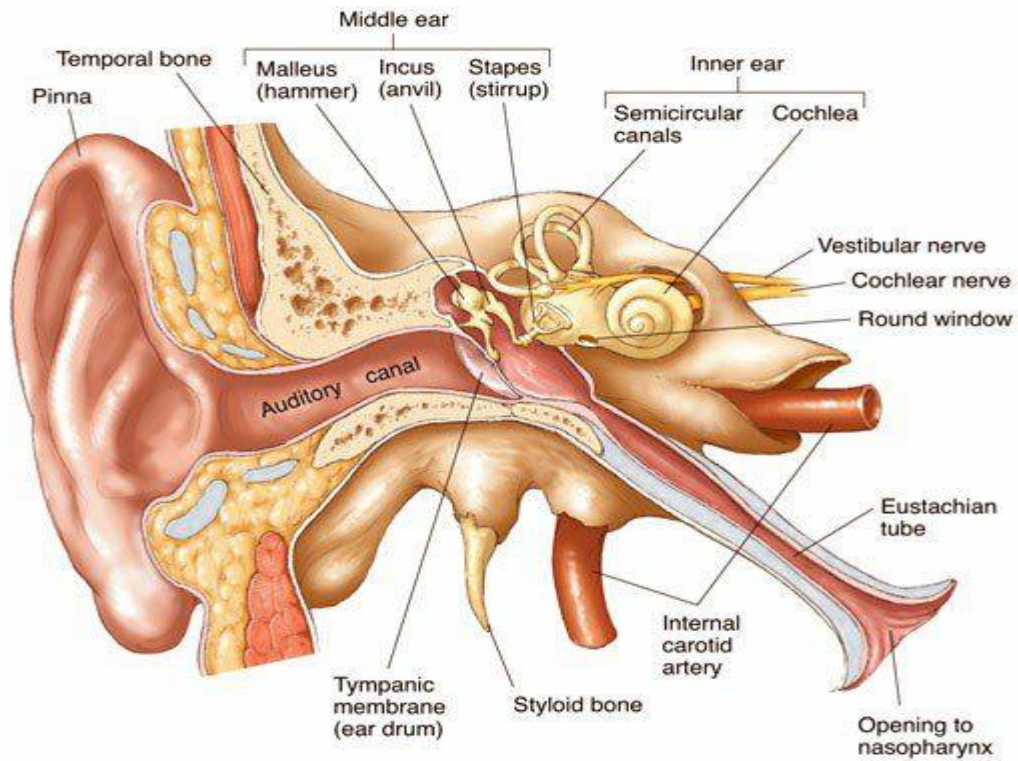


Figure.6. Auditory canal.

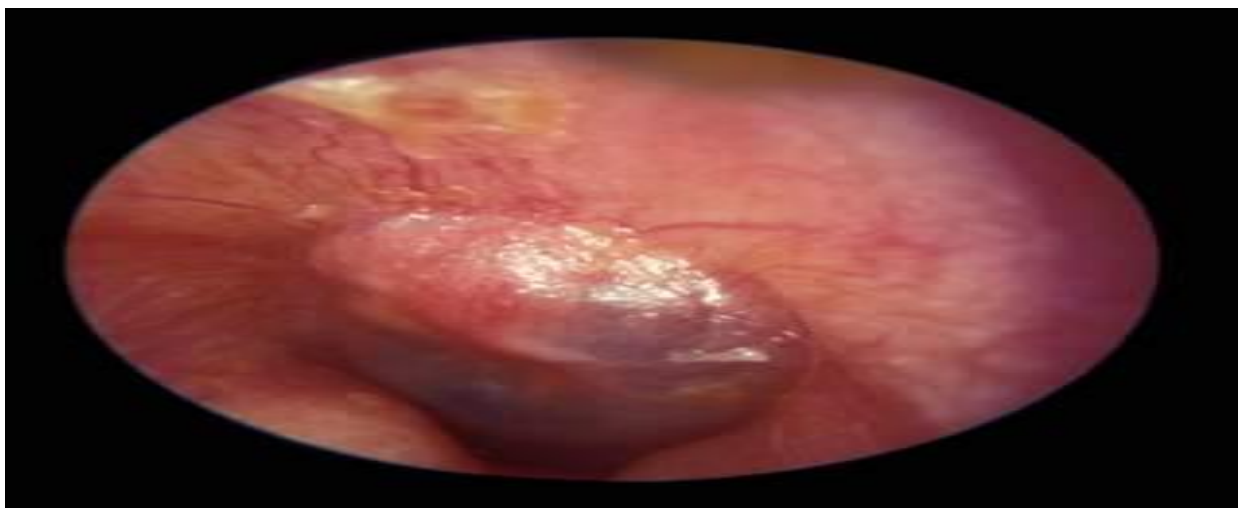


Figure 7. Otitis media with effusion (OME).

Moreover, difficulties in speech intelligibility, understanding of grammatical morphemes and number of different words produced by individuals with DS are related at the same time with hearing impairment. Delay shows in nonverbal communicative skills of requesting and delay in producing the first word and two word combinations (Chapman & Hesketh, 2000).

It can be concluded from this study that the delay in the production of speech sounds and vocalizations is related to many aspects in infants with DS such as the differences in the physiological features, expressive language impairment and hearing problems. Also, the production of most of these vocalizations is not meaningful and the first word produced by them by the end of the second year. Their production of speech sounds overlaps between the stages they go through. For example, when they produce their first word, they continue to babble.

2.1.2 Hearing problems

Hearing is sensitive in all aspects of development of an infant's life. Infants who have hearing loss are affected by their inability to recognize and discriminate sounds in general rather than specific speech sounds, which leads to delay in language acquisition (Beals, Dahl, Fink & Linebarger, 2016).

