# THE INCIDENCE OF DYSPHAGIA IN DIABETIC PATIENTS

A REPORT ON A STUDY SUBMITTED TO

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BY

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Declaration

I hereby declare that this dissertation is my own unaided work. It is submitted to the University of the Witwatersrand for the degree of Master of Arts (by coursework) in Speech Pathology. It has not been submitted before for any other degree or examination in any other university.

LBoolkin

Lauren Boolkin

For Errol, Gidon and Steele

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## ABSTRACT

This study was designed to examine the incidence of dysphagia in a group of fifty diabetic patients. The interrelationship between dysphagia and other complications of diabetes was examined. These included neuropathy, orthostatic dysfunction, renal dysfunction and respiratory disorders. Issues such as type of diabetes, patient age and age of onset were addressed. The utility and sensitivity of an interview schedule devised by the researcher was critically evaluated.

Data were obtained through the administration of a standardized open-ended interview schedule coupled with an examination of the patients' hospital files. Results were interpreted and tabulated by the researcher.

Results revealed that a significant proportion of diabetic patients are experiencing swallowing difficulties within all three phases of the swallow process. It is postulated that the cause of the dysphagia may be due to severe autonomic neuropathy and consequent vagal denervation. The highest incidence of dysphagia appeared to be amongst Type I diabetics who developed diabetes before the age of forty.

The interview schedule was thus able to detect those patients experiencing dysphagia. However it was found to be unsuccessful in determining the severity of the problem.

Clinical implications for both the Speech Therapist and the Medical team are discussed. Suggestions for future research are put forward.

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## AN INTRODUCTORY PERSPECTIVE

When examining the dysphagic patient, the speech pathologist generally expects to identify a local cause. This is, however, not always the case as systemic diseases may result in symptoms of dysphagia. A systemic disease may be defined as a disease process which affects more than one organ or organ system, for example, diabetes (Deron 1994).

Diabetes is a disorder of the pancreas. It is the most common of the serious metabolic diseases. The frequency of occurrence in the general population is difficult to ascertain due to differing standards of diagnosis, but is probably between 2-6 percent (Foster 1980). With regards the South African population no accurate statistics are reported. However, the South African Diabetes Association reports that there are one million diagnosed diabetics and between one to two million undiagnosed diabetic patients. The racial distribution is as follows: 4-5% of whites have diabetes, 10% of urban blacks and coloureds are diabetic, with a lower incidence in the rural areas. Indians have an incidence of diabetes of between 18-23% which is reportedly one of the highest in the world (Leuner 1997). The disease is characterized by a series of hormone-induced metabolic abnormalities, by long term complications, and by a microvascular lesion evident on electron microscopy (Foster 1980).

### 1.1 CLASSIFICATION OF DIABETIC PATIENTS

Diabetics have traditionally been classified into juvenile (Type I) and maturity onset (Type II) types. According to Leuner (1997) approximately 15% of diabetics in South Africa are Type I diabetics, whereas 85% are Type II diabetics. Juvenile, or insulin

dependent diabetes usually has its onset before 40 years of age. The onset of symptoms may be sudden, with thirst, excessive urination, increased appetite and weight loss occurring. Juvenile patients are generally not overweight, and may in fact evidence wasting depending on how quickly the disease is diagnosed. Maturity onset diabetes, as the term implies, usually begins in middle life or beyond. These patients are generally obese. Symptoms tend to have a more gradual onset, and often if weight loss is induced, symptoms subside. It must be acknowledged that this classification is a generalization because overlap syndromes do occur. An example of this would be a 40 year old who develops insulin dependent diabetes (Foster 1 30)

Nonetheless the metabolic abnormalities appear to be caused by relative or absolute insulin deficiency together with an excess or relative excess of glucagon (Foster 1980). Patients with Type I diabetes present with malaise, fatigue, weight loss, polyuria, polydipsia, infection and sometimes coma or precoma. The cause is unknown, but is thought to be multifactorial involving a genetic predisposition , and possibly viral infection, for example, mumps. Diabetes is often asymptomatic and is detected by routine urine testing (Rubenstein and Wayne 1985).

## 1.2 COMPLICATIONS OF DIABETES

The diabetic patient is susceptible to a series of complications. Some patients may never develop complications, whereas others develop complications early soon after diagnosis. Patients may experience only one or several complications. These include circulatory abnormalities, retinopathy, nephropathy and neuropathy.

Circulatory abnormalities manifest as arteriosclerosis. Thus, coronary artery disease and stroke are common. Diabetes may also be associated with cardiomyopathy, wherein heart failure occurs in the face of angiographically normal arteries.

Nephropathy appears in some cases to be related to these circulatory abnormalities in that arteriosclerosis of the efferent and afferent arterioles, and of the renal artery results in impaired kidney functioning. Although Speech Pathologists may view kidney functioning as beyond their realm, the dysphagia therapist needs to know that protein restriction, fluid maintenance and alkalization may be used as a treatment method in less severe cases. In such cases the clinician should be careful when introducing different food types.

As retinopathies appear to be beyond the scope of this discussion no details of this condition have been provided. Diabetic neuropathy may affect every part of the nervous system, with the exception of the brain. Distinct syndromes may be recognized, and often a patient will evidence several different types of neuropathy. The most common form of neuropathy is peripheral polyneuropathy which is usually bilateral. Symptoms include numbness, parathesias, severe hyperesthesias and pain. The pain is usually more severe at night. Mononeuropathy may also occur. This is characterized by a sudden wrist drop, foot drop, or paralysis of the third, fourth or sixth cranial nerves. The recurrent laryngeal nerve may also be involved. Mononeuropathy is characterized by spontaneous and quick recovery.

Autonomic neuropathy may present in numerous ways with the gastrointestinal tract being the primary target. Patients may complain of dysphagia, oesophageal dysfunction

and/or diarrhoea (Foster 1980). According to Adams and Asbury (1980) only 15% of patients with diabetes have both symptoms and signs of neuropathy, but more than 50% either complain of neuropathic symptoms or demonstrate slowing of nerve conduction velocity. Orthostatic dysfunction occurs as a result of autonomic neuropathy. It may be defined as a change in blood pressure due to the activation of the autonomic nervous system on change of posture (Stedman 1979).

A number of clinical diabetic syndromes have been delineated and described in the literature. Paralysis of the IIIrd, IVth, Vth or Xth cranial nerves may occur (Foster 1980).This has implications with regards to the swallow process in that both cranial nerves V and X are involved in the swallow process ( Castell and Donner 1987). In fact, the Xth cranial nerve has been implicated as the cause of dysphagia in diabetic patients (Borgstrom et al 1988).

In order to fully understand the roles played by the cranial nerves in the swallow process, the physiology of swallowing will be discussed prior to the anatomy of swallowing.

## 1.3 THE PHYSIOLOGY OF SWALLOWING

Swallowing has traditionally been divided into four phases: The oral preparatory phase, the oral phase, the pharyngeal phase and the oesophageal phase. It should however be remembered that although segmented, as in Figure 1, for the process of analysis, swallowing is in fact a simultaneous process rather than a sequential one.

primary contraction wave. Internal factors include age, respiratory functioning, laryngeal functioning and general physical and mental health.

*Lateral view of bolus propulsion during the swallow, beginning with the voluntary initiation of the swallow by the tongue (a); the triggering of the swallowing reflex (b); the bolus passage through the pharynx (c); the entry of the bolus through the cricopharyngeal sphincter into the cervical esophagus (d); and the completion of the pharyngeal stage of the swallow when the entire bolus is in the cervical esophagus (e).*

