Sexual Function in Women with Neurological Disorders

BY

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ACTA UNIVERSITATIS UPSALIENSIS
UPPSALA 1999
Dissertation for the Degree of Doctor of Medical Science in Neurology presented at Uppsala University in 1999

ABSTRACT


The purpose of this investigation was to study sexual function in women with neurological disorders at fairly distinct and separate locations. The dissertation comprises descriptive, retrospective, quantitative studies on sexual functioning in women with hypothalamo-pituitary disorders (HPD) (n=48), multiple sclerosis (MS) (n=47), and insulin-dependent diabetes mellitus (IDDM) (n=42). The results were compared with those in an age-matched control group (C) (n=42), and as reported by representative Swedish women (n=742) in the Swedish sex survey (SiS). The studies were based on comprehensive interviews, neurological examinations, incl. Vibration Perception Thresholds (IDDM), concentrations of prolactin and testosterone in serum (HPD), and a checklist on life satisfaction (IDDM, C, and SiS).

Sexual dysfunction was prevalent in almost all women with HPD and MS, and in 40% of the IDDM group. The problem of insufficient vaginal lubrication was more common in those with neurological disorders than among women in the SiS group. Sexual problems caused by reduced libido and orgasmic difficulties were more common in the HPD and MS groups than in the SiS group. In the HPD group, women with intrasellar adenomas had better sexual function than women having expansively growing pituitary adenomas with both intra- and suprasellar extension. Normal serum testosterone values correlated with masturbation activity. Amenorrhea and older age were correlated with sexual problems in all groups. In the MS group, symptoms of a weak pelvic floor and of bladder and bowel dysfunction were correlated with reduced lubrication and orgasmic ability. In the IDDM group, signs of autonomic neuropathy were correlated with sexual dysfunction. Concerning life satisfaction generally, proportionately fewer women with IDDM were satisfied or very satisfied, though differing significantly from the other two groups in only two domains of life: contacts with friends, and physical health.

Key words: diabetes mellitus, hypothalamus, IDDM, libido, lubrication, menstruation, multiple sclerosis, orgasm, perception, perspiration, pituitary, prolactin, quality of life, satisfaction, sensation, sexual dysfunction, sexuality, testosterone, vibration.

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ISSN 0282-7476

ISBN 91-554-4562-4

Printed in Sweden by Reprocentralen, Ekonomikum, Uppsala 1999
"Compassion alleviates suffering"

*Katie Eriksson*
Original papers

This thesis is based upon the following papers, which are referred to by their roman numerals. Some original observations, not earlier published, are also included in the thesis.

I: Hulter Birgitta and Lundberg PO. Sexual Function in Women with Hypothalamo-Pituitary Disorders. *Arch Sex Behav*, 1994; 23: 171-183


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### Abbreviations

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<th>Definition</th>
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<tbody>
<tr>
<td>BAER</td>
<td>Brainstem Auditory Evoked Response</td>
</tr>
<tr>
<td>BMI</td>
<td>Body Mass Index</td>
</tr>
<tr>
<td>C</td>
<td>Case-control group</td>
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<tr>
<td>CGMP</td>
<td>cyclic Guanosine 3',5'-MonoPhosphate</td>
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<tr>
<td>CNS</td>
<td>Central Nervous System</td>
</tr>
<tr>
<td>CT</td>
<td>Computer Tomography</td>
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<tr>
<td>HbA1c</td>
<td>Hemoglobin glycosylated</td>
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<td>HRQOL</td>
<td>Health Related Quality of Life</td>
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<tr>
<td>HPD</td>
<td>Hypothalamo-Pituitary Disorder</td>
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<tr>
<td>IUD</td>
<td>Intra-Uterine Device</td>
</tr>
<tr>
<td>IDDM</td>
<td>Insulin-Dependent Diabetes Mellitus</td>
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<tr>
<td>MOS</td>
<td>Medical Outcomes Study</td>
</tr>
<tr>
<td>MRI</td>
<td>Magnetic Resonance Imaging</td>
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<tr>
<td>MS</td>
<td>Multiple Sclerosis</td>
</tr>
<tr>
<td>NIDDM</td>
<td>Non-Insulin-Dependent Diabetes Mellitus</td>
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<tr>
<td>NO</td>
<td>Nitric Oxide</td>
</tr>
<tr>
<td>PDE</td>
<td>PhosphoDiEsterase</td>
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<tr>
<td>QL</td>
<td>Quality of Life</td>
</tr>
<tr>
<td>REM</td>
<td>Rapid Eye Movement</td>
</tr>
<tr>
<td>SD</td>
<td>Standard Deviation</td>
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<tr>
<td>SiS</td>
<td>Sex in Sweden, the 1996 survey</td>
</tr>
<tr>
<td>SWED-QUAL</td>
<td>Swedish Health-related Quality of Life Survey</td>
</tr>
<tr>
<td>Type 1 diabetes</td>
<td>IDDM</td>
</tr>
<tr>
<td>Type 2 diabetes</td>
<td>NIDDM</td>
</tr>
<tr>
<td>VIP</td>
<td>Vasoactive Intestinal Polypeptide</td>
</tr>
<tr>
<td>VPA</td>
<td>Vaginal Pulse Amplitudes</td>
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<tr>
<td>VPT</td>
<td>Vibratory Perception Threshold</td>
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Preface

Underlying this thesis is a basic assumption that sexual disabilities are the consequence of internal as well as external influences. The dissertation focuses on, explores and describes the internal, medical causes of sexual disabilities in women.

Introduction

Despite constant public exposure, human sexuality is a rather poorly explored topic in medical science. Researchers in the humanities and social sciences (psychology, anthropology, sociology, and theology) have contributed to existing knowledge (see for example Freud, 1905; Malinowski, 1929; Rainwater, 1968; Pagels, 1988). Sexual issues are charged with deep emotions and touch people's deepest values and emotional reactions. Sexuality is a subject of great diversity of valuation and socio-culturally based judgements. This complexity could be the reason why human sexology studies in medical science are so few, especially in women.

Individual perception of a particular sexual activity is an interpretation of sensations and signals received and processed instantaneously by the brain. The human body - together with knowledge and values formed in interaction with society in general, mental fantasies, as well as perception of the quality of one's current partner relationship - all contribute to the total experience. The meaning with which we imbue the act makes human sexuality unique among mammals. Some people associate certain sexual experiences more or less with spiritual experience. The individual significance of a certain sexual thought or act changes with time and depends on experiences and knowledge gained throughout life.

The physiological functions of importance for sexual pleasure are mainly neurological, if in neurology we include sensory and motor function as well as higher functions of the brain dealing with human emotions and moral values. Interacting with the neurological system in human sexual response are the circulatory and endocrinological systems. Knowledge of normal neurological functions is often improved by studying the impairments people suffer from. A single affliction in one specific part of the nervous system can give clues about what effects these structures have in normal physiological functioning. By studying sexual function in people with neurological disorders, knowledge can be gained regarding what constitutes healthy sexual functioning. The present thesis deals with human, female sexual experiences in relation to certain diseases affecting the neuro-physiological functioning of the body.
Anatomy and physiology of the sexual functions of women

The sexual physiology of women is presented in details in textbooks (see e.g. de Groat, 1992; Lundberg, 1994) and in review articles (Lundberg, 1992; Lundberg, 1999).

In their pioneer work, Masters and Johnson (1966), constructed a model of the sexual response cycle having four distinguishable phases (EPOR): the Excitement phase, Plateau, Orgasm and Resolution. These have been referred to in numerous scientific writings. However, their observations were not very well controlled and quantified. Helen Kaplan (1974) has simplified the sexual response model into three phases (DEO): Desire, Excitement, and Orgasm. This model is nowadays often used in work with patients. The question why women and men react in this way was left unanswered.

The anatomical conditions of the genitalia are of course essential prerequisites for sexual functioning. Basic anatomical facts are presented in textbooks (e.g. Lundberg, 1994).

The central and peripheral nervous systems

The brain – centre of all sexual experience

The central nervous system regulates the peripheral endocrine organs via the hypothalamus and the pituitary. Thus, neurological disorders afflicted these areas before puberty can cause endocrine dysfunction resulting in premature, retarded, or absence of sexual development. In adults, neurological disorders affecting hypothalamo-pituitary regulation can result in atrophy of the genital organs, abeyance of menstruation and ovulation, infertility, and waning or suppression of sexual desire. A number of observations support the assumption that there exists a centre for sexual desire in the basal hypothalamus. The limbic cortex and adjacent areas of the temporal lobe are also involved in regulating sexual interest and sexual activity.

Knowledge of the physiological organisation of human sexual response and its neural basis derives much of its information from lesion studies in animals. Investigations using experimental animals identified three phases of sexual response: arousal, copulation, and orgasm. Sexual arousal and object choice depend primarily on limbic system structures as well as on the hypothalamus and temporal lobe. The preoptic nucleus of the hypothalamus is sexually dimorphic and hormonal manipulations in utero
reversed the gender preference of male and female rats (Gorski et al., 1978; Partridge et al., 1982). Stimulating the septal region in primates (MacLean et al., 1963) can also induce copulatory behaviour. Heath (1964) described orgasmic sensations in patients during stimulation of this region. Different aspects of sexual behaviour are mediated by structures with extensive frontal and limbic connections. The basal frontal area has multiple connections with the thalamus, hypothalamus and other elements of the limbic system (Lundberg, 1960; Nauta, 1972). Prominent efferent pathways connect the frontal lobe to the preoptic region of the hypothalamus and may control sexual drive. In humans, hypothalamic lesions are known to depress sexual drive.

Needless to say, non-human primates have a sexual behaviour that differs from that of human beings, and animal studies are of little help in understanding human functioning. Hence, case-studies of brain injuries in humans are essential to an understanding of such functioning.

Structures contributing to human sexual desire are located in the evolutionarily older parts of the brain near sites of hunger and thirst. Brain injury can damage these structures and thus result in a truly asexual individual. Depressed sexual interest and activity are well known symptoms in patients who have suffered temporal lobe seizures (Herzog et al., 1982). Hence, this means that these structures are of importance in regulating sexual functions. However, excessive sexual behaviour (Poeck & Pilleri, 1965) and change of sexual preference are less common phenomena, even following brain injury. Hypersexual behaviour has been associated with the abrupt cessation of seizure either in the post-ictal period or following temporal lobectomy (Blumer, 1970). Ictal sexual auras have been described, occurring almost exclusively in women (Rémillard et al., 1983). Almost all of the few reported cases had parasagittal tumours (primary sensory cortex). Hypersexual behaviour following brain injury is uncommon but when seen is often associated with a basal frontal or diencephalic lesion. Sexual disinhibition, often associated with a general disinhibition of behaviour, and in some cases elements of secondary mania, have been described in the presence of dysfunction of the basal frontal lobe (Blumer & Benson, 1975). This can be due to rupture of an anterior communicating aneurysm, or presence of a subfrontal meningioma (Miller et al., 1986.)
About the central neurophysiology of orgasm, little is known. In healthy male subjects, Positron Emission Tomography (PET) has revealed increased activity in the right frontal lobe region during ejaculation (Tiilonen et al., 1994) but no focal activation in the medial anterior parietal lobe corresponding to the somato-sensory cortex of the genital projection area. This was interpreted as implying that the right prefrontal cortex is important for the emotional responses of male sexuality.