Hearing loss extends from mild to moderate, to severe to profound. Hearing loss is divided into two types. Firstly, conductive hearing loss takes place when the sound is not passed efficiently through the ear and ear drum which involves complexities in the middle or the outer ear. This is usually caused by infections like Otitis Media (Figure 8) The other category is sensorineural hearing loss occurs in the inner ear or auditory nerve as a result of noise exposure but has more effects than conductive hearing loss (Hall, Haas & Oyer, 2001, Smith, Bale & White, 2005, New & Cohran 2007).

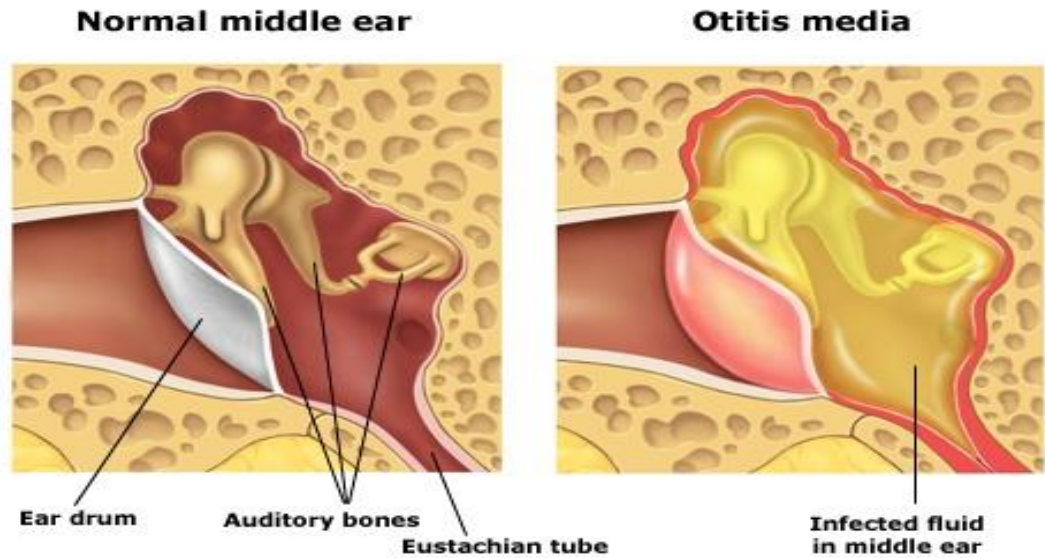


Figure 8. Otitis media

Hearing loss is measured in decibel (dB) (Figure 9). It is a unit of measurement mostly used in acoustics by audiologist to determine the sound pressure level. It is divided according to degrees into four: mild hearing loss (26-40) dB, moderate hearing loss (41-60) dB, severe hearing loss (61-80) and profound hearing loss (81- dB or greater) (Lang-Roth, 2014).



Figure 9. Decibel measurement device.

Infants with mild hearing loss cannot hear some words and quiet conversations. They have difficulty hearing in situations with background noise such as in restaurants, football stadium or cinema. Moderate hearing loss has an impact to understand speech although infants are able to hear loud and intense vowel sounds. In addition, they may miss some soft consonant sounds. Babies with severe hearing loss try to focus on the speaker's lips to understand speech. People have to use louder speech to be heard by babies. Babies also cannot hear more than a person speaking at one time. Babies with Profound hearing loss cannot hear either low or high sounds or voices without hearing aids (Clason, 2015).

According to Bansal (2016), the causes of hearing loss can be classified into three stages. The first stage is before birth. During this stage, hearing loss can be caused by genetic deficits especially in the inner ear, infection by fetus's mother. Drugs and radiation which mothers are exposed to during pregnancy may also lead infant's hearing loss. The second stage takes place few weeks immediately before and after birth. In this stage, hearing loss may be caused by many conditions including: infants are born less than 1.500g, birth injury and shortage in oxygen. The last stage is after birth. Infant's hearing loss is affected by genetic causes hereditary or non genetic causes such as infections, drugs that poison ears, shock by sudden loud noise and middle ear surgery (Bansal, 2016).

In terms of causes, hearing loss can be genetic or environmental (Smith, Bale & White, 2005). The cause is sometimes genetic through changes in the genes involved in the hearing process. Sometimes, the process of hearing loss is a mixture between genetic and environmental factors (Rehm, Williamson, Kenna, Corey & Korf, 2003).

There are causes of hearing loss that can be acquired which damages the ear especially the inner ear. Viral infection is one of the causes in which infants will acquire during pregnancy (Rehm, Williamson, Kenna, Corey & Korf, 2003). One of the main acquired factors of sensorineural hearing loss is also noise-induced hearing loss (Daniel, 2007 & Rabinowitz, 2000).

OM is the inflammation of the middle ear. It is considered the most widespread cause of deafness in infancy with the result that there will be a trouble in language acquisition. OM is divided into three major types: Acute Otitis Media (AOM) (Figure 10) Otitis Media with Effusion (OME) (Figure 11) and Chronic Supportive Otitis Media (Mar & Cripps, 2006).