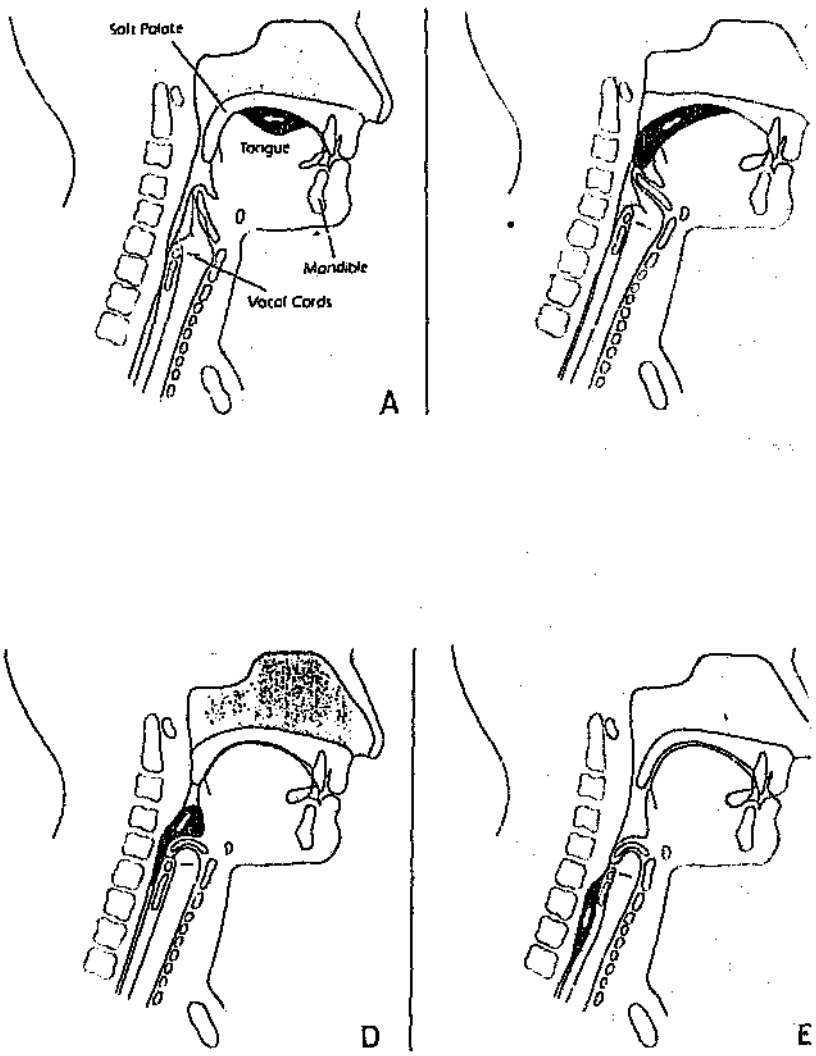



**Figure 1: Lateral view of bolus propulsion during the swallow**

**(After Logemann 1983 p22)**

During the oral preparatory phase food is manipulated in the mouth and masticated. The oral (voluntary) phase involves the propulsion of the bolus posteriorly by the tongue until the swallow response is triggered. Figure 1A illustrates this stage. The pharyngeal phase begins with this response, and ends when food reaches the upper oesophageal sphincter when the oesophageal phase is initiated (Logemann 1983). Figure 1B shows the passage of the bolus through the pharynx. Figures 1C and 1D depict the entry of the bolus into the cervical oesophagus through the upper oesophageal sphincter. Finally Figure 1E shows the completion of the pharyngeal phase and the beginning of the oesophageal phase (Logemann 1983).

Swallowing physiology is affected by both external and internal factors. External factors would include food type and temperature. Chi- Fishman et al (1994) have shown that cold thermal stimuli can even affect events occurring later than the oral phase of the swallow. For example, it is known that ingesting cold liquids can cause dilatation of the oesophagus, reduce or abolish primary peristalsis and prolong the primary contraction wave.

Internal factors include age, respiratory functioning, laryngeal functioning and general physical and mental health. Aging appears to affect some aspects of the swallow while others are preserved. Logemann 1990 and Ward et al 1989 discuss three effects of aging on swallowing. The primary effect is the result of the aging process itself, the secondary effect is the result of disease and the tertiary effect is related to environmental and psychosocial factors.

Martin et al 1994 report on the interdependence between the upper respiratory and digestive systems. They state that breathing and swallowing functions are well coordinated in the healthy adult and that this coordination is most evident at the laryngeal level. An open larynx is required to ensure effortless breathing at rest, however the prevention of aspiration during swallowing is dependent upon a sealed larynx at the level of the glottis. Hence, the notion that swallowing physiology is dependent upon adequate laryngeal functioning.

## 1.4 THE ANATOMY AND NEUROLOGY OF SWALLOWING IN RELATION TO DIABETIC NEUROPATHY

As previously mentioned cranial nerves V and X are involved in the swallow process. The course and function of these nerves will therefore be discussed in detail. As may be seen from Figure 2 The efferent portion of the Vth cranial nerve controls the muscles of mastication and the afferent portion supplies sensation to the anterior 2/3 of the tongue (Perlman 1991). Sensory input with regards the locus of the bolus in the mouth is relayed to the brain via the afferent portion of the Vth cranial nerve. The efferent portion of this nerve controls both chewing and the elevation of the larynx thus preventing aspiration. The Xth cranial nerve drives 2 systems, namely, smooth muscles and glands. It thus has a function within the autonomic system (Love and Webb 1992).

FIGURE 7-4 The neurology of swallowing

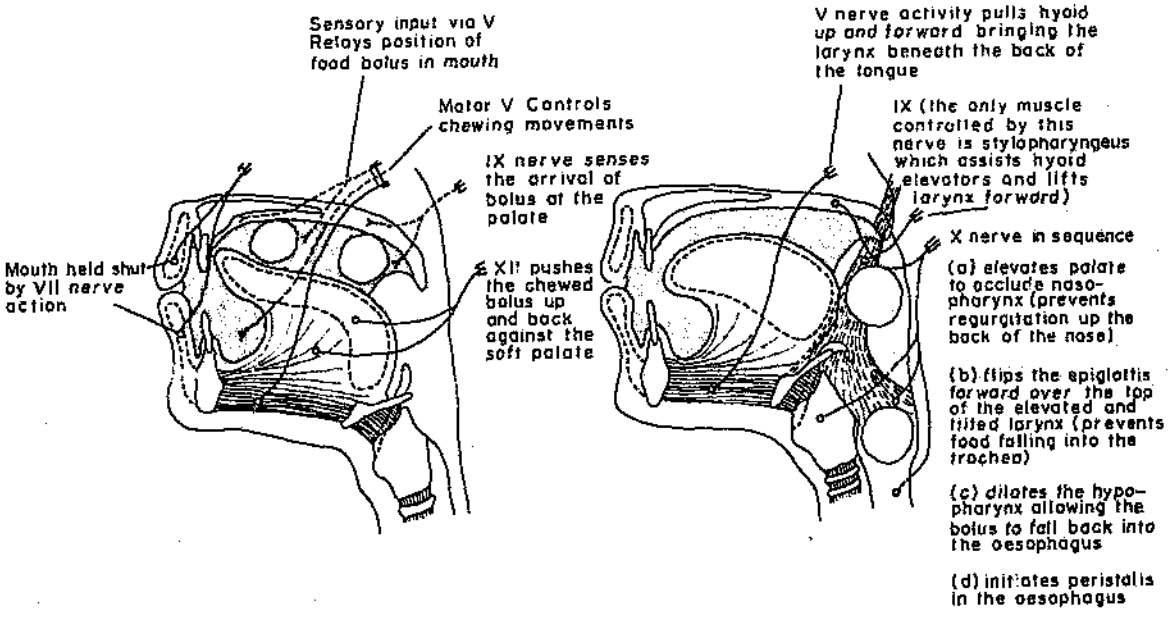



**Figure 7-4** The neurology of swallowing. Source: Redrawn and reproduced with permission from I. Patten, *Neurologic Differential Diagnosis* (London: H. Starke, Ltd., 1977).

**Figure 2: The Neurology of Swallowing**

**(After Love and Webb 1992 p131)**

Due to its important role within the swallow process, the course of the Xth cranial nerve will be described. This nerve is comprised of three nuclei: the nucleus ambiguus, the dorsal nucleus and the nucleus of the tractus solitarius. These are located in the medulla. The nucleus ambiguus has a pharyngeal and a laryngeal branch. Figure 3 partially illustrates the course of the Vagus nerve, and particularly illustrates the course of the recurrent laryngeal branch. The laryngeal branch gives rise to the recurrent laryngeal nerve. The right recurrent laryngeal nerve forms a loop behind the common carotid and subclavian arteries. The left recurrent laryngeal nerve leaves the Vagus at the lower level and loops under and behind the aortic arch. It ascends to the larynx between the trachea and oesophagus and enters through the cricothyroid membrane

(See Figure 2) (Love and Webb 1992). Nucleus ambiguus receives corticobulbar fibres from both hemispheres that are efferent to the pharyngeal constrictor muscles, and the intrinsic muscles of the larynx. The efferent fibres of the parasympathetic nucleus innervate the involuntary muscles of the bronchi, oesophagus, heart stomach, small intestine and a section of the large intestine. The Vagus nerve has an efferent branch which supplies the heart, respiratory system , and most of the digestive system. It supplies the pharyngeal constrictors together with the Glossopharyngeal (IXth cranial nerve) and innervates the intrinsic laryngeal muscles through the recurrent laryngeal branch. More specifically as Figure 2 exemplifies, the Xth cranial nerve: elevates the palate to close off the nasopharynx; tilts the epiglottis over the larynx to prevent food from entering the trachea; dilates the hypopharynx as previously mentioned and initiates peristalsis. (Love and Webb 1992)

The Glossopharyngeal nerve is also responsible for innervating Stylopharyngeus, which elevates the larynx and thus contributes to the opening of Cricopharyngeus, it is also thought to be the primary afferent of the swallow response, with the Vagus being the secondary afferent (Armstrong and Netterville 1995). Should aspiration occur, the cough reflex is induced by an irritation of the afferent portion of the Glossopharyngeal nerve together with the sensory endings of the Vagus (Love and Webb 1992)

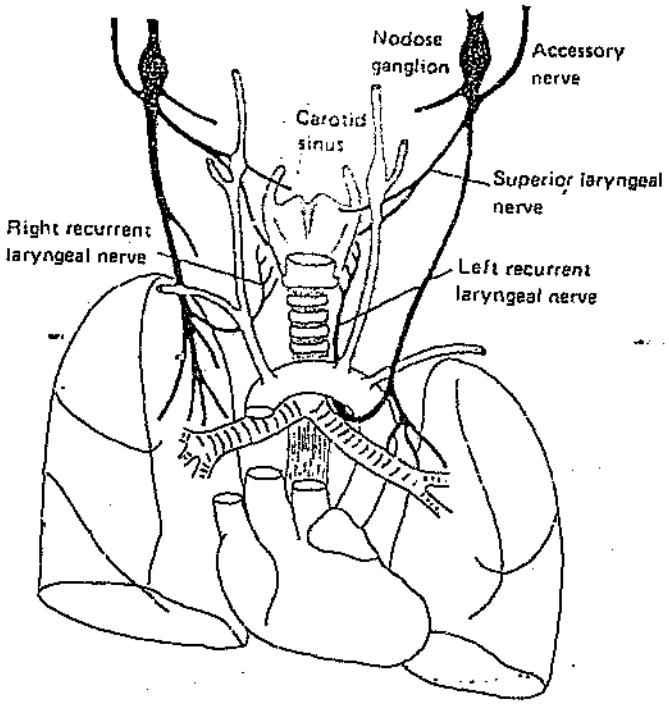



**Figure 3: Schematic of Partial Distribution of the Vagus Nerve, Showing the Course of the Recurrent Laryngeal Branch**

**After Zemlin 1981 p482**

The autonomic nervous system innervates involuntary structures. such as the heart, the smooth muscles, and the glands. It is distributed throughout both the central nervous system and the parasympathetic nervous system, and is thus comprised of two parts (sympathetic and parasympathetic). These two parts have antagonistic functions, the sympathetic system, otherwise termed the fight-or-flight system is responsible for preparatory measures, for example: accelerating the heart rate, or decreasing oesophageal peristalsis. It also closes the upper oesophageal sphincter.

