AIISH Survey of Fluency Disorders

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Project Report

Principal Investigator

Dr. Y V Geetha
Prof. of Speech Sciences
Department of Speech Language Sciences
All India Institute of Speech and Hearing
Manasagangothri
Mysore- 570006
Ph:2545698

Co-Investigator

Mrs. Sangeetha Mahesh
Clinical Lecturer
Department of Clinical Services
All India Institute of Speech and Hearing
Manasagangothri
Mysore- 06

Research Officer

Ms. Swathy A

All India Institute of Speech and Hearing

Manasagangothri, Mysore – 570 006

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Principal Investigator

Dr. Y. V. Geetha
Prof. in Speech Sciences
Department of Speech Language Sciences
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Manasagangothri
Mysore- 06

Co-Investigator

Mrs. Sangeetha Mahesh
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Department of Clinical Services
All India Institute of Speech and Hearing
Manasagangothri
Mysore- 06

Research Officer

Ms. Swathy A

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Ms. Sangeetha Mahesh
Clinical lecturer
Co- Investigator

Dr. Y. V. Geetha
Prof. of Speech Sciences
Principal Investigator

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ABSTRACT

Objective: *Fluency disorders, being a heterogeneous group of disorders, vary in their epidemiological aspects as well. The study was aimed to analyze the various epidemiological aspects of the clients with different fluency disorders, registered at AIISH over a 5 years.*

Design: *The first phase of the study included development of a checklist to obtain the information from the case files regarding the epidemiological factors of fluency disorders, socioeconomic status and other relevant information pertaining to the disorder as documented in the case files. In the second phase data collection was undertaken, wherein the case numbers of all paediatric and adult clients registered with different fluency disorders were short listed from the OPD registers. Further, the case files of the individual clients were reviewed and the checklists were filled for each of the clients included in the study. The data was analyzed with regard to various aspects for each of the subtypes of fluency disorders.*

Results: *The results of the present study revealed that among the clients with fluency disorders, 96.8%, 0.5%, 0.2% and 0.4% of the clients were identified with stuttering, cluttering, cluttering- stuttering and neurogenic stuttering respectively. 2.2% of the clients were classified as being NNF. The results also revealed that all fluency disorders except neurogenic stuttering had an onset in the childhood years. All the fluency disorders were male dominated and except for neurogenic stuttering all had a gradual onset. Clients with all fluency disorders except cluttering were monolinguals. Majority of the clients, among all the fluency disorders, had an unknown predisposing factor followed by heredity factors (37%) for PWS and had no associated problems other than articulation/ phonological disorder in a small proportion of PWS (4.8%). The results also revealed that on an average majority of the clients with the different fluency disorders came from SES I and/ or SES II.*

Conclusions: *It can be concluded that the bulk of the clients with fluency disorders were stuttering, with very minimal proportion of other types. The present results confirm those from the previous studies in finding that stuttering is familial and that small group of PWS is slower in phonological development. The current study provides information related to the various epidemiological factors, causative factors and the associated problems related to the different fluency disorders. Although not representative sample, information will be theoretically and clinically very useful in the overall understanding of fluency disorders and assessment and management of fluency disorders.*

CHAPTER I

INTRODUCTION

Communication is vital for both biological and social existence and it involves exchange of information between two or more individuals. “Communication refers to the process of sharing information between two or more persons, or more specifically, the transmission of thoughts or feelings from the mind of a speaker to the mind of a listener” (Harris & Raphael, 1994). It occurs in an array of natural circumstances either verbally through speech or non- verbally through gestures, a body movement, writing, sign language and thus encompasses both speech and language. Hence, speech and language form an important component of communication. Human communication through language provides meaningful exchange of words and it is “a socially shared code/ conventional systems for representing concepts through the use of arbitrary symbols (sounds and letters) and rule governed combinations of those symbols (grammar)”, (Owens, 2012). Language is a form of communication that enables humans to convey information with specificity and detail and thereby forming a link between the outside world and the mind. Language is also a medium through which they understand their social world and acquire their culture. In human beings, the primary means of communication is through speech. It is a verbal mode of communication, which includes the coordination of oral neuromuscular movements keeping in mind the end goal to create sounds and phonetic units. ‘Speech’, the means through which language is manifested, may be regarded as the basic element of verbal communication. Speech disorders comprise of any of the disorders in the aspects of speech, including articulation, voice and fluency.

“Fluency is defined as the effortless production of long, continuous utterances at a rapid rate. These three elements of fluency are related to each other. The pauses and hesitations, break up the smooth, continuous flow of speech and this determines the length and influences the rate of each utterance” (Stark Weather, 1987). A fluency disorder develops when there is a high rate of stoppages that disturb the stream of communication and are improper for person’s age, society, and etymological foundation. Fluency disorders include, stuttering, neurogenic stuttering and cluttering.

Stuttering is the most commonly occurring fluency disorder, onset of which in majority of children is during the preschool age. The person with stuttering (PWS) faces difficulty in producing the continuous utterances without effort. The typical characteristic features of stuttering include sound/syllable/part word repetitions, prolongations and articulatory fixations or blocks, generally in the beginning of utterances. These moments of stuttering may be accompanied by the secondary characteristics such as eye blinking, nose flaring, facial grimaces and jerky head or limb movements. Van Riper (1982) defined stuttering as a disorder "when the forward flow of speech is interrupted by a motorically disrupted sound, syllable, or word, or by the speaker's reactions thereto."

It is noted that children in general and many adults exhibit various types of disfluencies which are not typical stuttering-like. These include audible and inaudible pauses, interjections, broken words or phrases and hesitations. These are so called normal nonfluencies or disfluencies and there is a lot of debate in the recent literature on stuttering as to the inclusion of these disfluencies in the diagnosis of stuttering. England (1955) reported that the speech samples of typically developing children contained a higher percentage of audible pauses, whereas the speech of the children with stuttering (CWS) had a greater percentage of prolongations. According to Wingate (1976), the speech characteristics that distinguished stuttering disfluencies from normal disfluencies were “audible and silent elemental repetitions and prolongations”. He further stated that appropriate identification of these features as “stuttering” was enhanced through consideration of frequency, amount of effort, spacing of repetitions and analysis of what occurred during the intervals of a repetition. The investigation on development of fluency in 2, 4, 6 year old boys by Wexler and Mysak (1982) found revision- incomplete phrase and interjections to be the most frequent and part word repetitions to be the least type of non- fluencies. This could be used for differentiating children with and without stuttering from non- stuttering children.

The symptoms of developmental stuttering first appear during the childhood years. A number of researchers have attempted to identify the initial appearance of symptoms of stuttering that are most likely to appear. Stuttering seems to occur more in the early years of their life (<6 years) than after 6 years. In Johnson's major study (1959)

of the onset of stuttering, a median onset of 37 months was reported. Yairi and Ambrose (1992) reported a mean of 32.76 months and a median of 30 months to indicate a clear tendency for onset to occur under age 3 years. In the year 2005, Yairi and Ambrose demonstrated a range of onset, with children becoming disfluent as early as 16 months and as late as 69 months of age.

It is well accepted from majority of the studies that males are more likely to exhibit symptoms of stuttering than females. The ratio of males to females who stutter varies depending on the age of the cohort under investigation. Yairi's (1983) study reported finding which differed from many incidence surveys in which boys predominated at ratios varying from 2:1 to 5:1. Yairi and Ambrose (1992) reported a male-to-female ratio of 2:1 and Mansson (2000) reported a ratio of 1.65:1. Craig, Hancock, Tran, Craig, and Peters in 2002 reported that male to female ratio varied from 2.3:1 in children to 4:1 in adolescence.

Few literature studies suggest that the socio economic status is an issue as there are socio-cultural variability in identification and reactivity to different disabilities affecting specific population. Morgenstern (1956) reported that fathers in the class of semi-skilled weekly wage earners had the highest number of CWS. However, McKinnon, McLeod, and Reilly (2007) and Boyle, Schieve, Cohen, Blumberg, Yeargin-Allsopp, and Kogan (2011) reported no relation between SES and the prevalence of speech disorders. They reported a prevalence rate of 2.4% for children from the families who were below poverty level when compared to 1.07% prevalence rate for children who were above the poverty level.

Although stuttering has been researched over many decades, its cause is yet to be ascertained. Genetic causes, at least in a significant population, have been one of the main suspects. It has long been known that stuttering seems to run in families. This has lead to studies of familial patterns of stuttering. One basic analysis involves the computation of the percentage of cases that have other relatives who stutter. A second line of research entails examination of family aggregation patterns. This approach leads to information about which relatives of a proband are most at risk for exhibiting

stuttering. Grinager, Ambrose, Yairi, and Cox (1997) reported that male relatives of PWS stuttered more often than female relatives stuttered, but in case of female PWS, it was seen that less male relatives than female relatives, when comparing it with that of the male PWS, stuttered. The genetic basis of stuttering was studied by Kay in 1964, wherein he found an incidence rate of 13.65% among the first-degree relatives of probands. Ambrose et al (1993) found that the children with a positive history had a male to female ratio which was higher when compared to 1:1 for those with a negative history. Yairi and Ambrose (2005) stated that 69% of the preschoolers who stuttered had a positive family history of stuttering.

In order to explain causative factors for stuttering many theories have been proposed which mainly explain the onset, development and recovery of stuttering, causative factors, and moments of stuttering. Bloodstein (1995) tried to group theories as belonging to 3 types: “theories of the etiology of stuttering”, “theories of moments of stuttering”, and “theories that shift the frame of reference”. The etiology of stuttering is based on breakdown hypothesis, repressed need hypothesis and anticipatory struggle hypothesis. The theories have seen several shifts in frame of reference from psychological to physiological to psychological and lately to the combination of psychological and physiological attributes or the nature-nurture and the multidimensional nature of stuttering.

Starkweather (1987) has proposed the Demands-Capacities model from a multi-dimensional perspective that stuttering results when demands for a fluent speech from the social surroundings surpass the child's intellectual, phonetic, motor, or emotional limits for fluent speech. According to this formulation, either low innate capacity of excessive speech and language pressures may cause fluency to disintegrate. Unlike most breakdown theories, it does not assume that organic deficits are a necessary condition for stuttering. The concept invokes environmental factors that have more often been considered in connection with anticipatory struggle theories, but the failure of the child’s capacity for fluency to meet demands imposed upon it is assumed to lead directly to disorganization or breakdown of speech.

The recent theories highlight various elements like heredity, status of speech motor system, language, emotion, temperament, cognition, environment, and communicative context. These factors are present in widely varying proportions in individuals diagnosed with stuttering (so are differently weighted), which change over time. A small change in one factor, or in the complex interaction between and among factors, can result in the wide variability in onset, development, recovery or persistence of the problem, associated speech and language problems and the characteristic features of stuttering.

Throughout the years, a number of clinical researchers have noted that children who stutter often seem to exhibit coexisting difficulty with speech and language. Blood and Seider (1981) found that the most frequently co occurring disorder is articulation disorders and learning disability followed by voice disorder and cleft palate. St. Louis, Murray and Ashworth (1991) found persons with severe stuttering more likely to have delayed or disordered articulation than mild or moderate PWS. Louko, Edwards, and Conture's (1990) study revealed that CWS exhibited 18 phonological processes which were mostly atypical, whereas the normal children exhibited only 11.

Several studies have examined the language development of the CWS. Darley (1955) revealed the stuttering group being slightly older than the non-stuttering group in terms of language development. Okasha, Bishry, Kamel, and Hassan (1974) reported that the PWS reportedly were delayed on expressing first sentences compared to the PWNS. Arndt and Healey's (2001) survey revealed that larger percentage of children from preschool through high school exhibited fluency disorder and a phonological and/or language disorder.

There are few studies revealing the co-existence of other sensory and cognitive deficits in individuals with stuttering. Montgomery and Fitch's (1988) study on the prevalence of stuttering in hearing-impaired children revealed that stuttering is approximately 8 times more prevalent in the hearing population than the hearing-impaired population. This reduced prevalence of stuttering in those with hearing

impairment has led some researchers to speculate on the role of auditory feedback in stuttering.

In the population of mental retardation incidence was estimated to be 20.3% (Schlanger, 1953) and as high as 45% in the Down's syndrome subgroup (Schlanger & Gottsleben, 1957). A study by Keane (1970) revealed 10% incidence of stuttering among 200 subjects, with Downs' syndrome.

The other types of fluency disorders like cluttering and neurogenic stuttering are not so common unlike stuttering and the characteristic features and etiology also differ significantly.

The stuttering associated with acquired neurological disorders (SAAND) or commonly known as neurogenic stuttering is another variety of fluency disorder, which is brought about or exacerbated by neurological impairment. It is commonly acquired after childhood, and its etiology may be stroke, head injury, tumor, malady process, for example, Parkinson's, or drug toxicity. SAAND differs from developmental stuttering in a number of ways. Neurogenic stuttering usually has a sudden onset in adulthood. It may occur with similar frequency on function and content words, stuttering is less restricted to the initial syllable of words, have less adaption effect. Also many fluency inducing conditions do not reduce stuttering, and often there is little fear and few secondary behaviors.

The prevalence of neurogenic stuttering tends to be more in adults and male speakers. Market, Montague, Buffalo, and Drummond (1990) reported a mean age of onset of 43.7 years. Stewart and Rowley (1996) found 62% of the patients with acquired stuttering to be male and in their survey of 36 patients, they observed a mean age of onset of 48.2 years, where the patients' onset of stuttering was post head trauma and ischemic attacks. Historically neurogenic stuttering has been associated with aphasia syndromes and been described being a major part of aphasia or as a psychological reaction to the aphasia (Luchsinger & Arnold, 1965; Lebrun, Leleux, Rousseau, & Devreux, 1983). Theys, Wieringen, and De Nil (2008) surveyed TBI, Parkinson patients who acquired

neurogenic stuttering and found that the patients had apraxia of speech, aphasia, dysarthria and dysphonia as major associated problems along with stuttering.

Among the fluency disorders, the least researched area is cluttering. Cluttering in general terms refers to a communication disorder that leads to messy and disorganized speech. Cluttered speech may be excessively fast and interrupted more often than normal, and listeners may have difficulty deciphering the speaker's intention because speech sometimes is unintelligible and ideas are presented in a disorganized manner. The results from studies of people in the US, Bulgaria, Turkey and Russia suggests that the general public seems to be aware of cluttering- at least when researchers provide them with a definition of the disorder (St. Louis et al., 2010).

Cluttering has not attracted more attention from researchers and clinicians. Epidemiological factors also seem to have influenced the amount of research and clinical attention than stuttering. Although epidemiological data for cluttering is scarce, researchers generally agree that it is a low incidence disorder and that it is less common than stuttering. Heredity has been viewed as the most likely etiological component, in the bibliography (Becker & Grundmann, 1970; Luchsinger & Arnold, 1965; Op't Hof & Uys, 1974). Becker and Grundmann (1970) reported that 1.5% of 7- 8 year olds in German school manifested cluttering. There is little information on the onset of cluttering, although several authors suggest it is later than for stuttering, often after the age of 7 (Diedrich, 1984). It is reported that males are more affected than females and more likely co-occurring with other speech, language and cognitive dysfunctions ?than in isolation (Curlee, 1996). The literature suggests that cluttering co- occurs mostly with language disorders (St. Louis, Hinzman, & Hull, 1985; Myers, 1996; Pitluk, 1982), attention deficit disorder and learning disability (Molt, 1996).

A mixed type of fluency disorder is the cluttering – stuttering type. It is possible for speakers to exhibit both stutter like and clutter like disfluency. In such cases, i.e., cluttering- stuttering, speakers will exhibit markers of stuttering (excessive frequency of at least one of the primary forms of stutter- like disfluency) as well as cluttering (excessive frequency of interjections, revisions and false starts and/or any of the other symptoms of cluttered speech). Preus (1981) reported that 33% of PWS also manifested

cluttering. Georgieva and Miliev (1996) reported cases with stuttering and cluttering also exhibiting syllable/ sound repetition, multiple phrase and word repetitions, writing errors, lexical errors and poor handwriting.

"Epidemiology is the systematic study preformed in a scientific manner about any disease or disorder. It informs about the overall population risk of exhibiting the disorder, the risk to various sub-populations, factors that determine and influence the presence or absence of the disorder, its frequency of occurrence and various distributions (e.g., age, gender, and race), circumstance and places of occurrence, susceptibility to the disorder itself as well as to other conditions or disorders, the different courses the disorder can take, subtypes, and causes. The information about these complex aspects is interrelated" (Yairi & Ambrose, 2013). Incidence is an epidemiological statistic that captures the number of unique or newly diagnosed cases of a disorder within a population during a particular time frame as well as long- standing cases. The overall estimates of the life time incidence for developmental stuttering have ranged from about 3% - 6%. Prevalence, in contrast is an epidemiological statistic that captures how many cases of a disorder exist within a population at specific time. As such, it can include recently diagnosed cases. A general estimate of prevalence of stuttering is about 1% or less. According to Bloodstein's citation (Bloodstein, 1969, p. 72) of the Mills and Streit (1942) study reports a prevalence estimate of 1.5%, on a speech survey of 4685 school children in Massachusetts. Okalidou and Kampanaros (2001) reported a 2.2% prevalence rate among kindergarten children. Craig, Hancock, Tran, Craig, and Peters's (2002) survey reported 1.4 % prevalence rate for the age range 2-5 years, 1.44% for the age range 6–10 years, 0.53% for the age range 11- 20 years, 0.78% for the age range 21- 50 years and 0.37% for the subjects above 50 years of age.

Need for the study

Disorders of fluency of speech are a heterogeneous group of disorders evading researchers for decades in their attempts at understanding the nature of the problem, their cause and curative aspects. Majority of the theories on fluency disorders have focused on the signs, symptoms, and its stages, but still conclusive statements about the disorder cannot be made due to its heterogeneity.

The dearth of data regarding the epidemiological factors, predisposing, precipitating, and maintaining factors if any, in the onset, development and recovery in individuals with fluency disorders including stuttering, especially in the Indian context paves way to the need for the present study. The dearth of information is more so with respect to other fluency problems like cluttering and neurogenic stuttering. AIISH is the premier institute in the country catering to the needs of individuals with various communication disorders, and thousands of clients are evaluated annually. Fluency disorders comprise about 5-10 % of the total case load and it will be interesting to know the variety and nature of such disorders. This project is aimed at providing a better understanding of the current status of individuals with fluency disorders with regard to the heterogeneous nature of the disorder in the Indian context.

Aims and objectives of the study

The main aim of the present project is to study the epidemiological aspects of fluency disorders with regard to the age and nature of onset, gender factors, onset related factors and other associated characteristics of individuals registered at AIISH who are diagnosed as having fluency disorder.

The specific objectives include:

- To identify the distribution of subtypes of fluency disorders
- To identify the gender, age, nature of onset, socio economic status, family history, possible predisposing, precipitating, maintaining factors of sub types of fluency disorders
- To identify the associated problems if any in individuals with fluency disorders

CHAPTER II

REVIEW OF LITERATURE

The ability to communicate is often taken for granted until, one experiences some difficulty sometime. In good communication people take turn leading and following the conversation. The individual tries to stay “in step” with the other, reading every nuance of choice of words, tone of voice, inflections, pauses, hesitations, facial expressions, postures and gestures so that there is an easy and enjoyable flow of information during the conversation. “Communication refers to the process of sharing information between two or more persons, or more specifically, the transmission of thoughts or feelings from the mind of a speaker to the mind of a listener” (Harris & Raphael, 1994). Whether communication occurs via speech and hearing, writing and reading, or sign or other manual means, individuals are functional and effective communicators when they are able to successfully formulate, transmit, receive, and comprehend information.

Language, speech and hearing are the essential ingredients of human communication. These processes are used for formulation, transmission, reception and comprehension of information. Although speech, language and communication are often used synonymously, they describe very different processes. The evolution of speech and language was to accomplish the human need, to communicate. Language has been defined as “a socially shared code/ conventional systems for representing concepts through the use of arbitrary symbols (sounds and letters) and rule governed combinations of those symbols (grammar)” (Owens, 2012). Speech is the result of several physiological systems interacting and functioning in the near perfect timings and harmony. In order to produce sounds, the respiratory system has adequate inhalation and controlled exhalation. The muscles of the larynx and the vocal folds must have sufficient strength to do the task of speaking. When sounds are organized into syllables and words are organized into grammatical sentences, spoken language is generated. Spoken language is our primary and usually the most efficient form of communication. It gives the listener not only the content, but the supra segmental aspects in terms of voice inflections for emphasis and de-emphasis, that help the listener to understand the true intent of the message.

When we think about communication disorders, we usually think of speaking and listening. When we listen to someone talk, we typically pay attention to several features like, the individual's auditory ability, voice, language and speech skills. We also notice whether the person gets embarrassed/ frustrated with communication. A communication disorder is present when a person has significant difficulty in one or more aspects of communication when compared with the other people sharing the same language, dialect and culture. According to Van Riper (1978), "speech or language is disordered when it deviates from that of other people, calls attention to itself, interferes with communication or cause distress to both speaker and the listener". "A communication disorder is an impairment in the ability to receive, send, process, and comprehend concepts or verbal, nonverbal and graphic symbol systems. A communication disorder may be evident in the processes of hearing, language, and/or speech and may range in severity from mild to profound. It may be developmental or acquired. Individuals may demonstrate one or any combination of communication disorders and it may result as a primary disability or secondary to other disabilities" (ASHA, 1993). However, based on the early definition of communication, a communication disorder therefore may be defined as any impairment or disorder that interferes in people relating their wants, needs, thoughts, knowledge and feelings to other person/persons.

Communication disorders include disorders of hearing, literacy, cognition, language, resonance, voice, articulation and fluency. Fluency is a descriptive term used to characterize the flow of speech during communication. Fluent speech is smooth, effortless, and automatic along with appropriate rate and an easy rhythm. Disfluency is a speech behavior that disrupts the fluent forward flow of speech, such as pauses, interjections and revisions. A fluency disorder describes speech with an unusually high rate of stoppages or discontinuities that disrupt the flow of communication and are inappropriate for the speaker's age, culture, and linguistic background, including dialect. The types of fluency disorders include, stuttering, neurogenic stuttering and cluttering.

1. Epidemiology of communication disorders

The word "Epidemiology" is derived from Greek words 'epi', meaning upon and 'demos', meaning people, and 'logos', meaning the study of. In other words, the word

epidemiology has its roots in the study of what befalls a population. It is the scientific and systematic data distribution of health related issues in particular population, and applies to the prevention of health problems. In summary, epidemiology is the scientific, systematic, data-driven study of the pattern and frequency distribution, risk factors and cause determinants, of the health related states and events in specified populations; and the application of this study to the control of health problems. Incidence is usually defined as the occurrence of new cases during a specified period of time (Slome, Brogan, Eyres, & Lednar, 1986). Prevalence is defined as the number of confirmed cases in a sample at the time the sample is taken. This is known as point prevalence (Slome, Brogan, Eyres, & Lednar, 1986).