**Brain stem and spinal cord**

Extensive studies on people with spinal cord injuries have provided us with substantial evidence regarding the neurological sexual functioning of the spinal cord.

From the brain stem through the spinal cord, efferent impulses are conveyed mainly via the para-ependymal tract. The spinal cord is connected with the genital region via afferent and efferent nerve pathways, via the sympathetic and parasympathetic nervous systems, as well as by somatic nerves. A number of observations support the theory that there is a centre of importance in the cervical spinal cord for orgasm and ejaculation.

At a low thoracic level (Th10-L2) there is a centre for emission and ejaculation. The impulses are conveyed via the sympathetic nervous system, which also affects cerebral (psychogenic) erection as well as the inhibition of erection in a stress situation.

At sacral level (S2-4) there is a parasympathetic centre regulating reflex erection, lubrication and changes in blood flow in the genital area. Sensory nerve impulses from the genitalia are also mediated via both parasympathetic and somatic nerves.

Mainly in segment S2, there is a nucleus called Onuf’s nucleus. Formed of alpha-motor neurones to the pelvic floor muscles. These nerve cells have special properties. They do not degenerate in motor neurone disease or poliomyelitis. This nucleus also contains nerve cells belonging to the parasympathetic nervous system.

**Innervation of vagina and uterus**

Like men, women have hypogastric nerves and a hypogastric plexus (mainly sympathetic), pelvic nerves and a pelvic plexus (mainly parasympathetic), and pudendal nerves (somatic) on both sides, innervating their internal genitalia.
The hypogastric plexus is contiguous with the pelvic plexus, in the region beneath the cervix and superior parts of the vagina and rectum. The pelvic nerves enter this plexus from the sacral segments (S2-4) (Donker 1986). These numerous nerve cells are jointly called the hypogastric ganglion, or Frankenhäuser's ganglion. Most of the sensory innervation from the uterus passes this way.

Mechanical stimulation of the anterior wall of the vagina in women leads to a pronounced increase in the thresholds of pain detection and pain tolerance throughout the body (Whipple and Komisaruk, 1985). Mechanical stimulation of this part of the vagina can also elicit sexual arousal. Thus, this type of stimulation brings about hypalgesia – but not hypesthesia. This analgesic function occurs naturally during labour (Whipple et al., 1990).

Increased vaginal blood flow, erection of the cavernous tissue both in the clitoris and around the periphery parts of the vagina, and lubrication are probably brought about by neural mechanisms similar to those of cerebral and reflex erection in the males, though this has not yet been substantiated.

Innervation of clitoris

The clitoris is the most densely innervated part of the human surface area. The number of nerve fibres in the dorsal clitoral nerve is twice that in the dorsal penile nerve, and the sensory threshold of the clitoral area is also lower than that of the glans penis. Thus, the clitoris is one of the most sensitive areas of the human body as regards exteroceptive stimuli.

There are three types of nerve ending in the clitoral area that can perceive exteroception (Lowry, 1976). These nerve endings are located not only in the clitoris proper, but also in the inner labia and around the urethral orifice within or near the cavernous tissues. Signal traffic passing along the spinal cord to the brain is influenced by an engorgement of these tissues. Genital touch may thus be experienced merely as touch, or with a sexual quality dependent upon the degree of engorgement.

Some of these nerve endings can be modified by a number of factors such as hormone levels in the tissues, estrogens in particular (Abplanalp et al., 1979; Dennerstein & Burrows, 1982; Cutler, 1986; Davis, 1998). Estrogen deficiency can result in a change in the quality of sensations. Thus touch may be experienced as disagreeable rather than pleasurable. Nitric oxide (NO) is probably of importance for clitoral erection, as neuronal NO synthase immuno-reactivity has been detected in nerve bundles and nerve fibres within the human glans clitoris and corpora cavernous of the clitoris (Burnett et al., 1997).
Most of the sensory impulses from the clitoris are conveyed via the bilateral dorsal clitoral nerve. They have a protected course through the urogenital diaphragm at the base of the clitoris, beneath the urogenital diaphragm and as a part of the pudendal nerves. When the pudendal nerve is blocked (as in labour anaesthetic), the clitoris is also anaesthetised.

Certain reflexes can be evoked from the clitoris. The bulbocavernous reflex is spinal, somatic and bilaterally phasic. The reflex arc passes through the pudendal nerves and the reflex centre lies in sacral cord segments 2-3. The reflex can be elicited by pinching the glans with the result that the bulbocavernousus and external anal sphincter muscles respond by contracting. There is also a tonic reflex when vibratory stimulation of the clitoris causes sustained contraction of certain pelvic floor muscles (Gillan & Brindley, 1979).

**Desire**

Human sexual functions can conceptually be divided into separate entities: sexual drive (*desire*), and the sexual sensations and reactions in the genital organ (*sexual abilities*).

**Lubrication**

**Vaginal blood flow**

Already during the E-phase the blood flow increases not only in the vulva but also in the vagina. There are great differences among women, in part dependent upon parity. Thus, Masters and Johnson described the vulva of parous women as having a darker, more blueish hue. This could denote a slower bloodcirculation, partly because some of the great veins are varicose.

The blood flow in the labia and the vagina can be measured both directly and indirectly, for instance by measuring temperature gradients and degree of oxygenation. Using the Xenon 133 washout technique, Wagner and Ottesen (1980) calculated an average baseline vaginal blood flow of 9.8 ml per min per 100 g tissue. During digital clitoral self-stimulation there was an increase in blood flow up to 28.9 ml per min per 100 g tissue.

Electrical stimulation of anterior roots S2 and S3 (but not S4) increased the vaginal blood flow (Levin & Macdonagh, 1993). VIP (vasoactive intestinal peptide) is present both in Frankenhäuser's ganglion and in nerve fibres in the vaginal mucosa (Ottesen, 1983). Systemic infusion of VIP, as well as local injection of VIP into the vaginal wall causes a dose-dependent increase in vaginal blood flow, with consequent lubrication (Ottesen et al.,
1987). Sexual stimulation increases blood VIP concentration. VIP has physiological effects on the uterus. It relaxes the isthmus and causes uterine vasodilatation.

It is important to note that the bulk of the spongy tissues in the female are located on either side of the introitus, and around the urethra, especially in the tissues between the vagina and the urethra. These structures also respond to sexual stimulation, especially if concentrated on the anterior vagina, where there are nerve receptors that respond to pressure. This results in a local increase in blood volume visualised as a distinct swelling. A particular area of the anterior vaginal wall is the so-called G-spot (Gräfenberg’s spot, Gräfenberg, 1950). From the anatomical point of view, however, this area is not well-defined and may not be found in all women (Whipple and Komisaruk, 1991). However, recent anatomical studies have revealed abundant innervation of fine nerve fibres organised like brooms in the epithelium and other forms of nerve fibre structures in deeper layers of the mucosa of this particular part of the vaginal wall (Hilliges et al., 1995).

**Vaginal lubrication**

Vaginal fluids (excluding menstrual products) in fertile women discharge from the vaginal walls and from Bartholini’s glands. The transudation through the vaginal walls, lubrication, and secretion from Bartholini’s glands, are most important in sexual function. One further source of lubricating fluid is secretion from the para-urethral glands, discharging through the urethra. There are no active secretory gland cells in the vaginal walls. Lubrication is a non-secretory process entirely dependent upon increased vaginal blood flow. However, the lubrication fluid contains more potassium and less sodium and chloride than the plasma (Wagner & Levin, 1978, 1980). It takes only half a minute of sexual excitement to create lubrication. Thus, the vaginal walls and the introitus are covered by a lubrication film early in the E-phase, continuing during the P-and O-phases though less profusely.

Normal lubrication depends on both intact innervation and a normal estrogen level. Estrogen deficiency, as after normal or therapy-induced menopause, in pituitary insufficiency or ovarian insufficiency, reduces lubrication capacity. This can be treated by general or local estrogen substitution. Increased genital blood flow and lubrication occur normally in women at night during REM-sleep phases in the same way as erection in men.
Vagina during sexual arousal

The unstimulated vagina is a collapsed structure forming a cavity during sexual stimulation. This is only partly due to intromission of the penis. There is also an active process where the muscles in the pelvic area give a deepening and widening of the upper two-thirds of the vagina. The detailed mechanisms underlying this process are not well known. Both intravaginal and intra-abdominal pressure varies considerably during coitus. The intravaginal pressure is negative during intromission but positive during female orgasm (Fox et al., 1970). However, the inter- and intra-abdominal variations are both considerable. Some women can dilate their vagina episodically, presumably by changes in intra-abdominal pressure and movements of the thoracic diaphragm. The vagina can also be contracted to a smaller volume. Probably several factors – such as parity, degree of sexual stimulation, position during coitus and voluntary manoeuvres - contribute to these capacities. These circumstances may be of particular importance to disabled people.


text

Erection

Spongy tissue

Glans clitoris is homologous to glans penis, and crura clitoris to the two corpora cavernosa of the penis. Both glans and crura contain spongy tissue and are surrounded by a firm tunic. At sexual stimulation there is a more or less pronounced erection of the clitoris. Certain women also notice clitoral erection. This may not come immediately as vaginal lubrication, hence, usually requires increased sexual stimulation.

Nitric oxide (NO) plays a key role in mediating penile erection, and inhibition of its release has been implicated in the pathophysiology of erectile dysfunction (Finberg et al., 1993). Sildenafil (Viagra), a selective inhibitor of type 5 cGMP phosphodiesterase (PDE 5), enhances neuronal NO-dependent relaxation of the human corpus cavernosal smooth muscle (Jeremy et al., 1996) and is now a common effective treatment for impotence of various aetiologies in men. Sildenafil has also been tested in women, with varying effects on lubrication, orgasm and clitoral sensations. Overall sexual function did not improve significantly, despite changes in vaginal lubrication and clitoral sensitivity (Kaplan et al., 1999). Clitoral erections are seldom specifically evaluated in female sexual function. However, clitoral discomfort and ‘hypersensitivity’ occurred in 21% of 33 treated postmenopausal women (Kaplan et al., 1999).
The ischio-cavernosus muscle surrounding each of the two crura also plays a part in the erectile mechanism of the clitoris. The blood volume in the clitoral preputium increases at arousal. This phenomenon, as well as the tonic contraction of the ischio-cavernosus muscles, causes the clitoris to "disappear". The bulbo-cavernosus muscle surrounds the vaginal introitus, then passes forward and inserts at the dorsal surface of the clitoris. Thus the muscles on either side together form a sling around the clitoris. Contraction of these muscles increases clitoral erection by a mechanism compressing the dorsal vein of the clitoris. It also compresses the cavernous tissue on either side of the introitus, the so-called bulbus vestibuli. Passive dilatation of the vagina results in a reflector contraction of both the bulbo- and the ischio-cavernosus muscles (Shafik, 1993). In this way, direct vaginal stimulation, such as caused by movements of the penis, may indirectly affect the clitoris and sensory perception from the clitoris.