The parasympathetic branch has an almost opposite calming effect on bodily function. Its role is to conserve and restore energy by slowing the heart rate, increasing intestinal peristalsis and opening the sphincters. As a consequence of parasympathetic action, other functions, for example, increased salivation and increased secretion of glands of the gastrointestinal tract may occur. Both the sympathetic and parasympathetic system work together with the endocrine system to maintain the stability of the body's internal environment. The endocrine system includes such organs as the pancreas, the pineal gland, the pituitary gland, the thyroid, the gonads and the adrenal glands (Love and Webb 1992).

## 1.5 PREVIOUS RESEARCH

In recent years there has been an interest in diabetic autonomic neuropathy, although postural and sexual disturbances are reported to have predominated in the literature. Difficulties in swallowing are also autonomic neuropathy symptoms, although very little coverage has been granted to them. Ippoliti (1983) states that motility disturbances of the pharynx and oesophagus are common in diabetics with autonomic neuropathy. The usual findings are a decrease in the amplitude of oesophageal contractions in the smooth muscle portion of the body, frequent absence of primary peristalsis, simultaneous or repetitive body contractions, and decrease in the velocity of peristalsis. These changes are reported to be asymptomatic. The smooth muscle portions are affected, because, as previously stated they are controlled by the autonomic nervous system.

Russell et al (1983) conducted a study which exemplifies the asymptomatic nature of these smooth muscle changes. They tested oesophageal motor function in twelve

patients with a clinical diagnosis of diabetic gastroenteropathy. Other insulin dependent diabetics with and without symptoms of gastrointestinal disease were also studied. Half the patients in the first group were found to have abnormal oesophageal function, even though only five had oesophageal symptoms. Half of the patients with neuropathy and one quarter of those with no neuropathy had abnormal oesophageal transit times. Thus, Russell et al (1983) conclude that oesophageal dysfunction is present in almost all patients with suspected diabetic gastroenteropathy. Table1 summarizes the results of Russell et al's (1983) study.

Table 1: Summary of the results obtained by Russell et al (1983) illustrating the asymptomatic nature of the smooth muscle changes in the oesophagus

| **Patients with diabetic gastroenteropathy** | **Insulin dependent diabetics with neuropathy but no gastrointestinal disease** | **Insulin dependent diabetics without neuropathy but no gastrointestinal disease** |
|---|---|---|
| 11/12 had abnormal oesophageal function (Only 5 were symptomatic) | ½ had abnormal oesophageal transit times | ¼ had abnormal oesophageal transit times |

Murakami et al (1982), describe a case of a 62 year old man with 11 years' duration of Type II diabetes mellitus, who was hospitalized due to a non-ketotic diabetic coma. No symptoms of dysphagia were reported by the patient until 3 days prior to his admission when they gradually developed, and he became comatose. Following his recovery from the coma, symptoms subsided within 2 weeks, and the dysphagia was attributed to autonomic nervous system dysfunction which reportedly impaired the motility of the pharynx and oesophagus. Decreased pharyngeal and oesophageal motility as a result of diabetes has also been discussed by Hannig and Wuttge-Hannig (1987).

Borgstrom et al (1988), describe a study in which pharyngeal and oesophageal function was monitored in 18 diabetic patients using cine and videofluoroscopic radiography. All 18 of their patients complained of swallowing difficulties, combined with a feeling of obstruction. Cineradiographs were analyzed retrospectively for pharyngeal function. Areas looked at included epiglottic movement, closure of the laryngeal vestibule, pharyngeal constrictor peristalsis, motor function of the pharyngo-oesophageal segment, including the Cricopharyngeus muscle, as well as the presence of webs or diverticulae. Results revealed that of the 14 patients with pharyngeal dysfunction, 4 patients showed defective epiglottic motility, nine patients had defective closure of the laryngeal vestibule, five patients had paresis of the pharyngeal constrictors, 4 patients had defective opening of the upper oesophageal sphincter, 7 patients had more than one pharyngeal abnormality, and 2 patients presented with cervical oesophageal webs. No correlation was reported between the duration of the diabetes and the degree of dysfunction, although older patients presented with more severe pharyngeal dysfunction than did the younger patients.

With regards to the disturbances of coordinated motor activity vagal denervation as a probable etiology is discussed. In fact, reports of histological evidence of vagal denervation are cited. In view of the anatomical and neurological information provided above, this would appear to be a likely occurrence.

## 1.6 DIAGNOSTIC TECHNIQUES

A number of instrumental techniques are used to define the stages of the swallow process The most common include radiographic procedures, manometry, electromyography and auscultation. Videofluoroscopy is a videotaped recording of the

movement patterns of the bolus, and of the structures involved in deglutition. It allows the examiner to analyze the film frame by frame, in slow motion. This is particularly useful as swallowing occurs very rapidly, with normal oral and pharyngeal transit times each lasting approximately one second (Logemann 1983). Auditory information can also be recorded. Manometry examines the pattern of the peristaltic pressure waves during deglutition. The patient is required to swallow three pressure sensitive tubes. These are positioned at the level of the Cricopharyngeus, within the oesophagus, and at the level of the lower oesophageal sphincter. Electromyography (EMG) measures the electrical activity of the pharyngeal constrictors during deglutition. With regards to auscultation, a stethoscope is placed on the patient's neck, and the sounds produced during deglutition are evaluated and interpreted by the examiner.

Some of these techniques are not yet available to the South African clinician, and those that are place a financial burden on the patient. Thus, despite the fact that clinicians frequently look to quantitative diagnostic measures, the utility and necessity of the bedside evaluation as the first step in the diagnostic procedure should not be overlooked (Castell and Donner 1987). In fact, Logemann (1983) has reported that during radiographic studies of swallowing disorders, the patient's perception of the locus of the swallowing disorder accurately matched the radiographic findings in 99.2% of cases.

Obviously, the accuracy of this diagnostic measure would be dependent on the skill of the clinician. Jones and Donner (1989) emphasize that the examination of the dysphagic patient is dependent on meticulous attention to the examination itself, and an in depth knowledge of the normal and abnormal anatomy and physiology of

swallowing. Emphasis is also placed on the fact that each patient is different, and thus the examination should be tailored to the specific needs of the patient. A bedside evaluation allows the clinician to do this.

## 1.7 RATIONALE FOR THE STUDY

It is felt that the paucity of literature regarding dysphagia within the diabetic population, justifies a more in depth investigation into this area. Furthermore, as previously mentioned, a number of patients have been reported to evidence no symptoms of oesophageal dysfunction, but, were still found to have abnormal transit times (Russell et al 1983). The implication of this as far as this study is concerned is that, these patients may also evidence delayed onset of the swallow response, as well as slower pharyngeal peristalsis. Furthermore, the fact that certain of the patients in the Borgstrom (1988) study evidenced defective laryngeal closure justifies an investigation, as aspiration in diabetic patients who are already more susceptible to infection should be considered particularly hazardous.

# METHODOLOGY

This section describes the aims as well as the subject selection criteria. The materials used and the method of analysis employed are presented.

## 2.1 AIMS

The purpose of this research is to determine whether patients, already diagnosed with diabetes, are experiencing swallowing difficulties. More specifically the aims of this study are:

2.1.1 To examine the nature of these swallowing problems and to relate them to four predetermined complications of diabetes.

2.1.2 To determine whether a relationship exists between the type of diabetes and the presence of dysphagia.

2.1.2.1 To determine whether there is a relationship between the type of diabetes, dysphagia and four predetermined complications of diabetes.

2.1.3 To detect interesting trends within the data in order to establish a hypothesis. Coolican (1993) terms this grounded theory and defines it as a form of qualitative research which is used in new fields in order to establish additional research hypotheses.

2.1.4 To determine the sensitivity of a devised interview protocol as a means of detecting and diagnosing dysphagia.

*" The careful taking of a concise history of the patient's symptoms and related abnormalities can usually be helpful in the approach to this problem and can lead to a strong suspicion of a diagnosis in the majority of these cases."*

( Castell and Donner 1987 p70)

## 2.2 SUBJECTS

### 2.2.1 SUBJECT SELECTION CRITERIA

Subjects selected were either Type I or Type II diabetics in order to attempt to determine whether the type of diabetes determines dysphagia. As Borgstrom et al (1988) found no correlation between the duration of the illness and the degree of dysfunction, duration was not considered in the selection but was noted in an attempt to determine whether this factor would affect the swallowing process. Subjects were between 19-74 years of age in order to differentiate between the effects of aging on the

swallow process and the effects of the disease process (Sheth and Diner 1988). Subject selection was not dependent on race, and thus no attempt was made to obtain representative samples from the different racial groups. All subjects were able to speak English. This was determined by conversing informally with the subjects prior to the administration of the questionnaire. Thus the interview schedule was administered by the researcher in all cases.