The prevalence of disorder is more clinically relevant and therefore, more commonly reported than the incidence. It is nearly impossible to determine the precise prevalence of communication disorders, and it is likely that overall estimates are underestimated because not all communication disorders are diagnosed/ diagnosed with the same criteria/ systematically reported to calculate their totals. More than 25% of all children with learning/ physical disabilities also have one/ more communication disorders. Males are more likely to have more communication disorders at all ages than females (ASHA, 2008a; Catts & Kamhi, 2005; National Dissemination Center for Children with Disabilities, 2010). Census of India's (2011) data on disability, report that 2.21% of the total population of India is disabled. Among the persons with disabilities, communication disorders accounted to 32%, which included disabilities of hearing (18.9%), speech (7.5%), and mental retardation (5.6%).

2. Stuttering

Stuttering is one of the most common forms of fluency disorders. It is a disorder of early childhood onset, occurring during the ages of 3 and 5 in more than 90% of children with a gradual onset. It is more prevalent in boys than girls with often reported 4:1 ratio.

The most characteristic features of stuttering are the repetitions of sounds, syllables/ words, prolongations of sounds, abnormal stoppage or "silent blocks". There

can be visible tensions/ struggle behaviors and a variety of facial grimaces and unusual limb movements. The silent blocks occur while articulators are fixed in one position for few seconds.

According to the standard definition of stuttering by Wingate (1964) “the term stuttering means: I.(a) Disruption in the fluency of verbal expression, which is (b) characterized by involuntary, audible or silent, repetitions or prolongations in the utterance of short speech elements, namely: sounds, syllables, and words of one syllable. These disruptions (c) usually occur frequently or are marked in character and (d) are not readily controllable. II. Sometimes the disruptions are (e) accomplished by accessory activities involving the speech apparatus, related or unrelated body structures, or stereotyped speech utterances. III. Also, there are not infrequently (f) indications or report of the presence of an emotional state, ranging from a general condition of ‘excitement’ or ‘tension’ to more specific emotions of a negative nature, such as fear, embarrassment, irritation, or the like. (g) The immediate source of stuttering is some incoordination expressed in the peripheral speech mechanism; the ultimate cause is presently unknown and may be complex or compound.”

"Guitar (2006) defines stuttering as an abnormal high frequency/ duration of stoppages in the forward flow of speech affecting its continuity, rhythm, rate, and effort. Stuttering can be one of the most emotionally difficult of all communication disorders (Bloodstein & Bernstein Ratner, 2008).

2.1. Incidence of Stuttering

Mansson (2000) carried out an incidence survey, including 1042 children born within a 2-year span and these children were assessed for their vocabulary, receptive language, syntax, fluency, phonology and grammar. A follow up was done after 6- 10 months for the children who showed positive signs in the areas assessed. Two years later, children diagnosed with stuttering were re-examined and then again 4 years later, a third survey was conducted to identify the possible new cases of stuttering. 51 (4.99%) out of the total, 1021 children were identified as children with stuttering (CWS) during the initial assessment of speech-language, at the age of 3. The number of new cases, who

exhibited stuttering later, was only 2. This accounted to the total incidence rate to be 5.19% over the entire 9 years. CWS who persisted stuttering was 28.4%, but the recovery rate from stuttering was 71.4%. In a study by Craig, Hancock, Tran, Craig, and Peters (2002), the incidence rate varied from 2.1% in adults to 2.8% in younger children and up to 3.4% in older children.

It is reported that about 5% of preschool age children have episodes of disfluency and in the general population approximately 1% of the school age children and adults stutter (Yairi & Ambrose, 2005). A review of 16 studies was done by Bloodstein and Bernstein Ratner (2008) who reported a low incidence rate of 0.7% by Culton, (1986) while a high incidence rate of as high as 5.4% was reported by Glasner and Rosenthal, (1957).

More recently, Reilly, Onslow, Packman, Cini, Conway, Ukoumunne, Bavin, Prior, Eadie, Block, et al. (2013) reported data on the incidence of stuttering in a sample of 1619 children. They tracked the children longitudinally from 7 months of age through age 4 and reported that 181 (11.2% of the total sample) developed stuttering prior to age 4. Unlike many other studies, a speech language pathologist confirmed the diagnosis of stuttering through direct observation of the children and then subsequently monitored the children's fluency performance through monthly visits. The incidence estimates noted by Reilly et al. (2013) of 11.2% appears substantially higher than percentages reported in most of the other studies reviewed. It is possible that the use of speech language pathologists in identifying cases of stuttering explains some of this difference as they presumably more attuned to the symptoms of stuttering and thus more likely to recognize children who have the disorder.

2.2. Prevalence of Stuttering

Bloodstein cites (Bloodstein, 1969, p. 72) study by Mills and Streit (1942) which reported a stuttering prevalence estimate of 1.5% based on a speech survey of 4685 school children in Holyoke, Massachusetts. Ten examiners who had at least one year of training in speech correction were given considerable direction and guidance during the course of the speech survey and two examiners participated in the evaluation of each

child labeled as speech defective. Considering only the first three grades, Mills and Streit report the prevalence of dysphemia (presumably stuttering) to be 2.7%, an estimate that is much higher than those reported in all the studies conducted since 1893, as reported by Bloodstein (1969). Among the population of 1196 first- through third-grade children, Mills and Streit report 399 or 33.4% speech defective cases.

A total of 1113 children in the age range of 4-5 years were surveyed by Okalidou and Kampanaros (2001). The survey revealed a 2.2% prevalence rate of stuttering among kindergarten children. A similar study carried out by McLeod and Harrison (2009), in Australia showed a prevalence rate of 5.6%.

Craig, Hancock, Tran, Craig, and Peters' (2002) surveyed 4689 families in Australia which accounted to a total of 12,131 members in the age range of 1-99 years. The survey revealed an overall prevalence rate of 0.72% stuttering with clear variations seen across the different age groups. 1.4 % was the prevalence rate for the age range 2-5 years, 1.44% for the age range 6–10 years, 0.53% for the age range 11- 20 years,0.78% for the age range 21- 50 years and 0.37% for the subjects above 50 years of age.

2.2.1. Stuttering and Bilingualism

Among the 4827 school children that Travis, Johnson, and Shover, surveyed in 1937, stuttering prevalence was found to be 2.8% in bilinguals, when compared to 1.8% in monolinguals. In a survey by Stern (1948), the stuttering prevalence was found to be 2.16 for bilinguals and 1.66% for monolinguals.

Au-Yeung, Howell, Charles, and Sackin (2000) conducted an internet survey of 794 individuals, from 40 countries. 83% of the participants were bilinguals whereas 17% were monolinguals. Comparison of the incidence rates between monolinguals and bilinguals showed no much variation. The incidence of stuttering for bilingual speakers was 21.65% and for monolinguals, it was 21.75%.

2.3. Age of Onset

The loss of fluency occurs rather gradually, with the gradual realization by the child and the parent that the achieved fluency is being lost/ failed to occur. It is also

significant that the average age at onset as usually recalled is distinctly closer to the earliest than to the later age. Stuttering begins in the early childhood years. For this reason, stuttering has often been called a disorder of childhood (Bloodstein, 1995; Conture, 1990; Van Riper, 1982). Historically most of our information about the ages at which children are said to begin to stutter comes from systematically gathered reports of parents, usually made many weeks or months later. Age is a significant risk factor in the development of a fluency disorder. Stuttering seems to occur more in the early years of their life (<6 years) than later after 6 years.

Darley (1955) reported a mean age of 46.2 months while Johnson et al. (1959) reported a mean age of 42.2 months and a median age of 40 months. Yairi, in 1983, studied the epidemiological aspects of stuttering in two and three year old children. 22 children, consisting of 11 girls and 11 boys in the ages of 2 and 3 years were taken for the study after an interview with their parents. Prior to 36 months of age all the children were reported to have begun stuttering. The interview covered four areas: personal information, familial background, circumstances of onset of stuttering, health and developmental history. The mean interval between onset of stuttering and date of interview was 5.6 months. The results revealed that the mean age at the onset of stuttering was 27.8 months for boys, which was 3.1 months later than the age of onset for girls (24.7 months) which was statistically significant. The mean ages of onset are substantially lower than findings of past studies or surveys whose subjects included preschool-aged children. The lower onset age found could be, to a large extent, a function of the strict age limits imposed on the sample and no direct comparisons can be made with previous studies.

Manner of onset was classified into 6 categories, 3 describing varying degrees of gradual onset and 3 describing varying degrees of sudden onset. According to parents, 12 children, 6 boys and 6 girls, showed a gradual onset, while 10 children, 5 boys and 5 girls, had sudden onsets. Parents of 8 of the latter 10 children reported the appearance of stuttering within l-day period. The finding that 36% of the subjects were viewed by their parents as having experienced such a sudden onset of stuttering indicates an appreciable departure from the gradual pattern of onset depicted by Johnson and associates (1959).

Yairi and Ambrose (1992) investigated the onset of stuttering and gender related variations seen in preschool children. Parents were interviewed using standardized questionnaire and 87 preschool children were selected for the study. The overall mean of 32.76 months and a median of 30 months indicate a clear tendency for onset to occur under age 3 years. Further inspection also revealed a large, 5-month difference in mean age at onset between males and females, with female participants exhibiting earlier onset as well as smaller dispersion. 44% of the entire group reported sudden onsets. It was seen that males and females were similarly distributed according to the two onset types and girls began stuttering at a significantly earlier age. Sudden onset for 27 subjects or 31% of the entire group of children with stuttering was rated as mild for 70% (60 children) and moderate or severe for 28% (14 and 10 children respectively). Mansson's (2000) study also revealed that the mean age at which the onset of stuttering was noted was 33 months. The mean age of onset for boys was 34 months, and for girls, it was 31 months, similar to the above findings.

163 children studied by Yairi and Ambrose (2005) demonstrated a range of onset, with children becoming disfluent as early as 16 months and as late as 69 months of age. The authors' analysis indicated that mean and median ages of onset was 33 months, about 9 months earlier than the mean age of onset calculated from 11 previously published studies (Yairi, 1997a). Both the 101 male and the 45 female participants in the early experimental group showed nearly identical mean ages of onset at 34.02 months. Although there were more males than females included in the total sample of 146 children, the pattern of onset for both genders was similar. Yairi and Ambrose (2005) found that onset of stuttering for 85% of the boys and girls occurred by 42 months, with 95% occurring by 4 years of age and only 5% of the children began stuttering beyond age 4. The majority of the onsets were concentrated between 24 and 42 months i.e., during the third year of life.

Plexico, Manning, and DiLollo (2005) observed that it is not unusual for adolescents and adults to report that the first time they remember realizing that they stuttered was just prior to or during their early teenage years. In some instances, it may be that while the actual onset took place during the preschool years, the stuttering was

present in a mild or less than handicapping fashion. Bloodsein and Bernstein Ratner (2008) noted that a number of studies have reported stuttering onset occurring during early adolescence.

2.4. Gender and Stuttering

Gender is a predisposing factor of stuttering, with males being more likely to develop a fluency disorder than females. A live generational 1,200-member family study revealed that males were affected more than females, and that, the male to female ratio was 1.8:1 (McFarlane, Hanson, Walton, & Mellon, 1991). Yairi's (1983) findings differed from many incidence surveys in which boys predominated at ratios varying from 2:1 to 5:1. Yairi and Ambrose (1992) in their study noted a 2.1:1 male-to-female ratio for the entire sample (87) and a significant gender factor was found with twice as many boys as girls stuttered.

Among children in the early stages of developmental stuttering, the gender ratio is about 3 males to 1 female (Ambrose, Cox & Yairi, 1997). Among adolescents and adults who have not resolved their stuttering, the gender ratio shifts to about 7 males to 1 female. Therefore, while males are not only more likely to experience a fluency disorder, they are more likely to persist in the disorder, once it is manifested. Mansson (2000) noted a male to female ratio of CWS to be 1.65:1. While Craig, Hancock, Tran, Craig, and Peters (2002) noted an increased male to female ratio varying from 2.3:1 in children to 4:1 in adolescence.

2.5. Socioeconomic Status (SES) and Stuttering

Relatively few data that are available concerning a child's socioeconomic status suggest that stuttering is present at the same frequency of occurrence in all socioeconomic groups. Undoubtedly SES is an issue as a lack of diagnostic and treatment services is likely to result in an underestimate of the occurrence of stuttering for certain populations in lower socioeconomic categories. It may also be that those in upper socioeconomic categories are more informed about and economically capable of obtaining assistance. Morgenstern (1956) investigated the presence of stuttering in 29,299 children in the 6^{th} and 7^{th} standard. Only 355 among the total number of children

stuttered. Among this 289 were males and 66 females, which accounted for mean prevalence rate of 1.2%. These children were later classified according to their fathers' SES. Fathers of CWS, who were in the class of semi-skilled weekly wage earners, had the highest no of CWS. The author concluded that this group of children had the strongest desire to improve their fluency. Both lower SES class and higher SES class had a lower percentage of CWS.

Bloodstein (1987) suggests that the occurrence of stuttering may be related to the imposition of high standards for the achievement of status and prestige, along with the intolerance of deviancy, values that may vary depending on the socioeconomic status of the families. McKinnon McLeod, and Reilly (2007) did a survey study of 3 speech disorders including stuttering and found that there is no relation between SES and the prevalence of the 3 speech disorders.

Boyle Boulet, Schieve, Cohen, Blumberg, Yeargin-Allsopp, and Kogan, (2011) along with USA Center for Disease Control and Prevention did a survey to see the relationship between stuttering in 3- 17 years and SES. 2.57% prevalence rate was seen in CWS whose mothers had less than high school education, which declined to 1.59% for CWS whose mothers had high school/some college education, which further declined to 0.96% for CWS whose mothers had college degree or higher education. The survey also found that the prevalence rate of 2.4% was seen in children from the families who were below poverty level when compared to 1.07% prevalence rate in children who were above the poverty level.

2.6. Causative Factors

There is a long history of documentation that stuttering occurs with much greater than usual frequency in some families. In 1964, Andrews and Harris published results from a prospective study of stuttering in 43 children who were followed from birth to 16 years. In addition, the investigators examined the family histories of 78 school children who stuttered, in the age ranges of 10-11 years, 83 clinic cases aged 2 to 14 years, and 52 adolescent and adult clinic cases. Analyses of families of the subjects in these samples indicated that the relatives of female PWS having an incidence of as high as 20.2% which

is significantly much higher than that seen in relatives of male PWS, which accounts to only 12.2%. Specifically, the highest risk was seen for male relatives of females who stutter, followed by male relatives of males who stutter, then female relatives of females with stuttering, with the lowest risk for female relatives of males with stuttering. Andrews Hoddinott, Craig, Howie, Feyer and Neilson (1983) estimated the risk among first-degree relatives of probands to be three times greater than that of relatives of control subjects.

The genetic basis of stuttering was studied by Kay in 1964, wherein he found an incidence rate of 13.65% among the first-degree relatives of probands. There was a variation in the incidence rates among the different probands' relatives. He found that more male relatives than female relatives had a higher incidence rate for stuttering, and also that, male relatives of female PWS had the highest incidence of stuttering and that the female relatives of the male PWS had the lowest incidence rate for stuttering.

In Yairi's (1983) study, the family history was noted in 65% of the total sample, which included both first degree and second degree relatives. It may be of some significance to notice that 9 of the 11 girls had stuttering relatives while this was true for only 6 of 11 boys. Thus, parental reports of familial incidence of stuttering are consistent with previous notions about a strong tendency for this disorder to have familial background (Kidd, 1977). These figures were considerably above the mean of 25% calculated by Sheehan and Costly (1977) for 25 studies or the 29.5% reported by Porfert and Rosenfield (1978).

During the 1970s, the Yale Family study of stuttering produced several reports on familial incidence of stuttering, which were later summarized by Kidd (1984). In this report, he presented incidence data from a large database of complete pedigrees of first-degree relatives of 600 probands, mostly adults exhibiting chronic stuttering. The risk of stuttering in each family was calculated. The overall incidence of stuttering in first-degree relatives was approximately 15%. Brothers and fathers had appreciably higher risks than mothers and sisters for probands of both sexes. All categories of relatives of females who stuttered had higher risk for stuttering than relatives of male probands with an overall rate of 17% and 12%, respectively. Further analysis of the data involved

examination of frequency of stuttering in brothers, sisters, sons, and daughters of males or females who stutter for two family types: (a) neither parent of the proband had ever stuttered and (b) father (and not mother) of the proband stuttered. Statistically significant differences were found in the overall lower incidence of stuttering in females and in the higher incidence of stuttering in relatives of females. Kidd hypothesized that males are more susceptible to develop stuttering than females and that males have a lower threshold than females, who need more genetic loading for stuttering to be expressed.

McFarlane, Hanson, Walton, and Mellon (1991) studied the occurrence of stuttering in the five generations of a single family. A live generational 1,200-member family with high prevalence of a stuttering was considered for the study. The pedigree structure showed eight branches, with two branches consisting of over 400 members, showing no history of stuttering, five branches consisting of 500 members who had stuttering at a rate five to ten times the population average, and one branch had high occurrence of stuttering at about l0-15 times the general population level. They studied the first two generations and all the members of the high-occurrence branch who were above the age of five. Transmission from an affected father as well as an affected mother was seen more often in an affected son than the affected daughter. Affected females were more likely to have an affected parent more than affected males. Affected males may frequently have both parents unaffected and female offspring tend to be unaffected even if both parents are affected.

In the study by Yairi and Ambrose (1992), 66.3% of the subjects had positive history. 46.6% had a history in first-degree relatives. Stuttering history in second- or third degree relatives only was reported in 19.7% of the subjects. Although positive history was more common among males than females, the chi-square test indicated no significant difference.

Grinager, Ambrose, Yairi, and Cox (1997) investigated the frequency of stuttering in the relatives of 69 pre-school aged CWS and the ones who were seen close to the onset. The probands (the stuttering subjects through whom the families included in the study were identified) were 69 children ranging in age from 2 years, 1 month to 6 years, 3 months. Of the 69 probands, 33 were first-born of which, 11 were the only children, 18

had one younger sibling, 3 had two and 1 had three younger siblings. Twenty-eight were second born, of which 21 were the youngest, 4 were second of three children, and 3 were second of four children. The subjects were about evenly split between being first-born or later born. A pedigree for each proband was obtained from one or both biological parents during an extensive intake interview. Data was gathered on the stuttering history in maternal and paternal grandparents, aunts, uncles, first cousins, siblings and parents of the subjects. It revealed that male relatives stuttered more than female relatives, but in case of female PWS, it was seen that less male relatives than female relatives stuttered, when comparing to that of the male PWS.

The results of Mansson's (2000) study revealed that family history of stuttering was seen in 67% of the CWS, which includes 50% of the CWS had first degree relatives who stuttered and 17% of CWS had second degree relatives who stuttered.

A segregation analysis of 56 pedigrees of PWS was carried out by Viswanath, Lee, and Chakraborty, in 2004. The results of the analysis revealed an autosomal dominant major gene effect in stuttering influenced by the sex and the affected status of parents. Yairi and Ambrose (2005) confirmed that whereas 88% of children who persisted stuttering had a positive familial history of stuttering, only 65% of children who recovered naturally had such a history.

Yairi and Ambrose (2005) reported on familial patterns of stuttering in children with persistent stuttering. They found that the observed frequency of stuttering was significantly greater than the expected frequency for each of the four possible basic patterns of aggregation. That is, stuttering was observed in 24% of the immediate relatives of a male proband who stuttered (which is 16 times greater than the expected percentage); 33% of the immediate male relatives of a female proband who stuttered (which is 22 times greater than the expected percentage); 7% of the immediate female relatives of a male proband who stuttered (which is 14 times greater than the expected percentage) and 12% of a female proband who stuttered (which is 24 times greater than the expected percentage). These findings are generally consistent with findings from other studies (Andrews & Harris, 1964; Kidd 1984; MacFarlane, Hanson, Walton & Mellon, 1991).

Bloodstein and Bernstein Ratner's (2008) review indicates that the percentage of people who have relatives who stuttered on the maternal or paternal side ranges from 30-69%. The studies concerning the genetics of stuttering have focused on the occurrence of stuttering in families, particularly in instances where there is a high density of stuttering in the first and second degree relatives. Research during the past few decades has indicated a genetic component in selected groups of people who stutter (Cox, Seider, & Kidd, 1984; Falsefeld, 1997; Johnson & associates, 1959; Kidd, 1977; Kidd, 1984; Kidd, Heimbuch, Records, Oehlert, & Webster, 1980; Pauls, 1990; Poulos & Webster, 1991; Sheehan & Costley, 1977; Yairi, 1983).

The demands and capacities model proposes a disparity between child's existing capacities in producing fluent speech and the demands placed on him. The model suggests that the CWS have a hereditarily inclinations for disfluency and that act together with the environmental elements to both initiate and retain the issue. In this model, the worsening of fluency is seen as mirroring an irregularity between the kid's present abilities for delivering fluent speech and the demands put on the kid. The model talks about capacities which can be normal or abnormal, and four types: (1) general motoric; (2) linguistic; (3) socio-emotional; and (4) cognitive (Meta-linguistic skills). Demands take the form not only of environmental demands (external) but also self imposed demands (internal). All these demands and capacities are dynamic and changing rather than static. If the internal or external demands exceed the capacities of a particular child, stuttering is more likely to occur.

Fundamentally, there is no main factor(s) vital for stuttering to rise or hold on children. Stuttering is an intricate issue, and the disfluent speech is unpredictable. Hence, it is not prone to be activated by one factor, but rather by a few. These variables can be either internal or external, and are "bundled" in distinctive courses for diverse children. They are thought to be 'hazard s of stuttering'. Smith and Kelly (1997) provide a novel way of describing the multifactorial nature of stuttering within a nonlinear, dynamic framework. They tried to integrate both the nature and nurture views of onset. Both the structure and function of the brain are remodeled not only during the early years of development but also, as a result of experience and learning throughout all stages of life.

Nearly all the recent neurological and genetic research suggests that interactive and dynamic nature of the organism with the environment, supporting Smith's premise that understanding the onset and development is not a nature vs. nurture issue. The two perspectives are essentially one and the same, an organic- learning combination.

2.7. Normal Nonfluency (NNF) Vs Stuttering

Although NNF is not a clinical condition, parents often bring their children suspecting a fluency problem and clinicians often will not make a diagnosis of stuttering for fear of misdiagnosing the child leading to stuttering as per diagnosogenic theory of stuttering. Further, early stuttering is episodic in nature and varies in symptomatology making the diagnosis a challenge.

According to one of the assumptions, the normal disfluencies are on the same continuum as stuttering and that the latter is simply a more severe and frequent manifestation of the former. However, this assumption of Johnson and associates (1959) which was the basis for the Diagnosogenic theory has been questioned by subsequent research on children close to onset of stuttering (Ambrose & Yairi, 1999; Yairi, 1981, 1982; Yairi, 1997; Yairi & Lewis, 1984). According to them stuttering disfluencies are qualitatively and quantitatively different from the so called typical or normal disfluencies.

Most studies of early childhood non fluencies observed interjections, part word repetitions, revisions of incomplete phrases, disrhythmic phonation and tense pauses (Johnson, et al., 1967). Several protocols have been published that are designed to help SLPs distinguish children who are typically fluent from children who stutter. England (1955) evaluated the occurrence of non- fluencies in a group of 26 kindergarten children with no stuttering (CWNS) and 3 pre-school age CWS. The non stuttering group had a lower frequency of sound or syllable repetitions than either word or phrase repetitions. Repetition of parts of words constituted the most common type of repetitious speech in both the groups. However, CWS showed a markedly higher percentage of repetitions of all types, the repetitions consisted more heavily of sound or syllable repetition and very few phrase repetitions. The CWS showed repetitions consisting of 1-5 iterations of the repeated part, whereas CWNS group had repetitions ranging from 1-3. The speech

samples of CWNS contained a higher percentage of audible pauses, whereas the speech of the CWS had a greater percentage of prolongations.