Acute Otitis Media

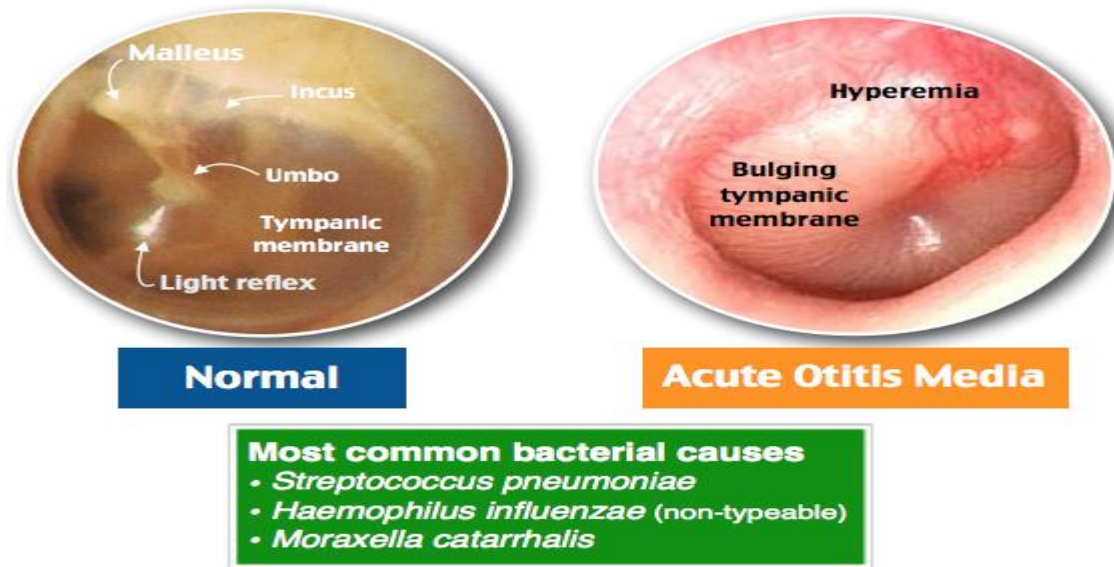


Figure 10. Acute Otitis media (AOM)

Otitis media with effusion

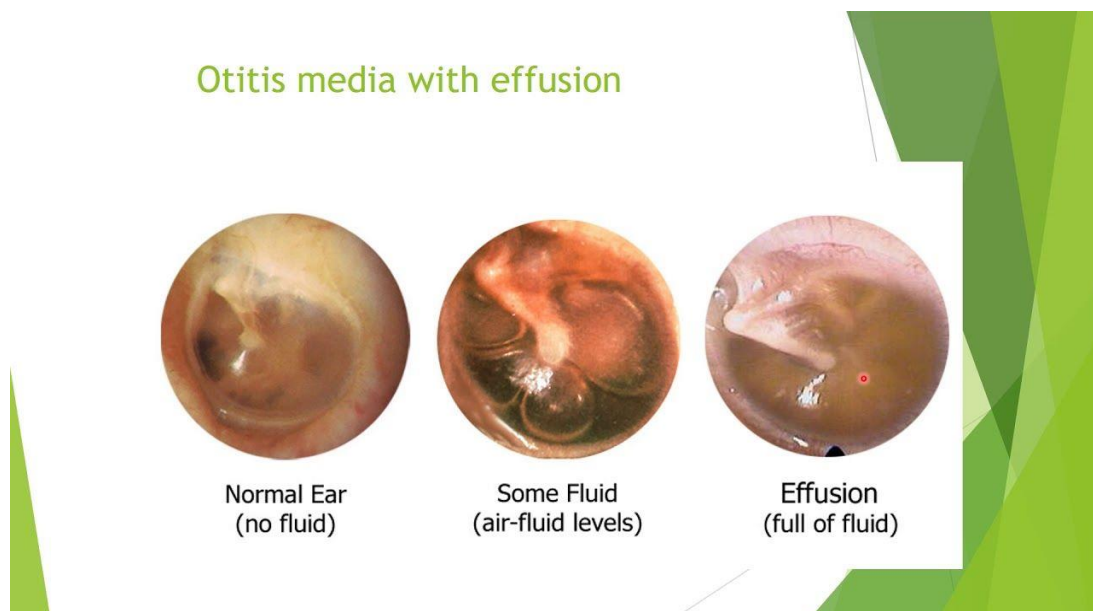


Figure 11. Otitis media with effusion (OME).

OME (Figure 10) is the accumulation of fluid in the middle ear resulting from upper respiratory infection with poor functioning of the Eustachian tube (Figure 12). It plays a vital

part in the development of language in children because each part of OME has a specific period of impairment in hearing so the ability of hearing can affect spoken language learning. OME often leads to mild and fluctuating hearing loss (Leonard, 2017). In addition, one of the most important problems in infants with OME is that they do not suffer from any pain and it could be completely absent but the main feature to notice the problem is deafness (Mar & Cripps, 2006).

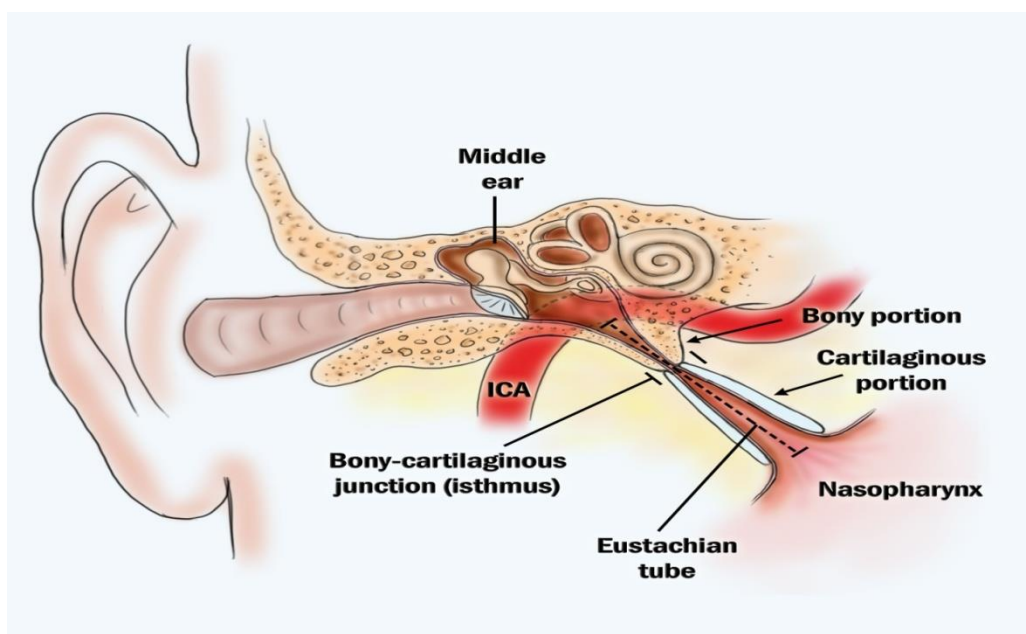


Figure 12. Eustachian tube.