### 2.2.2 SAMPLE SIZE

Fifty consecutive patients already diagnosed with diabetes, who attend the outpatient clinic at the Johannesburg Hospital were interviewed. Nineteen of these cases were patients who were already diagnosed with neuropathies. This was done to enable the researcher to determine whether dysphagia exists only in diabetic patients with neuropathies, or in all diabetic patients. Ethical clearance was sought and obtained from the committee for Research on Human Subjects.

## 2.3 MATERIALS

The interview took the form of a standardized open-ended interview as described by Patton (1980). In this context it appears as if Patton (1980) adopts the term standardized as meaning that the same questions should be asked of all subjects in the same order. Thus, this format is different to a purely open ended format in which questions are not preplanned. The interview was coupled with a brief evaluation of laryngeal functioning. An attempt was made to ask only singular questions as multiple questions may create tension and confusion because the interviewee does not really know what is being asked (Patton 1980).

Subjects were asked to answer the questions as accurately as possible. An information sheet was given to all subjects prior to the interview. The fact that subjects were told to discuss aspects of the questionnaire while the interview was in progress makes the interview an open ended one (See Appendix C).

Patton (1980) suggests three reasons for the utilization of the standardized open ended approach:

a) The exact instrument utilized in the assessment is available for inspection by decision makers and information users.
b) Variation among interviewers can be minimized where a number of different interviewers are used.
c) The interview is highly focused, thus reducing administration time.

A limitation of this approach is that it does not permit the researcher to pursue issues that were not anticipated when the questionnaire was devised. In addition, constraints are placed on the use of different lines of questioning with different individuals based on their unique experiences (Patton 1980) (See Appendix 1)

Based on the literature (Logemann 1983; Castell and Donner 1987) as well as on the results of a pilot study conducted by the researcher at an outpatient diabetic clinic at the Johannesburg Hospital, questions were devised to tap the following specific content areas: locus of swallowing difficulty (oral, pharyngeal or oesophageal) and difficulties with the type and temperature of the food (Chi-Fishman etal 1994). In addition a brief evaluation of laryngeal functioning was included in order to supplement information provided by the subjects.

Four complications of diabetes were selected as possibly having a relationship to swallowing. The selection was based on the literature (Borgstrom et al 1988; Rubenstein and Wayne 1985) and on the abovementioned pilot study. These were:

a) The presence of neuropathy.

b) The presence of orthostatic dysfunction (Borgstrom et al 1988).

c) The presence of renal dysfunction, such as proteinuria, which is reportedly a marker of more severe complications (Kalk 1997).

d) The presence of respiratory problems, for example Rubenstein and Wayne (1985) report that diabetics frequently cough due to chronic bronchitis. The link between this and possible aspiration cannot be ignored.

Although self report measures introduce a degree of subjectivity into the study, ethical considerations would preclude the use of a more invasive method of analysis such as Videofluoroscopy. Furthermore, due to the lack of data available with regards to swallowing and diabetes it is felt that a preliminary investigation such as this one is justified.

## 2.4 RESEARCH DESIGN

*"... in descriptive research, the goal of the investigation tends to be the careful mapping out of a situation or a set of events. The research objective is to describe what is happening behaviorally. Causal explanations are not of direct concern except perhaps speculatively."*

(Rosner and Rosenthal 1996 p15)

The present study was quasi-experimental and descriptive in nature in an attempt to establish a hypothesis.

## 2.5 ANALYSIS AND PRESENTATION OF RESULTS

Results were interpreted and tabulated by the researcher. Data were analysed by attempting to relate the presence or absence of dysphagia with neuropathy, orthostatic dysfunction, renal dysfunction and respiratory dysfunction. The type of dysphagia was also tabulated in relation to the abovementioned four categories.

A chi squared test was performed in order to test the relation between the different variables by assessing the discrepancy between the expected frequency of occurrence, and the obtained frequency of occurrence (Rosner and Rosenthal 1996). Fisher's Exact Test was utilized when the cell size precluded the use of a chi squared ratio (Rosner and Rosenthal 1996). A 10% level of significance was accepted throughout due to the exploratory nature of this study (Silverman 1993).

> *"You can be as stringent as you like in setting a rejection criterion, but you may eventually pay for this decision by rejecting what you perhaps should not."*
>
> (Rosner and Rosenthal 1996 p251)

Pie charts, tables and Venn diagrams were utilized to simplify and summarize the results.

## RESEARCH RESULTS AND DISCUSSION

In this section the findings obtained from the administration of the questionnaire will be presented. The aims discussed within the methodology form the basis for the discussion which ensues. Due to the repetitive nature of the data diagrams have been used to summarize the results. Thus, the reader is requested to consult these diagrams in order to obtain a full understanding of the issues at hand.

*"It is often said that a good picture is worth a thousand words"*

(Rosner and Rosenthal 1996 p214)

### 3.1 TO DETERMINE WHETHER PATIENTS ALREADY DIAGNOSED WITH DIABETES ARE EXPERIENCING SWALLOWING DIFFICULTIES

Fifty diabetic patients were interviewed. One interview schedule was discarded due to the fact that the subject has also been diagnosed with motor neurone disease.
Of the remaining subjects, 17 were male and 32 were female. Subjects ranged in age from 19-74 years, with a median age of 41years. Thirty (61.2%) of the subjects reported swallowing difficulties. The relationship between swallowing and diabetes was significant at the 10% level ( value =1,656).

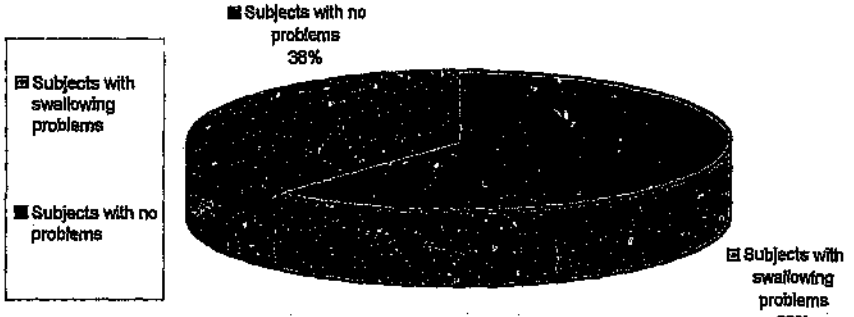



**Figure 4: A Pie Chart illustrating the Percentage of Diabetic Patients Experiencing Swallowing Difficulties**

### 3.1.1 THE NATURE OF THE SWALLOWING DIFFICULTIES AND THEIR RELATIONSHIP WITH OTHER COMPLICATIONS OF DIABETES

As is evident from Figures 5 and 6, swallowing difficulties appear to occur predominantly during the pharyngeal and oesophageal phases of the swallow process. Figure 5 illustrates the percentage of subjects experiencing dysphagia within each of the different phases of the swallowing process. As percentages may be deceiving, Figure 6 has been included to illustrate the actual numbers. As is clear from both the pie chart and the later Venn diagram (Figures 5 and 6), there is an overlap between each of the different phases of the swallowing process.

As previously mentioned swallowing difficulties appear to occur predominantly during the pharyngeal and oesophageal phases. The reasons for this occurrence can be clarified by an examination of the relationship between dysphagia and other complications of diabetes. Each of the four complications will be discussed individually.

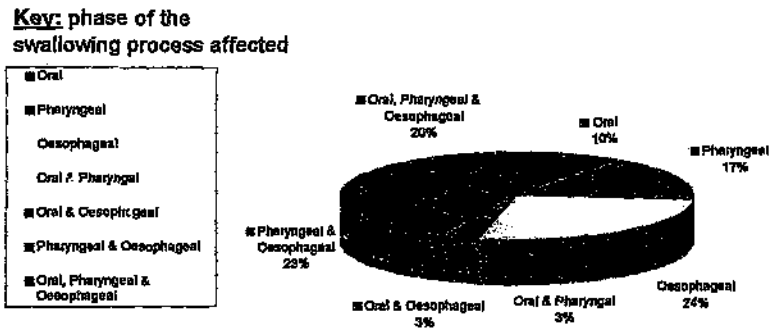



Figure 5: Distribution of Swallowing Problems

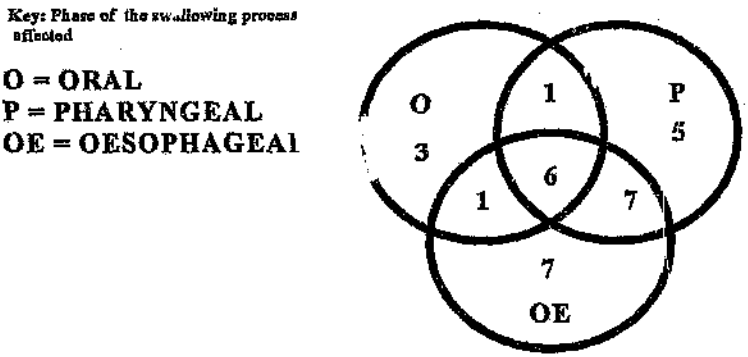



**Figure 6: The Distribution of Swallowing Problems by number**

3.1.1.1 NEUROPATHY

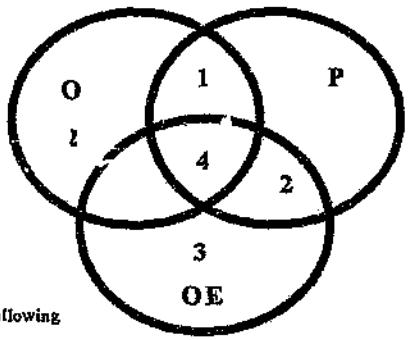
Nineteen of the forty nine subjects were reported to have diabetic neuropathy. Of these subjects twelve reported dysphagia. Figure 7 demonstrates the prevalence of swallowing problems within each of the phases of the swallow process. It is evident from this figure that four subjects experienced swallowing difficulties during all three phases of the swallowing process and that three subjects experienced swallowing difficulties during the oesophageal phase only. The relationship between diabetic neuropathy and swallowing was significant at the 10% level ( value = 0.049). The

reason for this may be attributable to vagal denervation which may occur in cases of severe neuropathy (Westin et al 1986).