In a study conducted in the year 1962, Wingate concluded that stuttering can be differentiated from NNF in two ways (a) on the basis of sound or syllable repetition and prolongations, somewhat secondarily in terms of hesitation, and (b) the severity of expression of symptoms, which is judged in terms of frequency within which the foregoing irregularities are evidenced, the presence of a combination of these irregularities or both. Thus, sound repetitions, syllable repetitions, prolongations and hesitations might be designated as "Stuttering disfluencies". Fluency irregularities ordinarily accepted as normal are the word repetitions, revisions and interjections.

Adams (1977) drew from several sources in delineating a strategy to distinguish normally non- fluent children from incipient CWS. The following qualitative and quantitative criterions were cited.

- CWS were twice as non- fluent as CWNS.
- CWS produced 1-5 reiterations of a part word repetition whereas CWNS produced 1-3 iterations.
- CWS demonstrated an abrupt abnormal cessation of voice or airflow while this was not evident with CWNS.
- CWS displayed schwa intrusion in repetitions whereas CWNS did not.

According to Adams (1977), children who stutter will generally have ten or more disfluencies for every 100 words while children who do not stutter will tend to have no more than 5 disfluencies for every 100 words. Some danger signs to watch for are the duration of disfluencies, abnormal airflow, voicing and schwa insertions. CWS tend to repeat sounds longer than do CWNS who generally repeat the sounds only once or twice. They also exhibit abnormal voicing and airflow during the production of disfluencies and usage of schwa vowel usually in the syllable being repeated.

Sowmya (1992) aimed at differentially diagnosing the CWS with normally nonfluent children in the Indian context. She noted that repetitions, unfilled pauses and filled pauses to a greater extent and prolongations and audible inspirations to a lesser

extent seem to guide in the diagnosis of a child with stuttering. Unfilled and filled pauses in the younger age group and repetitions and filled paused in the older age group facilitated easy diagnosis of stuttering. The speech language pathologists appeared to follow varied criteria in differentially diagnosing the children as CWS or normally non-fluent. In the younger age group, the SLPs tended to label the child as “normally non-fluent” and with increase in age, the label of “stuttering” was used more frequently.

Prakash, Sarah and Savithri (1999) studied acoustic aspects in the speech of CWS. 4 normally nonfluent children and 4 CWS were considered for the study. The steady state portion of the vowel V1 in C1V1C2V2 syllable, frequency of F2, Formant Frequency Fluctuation (FFF), and F0 variation were measured. They reported that CWS consistently showed higher frequency of F2, greater FFF, and greater F0 variation in the vowel steady state portion.

Geetha, Karanth, Ashok, and Ravindra (2000) sub-grouped children with disfluency on the basis of their family history of stuttering and the co-occurring speech and language disorders along with historical, attitudinal and behavioral indicators. The groups were classified using Artificial Neural Network (ANN), a computerized program. Two groups of disfluent children were taken, which included, Group I consisting of 25 children and Group II comprising of 26 new disfluent who were followed up after 6 months in order to confirm the condition and to determine the predictive accuracy of the ANN diagnosis. Comparison of the different test results of language and articulation tests were done using the norms available. Comparisons were made between the scores of NNF and CWS groups I and II. Based on historical, attitudinal and behavioral indicator scores of stuttering obtained in Group I, Group II CWS could be successfully classified using ANN. Their results revealed that the mean age of the onset of disfluencies were 3 years with 70% of the children having had a gradual onset, in both the groups. The stuttering group had a male-to-female sex ratio of 4:1. 70% of the children in both the stuttering groups had a family history of stuttering, which is really high. The disfluency of children with NNF was 2-3% when compared to the stuttering group of children, who showed greater than 10% disfluencies. The study also revealed that children in both the stuttering groups combined had articulation and language problems as the highly co-

occurring disorders, with group II showing 80%, when compared to group I. Also, 50% of the children with stuttering had delay in speech, language and motor developmental.

2.8. Stuttering and concomitant disorders

There continues to be active investigation of the degree to which CWS are delayed in speech and language development or display depressed performance on standardized speech and language measures or spontaneous language analysis.

Although adolescent prevalence rates have rarely been studied, Ardila in 1994 investigated 1879 Spanish speaking adults, 946 males and 933 females, for the frequency self-reported stuttering and its possible risk factors of CNS dysfunction including co-occurring disorders and the depression symptoms in these participants. Mean age of the participants were 24 years and they were asked to fill in a questionnaire which was designed for the purpose of assessing the frequency of stuttering and its relations to the several risk factors, co-occurring disorders and depression symptoms. Only 2% of the total subjects reported to have stuttering, which included 17 females and 20 males. On comparing PWS and PWNS, the distribution of handedness was similar for both the groups. Even though significant difference was not observed in clients with history of seizures, it was twice more frequent in PWS than in PWNS. Dyslexia was the co-occurring disorder which showed a strong association with stuttering. The occurrence of depressive symptoms was much elevated in the PWS group compared to the PWNS group.

2.8.1. Stuttering and Articulation and/ or Phonological abilities

McDowell and Dickinson (1928), who matched 33 CWS to 33 CWNS on the basis of chronological age, intelligence, gender, native language, and racial background. The mean age was approximately 10 years for both the groups. Mean IQs were 100 for the CWS and 101 for the CWNS on the Stanford Revision of the Binet Intelligence Test. Each child was given a non-standardized articulation test that required the youngster to repeat a series of sentences after an examiner, who recorded any errors in the production of vowels, diphthongs, consonants, or consonant clusters. Mean error rates for the CWS

and non-CWNS respectively were, 19% and 16%, which represented a small but statistically significant difference between groups.

Williams and Silverman (1968) examined articulation in connected speech of CWS. One hundred fifteen CWS from kindergarten through ninth grade were matched to 115 CWNS on chronological age, grade level, and gender. Information concerning ethnic and linguistic background and socioeconomic level was not reported. Each subject told a story in response to a set of picture cards. In addition, the kindergarteners and first graders repeated a set of sentences three times, and the second through ninth graders read a passage aloud three times. From audio-recorded samples, it was determined whether or not the child had at least one consistent articulation error in the form of an omission, substitution, or distortion. The results showed that the CWS had a higher percentage of errors than the CWNS, especially at the lower grade levels. For example, for the kindergarteners and first graders combined (N = 25), 72% of the CWS versus 24% of the CWNS had at least one consistent error and for the second and third graders combined (N = 32), 18.8% of the CWS versus 6.2% of the CWNS had that problem.

An investigation designed to determine the frequency of additional speech problems occurring in the PWS was made by Blood and Seider (1981). The sample consisted of 1060 PWS. The data were analyzed as to the frequency and percentage of responses in each category of concomitant problems. Of all the young PWS identified in the survey, 335 (32%) were reported to be free from any other problem. The remaining 68% were judged to have other problems in addition to their stuttering, 469 (44%) PWS one concomitant problem and 256 PWS reported to have more than one problem. The most frequently co-occurring disorder was articulation disorders and learning disability followed by voice disorder and cleft palate.

Louko, Edwards, and Conture (1990) compared CWS and their normally fluent peers for their phonological processes, and to make a relation between the phonological processes to typical measures of stuttering and other speaking variables. 30 CWS and age and gender matched fluent children, with mean age of 4 years were selected for the study. Each subject’s session lasting 30 minutes were audio and video recorded for further analysis for deriving phonological processes and also to calculate the several measures of

stuttering behavior. The results were in agreement with the previous researches which indicated that CWS have higher chances of developing speech sound errors than their normal children. The CWS exhibited 18 phonological processes, whereas the normal children exhibited only 11. Normally fluent children did not exhibit some of the phonological processes which were exhibited by CWS and they also did not exhibit any phonological processes that were not exhibited by CWS.

St. Louis, Murray and Ashworth (1991) randomly selected 24 PWS, 19 males and 5 females from grades 1-12 and analyzed their speech, language, and hearing. The analysis of the types of disfluencies, language and articulation were done using the recorded conversation sample. The results revealed that 17.05% accounted to the disfluent words. The mean percentage of words stuttered was 4.89% and the MLU was 6. The mean of the utterance complexity was 1.3, with the mean articulatory errors being 3.4. The analysis revealed that 58% of the participants were normal, and 42% had articulation error, and 50% exhibited deviance in voice.

Arndt and Healey (2001) investigated the number of children who stutter with verified or suspected concomitant phonological and language disorders. 467 children in the age range of 3- 20 years were identified as having stuttering. Of this 467, 56% of children were identified as verified fluency disordered only, and 44% exhibited a verified fluency and a concomitant phonological and/or language disorder. Within the latter group 32% of the children had phonological disorders, 35% had language disorder, and 33% had phonological and language disorder. Of the 56% of children in the first group, 42% had a suspected concomitant disorder and 58% had no suspected concomitant disorder. Among the 42% of children having a suspected concomitant disorder, 13% had a suspected phonological disorder. The survey results have revealed that large percentage of children from preschool through high school had a fluency disorder and a phonological and/or language disorder.

Gregg and Yairi in 2007 analyzed the phonological abilities in CWS near stuttering onset, before the time when the children's stuttering ultimately diverge into persistent and recovered pathways. The subjects included 28 CWS, which included 20 boys and 8 girls, in the age range of 25- 38 months. Four groups were made with age and

gender matched subjects. The first group included 5 boys and 2 girls, with mean age of 29.4 months, who were diagnosed as having mild stuttering. The second group included 5 boys and 2 girls, with mean age 31.4 months, who were diagnosed as having severe stuttering. The other two groups were selected based on the phonological ability. The first phonology-based group included 5 boys and 2 girls with stuttering, who exhibited minimal phonological deviations. The mean age of this group was 33.8 months. The second phonology-based group included 5 boys and 2 girls with stuttering, who exhibited moderate phonological deviations. The mean age of this group was 32.5 months. The subject's conversational speech sample was audio recorded and then orthographically transcribed and analyzed for disfluencies. Each of the subjects was administered "The Assessment of Phonological Processes- Revised" (Hodson, 1986). The results of the analysis revealed that, there was homogeneity among the groups in terms of the number of SLDs (Mean= 4.16). Phonological complexity in the moderate category was seen for the groups. A slight trend was evident towards moderate phonological deviations associated with severe stuttering. Four children out of the seven from the minimal deviations group exhibited moderate stuttering, one close to severe stuttering and two with severe stuttering. Neither of the two factors had statistically significant differences. Gregg and Yairi scrutinized the articulation development of CWS and examined the relationship of phonological acquisition to stuttering persistence and recovery in their sample. In general, CWS tended to lag somewhat behind fluent peers and children whose stuttering persisted tended to demonstrate slower development than children who spontaneously recovered. No differences in the profile of phonological development were apparent among persistent, recovered, and fluent children, and phonological profile alone was insufficient to distinguish statistically between either stuttering from fluent children, or persistent from recovered children.

LaSalle and Wolk (2011) considered three male subjects aged 14 years, who were diagnosed with stuttering, cluttering, and stuttering–cluttering. Spontaneous speech samples were recorded and the disfluent words were matched to fluent words on grammatical class, word familiarity and the number of syllables. Online database was used to derive word frequency, density and phonological neighborhood frequency, and an

index of phonological complexity was determined per word. The dysfluent words were phonologically more complex and less frequent than the fluent words.

2.8.2. Stuttering and Language

Darley (1955) examined language onset in CWS and obtained results that were more consistent with Berry's (1938b) findings than with Johnson's (1955). Darley questioned the parents of 50 CWS and 50 CWNS concerning the ages at which their child's first words, first two-word combinations, and first sentences were produced. The two groups of children had been matched for chronological age, gender, and socioeconomic level. At the time of the interview, the mean ages were 9:2 (range = 2:4-14:4) for the CWS and 9:0 (range = 2:2-14:0) for the CWNS. Each group contained 39 boys and 11 girls from upper middle- or lower middle-class homes. IQs, available for the stuttering group only, ranged from 54 to 162, with 82% of the children having average or higher-than-average IQs and 18% having lower-than-average IQs. Results of the interview revealed the stuttering group to be slightly older than the non-stuttering group in reaching all three language milestones: mean ages for first words, first two-word combinations and first sentences for the CWS were 10.89, 18.31, and 26.65 months, and for the CWNS, they were 9.92, 17.51 and 24.58 months, respectively. However, it was not reported if the differences between groups were statistically significant.

An investigation of 80 CWS was conducted by Andrews and Harris (1964), who interviewed each child's mother concerning the age at which the youngster's first phrases had occurred. At the time of the interview, the CWS were 9, 10, and 11 years old. Each was matched for chronological age and gender to a CWNS. Maternal report indicated that the CWS, on the average, produced their first phrases approximately 4 months later than the CWNS, representing a statistically significant difference.

Okasha, Bishry, Kamel, and Hassan (1974) questioned mothers of CWS and CWNS concerning the ages at which their children's first sentences had occurred. Seventy-nine CWS, ages 6-12 years, were matched to 80 CWNS for chronological age, gender, and social class. Ethnic and linguistic background information was not reported. Mean IQs were 94 for the CWS and 101 for the CWNS. Although group means for age of

first sentences were not provided, the CWS reportedly were delayed on this variable compared to the CWNS.

Montgomery and Fitch (1988) studied the prevalence of stuttering in the hearing-impaired school age population. The survey questionnaires were sent to 150 regional, private, and state schools for the hearing impaired, from which a total of 9,930 students were enrolled. A total of 12 children were reported to be having stuttering. Of the 12, all but one was congenitally hearing impaired. The male to female ratio was 3:1, with age range from 5 to 18 years. Three of the children were reported to be disfluent only in the oral mode, 6 only in the manual mode, and 3 were reported to be disfluent in both oral and manual. All but one child were reported to have a severe or greater loss (1 child was reported to have a moderate loss, 5 severe, 2 severe-to-profound, and 4 profound). The result revealed that the prevalence of stuttering in the hearing-impaired population in this study was found to be lower than in the hearing population. Twelve PWS were reported in 77 schools with a total enrollment of 9,930 hearing-impaired students. The number of schools responding was large enough to project a reliable prevalence figure of 0.12%. This suggested that stuttering was approximately 8 times more prevalent in the persons with normal hearing than with the hearing-impaired population. The results of this study also indicate that there is a perceived manual disfluency that is of greater prevalence than oral stuttering in the hearing-impaired population. This suggests that the underlying basis for stuttering is language based and not bound by expressive modality. As previously explained, St. Louis, Murray and Ashworth (1991) reported that except one subject who had normal hearing ability, all the others had moderate unilateral hearing loss.

Arndt and Healey (2001) investigated the number of children who stutter with verified or suspected concomitant language disorders. Among the 42% of children having a concomitant disorder, 20% of them had language disorder, and 5% had voice disorder. In total 24% of the children suspected of having a LD and 14% had reading disability. A total of 16% had emotional disturbance/attention disorder (emotional disorder = 12%; attention deficit disorder (ADD) = 0.6%; attention deficit hyperactivity disorder (ADHD) = 3%), 1% having a hearing impairment and approximately 1% exhibited symptoms consistent with traumatic brain injury (TBI). The remaining 6% of cases included a

variety of problems that respondents placed in “other” category. These included sensory integration impairment, social delay, mental retardation, auditory processing difficulties, and Prader Willi Syndrome.

2.8.3. Stuttering and cognitive impairment

The findings from literature suggests that stuttering is slightly more common in the less intelligent of the normal population, and it might be expected to be especially prevalent among persons with mental retardation. Although the prevalence figures that have been reported vary widely, almost all of them are far higher than the 1% that is usual in an ordinary population. While the incidence of stuttering in the general population is estimated to be 1%, in the population of mental retardation incidence was estimated to be 20.3 % (Schlanger, 1953) and as high as 45% in the Down's syndrome subgroup (Schlanger & Gottsleben, 1957). An analysis of the disfluent speech behavior of children with mental retardation (MR) appears to be particularly important because of the reported high prevalence of stuttering in this population and because of the differential contribution of certain disfluency types to the perception of stuttering. Schlanger (1953) surveyed the speech characteristics of seventy-four students with MR from a private school for exceptional children in Wisconsin. These students ranged in chronological age from eight to sixteen years and had intelligence quotients of forty or above. They were observed by the school teachers for the purpose of initial classification of speech characteristics. Based on teachers' judgments, 20.3% of the students, five girls and ten boys, had stuttering.

Another study which threw some light on the problem of environmental influences on the incidence of stuttering in mongoloids was conducted by Lubman (1955). Of 155 students from the Cleveland, Ohio public school classes for the children with retardation, twelve children stuttered so "severely as to handicap that speech which existed". Of these 155 students, forty-eight were mongoloid and of the twelve with stuttering, ten were mongoloid. A prevalence of 33%, based on independent judgments of 3 SLPs was recorded by Gottsleben (1955).

Schlanger and Gottsleben (1957) studied the speech of the entire population of 516 (377 males & 139 females) residents at the Vineland Training school. The study reported a stuttering incidence of 17% (89) among the total 516 residents, who had a mean chronological age of twenty-eight years, nine months and a mean mental age of seven years, eight months. The judgments were based on a yearly speech evaluation for five consecutive years. Secondary stuttering reactions were observed in only 26% of the eighty-nine CWS. The pattern of stuttering ranged from mild to severe blocking, with 82 of the stutterers demonstrating clonic blocks. The fact that the majority of the subjects did not exhibit secondary characteristics raised some question as to what these researchers defined as stuttering behavior and what types of characteristics were exhibited by those not displaying the secondary characteristics.

Eighty mongoloid and eighty non-mongoloid children and adults enrolled at Indiana state institutions for the mental retardation were investigated by Shubert (1966). Twenty seven children and adults were ultimately chosen to be recorded because they were regarded by the cottage supervisors as displaying "stuttering behavior." The results indicated that the incidence rate of stuttering declines as a higher critical level was employed. The highest incidence rate was 15% for mongoloids and 8.8 per cent for non-mongoloids, under the individual criteria level. Further, a study by Keane (1970) resulted in a total incidence of stuttering of 10% among 200 mongoloid subjects, 100 institutionalized and 100 non-institutionalized. Twelve of the twenty PWS were non-institutionalized and the remaining eight were from institutions.

The most detailed examination of disfluencies in Down syndrome to date was carried out by Preus (1972) on a sample of 47 individuals selected only for fairly intelligible speech. Preus studied chiefly the frequency of whole word repetitions, and prolongations in the subjects' speech. He found a high frequency of each of these symptoms in the group as a whole. Using an arbitrary criterion of 5 instances of such disfluencies per 100 words, he classified 46.8% of the sample as PWS. Unexpectedly Preus found in 29.8% of the cases with secondary symptoms consisting of associated bodily movements or of devices such as avoidance and postponement. With aid of judges' ratings, he also classified 31.9% of the same sample as clear of no pronounced

cluttering, and there was no correlation between stuttering and cluttering. Preus concluded that the disfluencies found in children with Down syndrome may be classified as “genuine stuttering”.

Chapman and Cooper (1973) conducted a survey which was aimed at determining the incidence of stuttering among institutionalized persons with retardation and in determining if the adaptation, consistency and expectancy phenomena are evident in the stuttering behavior of this same group. Of the 1,192 residents at an Alabama state school for the retarded, thirty-six (3.02%) were diagnosed to have stuttering. Stansfield (1990) found a modestly elevated prevalence of 6.3% of the “idiopathic disfluency” (stuttering and cluttering) in a sample of 800 adults with intellectual disability.

To summarize, the epidemiological issues related to stuttering provides few interesting facts. Although the incidence of stuttering in the general population is around 1% it has been reported to range from as low as 0.7% to as high as 5.4%. Although a general male to female ratio of 1.65:1 was noted for CWS with a recovery rate of 71.4% among children in the early stages of developmental stuttering (2- 8 years), the gender ratio is about 3 males to 1 female indicating probable higher recovery rates for girls compared to boys. Among adolescents and adults with unresolved stuttering, the gender ratio further increases to 7 males to 1 female. Hence, males are not only more likely to develop fluency disorder but are also likely to persist in the disorder once manifested.

The results of genetic studies have revealed an autosomal dominant major gene effect influenced by the sex and affected status of parents, also for the recovery or persistence of stuttering. In addition, highest risk for stuttering was noted for male relatives of females with stuttering, followed by male relatives of males who stutter, than female relatives of females with stuttering, with the lowest risk noted for female relatives of males who stutter. This collection of findings has lead several researchers to propose that males have a lower threshold than females, for the genetic loading for stuttering to manifest.

The general mean age of onset of stuttering has revealed that it is concentrated between 24 and 42 months or during the 3rd year of life. Investigations evaluating ages of

onset revealed mixed results with about 36% to 44% of parents of CWS reporting a sudden onset, indicating an appreciable departure from the reported gradual pattern of onset. Research evaluating the role of SES in a child's stuttering revealed no definitive results. A comparison of distribution of handedness across PWS and AWNS revealed similar distribution for both the groups. Literature scrutinizing concomitant disorders in CWS revealed that CWS tended to lag in their phonological and language acquisition somewhat behind their fluent peers and that children whose stuttering persisted, tended to demonstrate slower development than children who spontaneously recovered. Furthermore, CWS demonstrated a rather pronounced tendency to have functional difficulties of articulation with CWS having a severe degree of stuttering more likely to have delayed or disordered articulation than mild or moderate degrees of stuttering. The most frequently co-occurring disorders reported were articulation/ phonological disorders and learning disability followed by voice disorder and cleft palate along with a history of seizures and dyslexia. An elevation in depressive symptoms was also noted in adolescents with stuttering than in their non- stuttering counter parts. A high prevalence of stuttering has reported in children with mental retardation, particularly in Down's syndrome and less prevalence in children with hearing impairment

2. Neurogenic stuttering

The sudden or gradual development of stuttering or stuttering like speech disfluencies in adults has been documented extensively in the literature. Authors have variously referred to neurogenic stuttering as late onset stuttering, acquired onset stuttering, adult- onset stuttering, neurological stuttering, cortical stuttering, sudden onset stuttering, organic stuttering, 199 (SAAND), and dysphasic stuttering, among the others.

Nancy Helm- Estabrooks' (1993) definition for SAAND was: "Stuttering refers to disorders in the rhythm of speech in which the individual knows precisely what he or she wishes to say but at the time is unable to say it because of an involuntary repetition, prolongation or cessation of a sound. When this behavior first occurs, notably worsens, or recurs in the presence of acquired neurological problems, it is diagnosed as stuttering associated with acquired neurological disorders (SAAND)"

SAAND consists of the largest subgroup, even though the data available regarding the same is sparse. The causes of SAAND vary from one individual to another. The common causes include Alzheimer's disease, stroke, brain tumor, TBI, progressive supra-nuclear palsy, Parkinson's disease, renal dialysis and drug usage (Brazis, Masdeu, & Biller, 1996; Christensen, Byerly, & McElroy, 1996; Helm-Esterbrooks, 1999; Heuer et al., 1996; Lee et al., 2001; Supprian et al., 1999).