**Orgasm**

**Muscles of the pelvic floor**

The pelvic floor has two layers of striated muscles: the outer layer, called the uro-genital diaphragm, located in the anterior part of the floor where the urethra and the vagina pass, and a deeper layer, the pelvic diaphragm, through which the rectum also passes. These striated muscles are innervated from the so-called Onuf nucleus at sacral segments 2-5 of the spinal cord. Besides these muscles, there are also several that have a pure sphincter function. The muscles have two types of slender striated muscle fibre, type 1 and type 2. Type 1 fibres give a long-lasting tonic contraction, in such a way as to maintain continence. The type 2 fibres can rapidly, - but only briefly - strengthen the contraction and in such a way maintain continence in a stress situation. These muscles have estrogen receptors, and a minimum estrogen level in the tissue is necessary to maintain continence. There are also androgen receptors in the muscles. Androgens are of importance for the development of the pelvic muscles. The striated pelvic floor muscles are innervated from below through the pudendal nerve (the muscles of the uro-genital diaphragm), and from above from the pudendal plexus, sacral segments 3-5 (the pubo-coccygeus muscle). Childbirth can cause considerable damage to both muscles and nerves of the pelvic floor, as can be judged by measurements of pudendal nerve terminal motor latency (Tetzchner et al., 1997), as well as by electromyography. However, in most instances there is a good recovery after some time (Tetzchner et al., 1996). A normal and fit pelvic floor muscle function is believed to be of importance both for the orgasmic capacity and for pleasure at orgasm.
Orgasm — a definition

Theoretically, orgasm can be described as the sum of what happens in the body during sexual climax and how the individual experiences this (Lundberg, 1994). Much has been written about female orgasm, but factual knowledge is sparse. One explanation is that the orgasmic experience per se blunts consciousness, thus precluding a description embracing the whole.

The sensations, duration and intensity of an orgasm vary among women, and every single woman can have a wide variety of orgasmic experiences.

During orgasm a series of synchronous contractions of the sphincter and vaginal muscles occur at intervals of 0.8 sec (Bohlen et al., 1982). As many as 20 consecutive contractions have been registered. The duration of the period of contractions varies from 10 to 50 secs. However, some women claim that they have not noticed any contractions at all. The contractions can be used as a definite marker of an orgasm, but there are other orgasmic experiences too. Most women describe extremely pleasurable sensations in the genital region at orgasm, diffusing more or less throughout the body. The physiological reactions and the way they are experienced can differ, depending on whether sexual stimulation is directed towards the clitoris or via vaginal penetration. The local reactions in the pelvic area ought to depend on whether or not there is vaginal penetration.

Orgasm can be evoked in many different ways: by clitoral stimulation, vaginal penetration, anal penetration, breast stimulation, etc. Also stimulation of parts of the body not primarily regarded as erogenous zones, such as the back of the neck and the ears, may result in an orgasm. Orgasm may also be attained through pure respiratory movements, and even in some persons merely by fantasies. Spontaneous orgasm can occur in patients with lesions in specific parts of the CNS. One woman with a stroke after a right superior cerebellar artery aneurysm, leaving a left-sided motor and sensory deficit, and a behavioural change, described after recovery how she had experienced erotic-orgasmic sensations throughout the period of her increased interest in sex. A CT scan revealed a lucency in the right thalamic and hypothalamic regions. She gradually recovered and the heightened sexual sensations disappeared after one month (Miller et al., 1986). Although peripheral somato-sensory inputs are important for sexual activity, people with paraplegia can experience arousal and even orgasm without such input, suggesting that central structures are sufficient for this experience (Money, 1960). These facts may be of importance to patients with neurological disabilities or with certain diseases in the genital region.
Many women can attain multiple orgasms. This is defined as a series of climaxes (O-phases) reached during the same P-phase. In our study on women with diabetes mellitus, most of the women (in the IDDM group 69% (m: 3.6, median 3, range 2-20) and in the control group 60% (m: 3.5, median 3, range 2-11) had experienced multiple orgasms on at least one occasion (Hulter & Lundberg, unpublished). Around one-third of healthy women reported multiple orgasms in an earlier study (Kratochvil 1993). These climaxes may succeed one another within 15 sec, or more often at intervals of 1-2 minutes. For women who attain multiple orgasms, it is usually easier to reach orgasm – it takes less time. The experience is also described as more intense.

Uterus during sexual arousal and orgasm

According to Masters and Johnson, the cervix elevates during the latter part of the E-phase. During the P- and O-phases there is a certain dilation of the cervical os. During orgasm there are contractions of the uterine muscles. Intrauterine pressure first increases and then rapidly subsides after an orgasm. This may give the uterus a suction capacity, which is believed to facilitate sperm transport. During orgasm, the cervix dips several times down against the posterior vaginal wall where the seminal pool collects. Studies in women who have undergone subtotal hysterectomy have not revealed any decrease in their capacity to respond sexually or any change in the quality of orgasm (Helström et al., 1993). However, to some women, vigorous uterine contractions seem to be highly pleasurable.

Oxytocin secretion

Caressing of erogenous zones of the body, especially the female breasts, or stimulation of the uterine cervix, releases oxytocin from the hypothalamus-posterior pituitary. Oxytocin content is known to rise during sexual arousal (Carmichael et al., 1994) and peak during orgasm (Murphy et al., 1990). Oxytocin evokes contraction of the smooth muscles in the ducts of the mammary glands resulting in ejection of milk from the breast in a nursing woman.

The involvement of oxytocin in the facilitation of gamete transport is suggested by studies on smooth muscles contractions with oxytocin administration to the myometrium (Steer, 1990). Release of oxytocin by intercourse may also have an effect on the uterus during delivery, but probably not during other parts of pregnancy. We can see this behind the belief that labour can be initiated by sexual activity. During the lactation amenorrhoic period, which can last for a year or more, sexual interest is
usually diminished in the woman, she experiences reduced vaginal lubrication, and consequently coitus is less pleasurable (Kayner & Zagar, 1983). Physiologically, an increased serum prolactin concentration may be responsible for this phenomenon.

Satisfaction

Masters and Johnson (1966) present three somewhat differing patterns for the female sexual response cycle. A woman may be sexually satisfied after one orgasm, after multiple orgasms, and even without an orgasm. These three patterns are simplifications of the most frequent variations in women’s sexual response cycles. Women show a wide variety in their sexual responses throughout life as regards desire, sexual activity, and orgasm frequency and duration. Men usually are more uniform over time in their way of reacting and have smaller individual differences. It is important to point out that sexual satisfaction needs to be judged by the individual woman herself. She may have experienced multiple orgasms and still not feel satisfied – yet she might not feel frustrated even though she had none.

Aims of the investigation

It is clear from the foregoing description that neurological disorders at various levels of the nervous system can adversely affect sexual function. The purpose of this investigation was to study the symptoms and prevalence of sexual dysfunction in women with disorders at fairly distinct and separate locations. The focus was on the following diagnoses:

(A) Hypothalamo-pituitary disorders (HPD)
(B) Multiple sclerosis (MS)
(C) Insulin-dependent diabetes mellitus (IDDM)

HPD affect the hypothalamus and/or the pituitary and may include strong endocrine components. MS affects the central nervous system (CNS), the brain as well as the spinal cord, while diabetes mellitus causes primarily peripheral neuropathies. Modern sexual physiology, especially studied in men, has taught us that it is necessary to distinguish sexual phenomena such as desire from sexual arousal, and to recognise well-defined sexual reactions in the genitals such as erection/lubrication, emission and ejaculation/genital experience of orgasm. For further knowledge it is essential to analyse the different parts of the sexual reaction pattern – also in women – where sexual dysfunction can be expected.
**Purpose of study I**

The first study investigated the extent to which hypothalamo-pituitary disorders in the women had affected their sexual desire and sexual abilities and correlated data on their sexual functions with blood hormone levels and diagnoses.

**Purpose of study II**

The second study determined the extent to which women with multiple sclerosis had experienced changes in their sexual life and whether the changes could be correlated with neurological symptoms and handicap score.

**Purpose of study III**

The third study determined the extent to which women with insulin-dependent diabetes mellitus had experienced changes in their sexual life and whether these changes were related to signs of neuropathy or other diabetic complications, or to social or psychological factors. The need for neurologically healthy controls became obvious. For that purpose age-matched controls for the women with diabetes mellitus were recruited. An age-matched group of women without any diagnosis of diabetes or any neurological disease were studied for purposes of comparison.

A Swedish survey on sexuality and health was conducted in 1996, (SiS), recruiting 1335 representative Swedish women, which thus gave an opportunity for a reference material for the women in the defined disease groups. However, the survey gave only sparse information on medical health issues.

**Purpose of study IV**

The analysis of the impact of sexual problems on life satisfaction was the focus of the fourth study. The study endeavoured to describe levels of satisfaction with life as a whole and with ten domains of life in women with insulin-dependent diabetes mellitus. The results were compared with those reported by the age-matched control group and by women in the Swedish sex survey. The occurrence of sexual problems was correlated with life satisfaction as a whole and with sexual satisfaction.
Signs and symptoms of certain neurological disorders

*Hypothalamo-pituitary disorders (HPD)*

The centre of sexual desire is located mainly in hypothalamus. The principal disturbances that can may follow hypothalamic lesions are those of pituitary function, food and water balance, and temperature and blood pressure regulation. One cause of a hypothalamic lesion is a severe head injury, and diabetes insipidus, which may follow. The lesion may be a tumour or a vascular lesion, particularly rupture of an aneurysm on the circle of Willis. The three types of tumour which commonly occur in the small region at the base of the brain in and around the hypophysis and the optic chiasma are: pituitary adenoma, craniopharyngioma and suprasellar meningeoma. The symptoms of the tumours can be divided into: pressure symptoms and endocrine disturbances.

The common pressure symptoms are: headache, usually with a bitemporal distribution, and visual disturbances. Since the optic chiasma lies above the sella turcica, visual field defects are an important and early symptom of hypophysial tumour.

The endocrine disturbances are typically hyper- or hypopituitarism.

1. Null cell adenoma is a ‘non-functioning pituitary adenoma’- presenting with symptoms of endocrine deficiency from the thyroid, adrenal, gonadal as well as growth hormones.

2. Prolactin-secreting tumours in women may present with amenorrhoea. Galactorrhoea may not be present, since other factors including high levels of estrogen are a precondition for galactorrhoea. Prolactin levels should therefore be measured in any patient with amenorrhoea and may be elevated in some 20 % of patients with secondary amenorrhoea. Many of all these patients have pituitary adenomas, even if plain X-rays of the skull are normal. Tumours secreting prolactin are often small when first giving rise to clinical symptoms and laterally placed.

3. Acromegaly accompanies endocrine symptoms of hyperpituitarism, especially of the growth hormone. When the tumour arises before growth has ceased, gigantism occurs. When, as more frequently happens, the tumour begins during adult life, acromegaly results. This is characterised by slow changes in the skin and subcutaneous tissues, bones, viscera, general metabolism, and sexual activity. The skin and subcutaneous tissues, especially of the fingers, lips, ears, and tongue, exhibit a fibrous hyperplasia. Overgrowth of the bones is most evident in the skull, face, mandible, and at the periphery of the extremities. Carbohydrate metabolism is often disturbed, leading to hyperglycaemia
and glykosuria. Impairment of sexual function occurs in both gigantism and acromegaly.