Anatomically, the nucleus ambiguus innervates the pharynx and the nucleus dorsalis innervates the oesophagus. A split de-ervation would explain why patients report both pharyngeal and oesophageal phase symptoms (Borgstrom et al 1988). Table 2 may be used to compare the prevalence of swallowing disorders during each phase of the swallowing process. It also allows for a comparison between each of the four complications of diabetes.

Table 2: The number of subjects experiencing dysphagia within each of the four complications of diabetes.

| Phase of the swallowing process affected | Neuropathy (n=19) | Renal Dysfunction (n=5) | Orthostatic Dysfunction (n=11) | Respiratory Dysfunction (n=7) |
|---|---|---|---|---|
| Oral | 2 | | | |
| Pharyngeal | | | 3 | 1 |
| Oesophageal | 3 | 1 | 2 | 2 |
| Oral & Pharyngeal | 1 | 1 | 1 | |
| Oral & Oesophageal | | | 1 | |
| Pharyngeal & Oesophageal | 2 | 1 | | |
| Oral, Pharyngeal & Oesophageal | 4 | 1 | 2 | 2 |
| Total | 12 | 4 | 9 | 5 |




Key: Phase of the swallowing process affected

**O = ORAL**
**P = PHARYNGEAL**
**OE = OESOPHAGEAL**

**Figure 7: Number of subjects with diabetic neuropathy experiencing dysphagia during the oral and / or pharyngeal and/or oesophageal phases of the swallowing process**

### 3.1.1.2 RENAL DYSFUNCTION

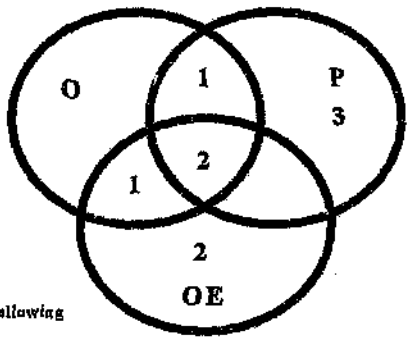
Five of the forty nine subjects were reported to have renal dysfunction. Of these subjects four reported dysphagia. Table 2 reveals that problems lay within all three phases of the swallowing process. There was no statistical relationship between swallowing difficulties and renal dysfunction (value = 0,827). However, an evaluation of the numbers given in Table 2 suggests that both dysphagia and renal functioning are linked to the severity of the diabetes. The writer postulates that the lack of relationship may be due to the fact that cranial nerve lesions, specifically with regards to the Vagus nerve, are reportedly not responsible for diabetic nephropathy.

Rather, severe diabetes is reported to result in lesions within the kidneys which affect their structure and functioning. These lesions result in proteinuria which in some cases may precede the clinical appearance of diabetes (Glassock and Brenner 1980). This

reinforces the notion that dysphagia and renal dysfunction are indicators of the severity of the diabetic condition.

### 3.1.1.3 ORTHOSTATIC DYSFUNCTION

Eleven Subjects were reported to have orthostatic dysfunction. Of these subjects, nine reported swallowing difficulties. The relationship between orthostatic dysfunction and swallowing was significant at the 10% level (value = 2,534). Figure 8 depicts the phases of the swallow process which have been affected by orthostatic dysfunction. It is evident from this figure that swallowing problems occurred predominantly during the pharyngeal and oesophageal phases, with four out of eleven subjects evidencing dysphagia during all three phases. No purely oral phase difficulties were evident. These results are similar to those obtained by Borgstrom et al (1988), who attribute the strong correlation between swallowing dysfunction and orthostatic dysfunction found in their study to an advanced degree of neuropathy (See Table 4). This appears to be a reasonable assumption in that anatomically the sympathetic nervous system does not appear to influence pharyngeal functioning (Love and Webb 1992).




Key: Phase of the swallowing process affected

**O = ORAL**
**P = PHARYNGEAL**
**OE = OESOPHAGEAL**

**Figure 8: Number of subjects with Orthostatic Dysfunction experiencing dysphagia during the oral and/ or pharyngeal and/ or oesophageal phases of the swallowing process**

### 3.1.1.4 RESPIRATORY DYSFUNCTION

Seven subjects were reported to have respiratory dysfunction. Of these subjects five reported dysphagia. The relationship between respiratory functioning and swallowing was statistically significant (Fisher's Exact Test, 2 tail p=0,691). Table 2 illustrates the phase of the swallowing process affected. It is apparent from the table that the pharyngeal and oesophageal phases have been affected rather than the oral phase.

It is apparent that once again this area does not exist in isolation, but is related to both orthostatic functioning (Martin et al 1994) and consequently the integrity of the Vagus Nerve. Nonetheless, since disorders of respiration and swallowing occur together and because of the neurophysiological, structural and functional interdependence between the upper respiratory tract and the digestive system (Martin et al 1994) the omission of

this area within an assessment may prevent the clinician from obtaining valuable information.

### 3.1.2 THE RELATIONSHIP BETWEEN THE TYPE OF DIABETES AND THE PRESENCE OF DYSPHAGIA

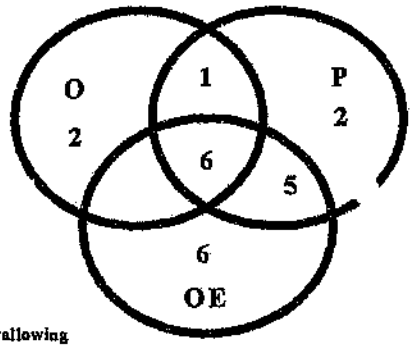
Thirty one subjects (63,2%) had Type I diabetes and eighteen subjects (36,7%) had Type II diabetes. Of the former group twenty two subjects (70,9%) reported swallowing problems. Figure 9 depicts the distribution of swallowing problems within this group. With regards the subjects with Type II diabetes, eight subjects reported difficulty swallowing (44.4%) (See Figure 10). Both Figures 9 and 10 as well as Table3 illustrate the phase of breakdown as well as the fact that dysphagia is more common amongst Type I diabetics. Table 3 appears to show a different pattern for Type I and Type II diabetics. Type II patients show more difficulties during the oral and pharyngeal phases whereas Type I patients have more oesophageal phase problems.

The writer postulates that this may be due to the fact that Type II patients are on the whole older than Type I patients and it appears from the literature that the oropharyngeal stage of the swallow is more affected by age than the oesophageal phase (Logemann et al 1990: Robbins et al 1992 and Robbins 1995). It is interesting to note at this point that Sonies (1992) views the issue of aging and swallowing from a different perspective in that she regards dysphagia in the elderly as a manifestation of a pathologic condition rather than an effect of the normal aging process. The reason given for this viewpoint is that despite changes in muscular tension, response speed, taste and smell, the physiology of the swallow process does not alter. A perusal of

other literature in the field supports this supposition. For example, although Tracy et al 1989; Cook et al (1994) and Sheth and Diner (1988) all state that aging in itself can cause dysphagia, an analysis of their writings clearly points to underlying systemic disease. For example, arthritis may result in changes in the cricoarytenoid joint thus affecting laryngeal closure. It may be concluded then, that the aging process may result in a slowing down of the swallow. However, the actual physiologic process appears to remain the same unless affected by a disease process.

Table 3: A Comparison of the phases of breakdown in Type I and Type II diabetics

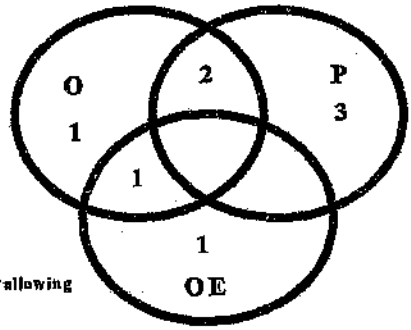
| **Phase of the swallowing process affected** | **Type I Diabetics (n=31)** | **Type II Diabetics (n=18)** |
|---|---|---|
| Oral | 2 | 2 |
| Pharyngeal | 2 | 3 |
| Oesophageal | 6 | 1 |
| Oral & Pharyngeal | 1 | 2 |
| Oral & Oesophageal | | |
| Pharyngeal & Oesophageal | 5 | |
| Oral, Pharyngeal & Oesophageal | 6 | |
| **Total** | **22 = 70.9%** | **8 = 44.4%** |




Key: Phase of the Swallowing Process Affected

O = ORAL
P = PHARYNGEAL
OE = OESOPHAGEAL

Figure 9: The Numerical Distribution of swallowing problems in patients with Type I diabetes




Key: Phase of the swallowing process affected

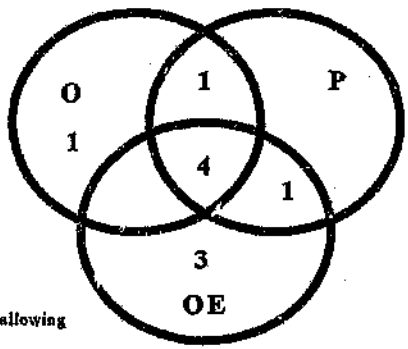
O = ORAL
P = PHARYNGEAL
OE = OESOPHAGEAL

Figure 10: The Numerical Distribution of swallowing Problems in Patients with Type II diabetes

As in the previous section, each of the four complications will again be discussed individually in relation to the type of diabetes. Although there appeared to be a higher incidence of swallowing problems within the Type I population, a number of patients with Type II diabetes also reported swallowing problems.