Hearing loss is a case in which infants cannot hear voices by ears. This can be shown by many signs such as mumbling, adding extra sounds and words, making a temporary stop when trying to communicate, and making a deviation in sounds when talking as well as trouble with articulation. So, speech disorder may be a trouble in articulation, making sounds, phonological processes or hearing and repeating sounds (Martel, 2016)

Parents and caregivers are the first to notice if their children have hearing problems. There are many behaviors that indicate hearing impairment such as asking for repetition by other

speakers. Infants do not understand what is said to them. Also, they seem not concerned with the tasks related to listening such as they do not look at people who are speaking and they avoid participating in conversation. They look tired at the end of the day and they do not participate in situations that need listening skills because of hearing difficulty. They often encounter problems with specific sounds (Hall, Haas & Oyer, 2001).

Many studies show that there is a relation between hearing loss and language development. Children with Otitis Media (OM) for example suffer from weak receptive language, expressive language, less diverse words and different use of words. Also, children with hearing impairment caused by OM show less attention to language input which can lead to problems in language development (Roberts, Burchinal & Campbell, 1994). In addition, infants with chronic Otitis Media produce nonverbal gestures than healthy infants which are a sign of later language development (Yont, Snow & Vernon-Feagans, 2001).

Normal infants pass into stages in the first year in which each stage represents milestone or more. One of these milestones is babbling which begins at the age of 4 months and continues to 9 months. On the other hand, infants who have severe or profound hearing impairment do not reach babbling properly such as canonical babbling until 11 months and more because canonical babbling is considered the building blocks of developing speech later on (Eilers & Oller, 1994). Infants with profound hearing loss do not babble sounds like *baba*, *mama* which are produced by normal hearing infants by the age of eight months (Packer, 2016). This may inhibit the developing of producing speech sounds in the following stage which represents the beginning of production of the first word by the age of twelve months with the result that infants will give up developing their speech and language.

According to Grindle (2014), cooing and babbling milestones will be passed normally by infants who suffer from severe to profound hearing loss between the ages six to nine months. But their ability to produce these sounds disappears after nine months and they miss such skills which affect their speech development. They will also not be able to respond to sounds produced by others in the environment.

They do not produce sounds such as *s*, *sh*, *f*, *t* or *k* because it is difficult for them to hear such quiet sounds and they do not hear their voice while speaking whether it is high or low leading people to believe that they stutter or produce sounds variously (anonymous, n.d. c). These are voiceless consonant sounds which do not need to use vocal cords. Normal infants do not use their lip in the production of such sounds (Kreidler, 2001). This makes it difficult for infants with hearing loss to hear these sounds or to see lips movement when producing such sounds with the result that the production of these sounds is inaccurate.

Vocabulary often develops more slowly in infants who suffer from hearing problems. One of the most important social and cognitive milestones that indicate the ability of child development is the beginning of the spoken word comprehension and recognizing the meaning of words which can lead to direct use of these words (Marschark & Spencer, 2016). The authors add that vocabulary knowledge plays an important role in supporting and foreseeing many fields of development such as speech comprehension and word recognition, understanding language, communication, social cognitive development, theory of mind and academic outcomes.

2.2 Empirical studies

This part aims at reviewing the empirical studies that have been conducted in the field of delayed infant's speech. It concentrates on what Down syndrome and hearing problems are and on the linguistic aspects that result from these physiological problems.

2.2.1 Down syndrome (DS)

DS is a genetic syndrome that is caused by an addition of chromosomes in some babies in comparison with others who have a typical chromosomal structure. Individuals with DS usually have different characteristics related to intellectual disability and facial features (Figure 13). Also, infants with DS have a speech and language delay, and their development is generally later than their normal peers.



Figure 13. Facial features of infant with Down syndrome.

Iverson, Longobardi & Casselli (2003) did a research using a sample containing ten children, half of them with DS (3 boys and two girls) with:

- An average chronological age of 47.6 months

- An average mental age of 22.4 months which refers to the infant's intelligence at this age because infants with DS are affected by mild to moderate intellectual disability that may lead to development delays.

- An average language age of 18 months which indicates to infant's ability to produce sound, words and phrases at a target age.

The children with DS were matched with normal developing children according to gender, correspondence between normal children's chronological age and that of DS children and the observed vocabulary size language age to assess expressive vocabulary size.

The researchers classified gestures into two categories. Deictic gestures which refer to the things in the environment and so the meaning is restricted, such as raising an object in front of the listener to show something, to pointing with finger to what is referred to and reaching to a thing you need using hands and gazing to the listener. Representational gestures represent certain referents but the basic semantic content does not change obviously in the context (e.g. raising the arms high for tall, shaking the hands for too hot).

Also, the researchers classified words into two categories. Deictic words which are personal, possessive and demonstrative pronouns and locative expressions e.g. 'I', 'yours', 'here' and 'there'. The context determines the meaning of these words. Representational words are nouns, verbs and adverbs.

The research shows that children with DS show some types of delay especially in using deictic words and the production of complementary and supplementary gesture-word combination such as pointing to mother and say *mama*. The results show that children with DS cannot produce two-word combinations. Although children with DS produce the same number of gestures in comparison with normal children, normal children produce word-gesture more than those with DS. Moreover, the function of using gestures by children with DS is different from normal children. Because of their ability to use gesture more than words, they use gestures to compensate the restriction of verbal abilities.

Mundy, Kasari, Sigman & Ruskin (1995) examined the hypothesis that there is a relation between the disturbance of nonverbal requesting skills and delay in expressive language. The study was conducted on 37 children with DS and 25 normal children using some screening criteria to recruit children with DS for the study of:

- 1) Chronological age between 12-36 months
- 2) Expressive speech of less than 20 words according to caregiver report
- 3) No known gross visual or auditory handicaps and
- 4) The functional use of both hands.