4. Cushing's disease is usually due to pituitary-dependent bilateral adrenoplasia associated with a pituitary hyperplasia or tumour and does not cause pressure symptoms. The endocrine changes are usually attributed to hypopituitarism, and consist of a depression of sexual function and amenorrhoea. Metabolic changes of hypopituitarism are likely to be present, including depressed functioning of the suprarenal cortex and the thyroid.

5. The craniopharyngioma, also known as the hypophysial epidermoid tumour, derives from an embryonic remnant of the craniopharyngeal pouch which comes to lie above the sella turcica. Symptoms usually appear at an early age, i.e. in childhood or adolescence, though they may cause no symptoms until middle life. They can produce a large variety of disturbances of growth and metabolism.

6. A patient is occasionally encountered with no signs of visual failure or endocrine disturbance, but an enlarged sella and thinned dorsum sella are found on skull X-ray. The patients, usually women, are sometimes hypertensive and frequently complain of headaches. It has been concluded from post-mortem studies that this condition probably arises as a result of a congenital deficiency of the diaphragm sella or a previous episode of transiently increased intracranial pressure. The normal pulsations of cerebral-spinal fluids remodel the sella, so causing the 'empty sella' syndrome.

Hypothalamo-pituitary disorders and sexual functioning

Lesions concerning the hypothalamus can affect sexual drive. Hence, hypothalamo-pituitary disorders often give symptoms of sexual dysfunction. In large series of patients (Bakay, 1950; Younghusband et al., 1952; Heimbach, 1959; Fischer, 1963; Fürst, 1966; Batzdorf & Stern, 1973) reduced sexual desire was reported to occur with a frequency ranging from 35% to 73%. It is believed that changes in sexual desire are dependent at least in part on blood levels of androgens in men and androgens together with estrogens in women. Hyperprolactinemia is reported to result in reduced libido in both men and women. However, the mechanisms of hyperprolactinemia are complex and prolactin has effects on many different levels of the hypothalamo-pituitary-gonadal brain circuit.
The Department of Neurology at Uppsala University Hospital is a regional centre for the treatment of patients with hypothalamo-pituitary disorders. This has made it feasible to study sexual problems in a large group of patients. Data on the sexual life of the patients have been correlated with diagnosis, tumor extension and pathology, endocrine insufficiency, and pituitary hormone hypersecretion in four different study groups comprising more than 250 patients. In one study, by Lundberg & Wide (1978), three-fourths of the of 63 adult men with pituitary tumors reported reduced or absent sexual desire. The decrease was greater for those with larger tumors extending into the suprasellar region than for those with intrasellar tumors. One-third of the patients reported reduced sexual desire as the first symptom of their tumor. This symptom usually had a rather abrupt onset, but very few men actually sought medical advice for this reason. A highly significant correlation was found between a low serum testosterone level and reduced desire. In another study, of 37 men (Hulting et al., 1985; Muhr et al., 1985) with pituitary tumors and hyperprolactinemia, reduced sexual desire was the first symptom in half. Many of these patients had lived with the problem for years. In this group a low serum testosterone level was also correlated with reduced desire. Some males with normal serum testosterone and hyperprolactinemia also reported reduced desire.

Among 109 women aged 20-60 years with morphologically verified hypothalamo-pituitary disorders (Lundberg et al., 1986), two-thirds had noticed the absence of or a considerable and troublesome decrease in sexual desire. This problem was acknowledged by 84% of the women with hyperprolactinemia, but by only 33% of those with a normal serum prolactin level (P<0.001). Almost all of these women had amenorrhea. There was, however, no significant correlation between a low serum estradiol level in the amenorrheic women – or a low serum testosterone level in all the women – and reduced sexual desire. Loss of sexual desire was noticed by almost all patients with a craniopharyngioma but by only half of those with acromegaly. The frequency of the problem was higher among patients with an intrasellar adenoma (77%) or invasive adenomas (83%) than among those with a large expansively growing adenoma (59%). Most tumors in the first two groups were prolactin producing.
Multiple sclerosis (MS)

Focal lesions of the CNS are typical of MS and, by affecting the neurological pathways, can strike at sexual functions. Multiple sclerosis, one of the commonest neurological diseases, is characterised by the widespread occurrence of patches of demyelination followed by gliosis in the white matter of the nervous system. The early symptoms are those of focal lesions of the CNS, while the later clinical picture is one of progressive dissemination. In most cases, MS begins with the symptom of a single focal lesion, or sometimes of several such lesions occurring within a short space of time. Unilateral acute optic neuritis is often the first symptom. Other such symptoms include numbness of some part of the body, usually part of a limb or one side of the face or both lower limbs, or double vision, or weakness of limb, particularly a lower limb with dragging of the foot, or precipitance of micturition. The other mode of onset is an insidious and slowly progressive weakness of one or both lower limbs. The tendency to remissions and relapses, leading to prognostic difficulties, makes coping with MS especially complicated. The prognosis for MS being extremely variable, ranging from total remission with no remaining signs of disease, to increasing disability until death due to the disease.

Multiple sclerosis and sexual functioning

Almost all patients in the advanced phase of MS notice changes in their sexual life (Lilius et al., 1976; Minderhoud et al., 1984; Schneider, 1974; Szasz et al., 1984; Stenager et al., 1992). Even in early and mild cases, sexual dysfunction is common (Lundberg, 1978, 1981). It may be the first symptom.

Diabetes mellitus (DM)

Neuropathy in diabetes can take any of several forms and may affect the peripheral innervation of the genitalia. The commonest form is a mild chronic symmetrical motor and sensory neuropathy, affecting the lower extremities in particular. Severe burning pain in the legs is sometimes a striking complaint. The sensory disturbance may be associated with trophic lesions of the skin and joints which are usually distal. This form of neuropathy resolves partially with improved control of the DM and is probably caused by the metabolic disturbance of diabetes.

The peripheral nerves and nerve roots are abnormally susceptible to the effect of pressure and trauma in DM, which explains the liability of diabetics to the carpal tunnel syndrome and to radiculopathy secondary to cervical and lumbar spondylosis.
When autonomic neuropathy occurs this can lead to impotence or disturbance of bowel control. Postural hypotension occasionally results from loss of autonomic reflexes which normally compensate for the tendency of blood to pool in the legs on standing.

The alterations in the peripheral somatic and autonomic nervous systems may be related to: 1) microangiopathic disturbances; 2) the accumulation of sorbitol and/or in the deficiency of myo-inositol; 3) toxic and/or 4) immunologic damage to neuronal tissue (Duchen et al., 1980).

Occasionally, wasting may be strikingly restricted to the proximal leg muscles, so-called diabetic amyotrophy, with proximal leg pain and loss of tendon reflexes. Electrophysiological studies have shown retarded conduction in the nerves of the wasted muscles in such patients so that it is in fact a form of neuropathy.

**Diabetes mellitus and sexual functioning**

Studies have shown high prevalence of irregular cycles in women with DM (Burkart et al., 1989; Griffin et al., 1994; Adcock et al., 1994; Yeshaya et al., 1995; Lunt, 1996). Delay in psychosexual development has been reported, and it has been suggested that this phenomenon could be one of many factors that contribute to the social and behavioural problems so often encountered in adolescents with diabetes (Surridge et al., 1984).

According to earlier studies, women with insulin-dependent diabetes mellitus (IDDM) have relatively fewer sexual problems than men have. Loss of sexual desire (Schreiner-Engel, 1983; Newman & Bertelson, 1986; Schreiner-Engel et al., 1987; Campbell et al., 1989), inadequate vaginal lubrication (Tyrer et al., 1983) as well as orgasmic dysfunction (Kolodny, 1971) has been reported. In a review, Ertekin (1998) listed the main sexual problems for women with DM as orgasmic dysfunction as well as reduced vaginal lubrication and dyspareunia. He also stated that even mild neuropathic changes in diabetes can significantly raise stimulatory threshold levels, requiring greater afferent stimuli to trigger the appropriate response. Hence, it is theoretically possible that most women do not lose the capacity to be orgasmic but simply require a more proactive stimulus to trigger the orgasmic reflex (Kolodny et al., 1979). Schreiner-Engel et al. (1987) reported a differing impact of diabetes type on female sexuality, thus underline the importance in future studies of differentiating the subjects according to type. Elzilin et al. (1998) reviewed 25 years of research on sexuality in women with DM and found 15 research reports. They concluded that diabetic women have, in analogy with men, a specific pattern of sexual dysfunction in which the arousal phase especially is affected.
In certain cases, signs of neurodegeneration and vascular damage in the clitoris have been found in post-mortem tissue samples from diabetic women (Zrustová et al., 1978).

Numerous studies have been conducted on male sexual dysfunction in DM. It might be valuable here to review some of the findings.

The vast majority of cases of sexual dysfunction in men with DM are primarily organogenic, or physiological in nature, but there are widely diverging views on the exact pathophysiology. Theories and research have tended to support diverse causes, ranging from a psychological cause, to endocrine, to vascular and to neuronal. Most attention, however, has been paid to peripheral vasculopathies or peripheral autonomic neuropathies as major candidates.

Ellenberg (1971) in “Impotence in diabetes. The neurologic factor” reported the results of neurogenic bladder studies in 45 impotent and 30 potent men with diabetes. Thirty-seven of the impotent men (82%) had evidence of neurogenic vesical abnormalities, compared with only 3 (10%) of the potent ones. Similarly, 38 (84%) of the impotent compared with 6 of the potent men had signs of neuropathy.

Bemelmans et al. (1994) studied metabolic parameters, endocrine factors, vasculogenic factors, and neurophysiological tests on the peripheral somatic and peripheral autonomic nervous system in impotent non-diabetic men, impotent men with diabetes and in non-impotent diabetic men. They found autonomic nervous system dysfunction in 85% of the impotent men with diabetes, whereas only 58% had evidence of vasculopathy. Endocrinological factors were not thought to play a significant role in the cause of their sexual dysfunction.

Finger and penile tactile sensitivity were evaluated in sexually functional and dysfunctional men with diabetes (Morrissette et al., 1999). Sexually dysfunctional diabetic men had higher values of glycosylated haemoglobin than had sexually functional diabetic men and both groups of diabetic men had lower bioavailable testosterone than had control subjects. Sexually dysfunctional diabetic men had higher finger and penile thresholds than had the functional ones. They exhibited different response patterns than sexually functional men regarding dimensions of intensity and pleasantness to penile stimulation.

More direct studies on the neural supply to the penile tissue and the neurotransmitters which communicate neuronal information in men with diabetes also support a neurogenic hypothesis of sexual dysfunction in men with diabetes. Melman and Henry (1978), showed a reduced
norepinephrine content in spongy erectile tissue of the penile corpora of impotent diabetic men, when compared with normals, and with non-diabetic impotent men. They interpreted the findings as suggesting that autonomic dysregulation of the smooth musculature in the penis contributes to the sexual dysfunction in diabetic men. Lin and Bradley (1984) measured nerve conduction velocity of the dorsal nerve of the penis, latency of the bulbo-cavernous reflex and pudendal evoked potentials in 23 normal men and 20 impotent men with diabetes. Although no significant differences between the groups were noted regarding measures of the latency of the bulbo-cavernous reflex and pudendal evoked potentials, the nerve conduction velocity of the dorsal nerve of the penis was significantly slower in diabetic men than in normal men. Gu et al. (1984) studied vasoactive intestinal polypeptide (VIP)-immunoreactive nerves in potent healthy men and in impotent and non-impotent men with diabetes. They found depletion of VIP-containing nerves in impotent subjects. The magnitude of this depletion reflected the severity of sexual dysfunction. In the diabetic impotent men, VIP levels were depleted by more than 80% of control values. These results strongly support a role for VIP as a major neurotransmitter system in erectile function and striking depletion of this system in impotent men with diabetes.