3.1.2.1 NEUROPATHY

Fourteen subjects with Type I diabetes had neuropathy, and five subjects with Type II diabetes had neuropathy. (See Table 4). Of the Type I diabetics with neuropathy ten subjects reported swallowing difficulties. This relationship was significant at the 10% level (value=3,434). Figure 11 shows the distribution of swallowing difficulties amongst these patients. Oesophageal phase problems appear to be the most common area of breakdown. Of the subjects with Type II diabetes and neuropathy two subjects reported swallowing difficulties. This finding is supported by the findings of Borgstrom et al (1988) who state that a swallowing problem is a symptom of diabetic neuropathy.




Key: Phase of the swallowing process affected

**O = ORAL**
**P = PHARYNGEAL**
**OE = OESOPHAGEAL**

**Figure 11: The Number of Subjects with Type I diabetes and neuropathy experiencing dysphagia at the oral and/pharyngeal and/oesophageal phases of the swallowing process**

3.1.2.2 RENAL DYSFUNCTION

Four subjects with Type I diabetes had renal dysfunction, and one subject with Type II diabetes had renal dysfunction. Of the Type I diabetics with renal dysfunction all four subjects reported swallowing difficulties (See Table 3). The subject with Type II diabetes and renal dysfunction did not report a swallowing problem. This finding may appear to contrast on the surface with the notion discussed in the previous section that renal involvement is not caused by neural involvement. However, if one views nephropathy and proteinuria as a marker of severity (Kalk 1996), it would be reasonable to postulate that in severe cases of diabetes, Vagal denervation may occur and hence the patient could present with swallowing problems.

3.1.2.3 ORTHOSTATIC DYSFUNCTION

Seven subjects with Type I diabetes had orthostatic dysfunction, and four subjects with Type II diabetes had orthostatic dysfunction. Of the Type I diabetics with orthostatic dysfunction five subjects reported swallowing difficulties. This relationship was significant at the 10% level (value = 5,398). Three subjects with Type II diabetes and orthostatic dysfunction reported swallowing difficulties. From the percentages given in Table 4 it is evident that the type of diabetes does not appear to have an overt relationship to dysphagia. The reason for this group being different is unclear.

Table 4: The number of Type I and Type II Diabetics exhibiting dysphagia and other complications of Diabetes

| | Type I | Type II |
|---|---|---|
| Neuropathy | 10 / 14 (71.4%) | 2 / 5 (40%) |
| Renal Dysfunction | 4 / 4 (100%) | 0 / 1 (0%) |
| Orthostatic Dysfunction | 5 / 7 (71.4%) | 3 / 4 (75%) |
| Respiratory Dysfunction | 4 / 6 (66.6%) | 0 / 1 (0%) |

3.1.2.4 RESPIRATORY DYSFUNCTION

The relationship between swallowing, respiratory dysfunction and diabetes was significant (Fisher's Exact Test p= 0,022). Six subjects with Type I diabetes had respiratory dysfunction, and one subject with Type II diabetes had respiratory dysfunction. Of the Type I diabetics with respiratory dysfunction four subjects reported swallowing difficulties. The subject with Type II diabetes and respiratory dysfunction did not have a swallowing problem.

It is thus apparent that the presence of dysphagia is determined by the accompanying neuropathic symptoms rather than by typology. Thus, the presence of neuropathy regardless of its form, is a strong indicator of a possible swallowing problem.

3.1.3 OTHER INTERESTING INFORMATION ARISING FROM THE DATA

The present study set out to address certain aims. In the process other interesting information became apparent. This should be viewed as an advantage of qualitative research in that it allows for the formation of grounded theory. In a developing field, such as that of dysphagia, this may be seen as a valid and much needed approach.

3.1.3.1 THE INTERACTION BETWEEN AGE, THE TYPE OF DIABETES AND SWALLOWING

In the 19-40 year old age group, 17 out of 24 (70,8%) subjects reported some form of dysphagia, whereas in the 40-74 year old group 13 out of 24 (54%) subjects reported

dysphagia One subject was not included as his age was unknown. This finding contrasts with that of Borgstrom et al (1988) who found that older patients presented with a more severe dysfunction than did the younger patients. It is thus postulated that perhaps, due to the fact that many of the younger patients in this sample had Type I diabetes, the issue may hinge on the type of diabetes rather than the age of the patient. That is, as may be seen from the previous (See section 3.1.2.2) and the ensuing findings, Type I early onset diabetics are more likely to present with neuropathy, and its consequent repercussions.

3.1.3.2 THE INTERACTION BETWEEN AGE OF ONSET AND SWALLOWING

Subjects were divided into three groups as determined by the age of onset of diabetes. In the birth-20 year old age group eleven out of seventeen subjects reported swallowing problems. In the 20-40 year old group ten out of thirteen subjects reported swallowing problems and in the 40-66 year old group seven out of eighteen subjects reported swallowing problems. One subject was excluded as his age of onset was unknown. The phases of breakdown may be illustrated by table 5.

Table 5: The Interaction between Age of Onset and Swallowing

| Phase of the swallowing process affected | Birth to 20 (n=17) | 20 to 40 (n=13) | 40 to 60 (n=18) |
|---|---|---|---|
| Oral | 2 | | 1 |
| Pharyngeal | 1 | 2 | 2 |
| Oesophageal | 3 | 3 | 1 |
| Oral & Pharyngeal | | | |
| Oral & Oesophageal | | | 1 |
| Pharyngeal & Oesophageal | 2 | 2 | 2 |
| Oral, Pharyngeal & Oesophageal | 3 | 3 | |
| Total | 11 | 10 | 7 |

From the above results it is apparent that the highest incidence of swallowing problems appeared to be amongst the subjects who experienced an early onset of Type I diabetes. It appears that these patients usually have a more severe form of diabetes and consequently are more predisposed to complications and their sequelae.

3.1.3.3 CHARACTERISTICS OF THE ASYMPTOMATIC GROUP

The asymptomatic group (a) was comprised of nineteen subjects. Nine subjects were male and ten subjects were female. Subjects ranged in age from 20 to 66 years. Their mean age was 41,8 years and the median age was 42 years. A comparison of this group with those subjects who reported a swallowing problem (s) yielded the following information: Seven subjects reported neuropathy (a=36,8% vs.s= 38,7%), two subjects reported orthostatic dysfunction ( a=10,5% vs s= 22,4%) and two subjects reported respiratory dysfunction (a=10,5% vs s=14,3%). The age of onset of their diabetes ranged from 4 to 61 years of age. The mean age of onset of group a was 33,8 years (vs. 28 years in group s), and the median age of onset of group a was 40 years of age. 8 subjects in the a group had Type I diabetes and eleven subjects in the a group had Type II diabetes.

This group does not appear to blatantly differ from the symptomatic group. It may be concluded then that the presence or absence of dysphagia is directly attributable to the severity of the diabetic neuropathy and consequent vagal denervation (Westin et al 1986). It is important to remember however that the extent of autonomic damage varies greatly in individual patients, and that there is a high frequency of neuropathy with simultaneous development at different levels, thus causing the nervous system lesion to manifest in different ways (Ponte et al 1992).

### 3.1.4 A CRITICAL EVALUATION OF THE DEVISED INTERVIEW PROTOCOL AS A MEANS OF DIAGNOSING DYSPHAGIA

In order to critically evaluate a questionnaire format the writer deems it necessary to define what the questionnaire will be used for. That is, as a screening measure or as a diagnostic tool which will pinpoint the locus of the problem.

The questionnaire used within the present study proved itself to be a reliable screening measure. Results revealed that thirty of the forty nine subjects interviewed reported a swallowing problem. Furthermore, the questionnaire was able to determine the phase of the swallow process where the breakdown was occurring, however the severity of the problem could not be accurately determined. It is felt that this is not a major flaw, as the questionnaire could still serve as a reliable screening measure.

A comparison of the results obtained in the present study with those obtained by Borgstrom et al (1988) supports this viewpoint. Table 6 summarizes and compares the results of the present study with those obtained by Borgstrom et al (1988). It appears that although Borgstrom et al (1988) may have obtained more specific results with regards to the locus of the problem, the present study was sensitive to the presence of a problem. This is particularly true with regards to the oral and oesophageal phases of the swallowing process. Nonetheless, the writer acknowledges that Videofluoroscopy is necessary in order to be more specific with regards to the locus of the problem (See Table 6 ). It is pertinent to note at this point that Borgstrom et al (1988) did not include oral phase problems within their research. The questionnaire used within this study was sensitive to the presence of oral phase difficulties. This may be viewed as an advantage. Therefore it is concluded that, as a screening measure this questionnaire

could aid other clinicians and researchers in their data collection and could certainly be used as a screening measure in determining whether or not to refer the patient for Videofluoroscopy. In a country with limited resources this is deemed to be particularly important.