The researchers found that normal children respond to requests faster and better than children with DS such as showing response to ‘‘look’’ and ‘‘come’’. Also, the use of different and many gestures such as pointing to attract attention of others by children with DS positively affects language development later on.

Lynch et al (1995) conducted a longitudinal study on 13 DS' infants and 27 normal infants from four to eighteen months of age. The study followed the canonical babbling between the two groups during monthly sessions for twenty minutes each. The findings indicate that the two groups began the babbling stage by the age of four months. But infants with DS showed delay in the beginning of canonical babbling about two months in comparison with normal infants and canonical babbling is less stable for them. This affected vocal development and, social and communicative functioning in the first year.

The development of early vocalizations in infants with DS or normal infants is controversial between researchers. A study tackled 9 normal infants and 10 infants with DS according to recordings analyzed using International Phonetic Alphabet in terms of 1) age at onset of reduplicated babbling 2) developmental trends for place of consonant articulation, and 3) developmental aspects of vocalic production. The findings of this study were unexpected because the two groups showed essential similarities especially through the onset of canonical and reduplicated babbling at 8-8½ months of age and there were similarities in terms of consonantal and vocalic development at 15 months of age. However, the difference came to appear in the way of these vocalizations i.e. they respond to other vocalizations or imitate those vocalizations (Smith & Oller, 1981).

According to Berglund, Eriksson & Johansson (2001), there is always individual variability among normal infants when they acquire language in terms of semantics but the producing of the first word is various, 9-12 months. However, the study found that in DS children, there was more variability depending on the severity of the problem only 12 % of 12-23 month-olds, 80 % of 24-35 month-olds, and 90 % of 36-47 month-olds produced one word,

whereas normal developing infants produce their first word by 12 months. Also, the process of increasing vocabulary is slow for infants with DS.

Normal infants begin to produce meaningful and recognizable speech by the age of 12 months but infants with DS the age of 21 months produce their first word, which means that there is a delay of about 7 months. This study compared speech production as following: 13 % of the vocalizations, the sounds produced by infants in response to external sounds and voices, by the first birthday, by normal infants are attempts at meaningful speech; about half of these vocalizations are considered to be meaningful, whereas only 2 % of vocalizations produced by infants with DS by the age of 21 months are considered meaningful and when they reach 30 months the meaningful vocalizations are below 5% (Berglund, Eriksson & Johansson 2001).

2.2.2 Hearing problems

Hearing problems emerge from different etiologies. The most important trait of hearing problems is that infants' auditory abilities are not able to receive speech fully. This is measured in decibels by audiologist to find out the degree of the problem. A hearing problem is one of the most important causes of speech delay in infants between birth and twenty four months. Hearing problems affect speech development which have various kinds including hearing loss which includes conductive hearing loss and sensorineural hearing loss, hard of hearing ranging from mild to moderate, to severe to profound (Anonymous, 2018).

Hearing loss ranges from mild, moderate, severe to profound. It affects speech development of infants between birth and twenty four months. Normal infants usually turn to milestones easily without any problem. For example, the end of babbling stage is considered the beginning of producing the first word approximately by the end of the first year.

The development of speech by infants who are affected by hearing loss is delayed. Hearing loss is a cause of delay in producing consonants and the development of syllable structure. They will encounter difficulty in producing fricative consonants, e.g., *f* and *th*, and affricate consonants, e.g. *ch* in chair development which is associated with the effects of sensorineural hearing loss on high frequency information and reduced audibility in contexts of noise and reverberation. So, this affects fricative and affricate development to be more slowly by infants with hearing loss than infants with normal hearing (Moeller et al, 2007.a).

Twenty one infants with normal hearing and twelve infants with hearing loss between the ages ten and twenty four months were followed in their vocalizations and early words. Infants with hearing loss were delayed in speech especially the turning point from babbling to producing the first word. Also, there were signs of delay in using syllables with consonants and there were vowel errors. In addition, they sometimes produce unrecognizable words (Moeller et al, 2007.b).

The history of Otitis Media affects children in terms of later language and literacy skill development. A study involving 43 children from Grade 1 and Grade 2 who had a history with OM and 43 normal children in the same grades using measures for phonological awareness, semantic knowledge, narration and reading ability. The researcher, Winskel, found that children with OM scored, lower on phonological awareness skills of alliteration, rhyme and non-word meaning, semantic skills of expressive vocabulary(i.e. infants misunderstand speech and words because of OM which negatively affect reading ability at advanced stages) and word definition and reading than normal children (Winskel, 2006).

OM influences expressive language in terms of delay in phonology. Eight infants with OM were followed in the first year of age to detect speech development using bilateral pneumatic otoscopy resulting from delay in speech. By the end of the second year they were analyzed phonologically and the results were infants with OM had less productive consonant sounds than their OM free peers. These consonant sounds were inaccurately produced by OM infants in comparison with those of infants without OM (Abraham, Wallace & Gravel, 1996).

OME affects infant's speech in the first year of life in many aspects, which sometimes makes a difference between ways of producing sounds (Schwartz, 1999). The researcher studied two groups of infants one with and the other without OME. The study took babbling samples from both groups taken at 10, 12, 14 months of age. The averages of vocalizations (i.e. consonants produced per minute) did not show any differences but the differences appeared in the place and manner of articulation between the two groups in terms of producing bilabial stops by infants with OME whereas infants without OME focused more on alveolar stops and nasals. It is concluded from this research that infants with OME prefer producing sounds that they are affected with the visibility to these sounds and it is easy to imitate them such as frontal consonants which include sounds like, *b, p, m*.

The early intervention and identification of hearing loss play an important role in language development. A study compared 72 identified infants with hearing loss before the age of six months and 78 identified infants after six month. Infants who received intervention and identification of hearing loss before six months showed better language and speech development than those whose identification takes place after six months (Yoshinaga-Itano, Sedey, Coulter & Mehl, 1998).