Neurogenic stuttering is mostly a consequence from a variety of disorders, and hence, the symptoms of neurogenic stuttering vary widely. The common symptomatology include: increased frequency of normal disfluencies or blockage in the free flow of speech; other disfluencies include, phrase, part word and whole word repetitions; pauses and hesitations in unexpected positions of an utterance; production of disturbing sounds during speaking; unintelligible rapid bursts of speech; inappropriate movements of lips, tongue, or jaw. Most of the patients with SAAND are unaware of their disrupted speech. Few of them may be aware about their speech problem and may express anxiety and even present with depression. Acquired stuttering has various neurological implications. This neurological relation lead the acquired PWS to respond negatively to stimuli which might improve fluency, like, DAF and FAF (Balasubramanian, Max, Van Borsel, Rayca, & Richardson, 1997), and Adaptation (Ringo & Dietrich, 1995).

Other than general observations that neurogenic stuttering is a rare or uncommon disorder (Rango & Dietrich, 1995), very little direct or reliable information is available regarding its prevalance or incidence. Ghika-Schmid, van Melle, Guex, and Bogousslavsky (1999), studied the emotions in acute stroke patients from the first four days to 3 months post stroke. Of the 53 patients followed during the study, one patient was reported to exhibit stuttering. This suggests an incidence rate of approximately 2% among the stroke patients.

The prevalence of neurogenic stuttering tends to be more likely in male speakers. Market et al. (1990) reported that in their surveyed group 79% of the affected individuals were males. Among the five younger children with symptoms of neurogenic stuttering reported by Aram et al. (1990), none were girls although girls made up 36% of the total

group of children with brain lesions. Stewart and Rowley (1996) found 62% of the patients with acquired stuttering to be male.

The onset of neurogenic stuttering theoretically can occur at any age, but it is most typically identified when stuttering occurs first post- puberty. Mazzucchi, Moretti, Carpeggiani, Parma, and Paini (1981) reported the mean age of onset of 48.5 years in their study of 16 patients. Surveying 81 patients with neurogenic stuttering, Market et al. (1990) reported a mean age of onset of 43.7 years. Similarly in their survey of 36 patients, Stewart and Rowley (1996) observed a mean age of onset of 48.2 years.

Neurogenic stuttering is seen to co- occur with several disorders like aphasia, dysarthria, apraxia, palilalia, and anomia. Degenerative disorders or lesions in various areas of the brain have been reported to cause neurogenic stuttering. There is no particular area in the brain or any particular degenerative disorder which is exclusively associated with neurogenic stuttering. Market et al. (1990) conducted a survey on 100 patients with neurogenic stuttering. The results of the study revealed that from a total of 75.3% patients, 38.3% had onset of stuttering with post head trauma and 37% with post ischemic accidents. Others acquired stuttering following the onset of a number of diseases and trauma conditions (1.2%).

Historically neurogenic stuttering has been associated with aphasia syndromes and was described being a core aspect of aphasia or as a psychological reaction to aphasia (Luchsinger & Arnold, 1965; Lebrun, Leleux, Rousseau, & Devreux, 1983). However, it is essential to bear in mind that a significant number of cases with neurogenic stuttering have not presented with any signs of aphasia. Therefore, it would be safe to say that while acquired disfluencies may co- occur with aphasia, the two phenomena can and do exist independent of each other. Stuttering like disfluencies have been known to be associated with motor speech disorders. For instance, verbal apraxia of speech (AOS) has often been linked with the repetition of phonemes in a manner, similar to that seen in neurogenic stuttering (Johns & Darley, 1970; Trost, 1971; Rosenbek, Messert, Collins, & Wertz, 1978). Koller (1983) reported that the disfluencies resulting from lesions to the extra pyramidal tracts included repetitions and initial syllable prolongations of grammatically simple and substantive words. Another form of a speech disfluency frequently described

with extra pyramidal tract lesions is palilalia. A critical difference between stuttering and palilalia is the fact that stuttering tends to occur at the phoneme level without affecting rate and articulatory precision, while palilalia tends to occur at the word/ phrase/ sentence level with festinations.

Systematic assessment of the speech characteristics of 12 patients with neurogenic stuttering secondary to TBI or stroke were studied by Jokel, De Nil and Sharpe, in 2007. Six distinguishable characteristics of neurogenic stuttering were found. Same rate of occurrence was found for both content and function words. The disfluencies like repetitions, prolongations and blocks occurred at all positions of words and the subjects show consistent stuttering instances across all the speech tasks. The subjects were not overly anxious. Secondary symptoms were seen rarely, and an adaptation effect was not observed.

Van Borsel and Taillieu (2001) conducted an experiment researching the resemblance between developmental and neurological stuttering. Video recording of the speech sample of 8 (4 developmental and 4 neurogenic stuttering) patients with stuttering were given to 9 SLPs and were asked to diagnose them as having developmental stuttering or neurogenic stuttering. Judges were asked to assess the severity of disfluencies for each of the eight participants. 3 of the 4 participants with neurogenic stuttering were male and the disfluencies they demonstrated consisted predominantly of repetitions and interjections. All four of the participants with developmental stuttering had reported of onset since early childhood. Predominant disfluencies demonstrated by this subgroup of participants included blocks, part word, word and phrase repetitions. A videotaped 3 minute conversational sample was selected, representative of the patient's usual speech. These were then presented to the judges with lapses in between samples to fill out an answering sheet detailing whether the disfluency presented was either developmental or neurogenic in nature. Results of the study revealed fairly good agreement between judges as to the severity of the disfluency. Further, the severity ratings of the participants with neurogenic stuttering did not vary significantly from those with developmental stuttering. The disfluencies demonstrated by the participants with neurogenic stuttering were more often reported to differ from the disfluencies exhibited

by the participants with developmental stuttering. 24% of the judgments were misdiagnosed, placing participants in the wrong diagnostic group. 42% of the judgments were indicated as "being unsure" and 18% of the judgments "rather sure or very sure" were erroneously classified all the same. As a group, participants with developmental stuttering were as likely as the subgroup with neurogenic stuttering to be misdiagnosed (chi-square, $p > 0.05$). The results of this experimental study demonstrated that a clear demarcation between neurogenic stuttering and developmental stuttering does not exist, especially in instances when only symptomatology is taken into account. Instead these results lend support to the claim that, at least in some instances, neurogenic stuttering can hardly be differentiated from developmental stuttering solely on the basis of person's disfluencies (Lebrun et al., 1983).

Theys, Wieringen and De Nil (2008) surveyed 58 neurogenic stuttering patients (Dutch speaking). 6 subjects among the 58 reported of having stuttering prior to the stroke/TBI and one with cluttering prior to the stroke/TBI. 29 subjects among the total had a history of stroke before the onset of neurogenic stuttering, 11 subjects had a history of TBI, and remaining 9 subjects had a history of neurodegenerative disease like, PD or AD. Of the 29 patients with stroke 27 had some co- occurring communication deficits, which included aphasia (mostly Broca's type), apraxia of speech, dysphonia, and dysarthria. Additionally, 10 of the 11 patients with TBI had apraxia of speech, aphasia, dysphonia, and/or dysarthria, along with stuttering. Out of 9 patients with neurodegenerative disease 7 had concomitant speech and language difficulties, in addition to stuttering, which were in a combination of dysarthria, aphasic problems or word finding difficulties. The 9 patients reported to have started to stutter after a variety of causes, which included epilepsy, brain surgery, medication, encephalitis, and unspecified cause. 8 out of these 9 patients had one or more speech and language disorders such as: word finding problems, dysarthria, apraxia of speech, dysphonia and aphasia. The results of the survey revealed that aphasic, dysarthric and specific word finding problems were the most common co- occurring disorders.

Tani and Sakai (2011) **e**xplained the characteristic features of neurogenic stuttering in five patients without aphasia, and patients with lesions in the basal ganglia.

The subjects did not have a history of developmental stuttering. All patients showed normal speech rate, prosody and articulatory movements. The most prominent characteristics were initial and part word repetitions. Secondary behaviors like, facial grimaces, limb movements, and avoidance behaviors were observed. The stuttering frequency in different speech tasks varied across patients. Out of the 5 patients 4 showed syllable repetitions and part-word repetitions. The results of the study showed that blocks were the most common type of stuttering and that adaptation effect was seen in all patients.

To summarize, neurogenic stuttering or SAAND consists of the largest subgroups with causes ranging from Alzheimer's disease, stroke, brain tumor, TBI, progressive supra-nuclear palsy, Parkinson's disease, renal dialysis and long term drug abuse. Since neurogenic stuttering results from a variety of disorders, its symptomatology also varies widely. Frequently noted symptoms include phrase, part word and whole word repetitions, pauses and hesitations in least expected positions of an utterance, rapid and unintelligible bursts of speech, and inappropriate movements of the oral musculature, usually accompanied by an unawareness of their problem.

Although there exists a paucity of reliable information, an incidence rate of approximately 2% has been reported among stroke patients. The prevalence rates documented show a distinct preference for males with 62% to 79% of affected individuals being male. Theoretically, though the onset of neurogenic stuttering can occur at any age, it is most typically identified post- puberty with mean ages of onset ranging between 43.7 to 48.5 years.

More often than not, neurogenic stuttering tends to co-occur with other disorders like aphasia, dysarthria, apraxia, plalilalia, anomia and other degenerative disorders. Literature surveys have indicated prevalence for neurogenic stuttering to occur post head trauma, and post ischemic accidents, followed by a variety of other diseases or trauma conditions.

3. Cluttering

Although less common than the developmental stuttering, cluttering is seen among children as well as adults. Cluttering is considered a fluency disorder that shares some characteristics of stuttering but differs in several important ways. Cluttered speech is abnormally fast with omissions of sounds and syllables so that words/ sounds are compressed/ truncated. A person who clutters has abnormal patterns of pausing and phrasing and has bursts of speech that may be unintelligible.

Traditionally, cluttering was thought to belong under the umbrella term fluency disorder. It is often assumed to be congenital in nature and has been frequently reported to be a syndrome due to the myriad of features that characterizes it (St. Louis, 1992; Weiss, 1964; 1992). Several definitions of cluttering classify it as a disorder of fluency, that may be easily confused with stuttering, and which frequently co occurs with it. Cluttering is also defined as a disorder of fluency characterized by rates either too rapid or too irregular for the speakers' articulatory abilities (St. Louis, Raphael, Myers, & Bakker, 2003). In simpler words, the rate may not be higher than standard norms- but may be too high for the individual's articulatory capacities nevertheless. This abnormal speech pattern is also characterized by a marked number of disfluencies that are not SLDs in nature (such as interjections, pauses and phrase repetitions). Additionally, this abnormal speech pattern lacks aspects of typical prosody and contains excessive degrees of co-articulation and frequent pauses (St. Louis, Myers, Faragasso, Townsend, & Gallaher, 2004). According to this school of thought, cluttering is primarily a speech disorder.

According to St Louis, Raphael, Myers, and Bakker (2003) "Cluttering is a syndrome characterized by a speech delivery which is either abnormally fast, irregular or both. In cluttered speech, the person's speech is affected by one or more of the following: (1) failure to maintain normally expected sound, syllable, phrase and pausing patterns (2) evidence of greater than expected incidents of disfluency, the majority of which are unlike those typical of people who stutter".

Very limited data and no recent studies exist regarding the prevalence of cluttering. Becker and Grundmann (1970) reported that 1.5% of 7- 8 year olds in German school manifested cluttering. Daly (1986) reported that about 5% of the fluency clients treated in a residential summer camp program was “pure” clutterers. Among group of stuttering, the reported percentage of those who also cluttered has varied across studies. At present no accurate estimates of the lifetime incidence of cluttering is available.

Similar to stuttering persons with cluttering (PWC) also tend to exhibit a positive family history (Freund, 1952; Luschinger & Arnold, 1965). Freund (1952) found that out of a group of 121 PWC, 84% reported a family history of either tachylalia (fast speech rate), or tachylalia together with stuttering as opposed to 21% among people who stutter.

Like stuttering, cluttering had evidence which says that males are more affected than females, co-occurring along with other speech, language and cognitive dysfunctions/ in isolation (Curlee, 1996). There is little information on the onset of cluttering, although several authors suggest it is later than for stuttering, often after the age of 7 (Diedrich, 1984). It is possible that cluttering may manifest itself when language and thought become relatively more sophisticated with age. It is also assumed that cluttering is unlikely to be observed in toddlers using one and two word utterances compared with the early elementary school age child who has much to say and uses lengthier and more complex utterances.

The influence of linguistic and articulatory aspects in cluttering helps us to differentially diagnose it from stuttering. Concurrence about the nature of cluttering tends to be restricted to the symptoms of fast, irregular rate and rhythm of speech and the type of disfluency exhibited (St. Louis, Hinzman, & Hull, 1985; St. Louis & Myers, 1995). Only a few symptoms are similar from client to client. These similarities include: rate anomalies, disfluencies, linguistic maze behaviors, and poor speech intelligibility. St. Louis and Myers (1995) caution that aside from these core areas, the hallmark of cluttering lies in the heterogeneity of symptoms. In addition, certain research has demonstrated that individuals with cluttering present with impaired pragmatic abilities similar to individuals with language-learning disorders (Teigland, 1996).

St. Louis, Hinzman, and Hull (1985) and St. Louis et al. (1996) concluded that persons with cluttering exhibited a higher frequency of other/normal disfluencies (revisions, interjections, phrase repetitions) and a low frequency of stuttering like disfluencies.

Filatova in 2007 studied the features which differentiate stuttering and cluttering. For this the study was carried out in several stages. In stage 1, on the basis of medical and pedagogical records**,** 100 children between the ages 7 and 16 years with a neurosis like form of stuttering were selected. In stage II of the study, these children were assessed with an adapted version of the modified Daly's checklist for possible cluttering (1996). This heterogeneous group of children were further categorized into the following four subgroups: (I) persons with pure stuttering (73%); (II) persons with stuttering and some characteristics of cluttering (21%); (III) persons with cluttering, complicated by stuttering (5%) and (IV) those with pure cluttering (1%). The experimental group consisted of children in the subgroups III and IV. Stage III consisted of an in-depth study of the experimental group. The children in this group were assessed for organization of serial movements and a sense of rhythm, attention and thinking capacities. The results revealed that the children with a neurosis like form of stuttering and the children with cluttering had several similarities such as, delayed speech and psychomotor abilities in childhood; a low level of temporo-rhythmical organization of movements in general and particularly with respect to speech development; anomalies in oral speech patterns such as a variety of repetitions, and deficiencies in language. Differences between these groups of children included disinhibitions in speech or talkativeness, differences in attention and memory, and differences in personality traits. Children with cluttering tended to be disinhibited in their speech, had attentional and memory processes deviating from the norms, were socially active and not overly critical of their verbal and non- verbal behaviors. Children with stuttering on the other hand, tended to use monosyllabic and stereotypic words, maintained limited eye contact, were socially less engaging and were critical of their speech and actions. The disinhibition of behavior and the lack of self monitoring lead to the disinhibition in intention that is a predominant feature in children with cluttering. These peculiarities in behavior, movement and speech of PWC are clues to organizational weaknesses in the CNS of these individuals. The author concluded that the following set

of symptoms typify a child with cluttering: fast rate of speech with a significant amount of normal disfluencies, disturbances in the sequencing of speech, attention and memory problems across various modalities, impulsiveness and disinhibitions, and an indifference to their own verbal and non- verbal behaviors.

Van Zaalen, Wijnen and De Jonckere (2009b) studied speech characteristics in PWS and PWC and differentiated the two. Their participants included 41 males (mean age =10.2 years) and 13 females (mean age= 12.9 years) in the clinical group and 17 males and 8 females in the control group. The participants were diagnosed by two SLPs having a specialization in fluency disorders, based on the audio recordings of 3 different speech tasks: spontaneous speech task, reading task and story retelling task. The SLPs were required to decide between 3 diagnostic codes: cluttering, stuttering, and cluttering-stuttering. The results of this study revealed a low correlation between the clinical judgments of the 2 SLPs. Of the 54 participants in the clinical group, only 27 (50%) demonstrated a positive correlation between the two professionals. More than half (56%) of the PWC were observed to have a fast articulatory rate in the task of spontaneous speech, while it was not noted for PWS. However, no differences among the groups were noted in the reading and story retelling tasks. 75% of the PWC satisfied the ratio disfluencies criteria for cluttering in the task of spontaneous speech, while 85.7% of the PWS satisfied the ratio disfluencies criteria for stuttering in the task of spontaneous speech. PWC were 6.4 times likely to present with normal disfluencies than SLD in spontaneous speech. Furthermore, PWC exhibited significantly greater accuracy errors (M= 2.1) when compared to the controls (M= 0.19) and PWS (M= 0.21) while repeating the multi syllabic word strings. Smooth flow scores of the subgroups under study, in the increasing order were: Controls followed by PWS, PWCS and PWC.

3.1. Cluttering and concomitant disorders

Quite a few important findings regarding concomitant language disorder in PWC were developed in US from a review of large speech and language data base (St. Louis & Hinzman 1988; St. Louis, Hinzman & Hull, 1985). From the studies it was evident that a considerable number of CWC have co-occurring language/ phonological disorder. But it should be noted that not all PWC have a language disorders.

Pitluk (1982) found near significant differences between four 9-12 year old PWC and four normal speaking controls on an expressive language test for aphasia. The small group of individuals with cluttering made less concise and more redundant descriptions as well as fewer self corrections than the normal speakers.

St. Louis, Hinzman, & Hull (1985) studied three groups of PWS, possible PWC, and controls that were matched for their age and gender, who were selected randomly form a nationwide data gathered during 1968-69. The spontaneous speech samples of the subjects were analyzed for the different disfluencies and language aspects. The results revealed all the three groups to be heterogeneous with respect to language and disfluency. As expected for PWS, PWC also showed word and phrase repetitions. But the possible PWC when compared to PWS had few sound/ syllable repetitions/ prolongations and less struggle behavior. The language aspects were found to be more affected in PWC than in PWS and the control subjects, mainly for the complexity of language used and the utterance completeness. The author concluded saying that the language difference between both the groups of fluency disorders, from literature were confirmed.

In an extensive review of co- existing disorders, St. Louis, Ruscello, and Lundeen (1992) described cluttering as a condition that nearly always co-exists with symptoms of other disorders. Language disorders are common in cluttering (Myers, 1996).

Deficiencies in pragmatics of 3 teenage PWC were studied by Teigland (1996). The subjects were diagnosed using Daly's checklist (1993). The results of the study showed that as expected, the language disorders were identified in PWC. The majority of the deficiencies were seen in the pragmatic aspect of language. The errors noted were: run on sentences, verbal mazes, disorganized thinking, LD, language delay and affected turn taking.

Some of the other co-occurring disorders with cluttering are ADD, CAPD and societal disorders. From a study by Heitman, Asbjørnsen and Helland (2004), PWC were observed to fail in executive functions and had no attention disorders. Consequently, even though the definitions of cluttering include attention difficulty to be co-occurring with cluttering, no much data is available to support the saying that all PWS have an attention disorder.

Three PWC and three matched controls were studied by Molt in 1996. All the 3 PWC had ADD and 2 also had LD. The participants underwent AEP tests and several tests of APD. The 3 PWC showed an obvious difference from that of their matched controls. But the differences may be because of the co-occuring AAD/ LD. Hence, the tests for CAPD do not present with sufficient proof to say that all PWC have an associated APD.

Other than stuttering, cluttering is also related to other disorders. The last few decades had seen many research related to LD. A number of disorders have been recognized, including psycholinguistic disorders, central auditory processing disorders, language learning disorders, attention deficit disorders, and minimal brain dysfunction. There are few studies which have also noted other co- occurring disorders like, ADHD, autism, hearing impairment, learning disability, and stuttering (Williams & Wener, 1996; Georgieva & Miliev1996; Langevin & Boberg, 1996; and Craig, 1998), and also a neurological damange (Thacker & DeNil, 1996; Lebrun, 1996).

The most plausible etiology of cluttering, like stuttering, is heredity (Becker & Grundmann 1970, Luchsinger & Arnold, 1965, and Op't Hof & Uys, 1974). A few authors have pointed out that the cerebral dominance issues may be related to genetic factor (Bradford, 1970; Williams & Wener (1996), or the result of APD, as hypothesized by the results from Molt's (1996) study.

To summarize, cluttering is viewed as a disorder of fluency that shares a few commonalities with stuttering but differs from it nevertheless, in several important factors like the speaker’s articulatory abilities, abnormal patterns of pausing and parsing accompanied by rapid bursts of unintelligible speech. Also, this abnormal speech pattern is characterized by disfluencies that tend not to be SLDs in nature. Other schools of thought view cluttering primarily as a disorder of speech due to its lack of the aspects of typical prosody and excessive degrees of co- articulation and frequent pauses.

Very limited reliable data exists regarding the prevalence of cluttering although a general prevalence rate of 1.5% has been agreed upon. Like stuttering, PWC also tend to exhibit a positive family history of either tachylalia or tachylalia together with stuttering

as opposed to stuttering alone. Additionally, most evidence points to a gender bias towards males than females. The role of linguistic and articulatory aspects in cluttering makes it easily distinguishable from stuttering. Other distinguishing characteristics of PWS include disinhibitions in speech and intentions, deviant attention and memory processes, impulsiveness and an indifference to their own verbal and non- verbal behaviors.

A review of the disorders concomitant to cluttering reveal that a language and / or phonological disorder tended to be most prevalent with a majority of deficiencies seen in the pragmatic aspects of language such as verbal mazes, disorganized thinking, leaning disabilities and affected turn- taking.

4. Cluttering- stuttering

Comparable to the phenotype exhibited by fraternal twins, cluttering and stuttering may be related, different and sometimes entirely antagonistic disorders. However unlike stuttering, cluttering is not purely a disorder of fluency, but extends to include linguistic and articulatory aspects as well.

Georgieva and Miliev (1996) studied 15 patients with fluency disorder to differentiate between stuttering and cluttering. The subjects included 3 females and 12 males and 11 among the total subjects were having a mean age of 11 years, which included 1 girl and 10 boys. The rest of the participants were 4 young adults, which included 2 males aged 20 and 33 years and 2 females, both aged 19 years. The subjects underwent a diagnostic battery and interview, which extracted details of the participant's case history and the related measures of fluency, which included articulation, intelligence, language, fluency and rate and also the motor and psycho-educational skills. The results of the study revealed that among the 15 subjects, 5 were diagnosed as PWC, 6 as PWS, and 4 as having mixed stuttering and cluttering. 6 of the subjects exhibited the typical dysfluencies of stuttering accompanied with tension in the speech muscles and secondary behaviors. The other two cases and cases with stuttering cluttering also exhibited syllable and sound repetitions. The subjects diagnosed as having cluttering and mixed cluttering stuttering exhibited multiple phrase and word repetitions, which served

as an important feature for the diagnosis of cluttering. Both PWS and PWC exhibited respiratory disrhythmia, but it was attributed to the muscle spasms in PWS and to defects in the phrase pronunciation in PWC. The PWC exhibited articulation errors which were not exhibited by PWS. Writing errors, lexical errors and poor handwriting were noted only in PWC and in PWCS, omission was one of the prominent writing errors.