With regards the relationship between orthostatic dysfunction and dysphagia, Borgstrom et al (1988) demonstrated a correlation between pharyngeal dysfunction and orthostatic failure. The present study served to support this relationship in that nine of the eleven subjects with orthostatic dysfunction reported swallowing difficulties. However, due to the fact that a separate section for orthostatic functioning was not included in the questionnaire the researcher was able to address this issue only informally within the body of the interview. This may be seen as a limitation of this research.

Table 6: A Comparison between the results of this study and those obtained by Borgstrom et al (1988) with regards to the percentage of diabetic subjects experiencing dysphagia.

| Phase of the Swallowing Process Affected | | | |
|---|---|---|---|
| | **Pharyngeal** | **Oesophageal** | **Pharyngeal & Oesophageal** |
| Present Study (N=30) | 20% | 27% | 43.3% |
| Borgstrom et al (1988) (N=18) | 77% | 55% | 55% |

## GENERAL DISCUSSION

In this section issues arising from the present research findings will be discussed. These include the mechanism of dysphagia in diabetic patients as well as the type of diabetic patient who appears to be most susceptible to dysphagia. A comparison of the

incidence of dysphagia in diabetes with other population groups is provided and the implications of this are discussed. The interview schedule used within this study is critically evaluated and the implications of the research results for both medical and paramedical practitioners are presented.

The main finding of this study is that a significant number of diabetic patients are experiencing swallowing difficulties during all three phases of the swallowing process rather than during the oesophageal phase only as suggested in previous literature ( Russell et al 1983, Foster 1980). It appears as if Type I diabetic patients who have experienced an early onset of the disease are most susceptible to swallowing disorders.

It is hypothesized that these difficulties are a symptom of severe diabetic autonomic neuropathy and consequent vagal denervation. The present study establishes associations between swallowing disorders, neuropathy and orthostatic functioning. This notion also fits in with the definition of systemic disease as discussed in the introduction, that is, a disease process which affects more than one organ or organ system (Deron 1994).

Just as diabetic neuropathy is a fluctuating condition (Foster 1980), so is the dysphagia found in these patients. As cited in the introduction, Murakami et al (1982) describe a patient with diabetes and dysphagia who gradually experienced dysphagia and then improved within a two week period. This illustrates the need to evaluate the possibility of dysphagia on a regular basis at each contact with the patient.

The prevalence of dysphagia has been well documented in other neurogenic populations. As table 7 reveals, the incidence varies from 25%-74% depending on the etiology and the setting. The fact that the group of patients showing dysphagia in this study was 61% suggests that this disorder should be given as much prominence as a potential cause for dysphagia as the others. These findings are particularly significant due to the high incidence of diabetes within the South African population.

Table 7: Summary of the reported prevalence of swallowing disorders since 1983

(After Groher and Bukatman 1986 page 4)

| Investigator | Subject of Study | Setting | Population | Method | Results |
|---|---|---|---|---|---|
| Trupe et al (1984) | Overall Prevalence | Nursing Home | All residents | questionnaire | 74 % with dysphagia |
| Winstein (1983) | Prevalence in specific category | Rehab. Hospital | Head Injured | Retrospective chart review | 25% of consecutive admissions |
| Pannell et al (1984) | Prevalence in specific category | Rehab. Institute | Neurogenic Disorders | Physical exam and chart review | 42% with dysphagia |
| Echelard et al (1984) | Prevalence in specific category | Acute General Hospital | Selected Groups | Physical exam and chart review | CVA's 25% Head Injuries 50% Head/Neck resections 30% |

In order to successfully deal with the diabetic patient, clinicians need to view dysphagia within a physiological and anatomical context. Thus, a full working knowledge of both anatomy and physiology is required. As previously stated there appears to be a tendency amongst therapists to remain in familiar territory. However, perhaps it is time to extend both our knowledge of other areas, as well as the knowledge of other professions with regards to our field.

In order to do this, clinicians need to be both accountable and highly professional in their interaction with both the medical team and the patients. This serves to establish credibility and trust. Rosenbek (1995) discusses the issue of efficacy in dysphagia. He states that data demonstrating the efficacy of behavioural methods for treating dysphagia are limited, and consequently there is a need for additional outcome measures for establishing appropriate treatment intensities. Rosenbek (1995) also points out the fact that response to treatment can serve to widen our limited knowledge of the physiology of swallowing thus enhancing our credibility.
Related to the issue of credibility is the issue of accountability. Therapists working within this field need to demonstrate a working knowledge of the theory coupled with a precise diagnostic evaluation and therapy plan. This will not only aid the patient but will also serve to create an awareness of the role of the speech pathologists amongst other medical and paramedical professionals.

The present paper has been devoted solely to the diagnosis of dysphagia. However, clinicians will do well to remember that our primary role is a rehabilitative one. Rosenbek (1995) examines dysphagia within the World Health Organization (1995) framework of impairment, disability and handicap. He states that changes on impairment are insufficient to convince medical practitioners of our abilities. Rather, what is convincing are changes in the patient's quality of life. This is particularly applicable to diabetic patient's whose enjoyment of food is already limited by dietary restrictions.

Although the issues of laryngeal functioning and food type were addressed within the body of the questionnaire no subjective differences were evident between the subjects

with dysphagia and the asymptomatic group. This may possibly support the notion that dysphagia in this group is due to vagal denervation rather than to reduced laryngeal closure during swallowing (Logemann 1983). Conversely Borgstrom et al (1988) discuss the fact that patients may be unaware of a swallowing problem. It is interesting to note that Borgstrom et al (1988) attribute this lack of awareness to a neuropathy-dependent decreased sensitivity. For example they report that patients were not aware of the passage of the contrast medium into the laryngeal vestibule and trachea. Moreover they speculate as to whether abnormal laryngeal closure is the explanation of sudden death in diabetic patients with vagal neuropathy. It is felt that the decreased sensitivity in these patients may explain why food type and temperature did not affect swal' wing. Future research may serve to illuminate this issue.

There is therefore a dire need for a subclinic within the diabetic clinic. That is, just as patient's are required to consult the podiatrist and dietitian so they should be referred to the Speech Pathologist. Perhaps, due to some overlap, the Speech Pathologist could work hand in hand with the dietitian. This need is illustrated by the fact that clinically it appears as if the focus is on renal, visual and foot care, with little or no attention directed towards swallowing. The paucity of literature in this area is an indication of this. Ponte et al (1992) state that the reason for this paucity is an underestimation of its importance in medical treatment. However, in view of the above hypotheses perhaps the seriousness of swallowing disorders should be reviewed by medical practitioners.

Patients should also be made aware of the implications of dysphagia. Within a busy clinical setting patients may feel that they are bothering the doctor and thus do not draw attention to their swallowing difficulties. An example of this phenomenon would

be the fact that at least four subjects reported that the medication causes them to have a dry mouth. An examination of the side effects of insulin, coupled with a discussion with a pharmacist, (Sostak 1997) revealed that the medication does not cause mouth dryness, rather a dry mouth is a symptom of diabetes, and insufficient insulin may be causing the mouth dryness in these patients (Turner 1985). This issue pinpoints the necessity of obtaining detailed medication information from the patient, and from this perspective, the bedside evaluation is particularly useful.

With regards the evaluation procedure chosen for this study, the format of the questionnaire did allow for description by the patient. However this should be regarded as a qualitative measure rather than a quantitative measure. The fact that the same interview schedule was utilized for all patients did serve to reduce the administration time, thus allowing the researcher to effectively increase the sample size thus yielding more reliable results. In addition the nature of the questionnaire allowed the investigator to address the issues of the relationship between the age of onset and the presence of dysphagia as well as the characteristics of the asymptomatic group. Conversely, videoradiography allows the therapist to pinpoint both the locus of the lesion and the severity of the problem. Nonetheless, the fact that the patients in the sample were undiagnosed indicates that this method of evaluation appears to be a good starting point for further investigations Furthermore, Ippoliti (1983) has shown that a decrease in the amplitude of oesophageal contractions in the smooth muscle portion in the body, frequent absence of primary peristalsis and a decrease in the velocity of peristalsis may manifest radiographically as delayed oesophageal emptying. As these changes do not produce symptoms, the administration of a thorough bedside evaluation may yield information that a radiographic examination cannot.

## 4.1 THEORETICAL AND CLINICAL IMPLICATIONS OF THIS STUDY

As discussed within the body of the discussion, this study has diagnostic and therapeutic implications for the speech pathologist. Due to the fact that limited research has been carried out by South African speech pathologists in the area of dysphagia this study attempts to justify the preventative, diagnostic and rehabilitative role of the Speech Pathologist in the area of dysphagia in general and in diabetes in particular.

This study also aims to justify the use of the bedside evaluation and to demonstrate its clinical utility in the diagnosis of other dysphagic patients. This is particularly pertinent within the South African context in that often advanced diagnostic measures are unavailable within the rural areas. Furthermore, due to the fluctuating nature of the dysph (Murakami et al 1982) a questionnaire type format may allow the therapist to pinpoint a problem that Videofluoroscopic measures may not pick up.

Hopefully, this study has shed some light on some of the hypothesized mechanisms of dysphagia in the diabetic patient thus facilitating further research and greater involvement of Speech Pathologists in the area of diabetes. The relationship between dysphagia and neuropathy may appeal to clinicians already working with neurological cases.