Recent studies also suggest that a component of sexual dysfunction in diabetes may be related to CNS pathology, resulting from the diabetic condition (Nofzinger, 1997). The existence in diabetic patients of a central neuropathy, in addition to peripheral neuropathies, has previously been suggested by Donald et al. (1984) following the finding of abnormal conduction velocities in brainstem auditory evoked response (BAER) testing in diabetic subjects. They suggested that the diabetes condition is associated with a conduction delay, combined with a reduced responsivity in the CNS. Based on their findings, localisation of the neuropathy, although not precise, may be in the upper brainstem or midbrain as well as in the cortex. In their subject sample, several psychiatric subsyndromal features were present, including a loss of energy, increased fatigue, subclinical depression with previous episodes of depression, and an increase in irritability with considerable fluctuations in mood over time. Comparisons of BAER measures between affected versus unaffected diabetic subgroups on these psychiatric variables showed more BAER abnormalities in affected individuals, indirectly supporting a functional significance for the discovered ‘central neuropathy’. Diabetic subjects have significant decreases in REM (rapid eye movement) sleep measures, a brain state in which there is selective activation of anterior paralimbic structures intimately related to motivation and the regulation of affect. This implies
that the central neuropathy observed by Donald et al. (1984) may be in structures that integrate basic physiological regulation with primarily adaptive or motivational behaviour. This may be related to the sexual dysfunction and autonomic dysregulation during sleep noted in diabetic patients. Further indirect evidence of central dysregulation of the autonomic nervous system as a component contributing to diabetic sexual dysfunction comes from studies on blood pressure variability during REM sleep in diabetic patients. Guilleminault et al. (1985) measured blood pressure changes at 15-min intervals throughout the night in 7 normal controls, 11 IDDM and 6 NIDDM patients. The IDDM patients revealed abnormal evolution of blood pressure changes overnight, including a failure to rise in the early morning hours, and a lack of normal variability during REM sleep in comparison with non-REM sleep episodes. Normally, blood pressure undergoes dramatic fluctuations during REM sleep corresponding to an ‘autonomic storm’ involving abrupt changes in the parasympathetic and sympathetic nervous systems. Functional imaging studies reveal increased glucose metabolism, or ‘activation’ of structures which are intimately related to regulation of the autonomic nervous system during REM sleep, including the infralimbic cortex, the insular cortex, the basal forebrain and lateral hypothalamus, and the amygdala. Alterations in REM sleep, most prominently reductions in REM sleep time, prolongation of REM sleep latency and reductions in phasic measures of REM sleep are predominant in diabetes patients. This suggests that diminished variability of the autonomic nervous system during REM sleep in diabetic patients may be related with a central neuropathy related in turn to the diabetic condition.

Although none of these studies focus on women, there is no reason to believe the results might not be applicable also to women. In a critical review of the literature on diabetes and female sexual dysfunction, Spector et al. (1993) suggested that methodological differences in earlier studies may account for the significant variability in the findings of sexual dysfunction in diabetic women. These include a failure to take into account the effects of diabetes type (IDDM or NIDDM); menopause; obesity; and predictor description (presence and severity of diabetic complications; particularly neuropathy, retinopathy, and nephropathy; or psychosocial factors including relationship satisfaction, presence or absence of depression, body image and disease acceptance) on sexual dysfunction. One study made in diabetic women found a significant positive correlation between sexual dysfunction and Beck depression inventory scores, with higher Beck scores for those diabetic women who had neuropathy (Leedom et al., 1991). Newman and Bertelson (1986) also found that diabetic
women with sexual dysfunction reported higher rates of depression than those without sexual dysfunction. Again the possibility of a central neuropathy in diabetic women affecting the anterior paralimbic system arises, thereby leading to disturbances in both primary motivation and drive, as well as in the limbic-cortico-visceral neural pathways that connect primary affective states, such as sexual desire, with peripheral autonomic regulation of sexual function.

**Diabetes mellitus and psychosocial problems**

Rubin & Peyrot (1992) reviewed extensively the literature on psychosocial problems in diabetes. Some information from two of the four major topic areas is presented here.

**Diabetes onset**

In contrast to the many anecdotal reports, longitudinal studies suggested a relatively benign course of early psychological adjustment. Kovacs et al. (1985) found that most children (64%) responded to a diagnosis with mild symptoms such as sadness, feelings of friendlessness, and social withdrawal. A minority (36%) of their sample did exhibit more severe symptoms, sufficient to diagnose a psychiatric disorder, but all children returned to normal levels of psychological functioning within 9 months of diagnosis. Kovacs et al. (1985) reported a similar pattern of adaptation for mothers, with fathers experiencing little in the way of distress at any time.

**Sexual sequelae**

It has been estimated that half of all diabetic men with impotence problems have a significant emotional overlay attributable to stress, anxiety, depression, or fear, that contributes to erectile dysfunction (Whitehead et al., 1983). Others have found a significant association between sexual problems and depression (and other psychiatric disorders) among diabetic men and women (Lustman & Clouse, 1990; Cavan et al., 1987; Leedom et al., 1991). These psychological factors may both exacerbate and be exacerbated by organic pathology in the development and maintenance of sexual dysfunction (Schiavi & Hogan, 1979)

**Psychopathology**

First, the criteria for disturbance vary from study to study, and some studies do not state whether the levels examined define a clinical disorder. Second, certain symptoms of some psychological disorders closely resemble certain symptoms of diabetes. For example, some symptoms of depression and chronic hyperglycaemia coincide, as do some symptoms of anxiety disorder and hypoglycaemia. Still, the reviewers found some evidence that psychological distress (Surridge et al., 1984; Murawski et al.,
1970) and diagnosable psychological disorders, especially depression (Wilkinson et al., 1988; Popkin et al., 1988; Trence et al., 1990; Skenazy & Bigler, 1985) are more common in diabetic adults than they are in the general population. However, these differences disappear when people with diabetes are compared with people who have some other chronic disease (Trence et al., 1990; Skenazy & Bigler, 1985; Popkin & Callies, 1987). This suggests that diabetes is no more distressing than other chronic diseases.

Lustman & Clouse (1990) have suggested that the symptoms of depression and diabetes may exacerbate one another. For example, hormonal dysregulation associated with depression may contribute to glycemic dysregulation (and vice-versa). Symptoms of some psychological disorders also may contribute to the disruption of self-care routines and to a cycle of deteriorating physical and emotional well-being. Numerous studies have found that for adults and children, psychological distress and poor glycemic control are associated, although none of the reports on children indicated whether the psychological distress met clinical criteria for a diagnosable disorder.

**Diabetes mellitus, quality of life and life satisfaction**

Reports from women are more negative concerning sexual functioning and quality of life than reports from men (Brorsson et al., 1993; Ventegodt, 1998).

Brorsson et al., (1993) presented a Swedish Health-Related Quality of Life Survey (SWED-QUAL) that was adapted from measures used in the Medical Outcomes Study (MOS). The development of these measures spans more than 20 years and their reliability and validity have been extensively tested. The SWED-QUAL consists of 61 items that form 11 multi-item scales tapping aspects of physical, mental, social and general health. Despite its comprehensiveness, the SWED-QUAL requires only about 12 min to complete. The instrument was mailed to a random stratified sample of 2,366 individuals from the Swedish general population aged 18-84 years. The response rate for this group was 61%. Telephone follow-up of non-responders indicated that most of those tended to have a better health-related quality of life than responders. The physical functioning scale correlated most closely with the scales measuring mobility, satisfaction with physical ability, role limitations due to physical health and pain. The scales measuring satisfaction with family life and marital functioning were closely interrelated and also had noteworthy associations with positive effect. The sexual functioning scale correlated
substantially with physical functioning. Definition of sexual functioning items were: lack of interest, inability to enjoy sex, difficulty in becoming aroused, having orgasm (women), getting or maintaining an erection (men). Physical health (physical functioning, mobility, satisfaction with physical health, role limitation due to physical health), pain and sexual functioning became systematically worse with ageing. Eighteen of 78 comparisons showed significantly worse HRQOL for women than for men. Women reported a considerably lower level of sexual functioning than men, especially in the youngest age groups. Sexually functioning in the age group 25-54 years was 77% and 94%, respectively. Women and men did not differ in terms of positive effect. General health perceptions tended to be more negative for women than for men.

A representative sample of the Danish population (Ventegodt, 1998) filled in a 317-item quality of life questionnaire, including five questions on sexuality. The response rate was 61%. Another 7% did not answer questions on sexual life, reducing the total response rate to 54%. Of the responders, 753 were women, 18 to 88 years of age. People who were not active sexually rated their quality of life lower than did the active ones. Also dimensions such as well-being, satisfaction with life, and happiness were below the population mean for sexually non-active people. Three-quarters of the women in the age range 28-53 years reported no sexual problems, though only 67-68% of the women was satisfied with their sexual lives. Of the men, 76-89% was without sexual problems, yet only 51-64% stated they were satisfied with their sexual life. Lacking a partner and impotence were most prevalent problems in men. In women, the sexual problems concerned lack of partner, 5-7% (reducing QL 17%); reduced desire, 13-17% (reducing QL 6%); pain/discomfort during intercourse, 4-5% (reducing QL 7%); lack of orgasm, 6-9%, with highest frequency in the younger ages (reducing QL 8%). ‘Other’ problems were reported by 4-7% of the women (reducing QL 4%).

Numerous authors have found that women with IDDM report a more negative impact of diabetes on their lives than men do (Challen et al., 1988; Jacobsen et al., 1988; Gåfvels et al., 1991; Eiser et al., 1992; Bradley, 1994; Wredling et al., 1995).

All patients with diabetes in a northern Swedish county and 1125 age-matched controls were approached with a postal questionnaire in order to investigate the social consequences of diabetes (Gåfvels et al., 1991). The response rates were 87% and 72% respectively. The study included 215 women (90% Type 1 diabetes), mean age 34 years. More women than men with IDDM lived alone and had no children. More women with diabetes were employed part-time, had taken more than one month of sick-leave
during the past 3 years, and were drawing a disability pension.

Wredling et al. (1995) among other groups, investigated a representative Swedish sample of 93 women with IDDM (mean age 57 years, SD 19.2) with questionnaires concerning well-being and treatment satisfaction. The response rate was 84%. Women reported a more negative impact of diabetes on daily life than did men. Women had significantly higher scores for depression. Compared with men with IDDM, they had significantly higher anxiety levels, lower energy levels, lower general well-being, the disease had a greater impact on daily life, and they worried more about the disease. The women’s higher depression scores were in agreement with a previous study, by Bradley (1994). One surprising observation was that the Swedish vis-à-vis the English patients with diabetes, (both IDDM and NIDDM), had higher scores for depression, a difference that was independent of gender.