Maskati, Wadhwaniya and Sanghi (2007) aimed at developing checklist for differentially diagnosing cluttering, stuttering, and mixed cluttering and stuttering. Participants for the study were 30 subjects with fluency disorders and 30 controls in the age range of 15- 30 years. To know about the awareness of their communication attitude, Erickson Communication Inventory was used. The criteria for differentially diagnosing the three fluency disorders were set, based on the cluttering checklist developed by them. That is, if they scored <40% on the checklist for stuttering and cluttering, they were termed as pure stuttering, and >70 % as pure cluttering and if score was between 40-60%, they were termed as mixed type. If the subjects scored high in the Erickson Communication Inventory, then it suggested stuttering but no scores were provided to differentiate cluttering and mixed type. The authors concluded suggesting few essential characteristics of individuals with cluttering, which were observed in all the subjects considered for the study: that is lack of clarity of inner formulation of speech, deletion of un-stressed syllables, cluster reduction and final consonant deletion, reduced concentration, improvement of speech fluency when attention is drawn to it, and unawareness about the problem.

The epidemiology of cluttering with stuttering was studied by Howell and Davis (2011). 96 PWS consisting of 79 males and 17 females were included in the study. 2 speech samples were taken from each participant. One sample recorded before the age of 12 years and the other recorded after the age of 12 years, with a minimum 12 months gap between the two recordings. The mean age of the participants at the time of first recording was 10 years; 4 months and the mean age at the time of second recording was 13 years; 8 months. The subjects were assessed for cluttering after both the recordings were done. The results of the study showed that 23 among the 96 subjects were diagnosed as cluttering. Out of 96 there were 17 who had at least one sample diagnosed as

cluttering. For 6 subjects, both the samples were diagnosed as cluttering. The prevalence rate of cluttering in this study was much lower than what was reported earlier that about one- third of the PWS also manifested cluttering (Preus, 1981). The results also showed that the mean age of onset of stuttering for PWC was 52.59 months, compared with 49.07 months for the participants who recovered from stuttering and 50.34 months for those who persisted stuttering. Out of the 17 subjects who stuttered, 15 were males compared to 32 and 39 subjects who recovered from stuttering.

To summarize, cluttering and stuttering have been listed to be comparable but sometimes entirely antagonistic disorders. Although early studies report that one third of all PWS manifest cluttering, actual rates seem to be much lower. Typical ages of onset of stuttering for PWS was 52.59 months, as against 49.07 months for persons who recovered from stuttering and 50.34 months for persons presenting with persistent stuttering. Key features of stuttering- cluttering included syllable and sound repetitions accompanied by multiple phrase and word repetitions, respiratory disrhythmia, minor errors in articulation and writing with omissions are the most prominent.

In general, detailed information on the nature of the onset of stuttering could constitute an important element in our efforts to identify subgroups of people who stutter, discern diverse developmental patterns, and make early prognoses for children at risk of becoming chronic PWS and those who are likely to recover. Research concerning age of onset, prevalence, and recovery from stuttering indicates some inconsistencies among findings. There are speculations as to if these large numbers of new onsets of stuttering after age nine to replace those children who are said to have recovered from stuttering. Despite excellent agreement to the contrary by researchers and clinicians, the data available to support this view have some limitations.

The recovery rates for stuttering are usually based on verbal reports of past events rather than on direct observation, and therefore it is important that these data be verified by comparison with other information. Prevalence and onset data offer an opportunity for such comparisons.

Surveys of studies concerned with the prevalence of stuttering reveal substantial disagreements in estimates. Research concerning the prevalence, onset, and natural history of stuttering is limited and difficult to interpret (Packman & Onslow, 1998). The majority of published studies have used self-selected or referred samples of PWS that almost certainly do not represent the population of children who begin to stutter. Similarly, only scant information has been reported about the incidence of stuttering. In addition to defining the magnitude of the disorder, incidence data are vitally important to the issue of spontaneous, or natural, recovery from stuttering among preschool age children. Furthermore, several authors have suggested that information concerning the onset of stuttering, such as age of onset, manner of onset, severity of stuttering, gender, and other factors, could be useful in making risk predictions. Such data also have theoretical significance to the understanding of the nature of stuttering as well as the factors that influence recovery. For example, genetic interpretations of recovery and sex ratio in stuttering are based on assumptions regarding the level of specific distribution of the original incidence of stuttering. Secure estimates of stuttering prevalence in adults, unfortunately, are greatly lacking.

Current scientific interest in early childhood stuttering has brought into focus many questions and problems – such as age of onset and its influence on characteristics, relationships between sex or familial history and age or characteristics, etc. More information on early phases of stuttering is needed, not only for basic research purposes, but also for clinical application where it could be useful in developing or improving differential diagnostic schemes.

Although a survey of literature has indicated that an awareness of the familial trend of stuttering has been around for a long time, it is surprising to note that all except one of the above-cited theoretical notions did not include a link to the familial trait of the disorder. The one that did address this phenomenon took pains to interpret it as just another example of the psychosocial phenomena that family members tend to share and pass down through generations, and which at least on the surface, are not considered to be genetically inherited. Specifically, it was suggested that a history of stuttering in the

family generates strong emotions that drive parents of young children to both act and react in ways that interfere with the child's normal speech (Diagnosogenic Theory).

In as much as the underlying patho-physiology of stuttering is unknown, family and twin studies have repeatedly implicated heredity as a major factor in the etiology of stuttering. However, the exact role heredity plays in stuttering is not clear. For instance, it is apparent that nongenetic forms of stuttering also exist, such as stuttering following brain injury and that even monozygotic twins are occasionally discordant for stuttering. Heritability of stuttering is not a simple, straightforward process. In complex behavior traits such as stuttering, it can be difficult to identify the contribution of a gene or genes and their interaction with environmental factors. Conditions that sometimes coexist with stuttering, such as phonologic disorders, learning deficits, and lower intellectual functions, maybe explained therein. In addition, genes interact with environmental factors may be shared by a family (life style, SES) or be unique to the individual (sibling/birth order, illness trauma). Failure to consider epidemiologic factors has probably biased previous results regarding the genetics of stuttering. In spite of limitations, studies in this area have served an important function in redirecting widespread thinking that familial stuttering is a psychologically based learned behavior, to the realization of its genetic bases.

A consistent finding in the literature on stuttering is that a small but significant percentage of children who stutter exhibit concomitant speech and/or language disorders in addition to their stuttering. Researchers and clinicians continue to grapple with the disorders of stuttering and cluttering and how they may be influenced by phonetic and phonologic variations. From a clinical perspective, determining the frequency of concomitant disorders in children who stutter is important because there might be a subgroup of children who require a different type of assessment and treatment procedures than those who only stutter. Unfortunately, the expected number of children with a concomitant disorder is somewhat unclear and seems to vary considerably among studies (Nippold, 1990). In short, there is a great deal of disparity among past studies on CWS who have a concomitant disorder, particularly a phonologic and/or language disorder.

In spite of the considerable progress that has been made, methods utilized to date have yielded conflicting results. To facilitate further progress, current knowledge and information gaps should be assessed, and problems inherent in research methods, ranging from definition of the disorder to identifying possible subtypes of stuttering, should be re-identified and addressed. Assessment and clarification and refocusing on current knowledge and unresolved issues would enhance identification of future directions for research in this area. The dearth of data regarding the epidemiological factors, predisposing, precipitating, and maintaining factors if any, in the onset, development and recovery in individuals with fluency disorders including stuttering, especially in the Indian context paves way to the need for the present study.

CHAPTER III

METHOD

The present project was undertaken in order to study the epidemiological and other aspects of fluency disorders. It is a heterogeneous group of disorders affecting the speech fluency which is predominantly of childhood onset and persists into adulthood in about 20% of the individuals.

Procedure

It was proposed to study the disorder with regard to the age, gender and nature of onset, socioeconomic and other demographic factors, onset related factors, predisposing, precipitating factors and other associated characteristics under the various sub groups of fluency disorders as reported in the literature. The case files of individuals registered at AIISH with the complaint of fluency problems and who were diagnosed as having fluency disorder, during a period of five years, from January 2010 to December 2014 were reviewed to obtain the required information.

The project proposal was presented before the AIISH Ethical clearance committee on 4.12.2014 and being a review research and as such there were no ethical issues, clearance from the committee was received. The study was carried out in two phases.

Phase I: Formulation of checklist

In the Phase I, a checklist was developed to obtain the information from the case files regarding the epidemiological factors, gender factors, nature and type of onset, development of fluency problem, the type and severity of fluency disorder, socioeconomic status and any other relevant information pertaining to the disorder as documented in the case files. The NIMH socio-economic status scale, revised version (2012) developed by Venkatesan was adapted and used in order to classify the SES of the clients. Out of the 4 sub-categories, pooled monthly income, highest education and occupation were considered for classifying the subjects according to SES, and excluded the sub-category of family properties (movable and immovable). After a pilot study with the checklist involving around 25 case files, suitable modifications were made in the

checklist before the final data collection was implemented. Finally, the parameters considered for data collection of the case files were based on demographic information, such as, age of the client, gender, SES, number of languages used, handedness, change in handedness, age of onset of the fluency disorders, nature of onset, type of fluency disorders, severity of the disorder, predisposing factors and associated problems (see Appendix I for details).

Phase II: Data Collection

Initially, case numbers of all pediatric and adult cases registered with different fluency disorders were short listed from the outpatient registers of the department of clinical services, AIISH, Mysore for the duration of 5 years selected for the study. The short listed cases with fluency disorders were numbered to 2958 cases. Later, from the Registration section the case files of the individual clients identified from the OPD registers were reviewed and the checklists were filled for each of the clients included in the study. From the 2958 cases initially listed, 217 were missing files, 337 wrongly short listed/ entered cases, 1 was with clinically fluent speech and 15 were with fast rate of speech. These were deducted from the original pool, and then the remaining total clients with fluency disorders numbered to 2388. Thus, from a total of 38,301 clients reported to the institute during the specified period of 5 years, 2388 (6.23%) clients were diagnosed to have different types of fluency disorders.

Data Analysis

The Laptop model, Samsung, NP300E5Z-A0PIN was used for data entry and analyses. The data was entered in the IBM SPSS 20 software for analyses. The data was analyzed for clients with fluency disorders using descriptive statistics for the variables age of the client, gender, SES, number of language used, handedness, change in handedness, age of onset of the fluency disorders, nature of onset, severity of the disorder, predisposing factors and associated problems. To find the association between the stuttering and the different parameters, cross tabulation was done followed by chi square test. The results are presented in the form of tables and pie-charts.

CHAPTER IV

RESULTS AND DISCUSSION

The main aim of the present project is to study the epidemiological aspects of fluency disorders with regard to the age and nature of onset, gender factors, onset related factors and other associated characteristics of individuals registered at AIISH who are diagnosed as having fluency disorder. The results are explained under the following headings:

1. Proportion of fluency disorders among the various communication disorders
2. Epidemiological aspects of fluency disorders
   - 2.1. Stuttering
     - 2.1.1. Age of onset
     - 2.1.2. Reporting age Vs severity of the disorder
     - 2.1.3. Nature of onset
     - 2.1.4. Gender
       - a) Age of onset Vs Gender
       - b) Gender Vs Severity of the disorder
     - 2.1.5 Socioeconomic status
     - 2.1.6 Handedness
     - 2.1.7 Number of languages used among clients with stuttering
     - 2.1.8 Predisposing factors
     - 2.1.9 Associated problems
   - 2.2 Cluttering
     - 2.2.1Age
     - 2.2.2 Age of onset
     - 2.2.3 Nature of Onset
     - 2.2.4 Gender
     - 2.2.5 Socioeconomic Status
     - 2.2.6 Number of languages used
     - 2.2.7 Predisposing factors
     - 2.2.8 Associated problems

2.3 Neurogenic Stuttering

2.3.1 Age

2.3.2 Age and nature of onset

2.3.3 Gender and Socioeconomic status

2.3.4 Number of languages used

2.3.5 Predisposing factor and associated problems

3 Comparison of epidemiological aspects across fluency disorders

3.1 Age

3.2 Age of onset

3.3 Nature of onset

3.4 Gender

3.5 Socioeconomic status

3.6 Number of languages used

3.7 Predisposing factor

3.8 Associated problems

1. Proportion of fluency disorders among the various communication disorders

The total number of clients with communication disorders registered at the institute for the duration of 5 years i.e., from January 2010 to December 2014, was 38,301. 2,958 clients were identified with fluency disorders from the OPD register of AIISH. From the 2,958 clients, 217 were missing files, 337 were wrongly short listed/ entered clients, 1 client with clinically fluent speech and 15 clients with only fast rate of speech were eliminated, and then the remaining total clients with fluency disorders numbered to 2,388. Hence, from a total of 38,301 clients reported to the institute during the specified period, 2,388 (6.23%) clients were diagnosed to have different types of fluency disorders (Figure 1). Out of the 2.388 individuals with fluency disorders, 96.8%, 0.5%, 0.2% and 0.4% of the clients were identified as stuttering, cluttering, cluttering-stuttering and neurogenic stuttering respectively. Among the 2388, 2.2% of the clients with the complaint of disfluencies were classified as being NNF. The data is represented in table 1. Generally the estimation for language and speech disorders is established to be around 5% among school-aged children. This figure comprises of voice disorders (3%)

and stuttering (1%). The results of the current study are in stark contrast to earlier prevalence studies, such as Bloodstein (1969) who reported of a stuttering prevalence estimate of 1.5%. Okalidou and Kampanaros (2001) who documented stuttering prevalence rates of 2.2% among kindergarten children. The reason behind this drastic difference in prevalence estimates may be attributed to methodological variability. Prevalence studies generally rely on surveys of a selected general random population to establish prevalence estimates. The present study on the other hand reports only of the proportion of fluency disorders from among a sample of persons with communication disorders, and therefore cannot be taken to be indicative of the general population as a whole. A comparison of the various types of fluency disorders revealed that PWS had a maximum frequency of occurrence, and that the disorders of cluttering, cluttering stuttering, and neurogenic stuttering made rare appearances. A possible explanation for such disproportion in figures may be due to the fact that cluttering and cluttering-stuttering are often difficult to diagnose during childhood. Additionally, the errors in speech that CWC produce duplicate the errors produced by children with developmental language disorders and are hence, tough to differentiate.

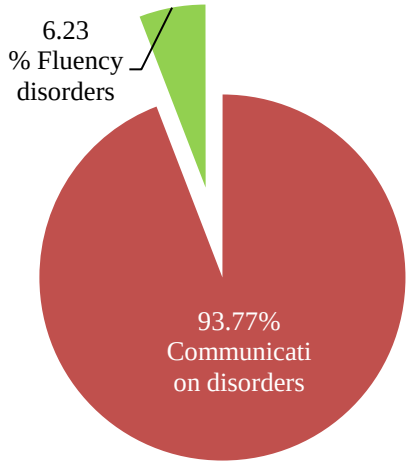

Figure 1. Proportion of fluency disorders among the various communication disorders

Table 1
Proportion of the different fluency disorders

Type of fluency disorder	% of clients
Fluency disorder classified as NNF	2.2
Stuttering	96.8
Cluttering	0.5
Neurogenic stuttering	0.4
Cluttering- stuttering	0.2

2. Epidemiological aspects of fluency disorders

Various epidemiological aspects related to fluency disorders were studied based on the information available in the client files. It included reporting age of the client, age of onset, nature of onset, gender, socioeconomic status, handedness and change in handedness, number of languages used, predisposing factors and associated problems. The detailed results with regard to the above aspects for each of the fluency disorders are as follows.

2.1. Stuttering

Stuttering was the major type of fluency disorder noted in the sample studied. Among the 2,388 clients with fluency disorders stuttering accounted to 2312 (96.80%).

2.1.1. Age of onset

The age of onset of stuttering, was categorized according to nine different age ranges. The categories were childhood (where the exact age of onset was not provided in the file but only mentioned as during childhood), 2-4 years, 4.1-6 years, 6.1-8 years, 8.1-10 years, 10.1-12 years, 12.1-17 years, 17.1-30 years, 30.1-50 years and >50 years. According to the results obtained, the most frequent age of onset of stuttering seen was childhood and up to 4- 6 years of age and there was a drastic reduction after that. The highest number of PWS i.e., 34.7% (802) of the total PWS had an age of onset during childhood, followed by 28.8% (667) at 2-4 years. The other frequent ages of onset were 7% (162) at 6.1-8 years; 6.2% (143) at 8.1-10 years; 3.3% (77) at 10.1-12 years; 3% (69) at 12.1-17 years; 1.9% (43) at 17.1-30 years; 0.6% (15) at 30.1-50 years and one subject

whose age of onset was >50 years, respectively, as illustrated in figure 2. The results are in support of the findings by many of the authors (Darley, 1955; Johnson & associates, 1959) that the onset of stuttering is mainly between 2 and 5 years of age. The findings of the present study are in concurrence with Ambrose and Yairi (2005) who reported a range of onset in the 163 CWS studied, demonstrating a mean age of onset of 33 months with a majority of onsets being concentrated between 24 and 42 months. These findings are also in agreement with Andrews (1984) who suggested that the risk of developing stuttering decreases by half after age 4, followed by a drop of 75% after 6 years of age, and becomes almost zero after age 12. Other contributing reasons that explain this phenomenon of the maximal occurrence of fluency disorders in early childhood may be found in the study by Ambrose and Yairi (2005) who analyzed the relationship between stuttering and expressive language and phonological abilities. These authors concluded that many of the CWS appeared to have language skills that exceeded their capabilities for fluent speech production. Conversely, CWS tend to lag behind their fluent counterparts in phonological development. However, the authors caution against relying solely on deficient phonological skills to predict the onset and course of stuttering. These findings combined with insufficiencies of the speech motor system demonstrated by delays or in-coordination between the various speech subsystems is likely to cause breakdowns in the development of normal fluency. Other factors such as gender and familial/genetic factors also appear to play a role in influencing the onset and nature of the disorder. The results also revealed that a few percentage of clients report the age of onset as after 12 years. According to literature some children might exhibit subtle deficits in fluency during childhood. However, such subtle deficits are unnoticed by the parents. In addition, spontaneous recovery is seen in 74% of CWS (Yairi & Ambrose, 1999). Hence, these participants might have spontaneously recovered, but again stuttering might have recurred during adolescent age.

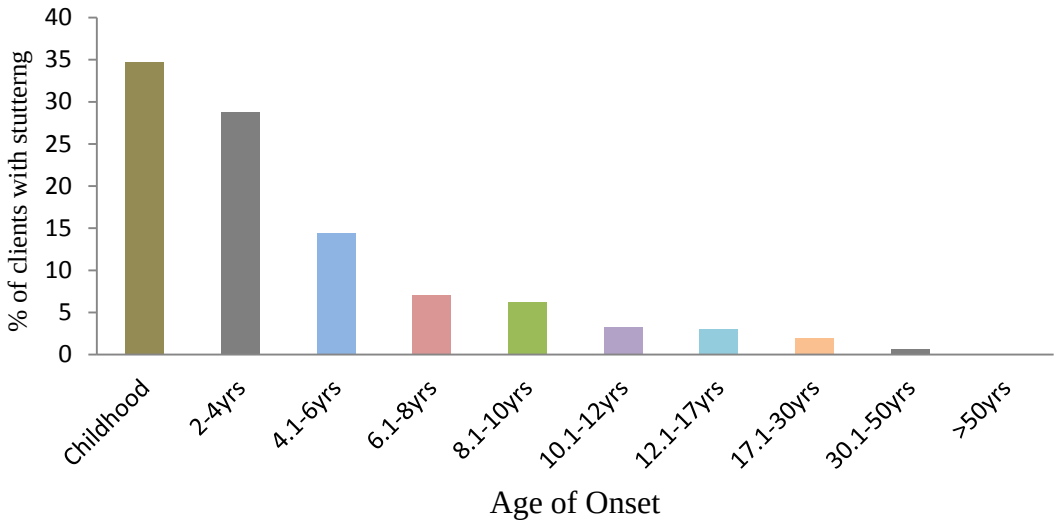

Figure 2.Mean percentage of age of onset of Stuttering

2.1.2. Reporting age Vs severity of the disorder

The actual age of the participant when reported to AIISH were categorized into nine age ranges as earlier: 2-4 years, 4.1-6 years, 6.1-8 years, 8.1-10 years, 10.1-12 years, 12.1-17 years, 17.1-30 years, 30.1-50 years, and >50 years. Further, the severity of stuttering was classified as proposed by Reilly (1994), as very mild, mild, moderate, severe and very severe stuttering.

Table 2
Percentage of occurrence of severity of stuttering across the reporting ages

Reporting age	V. Mild	Mild	Moderate	Severe	Very severe
2- 4 years	13	45.0	35.9	5.3	0.8
4.1- 6 years	9.7	36.8	38.8	13.6	1.2
6.1-8 years	9.3	30.1	38.9	16.6	5.2
8.1- 10 years	6.3	29.7	41.1	20.9	1.9
10.1-12 years	2.1	22.7	41.2	26.1	8
12.1-17 years	4.3	21.7	47.6	24.4	1.9
17.1-30 years	11.9	24.9	42.4	19	1.8
30.1-50 years	20.8	39.6	23.6	12.3	3.8
> 50 years	16.7	16.7	66.7	0	0

On comparing the level of severity across the age ranges considered, it was found that all the age ranges of reporting except 2-4 years and 30.1-50 years had mild severity as highly frequent, had moderate severity as the frequently occurring severity. Further, it was noted that in all ages of reporting, mild and moderate were the two highest frequently occurring severities which was followed by severe except in ages above 30 years. It was also noted that all the age ranges had very severe stuttering as the least occurring severity, as illustrated in table 2. The chi square test of association for severity of the disorder and reporting age of client revealed a significant association [χ^2 (32) =201.009, $p < 0.05$] between the two. The relation between the reporting age and the severity of the disorder has never been studied per se. The current study being retrospective in nature relies on parental accounts about the timing and features of stuttering onset. In several instances, many months and/or years had elapsed from the onset of the disfluency and the first interview with the parent and the opportunity to observe the child. A significant factor contributing to the singularly high proportion of clients reporting for initial assessment in the childhood years may be parental concern, especially in instances where a family history of stuttering is positive. Another obvious reason may be the fact that stuttering predominantly occurs during the early school years. The next significant age of reporting was the adolescent age group. This particular finding is in agreement with Plexico, Manning, and DiLollo (2005) who reported that it was not infrequent for adolescents to recount of stuttering onset during early adolescence. These authors suggest that although the stuttering may have had its onset during the preschool years, its presence would have been less than handicapping. It is not until the speaker experiences the social, emotional and educational disadvantages associated with stuttering, that it actually presents as a problem to be dealt with.

2.1.3. Nature of onset

Among the 2312 clients with stuttering, data related to nature of onset in stuttering was available for only 2066 (89.4%) clients, missing data accounted to the remaining 10.6%. From the available data, the nature of onset of stuttering was mostly noted to be gradual onset in 82.38% (n=1702), when compared to only 17.62 % (n= 364) of the clients who had a sudden onset, which is depicted in figure 3. The results are

suggestive of lower occurrence of sudden onset compared to the gradual onset of the disorder. This is in agreement with Van Riper's (1982) report that the onset of stuttering is usually gradual in nature. The above findings are in agreement with the results of Yairi and Ambrose (1992), who noted that about 69% of their CWS presented with a gradual onset of stuttering. These findings underscore the age-old view that stuttering has an inclination to develop gradually and follow a uniform pattern of development (Bluemel, 1932; Froeschels, 1943).