Finally, the study pinpoints the need for serious consideration of the dysphagic symptoms of the diabetic patient. Reasons for this are the fact that functional alterations have been demonstrated at every level in the gut and account for

considerable morbidity in the diabetic population (Yang et al 1984), and also because of the hazards of aspiration in diabetic patients with their increased susceptibility to infection (Borgstrom et al 1988).

## 4.2 LIMITATIONS OF THIS STUDY

The present study appears to have a number of overt limitations. These appear to be related to the questionnaire and its efficacy. Firstly, an element of subjectivity exists due to the fact that the interview schedule was devised, administered and interpreted by the researcher. Secondly, the nature of the evaluation procedure demands an element of skill on the part of the examiner. That is, the examiner must have a thorough knowledge of the area of dysphagia, as well as a knowledge of anatomy and physiology. Consequently this questionnaire cannot be administered by anyone who is not experienced in the fieldfof dysphagia. In the South African context, it would be useful to devise a screening measure which could be used by the nursing staff, in the absence of sufficient dysphagia therapists. As a separate section for orthostatic functioning was not included within the questionnaire, the researcher only addressed this issue informally within the body of the interview. This added a further element of subjectivity to this study. Finally, in retrospect the last three questions on the questionnaire would have been better placed within section A of the questionnaire as they are case history details rather than questions.

## 4.3 SUGGESTIONS FOR FURTHER RESEARCH

The results of the present research provide several implications for future research.

4.3.1 The findings obtained on the questionnaire should be compared and contrasted with videofluoroscopic findings. This would increase the objectivity of the results

and substantiate the findings with regards to the mechanism of dysphagia in diabetic patients.

4.3.2 An attempt should be made to devise a therapy plan for these patients and to evaluate its utility. This plan should attempt to produce changes in the patient's quality of life as suggested by Rosenbek (1995).

4.3.3 Additional research should be carried out to assess whether food type and temperature does not affect the swallow process due to neuropathy dependent decreased sensitivity (Borgstrom et al 1988). Furthermore, the patient's sensitivity with regards to the passage of the bolus should be examined in greater detail.

## 4.4 CONCLUDING COMMENT

This study has revealed that a significant number of a group of diabetic subjects have dysphagia. This problem is of significance for two main reasons, firstly from a medical perspective and secondly with regards to the patient's well being. The patient's quality of life is dependent on swallowing integrity although these symptoms may often be neglected by medical practitioners.

It is therefore hoped that the findings of this study have provided additional knowledge of the mechanism of dysphagia in the diabetic population. With such knowledge perhaps we as Speech Pathologists can serve our patients with confidence and integrity.

# APPENDIX A

## INTERVIEW SCHEDULE

The interview schedule was administered in its entirety by the researcher to all subjects.

**A: Demographic Details:**

| | | | | | |
|---|---|---|---|---|---|
| Name: | | | | Hospital Number: | |
| Date of Birth: | | Age: | | Phone Number: | |
| Address: | | | | | |
| | | | | | |
| Age of Onset of Diabetes: | | Complications: | | | |
| | | | | | |
| | | | | | |
| Current Medication: | | | | | |
| General Medical History: | | | | | |
| | | | | | |
| Surgical History: | | | | | |
| Deep X- irradiation | | | | | |
| Previous Medical Examinations: | | | | | |

**B: Patient Descriptions of their Swallow Process:**

| | |
|---|---|
| 1 | Does food remain in your mouth after swallowing, and if so where does it remain, for example, under the tongue, in the cheeks or on the hard palate? |
| | |
| 2 | Does food come out your nose during swallowing? |
| | |
| 3 | Do you snore? |
| | |
| 4 | Does it take you time to actually swallow? |
| | |
| 5 | Do you cough while you are eating? |
| | |
| 6 | Do you choke while you are eating? |
| | |
| 7 | Does food catch in your throat? |
| | |
| 8 | If food does ``catch``, can you point to where it is getting stuck? |
| | |
| 9 | Do you choke before swallowing? |
| | |
| 10 | Do you cough before swallowing? |
| | |
| 11 | Do you cough during swallowing? |
| | |
| 12 | Do you choke during swallowing? |
| | |
| 13 | Do you choke after swallowing? |
| | |
| 14 | Do you cough after swallowing? |
| | |
| 15 | Does food come up after you have swallowed? |
| | |
| 16 | Do you suffer from heartburn? |
| | |

| | |
|---|---|
| 17 | Is any food type more difficult than others to swallow? For example, meat, liquids, jellies, dry bread, or biscuits. |
| | |
| 18 | Is hot food easier than cold food to swallow and digest? |
| | |
| 19 | Is cold food easier than hot food to swallow and digest? |
| | |
| 20 | General facial Appearance and Symmetry |
| | |
| 21 | Laryngeal Functioning |
| | a) Subjective Impression of Voice: |
| | |
| | b) Can the patient prolong the phonemes /s/ and /z/ for an equal amount of time? |
| | |
| 22 | Has the patient ever had pneumonia, and if so when and how many times? |
| | |
| 23 | Has the patient been adequately controlled for diabetes? |
| | |
| 24 | Does the patient take his medication compliantly, as noted from the medical records? |
| | |

APPENDIX B SUMMARY OF DATA

| COUNT | O | P | CE | RENAL | ORTHO | RESP | NEURO | ONSET | TYPE |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 1 | 1 | 1 | | 1 | 15 | 1 |
| 2 | 1 | 1 | 1 | 1 | | | 1 | 39 | 1 |
| 3 | | | | | | | 1 | 52 | 2 |
| 4 | | | 1 | | 1 | | 1 | 27 | 1 |
| 5 | 1 | 1 | 1 | | | | 1 | 12 | 1 |
| 6 | | | | | 1 | | | 17.6 | 1 |
| 7 | 1 | 1 | | 1 | 1 | | 1 | | 1 |
| 8 | | 1 | 1 | | | | | 34 | 1 |
| 9 | | | | | | | 1 | 37 | 1 |
| 10 | | 1 | 1 | | | | | 24 | 1 |
| 11 | 1 | | | | | | 1 | 12 | 1 |
| 12 | | | | | | | 1 | 4 | 1 |
| 13 | | 1 | | | | | | 16 | 1 |
| 14 | 1 | | | | | | 1 | 45 | 2 |
| 15 | | 1 | 1 | | | | 1 | 49 | 2 |
| 16 | | 1 | 1 | | | | 1 | 12 | 1 |
| 17 | | | | | | | 1 | | 1 |
| 18 | | 1 | 1 | | | | | 66 | 2 |
| 19 | | | | | | | 1 | 12 | 1 |
| 20 | 1 | 1 | 1 | | 1 | 1 | | 30 | 1 |
| 21 | | | 1 | | | 1 | | 23 | 1 |
| 22 | | | | | 1 | 1 | 1 | 61 | 2 |
| 23 | | | | | | | | 40 | 2 |
| 24 | | | | | | | | 42 | 2 |
| 25 | 1 | | 1 | | 1 | | | 48 | 2 |
| 26 | | | | | | | | 52 | 2 |
| 27 | | 1 | | | 1 | | | 45 | 2 |
| 28 | 1 | 1 | 1 | | | | 1 | 20 | 1 |
| 30 | | | | | | | | 45 | 2 |
| 31 | 1 | | | | | | | 20 | 1 |
| 32 | | | | | | 1 | | 41 | 1 |
| 33 | | | | | | | | | 2 |
| 34 | 1 | 1 | 1 | | | | | 10 | 1 |
| 35 | | | 1 | | | | 1 | 3 | 1 |
| 36 | | 1 | | | 1 | | | 40 | 2 |
| 37 | | | | | | | | 8 | 1 |
| 38 | | | | | | | | 44 | 2 |
| 39 | | | 1 | | | | | -1 | 1 |
| 40 | | | | | | | | 33 | 1 |
| 41 | | | | | | | | 4 | 1 |
| 42 | | | | | | | | 38 | 2 |
| 43 | | 1 | 1 | 1 | | | | 18 | 1 |
| 44 | | | | 1 | | | 1 | 44 | 2 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 45 | 1 | 1 | 1 | | 1 | 1 | 1 | 36 | 1 |
| 46 | | 1 | | | 1 | 1 | | 34 | 1 |
| 47 | | | 1 | | | 1 | | 26 | 1 |
| 48 | | | 1 | | | | | 45 | 2 |
| 49 | | 1 | 1 | | | | | 11 | 1 |
| 50 | | 1 | | | | | | 45 | 2 |
| **Totals** | **11** | **19** | **21** | **5** | **11** | **7** | **19** | | |

APPENDIX C

The information sheet was given to all subjects who participated in the study. Subjects were told to contact the researcher should they have any questions with regards to the study or their dysphagia.

# Information Sheet:

My Name is Lauren Boolkin, I am a Speech Therapist, and I am trying to see whether people with diabetes ever experience difficulty swallowing.

I would very much like you to participate by responding to a questionnaire about how you swallow and what happens to you after you have swallowed. This should take about 10 minutes.

I will be asking for your name and address, however this information will be kept confidential, and will only be used to contact you if I need more information.

If you are concerned about anything that is discussed during the questionnaire, please feel free to stop me so that we can talk some more about your difficulties.

You may withdraw from the study at any time, and you are under no obligation to participate.

## Should you require further information, please contact:

**Lauren Boolkin**
**University of the Witwatersrand**
**Speech and Hearing Clinic**

**Phone 728 3422**

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