In Norway, Hanestad (1993) reported on a self-reported quality of life questionnaire comprising 28 items measuring satisfaction within the physical, psychological, social and activity/behavioural life domains and 11 well-being scales applied to 247 people with IDDM, of whom 109 (44%) were women (mean age 34 years). The response rate in this study was 92%. Satisfaction with life as a whole was rated as ‘quite good – very good’ by 84%, sexual life at 72%, and social contacts and relationships at 87-88%. Living alone had deleterious effects on satisfaction within the physical, social and psychological life domains. Women reported more guilt and tension, but perceived themselves more sociable than men.

When Eiser et al. (1992) measured quality of life in 69 young adults with Type 1 diabetes (mean age 21 years), the 41 women reported a worse impact of diabetes on their lives than did the young men (p<0.05). The response rate was 74%. Non-responders were found to have poorer attendance records than responders. A worse impact on women was also found in studies by Challen et al. (1988) and Jacobsen et al. (1988) on adults – but not on adolescents.
Subjects

Study I: women with hypothalamo-pituitary disorders (HPD)

The first study included women with HPD. They were regularly visiting the neurological clinic for diagnostic as well as therapeutic check-ups. Women over 60 years of age were excluded. Fifty-three women were invited personally by the author at their clinical visit to participate in the study. Forty-eight women (91%), aged 17 to 57 years (median 42) agreed to undergo the sexological interview (Table 1).

Study II: women with multiple sclerosis (MS)

The purpose of the second study was to invite women with MS and regularly visiting the neurological clinic. The physicians practising at the clinic were informed and asked to invite their patients to take part in the sexological study. However, only a few women were referred this way. Instead, the author established clinical co-operation with a rehabilitation centre for neurological diseases in Sigtuna, run by a foundation. A large number of women with MS visit this centre every year, and the Principal of the centre was seriously interested in co-operation in the sexological field. If the women had been recruited from the university clinic they would probably not have been so severely afflicted by the disease as now became the case.

Fifty-seven women with definite or probable MS, were invited personally by the author at their rehabilitation visit to participate in the study. The diagnosis had been known by each subject for at least one year before this investigation. Women over 60 years of age were excluded. Forty-seven women (82%), aged 21 to 55 years (median 46) agreed to take part (Table 1).

Study III: women with insulin-dependent diabetes mellitus (IDDM) and age-matched controls (C)

Seventy-six women, aged 25-50 years, with IDDM of at least one year’s duration, attending the Uppsala University Hospital Diabetic Centre, were invited personally by the author to participate in the study. Forty-two women (55%), aged 27 to 50 years (median 37.5) agreed to participate (Table 1).

Five hundred women, living in the same geographical area in Sweden as the IDDM group, were randomly selected from the Official Census Bureau. Among them, those women born in Sweden on dates as close as possible to
the women with IDDM, were selected for an invitation to participate in the study. Information about the research was sent by mail wherein the women were also invited to take part in the study. One hundred and twelve consecutively selected women were asked, before 42 women (38%), who had neither diabetes mellitus nor any neurological disease could be matched with the IDDM subjects (Table 1).

**Study IV: women from study III, and representative Swedish women (SiS)**

In study IV, findings from the women with diabetes mellitus and their age-matched controls (study III) were compared with the results from the Swedish population-based survey on sexuality and health (SiS), carried out in 1996. In SiS, the respondents were able to communicate in Swedish and were free from serious physical and mental diseases (i.e. not institutionalised). With a response rate of 59%, the SiS group included 2,810 respondents between 18 and 74 years – of whom 1,335 were women. Comparable data and results from all 742 women in the age interval 25 to 50 years (median 37) are presented in study IV (Table 1).

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<td>112</td>
<td>4,781*</td>
</tr>
<tr>
<td>Agreed to participate, n:</td>
<td>48</td>
<td>47</td>
<td>42</td>
<td>42</td>
<td>2,810*</td>
</tr>
<tr>
<td>Response rate</td>
<td>91%</td>
<td>82%</td>
<td>55%</td>
<td>38%</td>
<td>59% *</td>
</tr>
<tr>
<td>Median age, years (range)</td>
<td>42</td>
<td>46</td>
<td>37.5</td>
<td>38.5</td>
<td>37 (25-50)</td>
</tr>
</tbody>
</table>

*SiS in total, men and women 18-74 years


*Levin et al., 1998.
Methods

This dissertation comprises descriptive, retrospective, quantitative studies on sexual functioning in women with neurological disorders at fairly distinct and separate levels. The results are compared with those in an age-matched control group. The studies are based on personal interviews, neurological examinations, incl. VPT (IDDM), serum concentrations of prolactin and testosterone (HPD), and a checklist on life-satisfaction (IDDM, C). The results from the neurologically impaired women are also compared with those reported by Swedish representative women in the SiS.

The studies are based on comprehensive interviews, including questions concerning qualitative aspects, focusing on the social, medical and detailed sexological case histories of the women investigated. All collection of data, except in the Swedish sex survey, was performed by the female author, who is a tutor in nursing and registered nurse with a special education in sexology and neurology. During the last 5 years the investigator has held a full-time appointment in clinical sexological practice.

In study I, the interviews were wide open to the possibility of external influences on sexual disabilities in the women. Women with hypothalamic-pituitary disorders were interviewed concerning the following topics:

- family background and information on sexual matters during childhood and youth;
- religious/moral misgivings as regards sexuality;
- sexual experiences, début;
- events that could have affected sexual life;
- occupation;
- family situation;
- alcohol and smoking habits;
- body image, sex identification;
- any homosexual interest and experiences;
- illnesses, diseases, surgery, medical treatments;
- menstrual history, pregnancies, abortions, children, childbirth, and breast-feeding;
- sexual habits and sexual abilities, both before the first clinical symptom and at the time of interview;
• contentment/discontentment and any wish for a change;
• evaluation of the interview experience.

The demanding task of making a thorough sexual anamnesis was the main objective in this first study. Each interview lasted 1-2 hrs. To test the questionnaire and the interview situation, two pilot interviews were performed with healthy colleagues of the interviewer. To facilitate cooperation, both written and verbal information was given to the patients. The interviewee and the interviewer were sitting in comfortable chairs, almost opposite each other, with a small table in between. The patient was reminded that she could quit participation in the study at any time, and that she could also decline to answer any particular question that she might feel embarrassing. None of these eventualities occurred during the study. Much of the background information is omitted from the presentation.

All patients underwent a comprehensive endocrine evaluation. Venous blood samples were drawn in the morning. Radioimmunosorbent techniques were used to measure serum concentrations of prolactin and testosterone (Wide, 1969). The reference level for prolactin was less than 20μg/L. The reference range for serum testosterone in women was 0.8-3.0 nmol/L.

All patients underwent a physical examination by their regular doctor. Medical data from laboratory tests, clinical consultations, etc., were collected from the patients case-histories at the clinic.

For the statistical analyses, the women were divided into two groups: below 35 years and above 35 years of age.

In study II, focusing on women with MS, the wide scope of the interview from the first study was concentrated, and fewer questions and less time were spent on family background, upbringing, religious misgivings, and youth experiences. The focus was now more on qualitative aspects of their sexual experiences. The interviews were structured and followed a protocol that was decided on for this particular study. A separate sheet with answer options was given to the interviewee. There was always an open alternative to the specified ones if this was more suitable for the patient.

Each patient’s neurological impairment was rated from an expanded disability status scale (EDSS)(Kurtzke, 1983). Each interview was followed by a neurological examination, performed by the author, with special attention to the sacral segments.
In study III, on women with IDDM and their age-matched controls, the structured interviews included open-ended questions. The focus was on sexual experiences throughout their lives, as well as a subjective evaluation of the past month in relation to former experiences. The average length of the interview with the diabetic women was longer, due to discussions on medical history. The interviews lasted 1.5 and 1.1 hours respectively (S.D. 0.72 and 0.41) (P<0.01).

Each interview was followed by a neurological examination with special attention to the sacral segments. Measurements of vibration perception thresholds (VPT) were performed using a vibrameter (Somedic AB, Sweden). The VPT was the value first perceived by the subject when the stimulus was increased from zero. The test sites were the dorsal surface of both hands in the region of the second metacarpal bone, both feet in the region of the first metatarsal bone, labia major lateral to urethra, perineum, and the glans clitoris. The method, the apparatus and its principal action are described in studies by Fagius & Wahren, (1981) and Halonen (1986). VPT registrations in the vulvar region of healthy women are reported by Helström & Lundberg (1992).

All subjects in studies III and IV completed a self-administered checklist on life satisfaction (Fugl-Meyer & Fugl-Meyer, 1993). See Figure 1. The checklist comprises one overall item (satisfaction with life as a whole) and ten domain-specific items of life satisfaction. For each item, subjects were instructed to indicate their current level of life satisfaction along a six-graded scale ranging from 1 (very dissatisfied) through 6 (very satisfied). The responses were then dichotomised as ‘satisfied’ (responses 5 and 6) or ‘not satisfied’ (responses 1-4), characterising the level of satisfaction.

The epidemiological survey, SiS, used as a reference in study IV, was based on a combination of face-to-face structured interviews and self-reports using a structured questionnaire for the more intimate questions. Approximately 800 variables covered seven themes: social background, lifestyle, health, knowledge, attitudes, behaviour and estimation of private experience. The interviews were performed by trained interviewers with a special \( \frac{1}{2} \) day preparation, took approximately 1.5 hour, and were administered mostly in the respondents’ homes. Included in study IV are data on first sexual experiences and sexual activities as well as prevalence of sexual problems during the last year, together with life satisfaction and partnership status.
How satisfactory are these different aspects of your life?  
Indicate the number which best suits your situation.

<table>
<thead>
<tr>
<th></th>
<th>1 = Very dissatisfying</th>
<th>2 = Dissatisfying</th>
<th>3 = Rather dissatisfying</th>
<th>4 = Rather satisfying</th>
<th>5 = Satisfying</th>
<th>6 = Very satisfying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life as a whole is</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My vocational situation is</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My financial situation is</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My leisure situation is</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My contacts with friends and acquaintances are</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My sexual life is</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My ability to manage self-care is</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My family life is</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My partnership relation is</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My physical health is</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My psychological health is</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fugl-Meyer & Fugl-Meyer, 1993

Figure 1. Life satisfaction checklist

Ethics

Studies 1-III were approved by the Committee of Ethics at the Medical Faculty of the Uppsala University (1984, 1987, 1993) The SiS study was approved by the Swedish Council for Research in the Humanities and Social Sciences, 1995.
Statistics and data analyses

The results are expressed as median and range or, when appropriate, as mean and standard deviation. To test differences of proportions, a two-tailed t-test, ANOVAs with Fisher PLSD, and the chi-square test with Yates' correction and Mann-Whitney tests were conducted. Probabilities below 0.05 were regarded as statistically significant.

Main results

Study I: Hypothalamo-pituitary disorders and sexual functions

Signs and symptoms First clinical symptom, indicating a hypothalamic or pituitary dysfunction, appeared between the age of 16 and 35 in 65% of the women. The median age at first symptom of dysfunction was 23 years (range 10-57 years). The median duration of the disorder at the time of interview was 11 years (range 0-28 years), (Table 2).