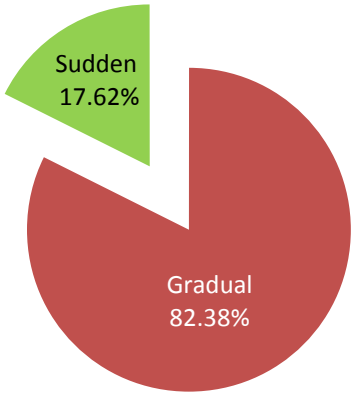

Figure 3. Nature of onset of Stuttering

2.1.4. Gender

Stuttering was noted to be highly predominant in males than females. 87.5% (n= 2022) of the clients with stuttering were males, when compared to females who accounted to only 12.5% (n= 290). The results revealed a male to female ratio of 6.97:1. Mean percentage of occurrence of stuttering across gender is represented in figure 4. This result is supported by Yairi's (1983) findings which reported that males tend to stutter 5 times more often than of females and among adolescents and adults, the gender ratio shifts to about 7 males to 1 female as reported by Ambrose, Cox and Yairi, 1997. This could be explained by hormonal issues in boys and their slower neurological maturity. According to literature, the social demands that are imposed on male children, when, by cultural imposition, they are called upon to speak correctly may also contribute to support the finding of the present study. School age children with stuttering and adult males are

expected in ratios that vary from 3:1 to as high as 6:1. The sex ratio has been explained genetically by hypothesizing that females have a higher threshold to be exceeded in order for stuttering to be expressed (Kidd, 1984).

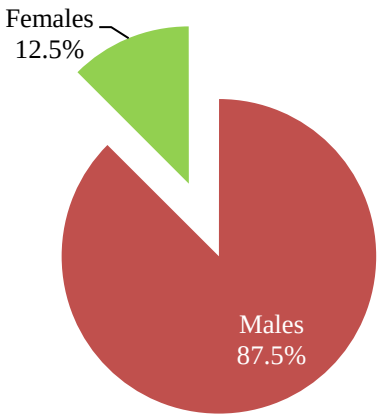

Figure 4. Mean percentage of occurrence of stuttering across gender

a) Age of onset Vs Gender

On comparing gender across the different ages of onset considered, it was noted that males were predominant across more than half of the ages of onset when compared to females, specifically in childhood, 6.1- 8 years, 8.1-10 years, 12.1- 17 years, 30.1-50 years. Further, it was found that for both males and females the highly frequent ages of onset were childhood, 2-4 years, and 4.1-6 years and the least occurring were above the age of 50 years. Also, for both male and female PWS a gradual decline in the onset of stuttering with advancing age was noted. Table 5 shows results of Chi square test of association for age of onset and gender which revealed a significant association [χ^2 (9) =36.399, p< 0.05] between the two factors. Table 3 represents the percentage of occurrence of males and females across the various ages of onset. The result have to be interpreted with caution and cannot be extrapolated to the general population as there was a significant gender bias with males dominating the total number of cases.

Table 3
Percentage of occurrence of males and females across the ages of onset

Gender	Age of onset in years									
	Childhood	2-4	4.1-6	6.1-8	8.1-10	10.1-12	12.1-17	17.1-30	30.1-50	>50
Males	35.8	28.1	13.2	7.3	6.3	3.2	3.4	1.9	0.7	0.0
Females	27.2	33.8	22.8	4.8	5.2	4.1	0.3	1.4	0.3	0.0

b) Gender Vs Severity of the disorder

On comparing the level of severity across gender, it was noted that males were predominant across all the levels of severity when compared to females. Both males and females predominantly exhibited moderate level of stuttering. Further, within each gender across the various severity levels, it was found that majority had mild and moderate severity, with the least frequently occurring severity being very severe in both gender groups. Table 4 illustrates the general trends in the occurrence of various severity levels across the two genders. Chi square test of association for gender and severity of the disorder revealed a significant association [χ^2 (4) =9.634, p< 0.05]. The Chi square and level of significance of the gender with severity and age of onset of the disorder is shown in the table 5. The relationships between these two variables have never been studied as of date and hence no reliable data is available. However, in the present study it was found that there coexists a significant association between gender and severity of the disorder.

Table 4
Percentage of occurrence of males and females across the different severity levels

Gender	Severity of the disorder				
	Very mild	Mild	Moderate	Severe	Very severe
Males	8.8	28.6	41.1	18.7	2.8
Females	12.2	33.0	39.2	14.2	1.4

Table 5
Chi square and level of significance of the gender with severity and age of onset

	χ^2 value	df	Asymp. Sig. (p value)
Gender X Severity of the disorder	9.63	4	0.047
Gender X Age of onset	36.39	9	0.000

2.1.5. Socioeconomic status

The results of analyses of socio economic status with regard to the occurrence of stuttering revealed that the most frequent SES class among the clients with stuttering was SES I (47.60%) followed by SES II (24.7%), SES III (13.4%), SES IV (5.40%) and SES V (1%), and there was missing information in 7.90%. The data related to SES is represented in figure 5. Bloodstein (1987) suggests occurrence of stuttering may be identified with the burden of elevated requirements for the accomplishment of status and distinction, alongside the bigotry and deviancy, values that may differ contingent upon the SES of families. As of now, there seems to be no persuading proof regarding the socioeconomic influence. The occurrence of stuttering in technologically developed countries is typically reported at approximately 0.7-1.0% of the population. The occurrence is somewhat higher in several cultures throughout the world, possibly due to a combination of limited gene pools and differing cultural responses to disfluency (Bullen, 1945; Snidecor, 1947; Lemert, 1953, 1962; Morgenstern, 1956). However recent studies are not available to link stuttering with SES. The literature suggests that stuttering persists in all SES.

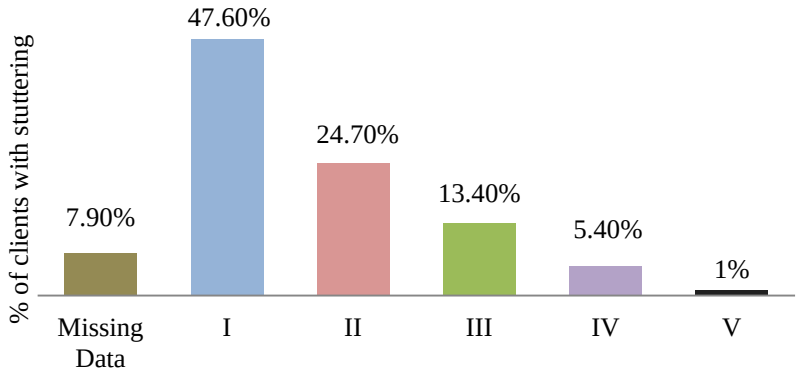

Figure 5. SES related to clients with stuttering

2.1.6. Handedness

The retrospective information obtained from the client files related to handedness is limited. Among the 2312 clients with stuttering, data related to handedness and change in handedness was available for only 265 (11.5%) and 264 (11.4%) clients respectively, which amounts to missing information of about 88.5% for each. From the available data, it is noted that 85.28% (226) were right handed followed by 9.06% (24) being left handed and 5.66% (15) being ambidextrous, which is depicted in figure 6.

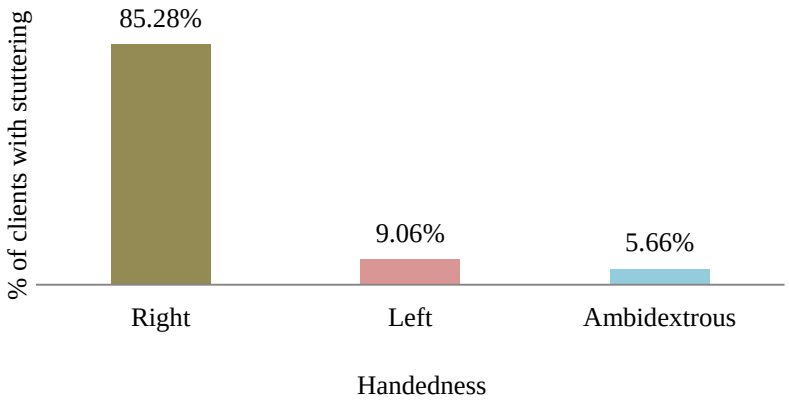

Figure 6. Handedness in clients with stuttering

It was also noted from the total available data (264), that 85.98% (227) of the clients with stuttering did not shift their handedness while 14.02% (37) were reported to have forced change of handedness from right to left. Change in handedness in clients with stuttering has been represented in figure 7. Since the missing data accounts to more than 88% of the PWS reviewed, the findings of this study cannot be considered a reliable indicator, either lending support or against the Orton and Travis' cerebral dominance theory, which states that one hemisphere should be dominant over the other in order for the speech to be properly synchronized.

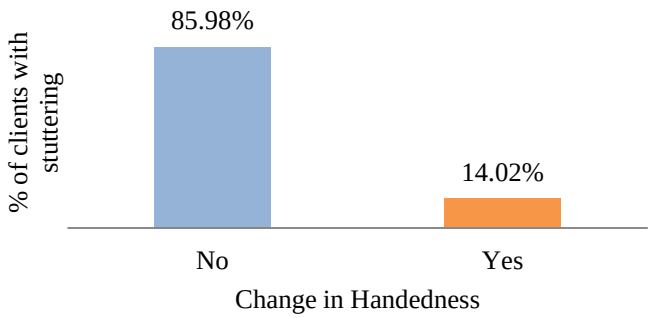

Figure 7. Change in handedness in clients with stuttering

2.1.7. Number of languages used among clients with stuttering

It was observed that among 2312 clients with stuttering, a few data related to the number of languages used by the clients were missing (1.60%). From the available information regarding the languages used, it was noted that the majority of the clients were monolinguals (50.3%; 1163) followed by bilinguals (31.7%; 733) and multilinguals (16.3%; 378). Figure 8 represents the number of languages used by clients with stuttering. The result of the present study is contradictory to the literature available which states that stuttering is predominant among bilinguals than monolinguals; but when bilinguals and multilinguals are combined, it accounts to 48%, suggesting no much variation of occurrence of stuttering among monolinguals and bilinguals/ multilinguals. From literature it is learnt that children who are bilingual before the age of 5 are significantly more likely to stutter and to find it harder to lose their impediment, than children who speak only one language before this age. The results of the study by Au-Yeung, Howell, Davis, Charles and Sackin (2000) indicated exceptionally similar incidence figures among monolingual (21.74%) and bilingual (21.65%) respondents. Bloodstein and Bernstein Ratner (2008) concluded that there was no solid indication that being a bilingual speaker is a risk factor for stuttering. Even though code mixing in bilinguals is thought to help them to improve their skills in the weaker language, it may elicit fluency breaks in their speech as they may find difficulty in choosing the right vocabulary to express. Further, the results can also be attributed to the fact that the majority of PWS who reported to the institute had less than high school education.

Another influencing factor may be incomplete, inept history and interviewing by student clinicians.

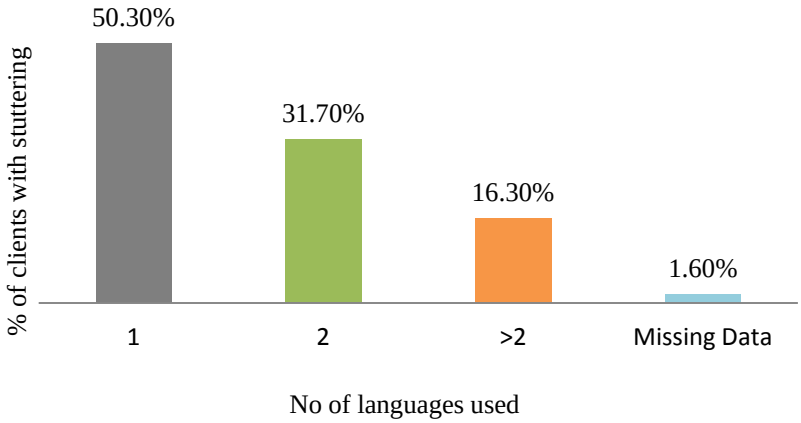

Figure 8. No of languages used by clients with stuttering

[Note: 1-Monolingual; 2-Bilingual; >2 Multilingual]

2.1.8. Predisposing factors

Descriptive analysis of the data revealed an idiopathic pre-disposing factor in more than half (57.2%) of the clients with stuttering studied which was followed by heredity factors (36.7%), other factors (E.g., fever) (4.6%), psychological factors (0.8%) which included fear and emotional trauma. A combination of these individual predisposing factors accounted to 0.7%. The data regarding the associating causative factors was based on the parental report of what they believed was the causative factor and the data is represented in figure 9.

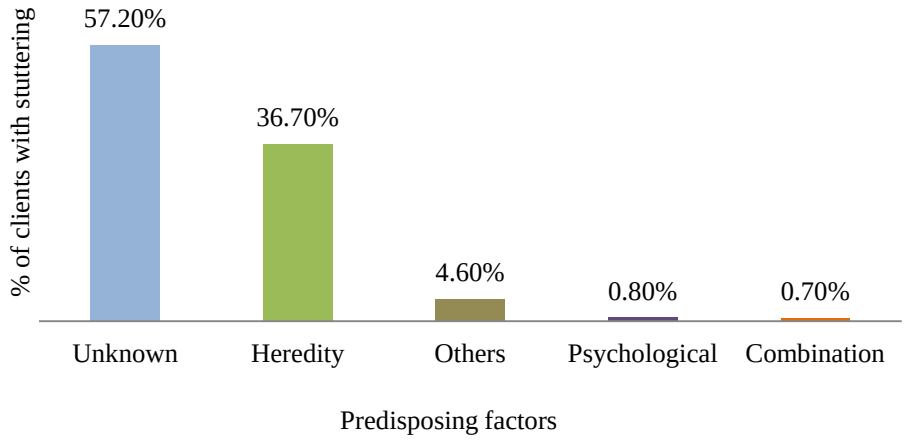

Figure 9. Predisposing factors of clients with stuttering

An attempt was made to compare the level of severity across the different predisposing factors. It was found that unknown factors singularly lead in all the severity levels. The next most commonly occurring predisposing factor was heredity, followed by other factors, psychological and combination factor were the least occurring predisposing factors. On evaluating the data further within each predisposing factor, it was found that the severity levels of mild and moderate levels tended to dominate alternatively across all the predisposing factors and that very severe degree of disfluency occurred the least. The frequency of occurrence of severity of stuttering and different predisposing factors has been illustrated in table 6. Chi square test of association for severity of the disorder and the predisposing factor revealed a significant association [χ^2 (16) =31.29, p< 0.05]. No known etiology could be determined in more than half of the clients with stuttering. The second most predisposing factor was heredity. The present results confirm previous studies in finding that, in general, stuttering is familial. This finding is in concurrence with previous research (Yairi, 1983; Mansson, 2000; Yairi & Ambrose, 2005; Bloodstein and Bernstein Ratner, 2008), which states that stuttering has a strong tendency to run in families.

Table 6
Frequency of occurrence of severity of stuttering and different predisposing factors

Severity of Stuttering	Predisposing factor of the disorder				
	Unknown	Heredity	Psychological	Combination	Others
Very mild	108	83	0	0	20
Mild	387	234	9	9	31
Moderate	537	349	4	4	42
Severe	243	157	3	3	12
Very severe	36	25	0	0	0

2.1.9. Associated problems

Descriptive analysis of the data regarding the associated problems revealed that the highest percentage (88.90%) of clients with stuttering had no concomitant disorder. Among those who had, the highest co-occurring disorder was articulation and phonological disorder (4.80%) which was followed by cognitive impairment (1.7%), learning disability (1.5%), hearing impairment (1.1%), voice disorders (1%), language delay (0.7%) and other disorders (0.3%). The other disorders included speech disorders and oromotor weaknesses. Table 7 represents the percentage of clients with stuttering having associated problems. These findings agree with the general observation of high proportion of PWS exhibiting coexisting language and phonological deficits, although it is much less prevalent compared to more than 30-40% reported by many. The co-occurrence of delayed phonological development and stuttering in children has been noted by many authors over several years. The co-existance of stuttering with phonological/ articulatory disorders was studied by Yairi and Ambrose (2005) who indicated that approximately 30-35% of children seem to have a co-occurrence with phonological / articulatory disorders. They concluded saying that children who persevere in stuttering are seen to be slower in the development of phonology than the children who ultimately recover and that the phonological development in CWS is alike in order of development and approaches used to those of normally fluent children.

Table 7
Percentage of clients with stuttering having associated problems

Associated problems	% of clients with stuttering
No associated disorders	88.90
Voice disorder	1
Articulation/ Phonological disorder	4.80
Language delay	0.70
Learning disability	1.50
Cognitive impairment	1.70
Hearing impairment	1.10
Other disorders	0.30

The level of severity across those with different associated problems was compared to examine if there is any association between the two. It was noted that the articulation/ phonological disorder singularly lead in all the severity levels. Further, within each associated problem, it was observed that the mild and moderate degrees of stuttering severity tended to dominate across a majority of associated problems. Furthermore, PWS with very severe degree of stuttering demonstrated the least tendency to exhibit associated disorders. Interestingly, PWS with very mild degree of stuttering also showed a minimal tendency to exhibit associated disorders. Table 8 depicts the general trends in the occurrence of various associated disorders across severity. Chi square test of association for severity of the disorder and the associated problems revealed a significant association [χ^2 (28) =67.940, p< 0.05]. The findings of the current study are in agreement with Blood and Seider (1981) and Arndt and Healey, (2001), who found that the most frequently co-occurring disorder with stuttering was articulation and phonological disorder and language disorder followed by learning disability and voice disorder. The findings also agrees with Bloodstein's (1975) statement that "ordinary defects of articulation appear to constitute the most common single provocation to stuttering" The results of the present study are in partial concurrence with Chapman and Cooper (1973) and Montgomery and Fitch (1988), who have reported the occurrence of cognitive (3.02% prevalence rate) and hearing impairment (0.12% prevalence rate) in PWS.

Table 8
Percentage of occurrence of severity of stuttering and the associated problems

Severity of stuttering	Associated problems							
	Nil	VD	AD/ PD	DSL	LD	CI	HI	Others
Very mild	85.4	0.9	9.0	2.4	0.0	0.5	1.9	0.0
Mild	85.4	1.3	6.4	1.0	1.6	2.7	1.2	0.3
Moderate	91.2	1.0	2.9	0.3	2.3	1.2	1.1	0.1
Severe	91.1	0.5%	4.3	0.0	0.2	2.2	1.0	0.7
Very severe	90.2	0.0	8.2	0.0	0.0	1.6	0.0	0.0

Note: Nil: no associated disorders; VD: voice disorders; AD/PD: articulation/ phonological disorders; LD: learning disability; CI: cognitive impairment; HI: hearing impairment.

To summarize the results considering the epidemiological factors in stuttering, some interesting facts were noted. The prevalence of stuttering was 96.80% among the fluency disorders. The clients who reported during 17.1-30 years of age were having severities mainly very mild to severe, and very severe was noted in clients who reported during 10.1- 12 years of age. The clients with stuttering had an onset in the early childhood years, mostly during 2-6 years, were predominantly males, had a gradual onset, and males were predominant across more than half of the ages of onset. It was noted that there was a significant association seen for gender and severity of the disorder. Majority of the PWS were monolinguals and right handed and all the PWS who were left handed were forced to change their handedness from left to right, although data on handedness was missing in a large majority of individuals. The predisposing factors of stuttering were majorly unknown and majority of them had no associated problems. Among those who exhibited concomitant problems, a hierarchy was noted of, cognitive impairment (1.7%), learning disability (1.5%), hearing impairment (1.1%), voice disorders (1%), language delay (0.7%) and other disorders (0.3%).

2.2. Cluttering

Among the 2,388 clients with fluency disorders cluttering accounted to only 0.5% (11) and cluttering – stuttering to 0.2% (4) which is depicted in figure 10. The low prevalence of cluttering and cluttering- stuttering may be because, it is assumed that the

public would be much less aware of cluttering, its presumed rarity as a clinical diagnosis (even among speech-language pathologists), its assumed infrequent occurrence, its virtual absence in the media, and its assumed lack of severity or saliency as a disorder (Weiss, 1964; St. Louis et al., 2003, 2007). It may also be attributed to the fact that student clinicians have less exposure to PWC and hence they tend to misdiagnose the clients who report of disfluencies.

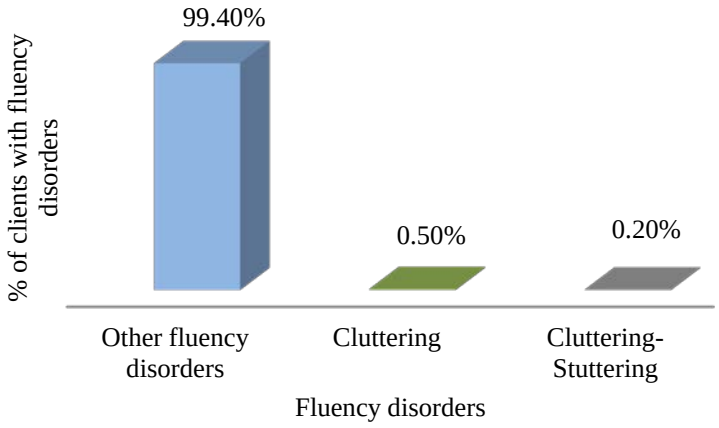

Figure 10. Percentage of occurrence of cluttering & cluttering- stuttering among fluency disorders

2.2.1. Age of reporting

It was observed that the age of reporting of clients with cluttering at 8.1- 10 years was 27.3% and at 17.1- 30 years it was 72.7%. In clients with cluttering- stuttering, 75% reported at the age of 17.1- 30 years and the remaining 25% reported at the age of 30.1- 50 years. The results suggested that the individuals with cluttering symptoms reported to the institute only after the age of 8 years. The results of the present study is in concurrence with the findings of several studies (Mensink & Ypma, 1990; Ward, 2006; Daly, 2008) which suggested that cluttering manifests often after 7, when the language development has advanced and they exhibit a high urgency to speak. Cluttering is not reported at younger ages due to 3 specific reasons. Firstly, younger children have a slower speech rate which is important for fluency. Secondly, the linguistic errors in the speech repertoire of children with cluttering are difficult to distinguish from that of children with developmental language disorders (Van Zaalen, Wijnen, & Dejonckere,

2009b, 2009d). Lastly, cluttering often goes misdiagnosed/ undiscovered for many years because a delay in any one area is very subtle, not requiring immediate attention.