A study done by Moeller (2000) enrolled 112 children by the age of five years with deaf and hard of hearing and received intervention and identification beginning from the second day, 18 months and 22 months in a test of vocabulary and reasoning skills. The researcher used measurements including Peabody Picture, Vocabulary test and criterion-referred measure and the Preschool Language Assessment Instrument. The study found that children of 5 years of age with hearing loss who were received intervention early (by the age of 11 months) because of the family involvement showed better findings in language development at five years. This means infants who were enrolled in intervention by the age of 11 months scores had a stronger words and verbal reasoning skills when they are asked abstract questions.

2.3 Treatment

Parents and caregivers are the closest people for infants with DS. So they are mainly responsible for following-up closely on the therapy of their infants as advised by specialists. Parents and caregivers have to know the timetables of speech and language development of normal infants. This makes it possible to follow their infants' development. This facilitates the decision of indulging them in suitable programs to deal with their status for treatment (Berglund, Eriksson & Johansson 2001).

Parents and caregivers can participate in the therapy of their infants using such procedures as making a better communication environment at home and feeding their infants in a way which facilitates oral development. They also use various communication skills e.g. eye contact and pointing while speaking to their infants, and focusing on the auditory discrimination for speech sound. This improves the phonological development by producing new sounds and words in each stage. In addition, parents can use gestures in the first year to help infants' perception (Buckley & Prevost, 2002).

The early identification and intervention of hearing loss affects receptive language between ten and sixteen months of age in which they are similar in this aspect in comparison with normal peers. Buckley and Prevost (2002) add that parents and caregivers continue to encourage speech development of their infants in the second year. They boost their infants' hearing and producing sounds using objects and pictures to make them perceive early vocabulary, exposing them in the daily language, using imitation of words that have initiated consonant sounds and teaching them two or three word phrases by playing and imitating.

The most important aspect affecting speech development is that most infants with DS have problems in hearing which ranges from mild to moderate hearing loss. Treatments are used to reduce impact of this problem by inserting tympanostomy tubes (Figure 14), using preventative drugs to cut off cycle of frequent OME and paying attention to the healthcare to prevent chronic ear disease. Also, infants may have an auditory training program accompanied with speech therapy (Stoel-Gammon, 2001).

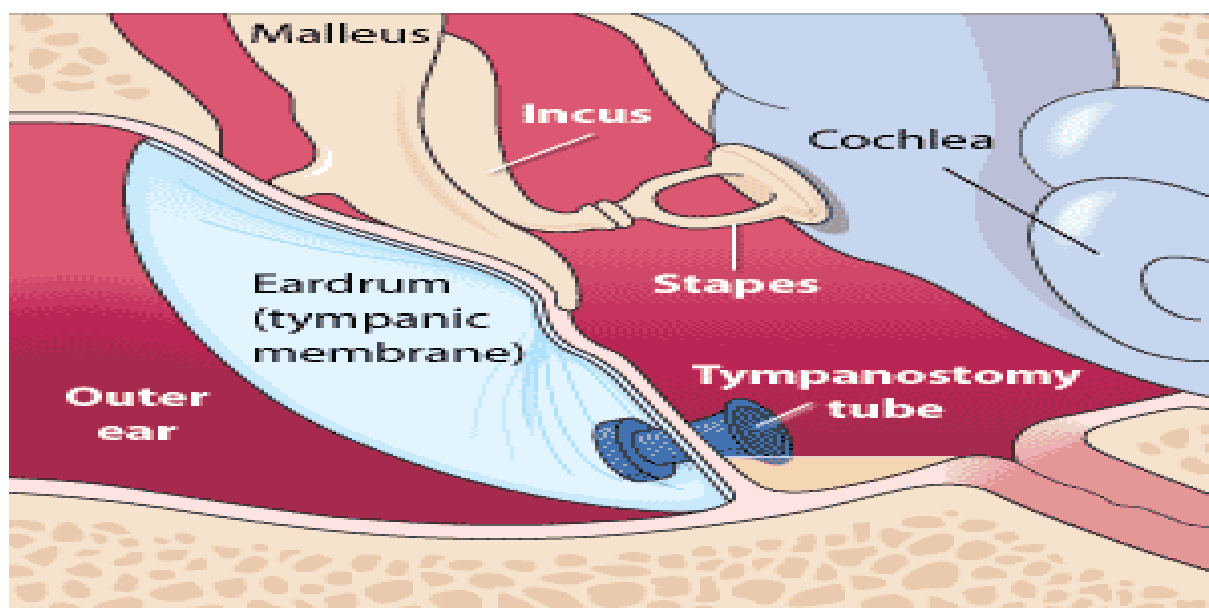


Figure 14. Tympanostomy tube.

Stoel-Gammon (2001) adds that another aspect is the physiological differences of infants with DS in oral structure, smaller oral cavity, the size of the tongue and weakness of facial muscles. The deficits can be treated using straw to strengthen the lips in the first year, strengthening the orofacial musculature through the use of lips massage and bubble (Figure 15). According to the size of the tongue, it is suggested to use surgery operation to reduce the size of the tongue to improve the articulator proficiency.



Figure 15. Bubble.

Speech delay can be affected by sensorineural hearing loss and this will influence communication and academic and social development. Sensorineural hearing loss can be treated by cochlear implantation that help children to hear. Speech and language outcomes are affected by the age in which infants receive cochlear implantation. Conner et al (2006) used Hierarchical Linear Modeling with 100 children who received cochlear implantation at different ages, one of the most important ages is the first year, between one year and ten years. The researchers found that there is an additional value for children who have cochlear implantation in the first year and the consonant-production accuracy, and vocabulary occur in a fast pace in comparison to those who receive cochlear implantation after the first year.

Chapter Three

Methodology and procedures

3.0 Introduction

This chapter presents the methodology and procedures followed by the researcher in conducting this study.

3.1 Methodology

The researcher used content analysis of the research data available in literature and data descriptive approach to conduct this study. He provided survey of literature for the theme of normal and abnormal stages of early speech and language acquisition. He assessed the level of agreement, disagreement and consensus in each of the themes and then he came with what seems to be common understanding of the nature of delayed speech. Finally, he looked for the causes and ways of treatment provided.