On the basis of CT and/or MRI, patients were divided into five groups depending on tumour classification. Most women (N:38, 79%) had tumours of the sellar region. Among 28 with pituitary adenomas, 10 had serum prolactin levels higher than 100μg/L. They were diagnosed as having prolactinomas. A further 22 had prolactin values between 20 and 100 μg/L. However, at the time of the interview only 7 had elevated serum prolactin (>20 μg/L). Six women had acromegaly caused by growth hormone producing adenomas.

Menstruation Thirty-three women (69%), did not menstruate (median age 42 years); 6 of these 33 were above 50 years of age (Table 2).

In 43 women (90%), the initial symptom of the HPD was a menstrual disorder. Three women had had irregular menstruations since menarche. Secondary amenorrhoea was experienced in 38 cases and primary amenorrhoea in 2. Partly as a result of therapy received (not substitution) 15 of the women were menstruating regularly (median age 40 years, range 24-46 years) at the time of interview.

Experiences Seventy-three percent (N:35) were cohabiting with a male sexual partner (Table 3).

The median number of sexual partners was 3 (mean 4, mode one, range 0-16). Four (8%) had never experienced sexual intercourse. The explanations given by the women for the lack of intercourse experience were: vaginismus, lack of an attractive partner, fear after attempted rape, and performance anxiety. Six (13%) could not recall ever having experienced a feeling of sexual desire. Twenty-two (50%) had never tried masturbation (4 missing answers).
Table 2. Age at onset of disease, duration of disease, and frequency of amenorrhea in women with hypothalamo-pituitary disorders, (HPD) (n:48), multiple sclerosis, (MS) (n:47), insulin-dependent diabetes mellitus, (IDDM) (n:42), age-matched case-controls, (C) (n:42), and women from the Swedish survey on sexuality and health, (SiS) (n:742)

<table>
<thead>
<tr>
<th></th>
<th>HPD</th>
<th>MS</th>
<th>IDDM</th>
<th>C</th>
<th>Sis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at onset of disease (median years)</td>
<td>23</td>
<td>26</td>
<td>16</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(range)</td>
<td>10-57</td>
<td>15-44</td>
<td>4-41</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Duration of disease (median years)</td>
<td>11</td>
<td>17</td>
<td>20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(range)</td>
<td>0-28</td>
<td>2-36</td>
<td>3-38</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Amenorrhea</td>
<td>69%</td>
<td>34%</td>
<td>12%</td>
<td>17%</td>
<td>6%</td>
</tr>
<tr>
<td>(Median/ *mean age)</td>
<td>42</td>
<td>53</td>
<td>36*</td>
<td>42*</td>
<td>32*</td>
</tr>
</tbody>
</table>


**Sexual ability** Altogether 45 (94%) declared that they currently had – or had had – a significant sexual dysfunction (**Table 3**). Two of the 3 women who did not report sexual disabilities had never had sexual intercourse. Thirty-eight (79%) had a considerable decrease in sexual desire. In 14 of the women a decrease in sexual desire (libido) was present at the beginning of the case history. However, in none of the patients had this particular symptom prompted them to seek medical advice. Thirty-one (65%) had problems with lubrication and 33 (69%) had problems with orgasm.

**Correlations** The women who were menstruating (n:15, 31%) had significantly better orgasmic ability (p<0.001) and more masturbation activity (p<0.02) than had the amenorrhoeic women. Having normal serum testosterone values also correlated to masturbation activity (p<0.05). The younger women (i.e. <35 years), more often experienced sexual desire (p<0.01). No significant correlation was found between elevated serum prolactin levels and sexual disability at the time of interview. However, at this point in time, only 7 patients had hyperprolactinemia. Women with intrasellar adenomas more often had normal sexual desire (p<0.01), lubrication, and orgasmic ability (p<0.05) than women having expansively growing pituitary adenomas with both intra- and suprasellar extension.
### Table 3. Results concerning some sexual experiences and sexual problems in women with hypothalamo-pituitary disorders, (HPD) (n:48), multiple sclerosis, (MS) (n:47), insulin-dependent diabetes mellitus, (IDDM) (n:42), age-matched controls, (C) (n:42), and women from the Swedish survey on sexuality and health, (SiS) (n:742).

The P-values are vis-à-vis SiS.

<table>
<thead>
<tr>
<th></th>
<th>HPD</th>
<th>P&lt;</th>
<th>MS</th>
<th>P&lt;</th>
<th>IDDM</th>
<th>P&lt;</th>
<th>SiS</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of partners, (median)</td>
<td>3</td>
<td></td>
<td>5</td>
<td></td>
<td>4</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>(range)</td>
<td>0-18&quot;</td>
<td></td>
<td>0-50&quot;</td>
<td></td>
<td>0-150&quot;</td>
<td></td>
<td>-</td>
<td>1-50</td>
</tr>
<tr>
<td>(mode)</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>3</td>
<td></td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Cohabiting</td>
<td>73%</td>
<td></td>
<td>62%</td>
<td></td>
<td>74%</td>
<td></td>
<td>68%+</td>
<td>86%</td>
</tr>
<tr>
<td></td>
<td>(76-46%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partner relationship</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
<td>81%</td>
<td></td>
<td>86%</td>
<td>98%</td>
</tr>
<tr>
<td>Problems with:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decreased sexual interest</td>
<td>79%</td>
<td>0.0001</td>
<td>60%</td>
<td>0.0001</td>
<td>26%</td>
<td>ns</td>
<td>17%</td>
<td>2%</td>
</tr>
<tr>
<td>Insufficient lubrication</td>
<td>65%</td>
<td>0.0001</td>
<td>47%</td>
<td>0.0001</td>
<td>22%</td>
<td>0.0001</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>Orgasmic difficulties</td>
<td>69%</td>
<td>0.0001</td>
<td>51% †</td>
<td>0.0001</td>
<td>14% †</td>
<td>ns</td>
<td>9%</td>
<td>2%</td>
</tr>
<tr>
<td>Sexually dysfunctional, in total</td>
<td>94%</td>
<td>83%</td>
<td>40%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* HPD 4 virgins, MS 2 virgins, IDDM 1 virgin
† Including women who had never had an orgasm
‡ SiS in total, women 18-74 years
|| Internal drop-out rate was 2%
§ Internal drop-out rate was 10%

Study II: Multiple sclerosis and sexual functions

Signs and symptoms First clinical symptom, indicating a neurological disorder, appeared between the ages of 20 and 29 in 62% of the women. The median age at onset of the disease was 26 years (range 15-44 years) and median duration at the time of the interview, 17 years (range 2-36 years). (Table 2).

EDSS scores for the whole group ranged between 1 and 9 (median 6.5). Only 3 women scored 1-2, 22 scored 4-6.5, and 22 scored 7-9. The patients were divided into two EDSS groups: those not confined to a wheelchair (scores of 1-6.5), and those confined to a wheelchair (scores of 7-9).

Ten (21%) of the women had never experienced any distinct remissions or relapses of the disease. At the time of the interview 77% were experiencing weakness of the pelvic muscles, and 62% complained of sensory dysfunction in the genital area. As many as 89% of the women had bladder disorders, and 66% had bowel problems.

Menstruation Median age at menarche was 13 years (range 10-17) (Table 4). Sixteen women (34%), were no longer menstruating (median age 53 years) (Table 2).

Experiences The median ages at first masturbation, first sexual intercourse, and first orgasm are presented in Table 4.

| Table 4. Age (median) at menarche, first masturbation, first sexual intercourse, and first orgasm in women with multiple sclerosis, (MS) (n:47), insulin-dependent diabetes mellitus, (IDDM) (n:42), age-matched case-controls, (C) (n:42), and women from the Swedish survey on sexuality and health, (SiS) (n:742) |
|-----------------|-------|-------|-------|-------|
| Age             | MS    | IDDM  | C     | SiS   |
| Menarche        | 13    | 13    | 13    | 13    |
| range           | 10-17 | 9-17  | 11-17 | 9-18  |
| First masturbation | 16    | 14    | 14    | 15    |
| range           | 10-30 | 7-30  | 6-40  | 4-42  |
| First sexual intercourse | 17    | 16    | 16    | 16    |
| range           | 13-23 | 13-34 | 13-25 | 12-29 |
| First orgasm    | 20    | 17    | 18    | 17    |
| range           | 10-40 | 8-29  | 4-36  | 5-40  |

Altogether 62% (n:29) of the women was cohabiting with a male sexual partner. However, more women in the lower EDSS score group (76%) than in the higher EDSS score group (46%) were cohabiting (p<0.05) (Table 3). In the higher scoring women, 8 had separated from a steady or cohabiting sexual partner, and all claimed that this was related to problems emanating from the disease, compared with 2 of the 7 separations among women lower in EDSS scores (p<0.05).

The median number of sexual partners was 5 (mean 9, mode one, range 1-50).

The women had had a steady relationship for (median) 20 years (range 0-34 years). During the month prior to the investigation 60 % (n:28) had been sexually active.

All women were asked the complete list of intimate questions concerning sexual experiences. The women who had had neither orgasms nor sexual intercourse during the past year, however, clearly had difficulties in judging quality aspects of their experiences.

Eleven of the women did not have children. Thirty-six women had one to four (median 2) children.

Sexual ability Twenty-eight (60%) women had noticed diminished sexual desire. (Table 3). Seventeen women (36%) reported a delay and some decrease in lubrication and another 5 (11%) did not know, because of lack of intercourse experience. These changes were associated with a worsening of the disease, with loss of menstruation, and in one case with surgery to create a urostomy. Three other women had noticed a temporary decrease in lubrication, one of them during treatment with the drug epenromium and one during treatment with intravaginal electrostimulation for urinary incontinence.

At the time of the interview, orgasmic function had deteriorated in 18 women (38%) and 6 others (13%) had never had an orgasm. Another 3 women had experienced a temporary decrease in orgasmic ability. Improvement in orgasmic capacity was noticed by 3 women. In one of them the orgasms were more easily triggered, enabling her to have more orgasms, but the sensations were less pronounced. In 5 women the orgasmic sensations were intensified – that is, orgasms had become longer lasting, stronger, or more pleasant. Twelve of the women (26%) had experienced at least one orgasm within the previous week; 15 women (33%) within the past year. Thirteen women (28%) had not had any orgasms in the last year and six women (13%) had never had an orgasm. In 10 women the orgasmic sensations were reduced, they were short lasting, less intense, or less agreeable. Of the 30 (64%) women who had ever
noticed clitoral erection during sexual stimulation, 6 (20%) had experienced a loss of such erections. Seventeen (36%) women had never noticed clitoral erection.

The most effective sexual stimulation techniques for the women to achieve an orgasm were in most cases genital caresses by the partner (n:36, 76%) and penile/vaginal sexual intercourse (n:18, 38%). Oral stimulation was effective for orgasm (n:16, 34%), and additional breast caressing and manual masturbation (n:12, 26%). A few women enjoyed the use of devices for stimulation – for example, showers and vibrators, rubbing against something, or fantasies and dreams.

Women with lower scores in EDSS reported more significant negative sexual changes regarding lubrication (p<0.01) and the disappearance of clitoral erections (p<0.05) than did the higher scored women. Experience of a decrease in orgasmic ability was also more common in the lower scoring group as well as marked changes in orgasmic sensations.