2.2.2. Age of onset

The data analysis for the age of onset revealed that 63.6% (7) clients with cluttering had onset during childhood, 27.3% (3) during the age 6.1- 8 years and 9.1% (1) of them had an onset during 17.1- 30 years. 75% clients with cluttering- stuttering had an onset in childhood and for the remaining 25%, the onset was during 17.1- 30 years. The results indicated that the majority of the clients with cluttering-stuttering had the age of onset during childhood. The percentage of occurrence of age of onset in clients with cluttering and cluttering- stuttering is depicted in figure 11. These findings are supported by the findings of the study by Becker and Grundman, (1970), who reported that cluttering is frequently manifested in school age children between the ages of 7 and 8 years. There have been no exact investigations of when cluttering starts and how it develops with time. Episodically, it has been accounted for that cluttering is generally not confirmed until ahead of grade level school years, i.e., around 7 or 8 years (Diedrich, 1984). In the event that this is true, one reason may be that the ability to talk quickly may not arise until after language is fairly well developed (van Zaalen, 2010). Bakker theorized that yet-to-be-understood components of the connection of the environment and identity may be in charge of CNS problem that cause cluttering not intensifying among preschool years similar to the case with stuttering (Myers, St. Louis, Bakker, Raphael, Wiig, Katz, Daly, & Kent, 2002b). Another reason is that it might be the scholastic demands of a school domain that is responsible of cluttering to rise as a perceptible issue in youngsters.

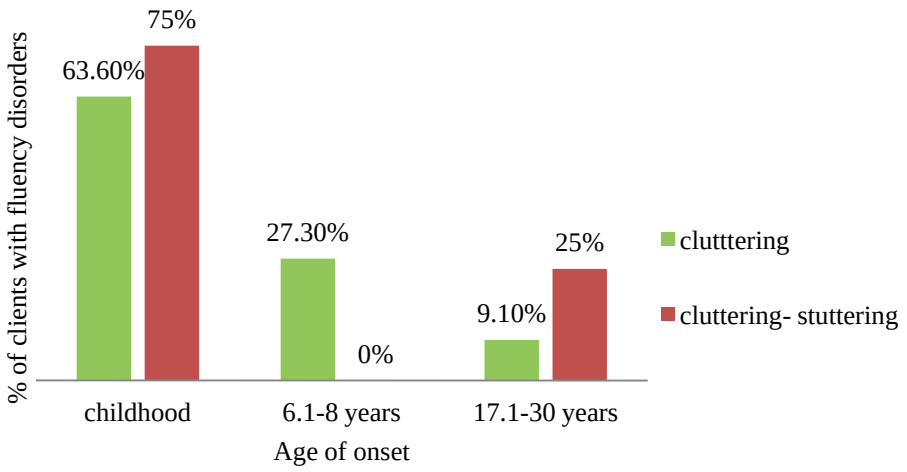

Figure 11. Percentage of occurrence of age of onset in clients with cluttering and cluttering- stuttering

2.2.3. Nature of Onset

On analyzing the data for nature of onset, it was found that there were missing data in both clients with cluttering (18.2%) and cluttering- stuttering (75%). From the available data it was observed that both, clients with cluttering (81.8%) and cluttering-stuttering (25%) had a gradual onset and that none exhibited a sudden onset (Figure 12). The results regarding the nature of onset indicated that all individuals with cluttering exhibited gradual onset.

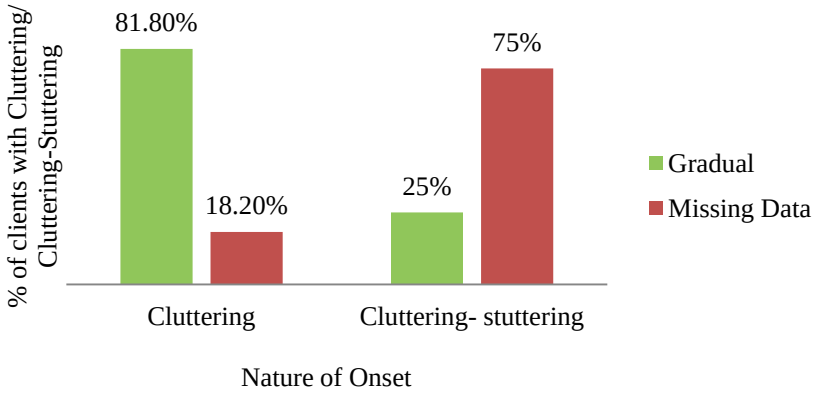

Figure 12. Percentage of nature of onset in clients with cluttering and cluttering-stuttering

The results regarding the nature of onset indicated that among the available data, all the individuals with cluttering, and cluttering- stuttering exhibited gradual onset. Although no empirical research exists documenting the nature of onset in either cluttering/ cluttering- stuttering, the present findings can be explained in terms of the fact that it is the parent/ care giver who are the primary informants and that even though the initial symptoms may be present in early childhood or preschool years, it tends to be subtle- such as an inclination to be restless, clumsy or disorganized. As the disorder progresses with advancing age, overt/ obvious symptoms tend to emerge in the form of cluttered speech.

2.2.4. Gender

Considering gender as a factor, it was observed that 100% of both the clients with cluttering and cluttering- stuttering were males and none were females. The results suggest that cluttering predominantly occurred among males in the present study. This result is in concurrence with the findings obtained by Curlee (1996), who reported that the subjects studied were mostly males. Arnold in 1960 reported a male to female ratio of 4:1 in PWC.

2.2.5. Socioeconomic Status

Analysis of socioeconomic status of clients with cluttering and cluttering-stuttering was performed. It was observed that the highest number of clients with cluttering was from SES II (45.5%) followed by SES IV (27.3%), SES I (18.2%), SES III, (9.1%) and none was observed to belong to SES V. In clients with cluttering-stuttering, highest occurrence was seen in SES I (50%), followed by SES III (25%) and SES II (25%), as represented in figure 13.

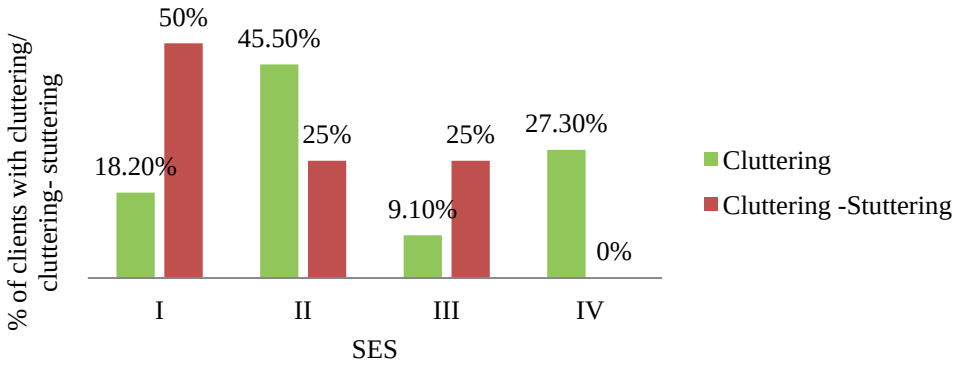

Figure 13. Percentage of occurrence of different SES cluttering and cluttering- stuttering

It was noted that none among the cluttering – stuttering group were from SES IV and SES V, which is illustrated in the figure 13. It can be concluded form the present study that the majority of the PWC were from the SES I and II. No reliable empirical research has conducted to investigate the association linking cluttering and cluttering-stuttering, with SES. However the results like in stuttering can be attributed to the recent initiatives on the part of the government for the up-liftment and empowerment of the rural and financially disadvantaged classes in terms of awareness programs and the rural outreach programs; also may be because, the clients from higher SES might consult SLPs in their respective place/ in private set up.

2.2.6. Number of languages used

On analyzing the data related to the number of languages used by the clients with cluttering and cluttering- stuttering, the following observations were noted. The bilinguals were the highest (54.5%) among clients with cluttering, followed by multilinguals (27.3%), and monolinguals (18.2%). Among the clients with cluttering-stuttering, it was noted that 50% of them were monolinguals followed by 25% bilinguals and 25% multilinguals. Percentage of occurrence of monolinguals, bilinguals and multilinguals in clients with cluttering and cluttering- stuttering is depicted in the figure 14. The results accounted to >50% monolinguals and bilinguals among cluttering and cluttering- stuttering group respectively. It can be concluded that the results with respect to both the groups varied in the use of languages. However, the results should be considered with caution as the sample size was limited. The cluttering group constituted

0.50% and cluttering- stuttering group 0.20% participants only. No reliable empirical research has been carried out to investigate the relationship between cluttering and cluttering- stuttering, with the number of languages used. However, PWC being unaware or partially aware about their problem may not show a variation in the severity of the problem when speaking in first language or any other language or languages.

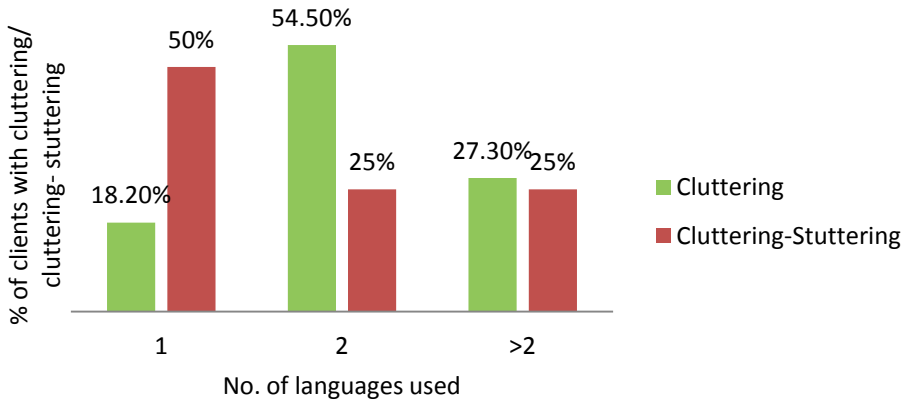

Figure 14. Percentage of occurrence of monolinguals, bilinguals & multilinguals in clients with cluttering and cluttering- stuttering
[Note: 1-Monolingual; 2-Bilingual; >2 Multilingual]

2.2.7. Predisposing factors

Analysis for the predisposing factors of cluttering and cluttering- stuttering revealed the following results: 75% of the clients with cluttering and 44.4% of the clients with cluttering- stuttering had a predisposing factor as unknown, while 25% of the clients with cluttering and 55.6% of the clients with cluttering- stuttering had some other (organic) factors as the predisposing factor, as represented in figure 15. The findings of the present study are in stark contrast with previous research by (Freund, 1952; Luschinger & Arnold, 1965) who stated that like stuttering, cluttering also has a familial predisposition.

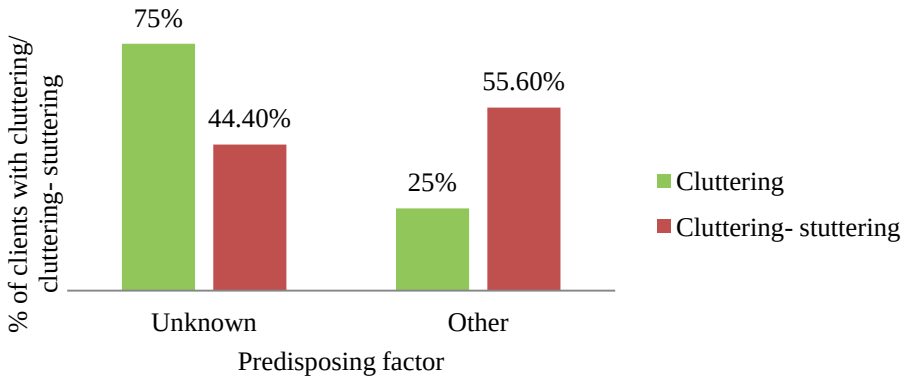

Figure 15. Percentage of occurrence of different predisposing factors in clients with cluttering and cluttering- stuttering

2.2.8. Associated problems

On analyzing the data it was noted that none of the clients with cluttering or cluttering- stuttering had any other associated problem. However, cluttering is found to co-exist mainly with learning disability (Molt, 1996; Teigland, 1996) and many other disorders, mainly language and phonology. Being a multidimentional disorder, cluttering is viewed as "the verbal manifestation of central language imbalance, which affects all the channels of communication (e.g., reading, writing, rhythm and musicality) and behavior in general" (Weiss, 1964). Weaknesses in the linguistic encoding of one's thoughts are reflected in a lack of coherence of communication efforts which are seen in language/ learning disabled population. In this study, this lack of associated problems in clients with cluttering or cluttering- stuttering may be attributed to the reduced keenness for the client's part to get the assessment completed or to the heterogeneity in assessment and the lack of a standard protocol of evaluation.

To summarize, the prevalence of cluttering was 0.50% and 0.20% for cluttering-stuttering among the fluency disorders, in the present data. The clients with cluttering reported to AIISH only after the age of 8 years and cluttering- stuttering reported at a much later age, i.e., during 17.1 years to 30 years. Majority of the clients with cluttering and cluttering- stuttering had onset in childhood. All the clients with both the fluency disorders had a gradual onset and were males. Majority of the clients with cluttering (45.5%) and cluttering- stuttering (50%) were from SES II and SES I respectively.

Predominantly, clients with cluttering were bilinguals and cluttering- stuttering were monolinguals. The predisposing factors of cluttering were mostly unknown and other factors were predominant in cluttering- stuttering and none of the clients with cluttering and cluttering- stuttering had any associated problems.

2.3. Neurogenic Stuttering

Among the 2,388 clients with fluency disorders neurogenic stuttering accounted to 0.40% (9). This low prevalence rate among other fluency disorders may be because of the difficulty to differentially diagnose developmental stuttering from SAAND. This may be because they can occur together- particularly with other neuro-pathologies like aphasia and dysarthria. The estimates of occurrence are complicated by a number of factors, including the multiple linguistic, cognitive, and motor problems that often accompany and sometimes mask the speaker's disfluency as well as the transient nature of the problem sometimes.

2.3.1. Age

It was noted that 66.7% (6) reported to AIISH at the age of >50 years and the remaining 33.3% (3) reported at the age of 30.1- 50 years, as represented in table 9.

Table 9
Percentage of occurrence of Neurogenic stuttering with respect to age, nature of onset, gender and SES

Demographic variables	Particulars	% of clients with neurogenic stuttering
Age of onset	17.1-30 yrs	33.30
	>50 yrs	66.70
Nature of onset	Sudden	100
	Gradual	0
Gender	Male	66.7
	Female	33.3
SES	SES I	22.2
	SES II	66.7
	Missing data	11.1

Neurogenic stuttering is likely to occur post puberty, characteristically occurring in the decade of the forties (Mazzucchi, Moretti, Carpeggiani, Parma, & Paini, 1981; Market et al., 1990; Jokel & De Nil 2003,). Being an acquired disorder, mainly due to a

neurological insult which occurs in the later ages, the reporting ages also are noted to be majorly in the later stages of life.

2.3.2. Age and nature of onset

The analyzed data revealed that the age of onset of neurogenic stuttering was reported to be after the age of 17 years. Further analysis revealed that 66.7% of the clients with neurogenic stuttering had an onset after 50 years of age and the remaining 33.3% had an onset during 17.1- 30 years. Also, it was noted that all the 9 clients with neurogenic stuttering had a sudden onset, as depicted in table 9. The results of the present study corresponds closely with the mean age of 48.5 years reported by Mazzucchi, Moretti, Caroeggiani, Parma and Paini, (1981), in their study of 16 patients. The later onset may be mainly because the neurological insult/ degenerative diseases occur in the later ages. Further, the onset of neurogenic stuttering may be suddenly and unambiguously associated with stroke, head trauma, etc.

2.3.3. Gender and Socioeconomic status

Among the total 9 clients with neurogenic stuttering, 6 (66.7%) were males and 3 (33.3%) were females. This finding suggested that about one third of the individuals with neurogenic stuttering were males. The results of the current study go in line with the findings of the Market et.al's (1990) study which revealed that more than half of the clients with neurogenic stuttering were males. This finding suggests that as with most fluency problems, the majority of individuals presenting with neurogenic stuttering are males (Market et.al., 1990; De Nil, Jokel & Rochon, 2007).

The data considering SES revealed that all the clients with neurogenic stuttering were within the SES I (22.2%) and SES II (66.7%). This result cannot be generalized because of the very few number of cases were reported, and further no reliable empirical research has been conducted till date so as to investigate the association linking SES and neurogenic stuttering.

2.3.4. Number of languages used

The number of languages used by the clients with neurogenic stuttering was one as reported by 7 individuals and two languages by 2 individuals. No reliable data regarding the number of languages used by clients with neurogenic stuttering have been studied yet. The results may be attributed to the fact that the majority of clients with neurogenic stuttering had less than high school education and hence the use of only native language may be present.

2.3.5. Predisposing factors and associated problems

The data analysis considering predisposing factors revealed that 5 (56%) had predisposing factors (such as stroke) and the remaining 4 of them had an unknown predisposing factor. Further, 8 (88.9%) individuals had no other associated problems while one had an associated language disorder. Percentage of occurrence of neurogenic stuttering with predisposing factors and associated problems are illustrated in table 10. This result is partially supported by the findings of many (Brazis, Masdeu, & Biller, 1996; Helm-Esterbrooks, 1999; Lee et al., 2001) who reported that neurogenic stuttering is caused by Alzheimer's disease, stroke, brain tumor, TBI, progressive supra-nuclear palsy, Parkinson's disease, renal dialysis and drug usage. Accordingly, neurogenic stuttering does not appear to be associated with a particular site of lesion. One or both hemispheres may be involved, although Rosenbek, Messert, Collins and Wertz (1978) indicated that left hemisphere is more likely to be implicated. This result is in partial agreement with the findings of the study by Theys, Wieringen and De Nil (2008), who concluded that apraxia of speech, aphasia, dysphonia, and/ or dysarthria were the common co-occurring disorders with neurogenic stuttering. Fluency problems are observed prior to what turns out to be a gradually evolving and yet- to- be discovered problems, including aphasia, dysarthria, apraxia, that tend to accompany neurogenic stuttering.

Table 10
Percentage of occurrence of Neurogenic stuttering by the number of languages used, Predisposing factor and associated problems

		% of clients with neurogenic stuttering
No. of languages used	1	77.8
	2	22.2
Predisposing factor	Unknown	44.4
	Other	55.6
	Negative	88.9
Associated problems	Language disorder	11.1

To summarize the results considering the epidemiological factors in neurogenic stuttering, some interesting facts were noted. The prevalence of neurogenic stuttering was 2.2% among other fluency disorders. The age of reporting and age of onset were mostly after 50 years and all the clients had a sudden onset. The clients were mainly monolinguals, males and were from SES II. The predominant predisposing factor was stroke and majority did not have any other associated problems.

3. Comparison of epidemiological aspects across fluency disorders

The epidemiological aspects across the fluency disorders stuttering, cluttering, cluttering- stuttering and neurogenic stuttering were compared across the clients registered at AIISH during a period of 5 years. The prevalence of the different fluency disorders were 6.23% of total clients registered with communication disorders in general. Of these, majority (96.8%) were with stuttering, 0.4% neurogenic stuttering 0.5 cluttering, and 0.2% with cluttering- stuttering. It was also noted that among the clients with the complaint of disfluencies a significant proportion (2.2%) were classified as NNF. This reveals the adherence to the Diagnosogenic theory by Wendell Johnson, which probably makes the clinicians apprehensive to diagnose very young children with complaints of disfluencies as stuttering.

3.1. Age

The data analysis of the ages of reporting across the different fluency disorders, it was noted that majority of all the fluency disorders reported to AIISH during 17.1- 30

years of age. On evaluating the data further within each ages of reporting, the following observations were made: only PWS reported to the institute during 2-8 years and 10.1-17 years of age, and both stuttering and cluttering were reported during the 8.1-10 years. During 17.1- 30 years of age more than half of both PWC and persons with cluttering-stuttering and one third of neurogenic clients reported to the institute. Majority of the persons with cluttering- stuttering reported during 30.1-50 years of age and more than half of the clients with neurogenic stuttering reported after the age of 50 years. It was also observed that among the clients with the complaint of disfluencies who were classified as NNF, majority of them reported to AIISH during the ages 2-4 years (82.7%). Table 11 depicts the frequency of occurrence of various types of fluency disorders and their reporting ages.

Table 11
Frequency of occurrence of various types of fluency disorders and the reporting ages

Fluency disorders	Age in years								
	2-4	4.1-6	6.1-8	8.1-10	10.1-12	12.1-17	17.1-30	30.1-50	>50
Stuttering	264	262	194	158	238	419	665	106	6
Cluttering	0	0	0	3	0	0	8	0	0
NS	0	0	0	0	0	0	3	0	6
C-S	0	0	0	0	0	0	3	1	0

[Note: NS- Neurogenic stuttering; C-S Cluttering-stuttering]

3.2. Age of onset

The data analysis of the ages of onset across the different fluency disorders revealed that majority of the clients with stuttering, cluttering and cluttering- stuttering had an earlier ages of onset, i.e., between 2 and 10 years of age compared to most of the clients with neurogenic stuttering who had a late onset, i.e., after 50 years of age. Further, within each ages of onset, majority of PWS, PWC and persons with cluttering- stuttering belonged in the category childhood onset. Only some PWS had onset during 2 and 6 and 8- 17 years of age. During 6.1- 8 years of age only PWC and PWS had onset with highest frequency of occurrence being PWC. During 17.1- 30 years, neurogenic stuttering and persons with cluttering- stuttering had onset with highest frequency of occurrence being neurogenic stuttering. Frequency of occurrence of various types of fluency disorders and their ages of onset are illustrated in table 12. It was also observed that among the clients

with the complaint of disfluencies who were classified as NNF, 100% of them had an onset during 2-4 years of age.

Table 12
Frequency of occurrence of various types of fluency disorders and their ages of onset

Fluency disorders	Age of onset in years									
	Childhood	2-4	4.1-6	6.1-8	8.1-10	10.1-12	12.1-17	17.1-30	30.1-50	>50
Stuttering	802	667	333	162	143	77	69	43	15	1
Cluttering	7	0	0	3	0	0	0	1	0	0
NS	0	0	0	0	0	0	0	3	0	6
C-S	3	0	0	0	0	0	0	1	0	0

[Note: NS- Neurogenic stuttering; C-S Cluttering-stuttering]

The findings are in support of results by several authors investigating various fluency disorders (Johnson et.al, 1959, Becker & Grundman, 1970; Ward, 2006; Daly, 2008) who reported that the disorders of stuttering, cluttering, cluttering- stuttering, almost always occur during the childhood/ developmental years. Furthermore, the present findings are also in agreement with Mazzucchi, Moretti, Caroeggiani, Parma and Paini, (1981) who noted that neurogencic stuttering as an acquired disorder did have a tendency to occur between the ages of 17 to 65 years, with a pronounced frequency of occurrence post 50 years of age.

3.3. Nature of onset

On analyzing the data of nature of onset it was found that there were missing data in all the fluency disorders which accounted to 10.67%, except for neurogenic stuttering. Regarding the nature of onset across the different fluency disorders, it was observed that PWS, PWC and persons with cluttering- stuttering had higher occurrence of gradual onset with 100% of the clients cluttering- stuttering group showing a gradual onset and 100% of all the clients with neurogenic stuttering exhibiting a sudden onset. Further, it was noted that 17.6% of PWS and PWC had a sudden onset. The data is represented in figure 16. It was noted that among the clients with the complaint of disfluencies who were classified as NNF, 54.2% had gradual onset and 45.8% had sudden onset. This finding lend support to the claims of Mazzucchi, Moretti, Caroeggiani, Parma and Paini,

(1981) and Van Riper (1982) who individually reported that the onset of stuttering, cluttering, cluttering- stuttering is usually gradual in nature while a majority of clients with neurogenic stuttering exhibit a sudden onset.