3.2 Procedures of the study

The researcher followed these procedures to conduct this study:

1. Reading some previous research studies and studies related to early language development of infants and first language acquisition.
2. Reading articles and books that show how infants delay in speech and what linguistic aspects that are affected by Down syndrome and hearing problems.

3. Reading some articles about Down syndrome in terms of its causes, symptoms and effects on speech and language.
4. Reading articles about hearing problems in health institutes which determine the types and degrees of hearing problems. They also provide us with the causes and effects of each type on speech.
5. Identifying examples of the types of sounds and words that are difficult to be produced by infants with Down syndrome and hearing problems.
6. Making a comparison between early normal speech and delayed speech by infants who are affected with Down syndrome and hearing problems.
8. Looking for possible treatments to each type of the problems suggested by specialists.
7. Reviewing and presenting findings of studies previously published by professionals and health institutes in academic journals.
8. Discussing the findings.
9. Drawing conclusions from the findings.
10. Listing the references according to APA style at the end of the thesis.

Chapter Four

Discussion and analysis

4.0 Introduction

The goal of this chapter is to discuss what is mentioned in the literature review by analyzing the results of research conducted by specialists in the field.

4.1 Stages of speech

Normal Infants and toddlers begin to achieve speech milestones from birth until they master the core of their mother tongue. Each stage has its own characteristics and normal elements of spoken communication.

4.1.1 Birth to two months

It is the first stage infants begin to produce different sounds. Researchers agree that all these sounds are produced by infants as a result of exposure to speech in their environment and attempts by infants. The earliest vocalizations by the newborn are called reflexive vocalizations e.g. crying, sneezing and coughing. Others call this stage vegetative sounds that are the natural sounds that infants make related to feeding (grunt, sighs, and tongue clicks).

The organs of speech move according to the specific muscular development of the organs. Because the lips are not close to each other and the tongue has a neutral position, the early sounds always seem to be vowels in this stage. However, raising the body of the tongue

toward the palate while phonation gives the other sounds the property of consonants. Gurgling is another type of sounds appears in this stage as a response to other sounds.

4.1.2 Two to four months

New sounds are produced by infants in this stage. The researchers agree that cooing and gooing sounds dominate this stage like ‘*ooh, aah*’ and other sounds. These sounds always appear as a result of hearing the same sounds during this period. Because infants hear the sounds especially from their caregivers and parents these sounds sometimes reflect their comfort of these sounds.

4.1.3 Four to six months

This stage is considered the first stage about which researchers disagree about the milestones achieved in this stage. Some of the researchers say that this stage is the extent of cooing and gooing sound stage which has already been started in the second month so it can be more obvious between four and six months.

On the other hand, most researchers agree that infants begin to produce consonant sounds accompanied with longer vowels that were used before. These vocalizations are called babbling sounds which contain consonant and vowel sounds. Infants initially use them as an imitation to sounds they hear from the environment. These sounds produced by infants do not resemble any meaning because they begin to use new organs of speech especially their lips which help them to use consonants like ‘*b, m*’. They also begin to use tone when they babble imitated other sounds.

‘‘Vocal play’’ has an important role in the development of infants speech sounds because infants will try to change the sounds produced by them according to the vocal apparatus. So it

may be noticed that infants have the desire to find out and develop new sounds which will be as an accidental tool to improve and develop different sounds.

4.1.4 Six to nine months

Infants of six to nine months pass through important milestones in terms of receptive and expressive language. They begin to comprehend words for the most important objects and people.

It is agreed by many researchers that all infants will babble in this stage but researchers give different names of the milestones and focus on different details about babbling. So the researcher agrees with the development of babbling in terms of the ‘reduplicated babbling’, when infants begin to use more than one consonants sound accompanied with vowels as an imitation of repetition of easy sounds such as ‘mama, baba’. This may encourage them to use more sounds and duplicate them in a way they think they are right with the expression of these words.

Then infants begin to use variegated sounds which are the use of different consonant sounds between vowels that are not harmonious in an attempt to produce the first word but it is difficult to pass because their mental capacity does not help them and their organs of speech are not fully ready. Also these variegated sounds do not have communicative purposes.

Although infants do not produce actual words and the variegated sounds do not carry meaning, these attempts motivate them to pronounce as much sounds as possible which help them later on to order these sounds making the first word in the following stage.

4.1.5 Nine to twelve months

All researchers agree that the first year of an infant's life is considered the starting point of producing their first word. Each researcher focuses on some specific aspect in the development of infant speech. Some of them adopt the aspect related to the pattern of the sound of the word itself such as the intonation pattern, rhythm and pauses.

Others are concerned with right production of the first word in this stage to emphasize that all they do not have any problem in speaking their mother tongue from early times. Other researchers concentrate on that infants can respond to other sounds, commands and questions using one word.

Although researchers differ in the targets of their surveys and researches, they agree that all normal infants can produce their first word by the end of the first year. So this help parents and caregivers to follow their infants and try to develop them using different means of communication.

4.1.6 Twelve to fifteen months

Infants begin to use more than one word; they can produce many words for different purposes and in different ways. Most researchers disagree about the number of words produced by infants in this stage and sometimes focus on the word as a whole unit instead of sequence of sounds together. Words in this stage according to some researchers characterize with most of them are nouns and they are understood by parents and caregivers.

4.1.7. Fifteen to eighteen months

The number of words produced in this stage increases by the time they store more words in their mind which will be used in other stages. The difference between researchers is the same difference in comparison with the previous stage which is the number of words produced by infants. The words in this stage consist of speech-like sounds. Also infants have the ability to comprehend the words produced by adults such as they can point to the specific parts of the body when they are mentioned. This means their speech intelligibility improves very well in this stage.