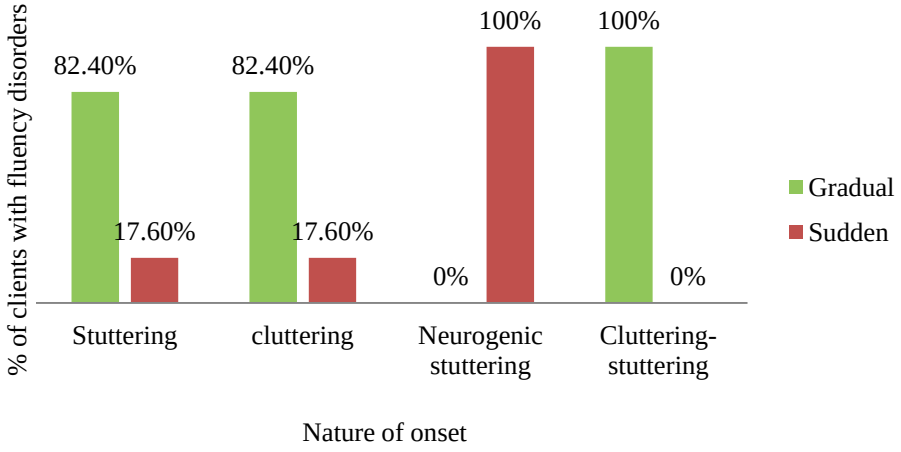

Figure 16. Frequency of occurrence of various types of fluency disorders and their nature of onset

3.4. Gender

On comparing the gender data, it was observed that males were predominant in all the fluency disorders when compared to females. Considering the gender across the different fluency disorders, it was observed that 100% of the PWC and persons with cluttering- stuttering were males. Further, it was noted that more than half of the clients with neurogenic stuttering was males and also more than three fourth of the PWS. It was also observed that one third of the persons with neurogenic stuttering, and 12.5% of the PWS were females as represented in figure 17. It was noted that among the clients with the complaint of disfluencies who were classified as NNF, 69.2% were males and 30.8% females. The current results followed the trend depicted in many studies (Yairi, 1983; Curlee, 1996; Amrose, Cox & Yairi, 1997) who noted a gender bias in the occurrence of the disorder of stuttering, cluttering, cluttering- stuttering to typically manifest in the male population. Similarly, these results also highlight the findings documented by Market et al. (1990) who reported of a male gender preference in the occurrence of neurogenic stuttering.

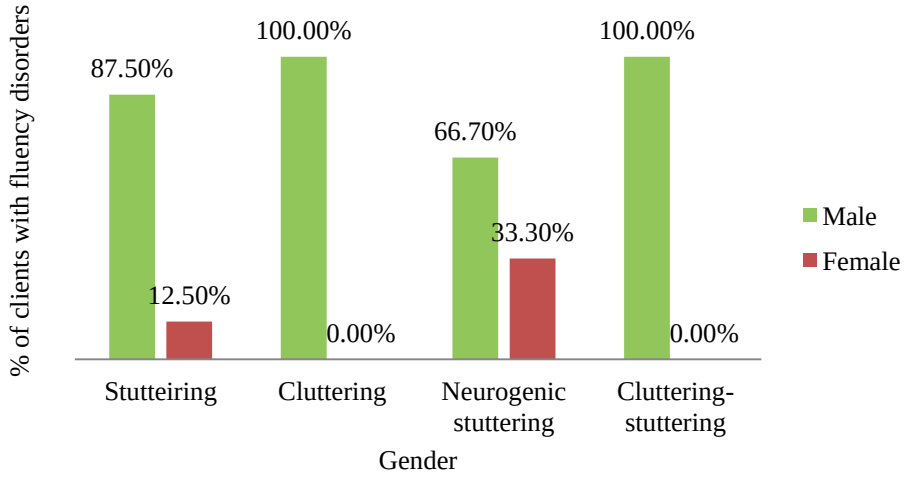

Figure 17. Percentage of occurrence of various types of fluency disorders across gender

3.5. Socioeconomic status

Analysis of the SES revealed that 7.8% of the data regarding SES was missing, and from the remaining data it was found that majority of the clients with fluency disorders were from SES I, SES II and SES III and least from SES IV and SES V. On further evaluation within each SES class, the following observations were made: the first two highest occurrence of the different SES class among PWS were SES I and SES II; SES II and SES IV for PWC; SES II for clients with neurogenic stuttering and for persons with cluttering- stuttering, the highly frequent SES class was SES I as represented in table 13. The occurrence of various levels of SES among the clients with the complaint of disfluencies who were classified as NNF, in the ascending order was, SES IV (5.8%), SES II (23.1%), SES III (25%), and SES I (42.3%). The findings obtained in the present study can be collectively ascribed to the recent undertakings by the government for the up-liftment and empowerment of the socially and economically disadvantaged classes and the fact that the majority of individuals had not completed a high school education.

Table 13
Frequency of occurrence of various types of fluency disorders and SES

Fluency disorders	Missing data	SES I	II	III	IV	V	Total
Stuttering	183	1101	570	310	125	23	2312
Cluttering	0	2	5	1	3	0	11
NS	1	2	6	0	0	0	9
C-S	0	2	1	1	0	0	4

[Note: NS- Neurogenic stuttering; C-S Cluttering-stuttering]

3.6. Number of languages used

The missing data regarding the number of languages used, in stuttering were 1.6%. The data regarding the number of languages used across the different fluency disorders revealed that, except for cluttering, all the other fluency disorders had majority of the clients who were monolinguals. It was noted that most of the PWC were bilinguals. The data regarding the number of languages used across fluency disorders is represented in table 14. The occurrence of the number of languages used among the clients with the complaint of disfluencies who were classified as NNF, in the ascending order was, multilinguals (11.5%), bilinguals (23.1%), and monolinguals (65.4%). Surprisingly, majority of the clients with the different fluency disorders who reported were monolingual speakers. A possible explanation for this may be the fact that a majority of these clients had less than high school education. Further, this higher number of monolinguals reported may be attributed to the incomplete case history, which fails to report the languages other than the client's native language.

Table 14
Frequency of occurrence of various types of fluency disorders and no. of languages used

Fluency disorders	No of Languages Used 1	2	>2
Stuttering	1163	733	378
Cluttering	2	6	3
NS	7	2	0
C- S	2	1	1

[Note: NS- Neurogenic stuttering; C-S Cluttering-stuttering]

3.7. Predisposing factor

The data analysis of the predisposing factors across the different fluency disorders revealed that majority of the fluency disorders has an unknown predisposing factor. Further, it was noted that psychological and heredity factors and other (stroke) factors acted as a predisposing factor only for PWS and clients with neurogenic stuttering respectively. An unknown etiology was noted for majority of both PWC and persons with cluttering- stuttering. Although no etiology could be established in more than half of the clients with stuttering, the second most frequently occurring predisposing factor noted was heredity. This findings that stuttering has a strong tendency to run in families is in agreement with previous researches by many authors (Mansson, 2000; Yairi & Amrose, 2005; Bloodstein & Bernstein Ratner, 2008). Comparable to the results depicted above, vast majority of clients with cluttering and cluttering- stuttering also demonstrated no known predisposing factors, with the remainder having other predisposing factors. In clients with neurogenic stuttering, slightly more than half reported of stroke occurring prior to the onset of stuttering, lending support to the previous research by Helm Estabrooks, (1999); and Lee et al. (2001).

Table 15

Frequency of occurrence of various types of fluency disorders and predisposing factors

Fluency disorders	Predisposing factor of the disorder				
	Combination	Unknown	Psychological	Heredity	Others
Stuttering	17	1323	18	848	106
Cluttering	0	11	0	0	0
NS	0	4	0	0	5
C-S	0	3	0	0	1

[Note: NS- Neurogenic stuttering; C-S Cluttering-stuttering]

Table 15 provides the above information for the disorder groups. The occurrence of various predisposing factors among the clients with the complaint of disfluencies, who were classified as NNF, in the ascending order was, psychological (1.9%), heredity (36.5%), unknown (61.5%).

3.8. Associated problems

Analysis of the data of associated problems across the different fluency disorders found that more than 80% of the clients with each type of fluency disorders had no other concomitant disorders. On further analysis, as represented in table 16, the frequency of occurrence of the fluency disorders in the different associated conditions considered, in the ascending order were: voice disorders, (1% of PWS), articulation/ phonological disorders (4.8% of PWS), language delay/ disorder (0.7% of PWS) and neurogenic stuttering (11.1%). Further, LD (1.5%), cognitive impairment (1.7%), hearing impairment (1.1%), and other disorders (0.3%) were seen only in PWS. The occurrence of various associated problems among the clients who were classified as NNF, only 3.8% was articulation/ phonological disorder while 96.2% of them had no associated problems. Above 80% of clients with each type of fluency disorder demonstrated no other concomitant disorders. This may be due to the flaws in the case history and evaluation procedures undertaken in the assessment of the clients. As this study was a retrospective in nature, this variable could not be controlled.

Table 16
Frequency of occurrence of various types of fluency disorders and associated problems

Fluency disorders	Associated problems							
	Nil	Voice disorder	Articulation disorder	Language delay	LD	Cognitive impairment	Hearing impairment	Others
Stuttering	2056	22	112	16	34	40	26	6
Cluttering	11	0	0	0	0	0	0	0
NS	8	0	0	1	0	0	0	0
C-S	4	0	0	0	0	0	0	0

[Note: NS- Neurogenic stuttering; C-S Cluttering-stuttering]

Among the clients with the complaint of disfluencies who were classified as NNF, it was noted that 100% of them had an onset during 2-4 years of age, which was majorly gradual (54.2%) in nature and were mostly seen in males (69.2%). The majority of these clients was from SES III (25%) and SES I (42.3%); and was mostly monolinguals (65.4%). The predisposing factors among these clients were generally unknown (61.5%) followed by heredity factors (36.5%). Only 3.8% of these clients had articulation/

phonological disorders, the remaining clients had no other associated problems. The pattern noted with regard to age of onset, the nature of onset, gender, predisposing factors, associated factors, and the number of languages used, in clients who were classified as NNF have a similar pattern as that of PWS. This suggests that these clients who were classified as NNF are possible stutters, who were misdiagnosed as NNF. This reveals that the clinicians stand by the diagnosogenic theory, hence labeling the very young children with complaints of disfluencies as stuttering.

To summarize the results considering the epidemiological factors across the fluency disorders, some remarkable data were noted. The most frequent age of reporting for all the fluency disorders was during 17.1- 30 years. The clients with stuttering, cluttering, and cluttering- stuttering had an onset in the childhood years and neurogenic stuttering during 17.1- 30 years. All the fluency disorders were predominantly seen in males. Gradual onset was noted in all the fluency disorders except for neurogenic stuttering, which had a sudden onset. Majority of clients with stuttering, neurogenic stuttering and cluttering- stuttering, were monolinguals and majority of all the clients among all the fluency disorders, had an unknown predisposing factor and had no associated problems. The SES data revealed that majority of the clients with the different fluency disorders came from SES I and/ or SES II.

CHAPTER V

SUMMARY AND CONCLUSIONS

Disorders of fluency of speech are a heterogeneous group of disorders evading researchers for decades in their attempts at understanding the nature of the problem, their cause and curative aspects. Various theories and hypothesis have been put forth to explain its nature, onset, and development, but none so far can provide satisfactory answers to all the vagaries of the disorder. There are no such studies in the Indian context aiming at understanding the various epidemiological aspects, of the different fluency disorders. Hence, the present project was aimed to study the various epidemiological aspects related to the different fluency disorders.

In the present study, 2388 case files of clients with various fluency disorders during a period of five years, from January 2010 to December 2014 were reviewed and analyzed, and relevant data pertaining to the various epidemiological aspects were collected using a checklist developed as a part of this project to serve this purpose. The developed checklist comprised of questions targeting the various epidemiological aspects of fluency disorders. Questions pertaining to the reporting age, gender, and age of onset, nature, handedness and change in handedness, severity, and predisposing factor, associated problems and the socioeconomic status of the clients were included in the checklist. The data was entered in the IBM SPSS 20 software for analyses. The data was analyzed for clients with fluency disorders using descriptive statistics for the various epidemiological aspects related to fluency disorders.

The results of the current study revealed that from a total of 38,301 clients who reported to the institute during the specified period of five years, 2,388 (6.23%) clients were diagnosed to have different types of fluency disorders. Among the clients with fluency disorders, 96.8%, 0.5%, 0.2% and 0.4% of the clients were identified as stuttering, cluttering, cluttering- stuttering and neurogenic stuttering respectively. Among the 2388, 2.2% of the clients with the complaint of disfluencies were classified as being NNF. The prevalence of stuttering was 96.80% among other fluency disorders. The most frequent age of onset of stuttering seen was childhood and up to 4- 6 years. Except for the

reporting ages of 2-4 years and 30.1-50 years, all the other reporting ages had moderate severity as the frequently occurring severity. PWS were predominantly males and had a gradual onset. Among the 11.5% of the available data, majority of the PWS were monolinguals and were right handed. It was also noted that all the PWS who were left handed were forced to change their handedness from left to right. The most frequent SES class among the PWS were SES I and SES II. The predisposing factors of stuttering were majorly unknown followed by heredity factors and the major associated problem was phonological/ articulation disorders.

The prevalence of cluttering was 0.50% and 0.20% for cluttering- stuttering among other fluency disorders. PWC reported to AIISH only after the age of 8 years and cluttering- stuttering reported at a much later age, i.e., during 17.1 years to 30 years. Majority of the clients with cluttering and cluttering- stuttering had a gradual onset in childhood and all the clients were males. Majority of the clients with cluttering and cluttering- stuttering were from SES II and SES I respectively. Predominantly, PWC were bilinguals and with cluttering- stuttering were monolinguals. The predisposing factors of cluttering were mostly unknown and other factors were predominant in cluttering- stuttering; none of the clients with cluttering and cluttering- stuttering had any associated problems.

In the present study, the prevalence of neurogenic stuttering was 2.2% among the fluency disorders. The age of reporting and age of onset were by and large after 50 years and all of them had a sudden onset. The clients were largely males, monolinguals and were from SES II. The predominant predisposing factor was stroke.

While considering the epidemiological factors across the different fluency disorders, it was noted that, majority of the clients with the different kinds of fluency disorders reported to AIISH during 17.1- 30 years of age. Except for neurogenic stuttering (> 50 years) majority of all the other clients with stuttering, cluttering, and cluttering- stuttering had an onset in the childhood years. All the fluency disorders were male dominated and except for neurogenic stuttering which had a sudden onset all the other fluency disorders had a gradual onset. Monolinguals were seen majorly among clients with stuttering, neurogenic stuttering and cluttering- stuttering. Majority of all the

clients, among all the fluency disorders, had an unknown predisposing factor and had no associated problems. It was noted that on an average majority of the clients with the different fluency disorders came from SES I and/ or SES II.

It can be concluded that the immature speech motor system may be a probable factor likely to cause breakdowns in the development of normal fluency in some children in addition to the undue demands for fluent and adult like production, hence the onset during early childhood. But the onset was noted in a later childhood years in CWC and cluttering- stuttering because it often goes misdiagnosed/ undiscovered for many years. The clients with neurogenic stuttering had an onset after 50 years of age, which can be attributed to the fact that neurogenic stuttering is noted after a stroke or brain injury, which occurs mostly in adults. The stroke is the main cause for neurogenic stuttering in this study.

The male to female ratio of 6.97:1 found in the study among the PWS may be attributed to the slower neurological maturity in males, and the social demands that are imposed on them. In other fluency disorders also males were predominant but, since the number of clients in other fluency disorders was limited, the results cannot be generalized. The present results confirm those from the previous studies in finding that stuttering is familial. PWS are slower in phonological development and that the phonological development in CWS is similar in order of progression and strategies used by those of normally fluent children. Among PWC, cluttering- stuttering and neurogenic stuttering, associated problems were not present in all the clients except for one with neurogenic stuttering who had an associated language disorder. Even though handedness and the number of languages used are among the major epidemiological factors, because majority of data was missing/ inappropriate, the results do not support the literature and also it cannot be generalized. The results may be attributed to the fact that the majority of PWC, cluttering-stuttering and neurogenic stuttering was from lower SES and/ or had less than high school education. An interesting point to be noted is that, among the 2388 clients who reported to the institute with disfluencies, 2.2% of the clients were classified as being NNF. This is quite a significant proportion where the diagnosis could have been

questionable due to the apprehension the clinicians have in making an early diagnosis of stuttering because of the diagnosogenic theory.

Limitations of the study

- Major conclusions could not be drawn from the study as the sample size of all the fluency disorders except stuttering was very less.
- The data on certain epidemiological factors (handedness, change in handedness) were not available hence the results cannot be generalized.
- The retrospective case file data from one clinical set up has limited scope in its generalizability of the findings.
- Although the OPD registers did not mention about the diagnosis of fluency disorder/neurogenic stuttering in children with mental retardation and aphasia, the review of files of those with these diagnoses could have given some insight as to the co-existence of fluency problem in them.

Clinical implications of the study

There are no studies reporting the epidemiological aspects across the different fluency disorders in one or across settings in the Indian or western scenario. The present study, in this context, provides information related to the proportion of different subtypes of fluency disorders along with the various epidemiological factors, causative factors and the associated problems related to the different fluency disorders, in spite of the limitations mentioned.

Future directions

- A similar prospective study may be carried out, controlling the variables in data collection.
- Data from different clinical set ups covering wider geographical distribution would provide better information pertaining to the study objectives.

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APPENDIX I

ARF Project on "AIISH Survey of fluency disorders"

Checklist

Case Name: **Case No:** **Gender:** i) Male; ii) Female **DOR:**

Income: i) Slab I ii) Slab II iii) Slab III

Occupation: i) Slab I ii) Slab II iii) Slab III

Education: i) Slab I ii) Slab II iii) Slab III

Age: i) 2- 4 yrs; ii) 4.1- 6 yrs; iii) 6.1- 8 yrs; iv) 8.1- 10 yrs; v) 10.1- 12 yrs; vi) 12.1- 17yrs; vii) 17.1- 30 yrs; viii) 30.1- 50yrs; ix) >50yrs

Contact Address/ Mob.No/ e-mail Id:

1) **Country:** Foreign (specify)/ Indian:

2) **State:** Kar /Non-Kar (specify):

3) **Area:** i) Rural ii) Urban

4) **Socioeconomic status of the family:**

   a). Education: i) Slab I ii) Slab II iii) Slab III;

   b). Occupation: i) Slab I ii) Slab II iii) Slab III

   c). Income: i) Slab I ii) Slab II iii) Slab II;

   d). Overall SES: i) Slab I ii) Slab II iii) Slab III

5) **Number of languages used (specify the languages):** i) One ii) Two iii) >Two

6) **Handedness:** R – Right; L – Left; A - Ambidextrous

7) **Change in handedness (If yes specify):** 0 – No; 1 - Yes

8) **Family history (Specify relation if any):**
   i) Not available ii) NA iii) -ve iv) +ve
   If positive, i) Voice ii) Fluency iii) Articulation iv) Language v) LD vi) MR vii) HI viii) Others (Specify)

9) **Family Pedigree if available (Draw and specify):**

10) **Type of fluency Disorder:**
   i) NNF ii) Stuttering iii) Fast rate of speech
   iv) Cluttering v) Neurogenic stuttering vi) Cluttering- Stuttering

11) Severity of the disorder:

L1: i) Very mild ii) Mild iii) Moderate iv) Severe v) Very severe
L2: i) Very mild ii) Mild iii) Moderate iv) Severe v) Very severe
L3: i) Very mild ii) Mild iii) Moderate iv) Severe v) Very severe

12) Age of onset of disorder:
i) 2- 4 yrs; ii) 4.1- 6 yrs; iii) 6.1- 8 yrs; iv) 8.1- 10 yrs; v) 10.1- 12 yrs;
vi) 12.1- 17yrs vii) 17.1- 30 yrs viii) 30.1- 50yrs ix) >50yrs

13) Nature of onset (if sudden specify the reason):
i) Gradual ii) Sudden (Specify)

14) Status of the condition: i) Static; ii) Decreasing; iii) Increasing; iv) Fluctuating

15) Chronicity (duration of the problem):
i) Not known; ii) Acute (< 1 month since onset); iii) 1-3 months;
iv) 3-6 months; v) 6 -12 months; v) >12 months

16) Awareness of the problem: i) Not Aware; ii) Aware

17) Concern of the client about the problem:
i) Not concerned; ii) Somewhat concerned; iii) Highly concerned

18) Concern of parents/ care givers about the problem:
i) Not concerned; ii) Somewhat concerned; iii) Highly concerned

19) Variability of the disorder:

i) Person a) No; b) Somewhat Variable; c) Highly variable

ii) Situations: a) No; b) Somewhat Variable; c) Highly variable;

iii) Languages:

L1: a) No; b) Somewhat Variable; c) Highly variable

L2: a) No; b) Somewhat Variable; c) Highly variable

L3: a) No; b) Somewhat Variable; c) Highly variable

20) Predisposing factor of the disorder:
i) Unknown; ii) Organic; iii) Psychological; iv) Heridity; v) Others (Specify)

21) Rate of Speech: i) Very slow; ii) Slow ; iii) Average; iv) Fast; v) Very Fast

22) Type of Disfluency:

SLDs: i) Repetition ii) Prolongation iii) Block

NDs: i) Pauses ii) Interjections iii) Broken words

23) Position of the disfluency: i) Initial; ii) Intermediate; iii) Final; iv) No position effect

24) Secondaries: i) Absent; ii) Present

25) Avoidance Behavior: i) Absent ii) Present (Specify)

23) Breathing Pattern:
i) NA; ii) Clavicular; iii) Thoracic; iv) Paradoxical; v) Diaphragmatic

24) Associated problems if any

i)Voice; ii) Fluency; iii) Articulation; iv) Language; v) LD; vi) MR; vii) HI; viii) Others (Specify)

25) Age at which therapy was provided:
i) 2- 4 yrs; ii) 4.1- 6 yrs; iii) 6.1- 8 yrs; iv) 8.1-10 yrs; v) 10.1-12 yrs; vi) 2.1-17yrs; vii) 17.1-30 yrs; viii) 30.1-50 yrs; ix) >50 yrs

26) Number of times Evaluations done: i) 1 ii) 2-3 iii) 3-5 iv) >5

27) Number of times therapy attended: i) 1 ii) 2-3 iii) 3-5 iv) >5

28) Total duration of speech therapy sessions:
i) 1 week; ii) 2 week; iii) 1-2 months; iv) 2-3 months; v) >3 months

29) Duration of most recent therapy:
i) < 1 week; ii) 1-2 weeks; iii) 2-4 weeks; iv) >1 month

30) Presently attending speech therapy classes: i) No; ii) Yes

31) Duration since stoppage of therapy:
i) 1-2 weeks; ii) 2-4 weeks; iii) 1-3 months; iv) 3-6 months; v) 6-12 months; vi) 1 year

32) Any other kinds of treatment tried for stuttering: i) No; ii) Yes

if yes, Specify:

33) Academic performance at school:
i) Below average; ii) Average; iii) Above average

34) SSI scores: I. Frequency = Duration = PC = Total = Severity =
II. Frequency = Duration = PC = Total = Severity =

Remarks:

Research officer (with date)