4.1.8 Eighteen to twenty four months

Most of the researchers in this field disagree about the exact number of words produced by infants in this stage because their samples of study come from different classes and educational environments in the English speaking communities. But they agree that most infants begin to combine two word phrases by the end of two years. This can be useful for them to express their feelings, needs and wants and make it easy for parents and caregivers to understand them in this stage better than the previous stages.

I am going through this personally observing as I follow the development of speech for my daughter between eighteen to twenty four months. I notice that this stage is considered the most important stage because she has shown an explosion in producing new words and phrases. She can use these words and phrases in proper intonation, question, and rhythm’’

4.2. Causes of speech delay

Parents and caregivers are the first who notice speech delay of infants because they are the nearest people who care to them. If their babies do not achieve the milestones their doctors

check for the babies, the doctors give advice because this is an indication for a potential speech delay. In this section, the researcher will discuss two main causes of speech delay, Down Syndrome (DS) and hearing problems.

4.2.1 Down syndrome (DS)

There is consensus among researchers that the main cause of DS is the existence of an additional copy or part of human chromosome 21 which disrupts most genes. They also agree that DS affects many aspects which include motor disorders, physical anomalies, physical appearance and intellectual disability with the result that language acquisition becomes less than normal in different stages.

It is agreed by many researchers that infants with some aspects of DS have the ability to receive language better than they can use it from early stages and they may react by looking at objects instead of using sounds or words.

Infants with DS with chronological age of 47 months and the mental age before 22.4 and average language age 18 months can communicate using gestures and word-gestures. Sometimes, using gestures is similar to normal infants throughout showing and pointing but at the same time the function of the word gesture is different from normal infants. In this age the number of word gestures is less than normal infants.

A study shows that normal infants and infants with DS produce babbling sounds at the age of eight months. But some researchers conclude that babbling begins from the age of six months when approximately all researches on normal children claim that this is the beginning of producing babbling sounds.

Many studies confirm that producing the first word is delayed by infants with DS in comparison with normal infants but they differ in period these infants show when they begin to pronounce the first word.

The differences which appear between infants with DS are affected by many aspects. As mentioned in the literature review infants with DS suffer from different conditions which make producing sounds difficult. Because of DS is a genetic disorder, there will always be special characteristics to those infants. The facial features such as the protruding and big tongue with the small mouth make it difficult to produce sounds. Also, the intellectual disability caused by DS leads to deficit in language acquisition so the chronological order of receptive and expressive language for infants with DS is affected with the result that speech delay is found in early stages of their life.

4.2.2 Hearing problems

It agreed by researchers that all infants with hearing problems encounter speech delay especially in two stages including babbling stage and the early development of vocabulary. But at the same time others agree that the early identification and early intervention before the first year positively affect the development of these infants in terms of catching other normal infants. Also the early identification and intervention make it possible to learn language at school later on.

It is agreed by many researchers that hearing problems play a vital part in speech delay because infants who suffer from such a problem cannot receive sounds from the surrounding social environment with the result that they are unable to use sounds to communicate with others.

Some researchers attribute one type of speech delay, which is related to the articulation of specific sounds such as infants prefer producing bilabial sounds e.g. *p*, *b*, *m*. more than alveolar stops or nasals. The problem also appears in the accuracy of producing certain sounds in which they omit sounds or replace sounds with others. Babbling is considered the most important milestone in the stages development of speech and language development because the deficit mostly appears in the consonant sounds.

This delay is related to specific hearing problems which are classified into conductive hearing loss, sensorineural hearing loss, OM, OME and deafness. Because these infants have hearing problems, they will not be able to hear speech sounds, and this leads to the inability to imitate such sounds in early stages with the result that they will delay at least in producing sounds according to the rate of the problem in hearing.

Deaf infants will never be able to produce sounds but infants with OM or OME can produce sounds but these sounds are produced with difficulty and sometimes these will not be accurate and contains some sort of errors because those infants do not hear all the sounds produced by other people e.g. they say *poon* instead of *spoon* .

Chapter Five

Conclusion and Recommendations

The researcher concludes that most infants go through different stages to produce their speech and these stages begin when they are in the womb in a way they are able to hear.

In fact, infants really begin to acquire their mother tongue from birth when they listen to the sounds and voices in the environment and discriminate human sounds from other sounds. They begin to produce sounds but these sounds are considered responses to some sounds produced by parents and caregivers and sometimes these sounds are expressions to needs, wants and pain.

The researcher thinks that babbling and one word stages are the most important ones. Achieving babbling stage timely gives us a reasonable idea that infants do not have any problem whether in hearing or in place of articulation. This is because infants with DS and hearing problems are not able to produce consonants sounds in the age range six up to twelve months. One word stage which takes place by the end of first year informs us that infants' speech and cognitive ability is at the right path and they will go on their speech and language development in the following stages and milestones.

The differences between infants in producing sounds seem to be obvious in infants with DS and infants who have hearing problems. The differences in genes show deficit in the development of speech in infants with DS. Also the differences in genes play a vital part in facial characteristics such as the heaviness and size of the tongue which represent a direct reason for

difficulty in producing sounds with the result that they will always have delay in speech especially in the first two years.

Infants with hearing problems encounter difficulties in hearing sounds or some sounds as a result of problems in the inner or the outer ear. Because the first stages approximately depend on imitation, this leads to delay in the development of speech since it is difficult for infants to hear sounds and speech in the environment.

Experts such as pathologist, pediatric and speech therapist and health institutions can diagnose infants from early stages to prevent any potential disease or problem that can affect infants' health. So, parents are responsible for the diagnosis of their infants by sending them to specialists regularly to be treated when there is any problem and to have advice so as to deal with their infants.

The researcher recommends that parents and caregivers should know at least the milestones achieved by normal infants in the first two years to be able to follow their infants development step by step to know if their infants need speech pathologist or not and to be diagnosed because the early identification and intervention lead to better treatment and development.

The researcher also recommends that other linguists continue look for which the syntactic development of infants who have speech delay at early stages because of DS or hearing problems.

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