Correlations Symptoms of weakness of the pelvic floor as well as bladder and bowel dysfunction were correlated with changes in lubrication and in orgasmic ability (p<0.01). Sensory symptoms from the trunk and genitals were correlated with orgasmic quality (p<0.05). Vertigo was correlated with changes in desire, lubrication, and both orgasmic ability and orgasmic sensations (p<0.01). Menstruation or estrogen replacement therapy was correlated with both lubrication and orgasmic sensations. Younger age had a stronger positive influence than menstruation.

Sexual desire was correlated with lubrication (p<0.05) and lubrication with orgasmic capacity (p<0.001). In the 5 women where orgasmic sensations were intensified, the improved orgasmic quality was significantly (p<0.05) correlated with non-smoking, with noticed erection of the clitoris, and with the subjective feeling of having an attractive body.

Satisfaction The EDSS groups were similar in their statements regarding contentment as regards sexual experiences as a whole (84% and 82%), bodily attractiveness (60% and 50%), and pleasure from their bodies (74% and 75%).

Interview experience Forty-four women (94%) had never been asked previously to discuss their sexuality in connection with their disease. Thirty-nine women (83%) felt the interview was a positive experience. One woman regarded the interview as mostly a negative experience, while 7 (15%) expressed indifference to the whole thing.
Study III: Diabetes mellitus and sexual functions

Signs and symptoms The median age at onset of diabetes was 16 years (range 4-41 years). The median duration of diabetes was 20 years (range 3-38 years). (Table 2).

Retinopathy was prevalent in 19 (45%), 12 (29%) had hypertension, 5 (11%) had cardiovascular symptoms, and 5 (11%) had signs of nephropathy. Thirty-six (86%) were treated with >4 doses of insulin per day, while the remaining 6 women were on 3 doses per day.

The intention was to recruit a representative group of age-matched healthy women, but which turned out to be a group of women who were neither completely healthy, nor afflicted by neurological diseases or diabetes mellitus. Fourteen women (33%) had not suffered any medical discomfort or treatments and reported themselves as in fact ‘healthy’. However, 11 women had joint or back problems, 9 had had some gynaecological disorder, 8 women had minor neurological symptoms, and 7 had suffered from urological disorders. Six women were treated for gastro-intestinal diseases, 5 were treated for endocrinological disturbances, and visual, allergic and psychiatric problems were reported by 3 women each.

The similarity in demographic and sexological history data between women with IDDM and their controls suggests that the controls were suitable for drawing comparisons regarding sexual function with the women with IDDM.

A number of symptoms were reported more often by the diabetic women than the controls. Seven women reported reduced foot perspiration ($p<0.01$), 13 increased gustatory perspiration ($p<0.05$) and 5 impaired vulvar sensibility ($p<0.05$). Changes in perspiration are symptoms of autonomic nervous dysfunction, very often seen in diabetes mellitus.

The diabetic women had higher mean vibration perception thresholds than the controls at all points measured. There were significant differences on the VPT’s for the hands and the clitoris ($p<0.05$). Impairment of vibration sense may be one of the first signs of peripheral neuropathy in diabetes. Fourteen women with diabetes and 4 controls lacked Achilles reflexes ($p<0.01$), 5 and one respectively had no patellar reflexes (n.s.) and 5 women with diabetes had no brachio-radial reflexes ($p<0.01$). Absence of Achilles tendon jerks in the controls was due to other types of peripheral nerve disorders. As expected, the duration of disease had an impact on the Achilles reflex, and perceived sensations of temperature and pain in the feet.
Mean Body Mass Indexes (BMI) were similar in the two groups, 23.2, S.D. 3.3 (IDDM) and 23.8, S.D. 3.7 (C), i.e. the women were not overweight. Eleven women (26%) in each group were smokers, i.e. average for the Swedish female population (Holm & Otterblad Olausson 1996).

Menstruation Median age at menarche was 13 years in both groups (Table 4). Menstrual irregularities were significantly \((p<0.001)\) more common among the diabetic women \((n:25, 60\%)\) than in the controls \((n:10, 24\%)\). Five women with diabetes (mean age 36 years) and 7 controls (mean age 42 years) were amenorrhoic (Table 2). Of the controls, 3 were using contraceptives (e.g. hormonal IUD) which caused the amenorrhoea and one woman had had a hysterectomy. Of the remaining 3, (mean age 49 years) 2 were taking hormonal replacement. Four diabetic and 11 controls used oestrogen in contraceptive pills or for postmenopausal complaints.

Experiences Altogether 74\% \((n:31)\) of the women with IDDM were cohabiting with a male sexual partner vis-à-vis 86\% \((n:36)\) of the women in the control group (Table 3).

The IDDM women had had (median) 4 sexual partners (mean 10, mode 3, range 0-150) and the controls had had (median) 5 (mean 9, mode 4, range 1-50) (Table 3). In both groups, 12 women (29\%) were familiar with the hospital environment, due to occupations. There were no significant differences between the groups regarding demographic characteristics, though women with IDDM were 12-21\% less experienced concerning: cohabitation (12\%), marriage (21\%), university education (19\%), and working part or full time (15\%).

Of the 34 women with IDDM who had a stable sexual relationship, 94\% \((n:32)\) were satisfied with the partner and of the controls, 40 out of 41 (98\%). Women in the IDDM group had had a steady relationship for (median) 15 years (range 0-32 years), the corresponding figure for the control group was (median) 17 years (range 4-32 years). During the month prior to the investigation all but one woman \((n:41, 98\%)\) in the control group had been sexually active, vis-à-vis 38 women (90\%) in the IDDM group.

The women had (median) 2 children (range 1-4). Nine women (21\%) in the IDDM group were nulliparous, vis-à-vis 5 (12\%) in the control group. Fewer women with IDDM (52\%) had had a positive experience of their latest childbirth \((p<0.05)\) than had the controls (81\%).

Sexual ability Taken together, the different types of sexual dysfunction were significantly more prevalent in the IDDM group (40\%) than in the control group (7\%) \((p<0.001)\).
Twenty six percent \((n:11)\) of the women with diabetes had reduced sexual desire, 22\% \((n:9)\) had problems with decreased lubrication and 10\% \((n:4)\) found it more difficult to reach orgasm (Table 3). Transient hypo- and hyperglycemia affected the sexual abilities. One woman with IDDM was still a virgin and 2 women had never experienced an orgasm. Only one of the control group had a problem with each of these sexual abilities.

Eight women with diabetes (19\%) had experienced an increased orgasmic response on certain occasions and this was reported by 18 of the controls (43\%). Thus, the orgasms came more easily, were felt more intensely and lasted longer. Women with IDDM attributed the improved orgasmic response to their improved sexual relationships, more frequent practice and greater knowledge.

More women in the diabetic group \((n:11, 26\%)\) had experienced unwelcome changes in orgasm than had the controls \((n:7, 17\%)\). They had either lost the capacity or needed more time to achieve an orgasm, or the orgasms had become less enjoyable.

Both groups reported variations in sexual function over the years. The women’s interpretations of the connections with concurrent life events differed between the groups. The women with IDDM associated their sexual abilities more with their relationships and with the disease. The controls attributed their fluctuations to changes in desire, childbearing and the use of hormonal contraceptives (the pill). The controls had experienced more improvements by practice and less deterioration in orgasmic capacity than had the women with diabetes.

The most effective sexual stimulation techniques for the women to achieve an orgasm were in most cases genital caresses by the partner \((n:18\) and \(n:17\)) and penile/vaginal sexual intercourse \((n:8\) and \(n:12\)). Masturbation was effective for orgasm \((n:8\) and \(n:7\)), as was oral/genital stimulation \((n:5\) and \(n:4\)). To achieve orgasm, sexual technique was important \((n:28\) and \(n:17\)), a positive relation with one’s partner \((n:11\) and \(n:8\)) and freedom from disturbance was mentioned by 6 and 5 of the women.

Despite the frequent medical complaints in the control group only one woman stated that the disease had cost her sexual abilities. This was a woman whose ulcerous colitis had been treated with colectomy, ileostomy and an intestinal reservoir. Since that operation she had had severe difficulty with lubrication and her pelvic muscle contractions at orgasm were weakened.
Satisfaction Generally speaking 79% of the women with IDDM were satisfied with their sexual experiences, as were 98% of the controls \( (p<0.01) \). General satisfaction with one’s own body attractiveness to one’s partner was 76% and 86%, respectively. General satisfaction with one’s own body giving pleasure was 79% and 93%, respectively. Positive evaluation of one’s own body attraction to a partner as well as one’s own body giving pleasure correlated with orgasmic ability \( (p<0.05-0.001) \).

Correlations Treatment with four doses of insulin per day was predominant in this group and no correlation were found between this treatment regimen or level of HbA1c and sexual function. Reduced foot perspiration and increased gustatory perspiration were correlated with sexual dysfunction. Decreased lubrication was correlated with constipation \( (p<0.05) \) and decreased orgasmic ability with difficulty in controlling urine \( (p<0.05) \). Altogether, 10 diabetic women had not experienced any orgasms during the preceding year, vis-à-vis 2 controls. Four of these diabetic women were amenorrhoic. The 6 who were menstruating had a mean of 39 days between the menses, compared with 30 days in the group of women with diabetes who had experienced orgasm during the last year. There was a significant correlation between sexual ability and contentment. Overall sexual satisfaction was also correlated with cohabitation and living in a steady relationship \( (p<0.05) \).

Interview experience The women with diabetes had not spoken with their regular physician or nurse about their sexual problems. However, the vast majority of them \( (n:39, 93\%) \) were positive about the interview, while 3 women (7%) were indifferent. Women in the control group also found it helpful to take part in the interview \( (n:41, 98\%) \), while only one woman was indifferent to this experience.
Study IV: Sexual problems, diabetes mellitus and life satisfaction

Signs and symptoms Signs and symptoms of women in study III are described above.

The epidemiological Swedish survey of sexuality and health, SiS, included little information on medical health issues. As reported by Levin et al. (1998) the respondents were free from serious physical and mental diseases (i.e., not institutionalised), yet their health status was reported being bad in 4% and intermediate in 20%. Ten percent of the women could not run 100 meters. Twenty-four percent had been diagnosed by a physician as having a chronic disease that was bothering them or had needed medical treatment at least one month during the past year. A few of the women in this group were suffering from various diseases having a performance-reducing effect. Some diseases are well known contributors to sexual disabilities, viz. hypertension, cardiovascular disease, chronic pain, back problem, bronchial asthma, cancer, rheumatic arthritis, gastrointestinal diseases, depression, urinary infections, diabetes mellitus (0.6%), totalling 28%, though single individuals probably carry more than one disease. Ten percent had had an injury and 15% of them felt it had been devastating to their sexual performance. Twenty seven percent were smokers.

Menstruation Median age at menarche was 13 years (range 9-18) (Table 4). Menstrual irregularities were significantly \( p<0.001 \) more common among the diabetic women \( n=25, 60\% \) than in the controls \( n=10, 24\% \) and in the SiS group \( n=89, 12\% \). Five of the IDDM group (12%, mean age 36 years), 7 in the control group (17%, mean age 42) and 44 in the SiS group (6%, mean age 32) were amenorrhoic (Table 2).

There are no figures on oestrogen replacement therapy in the SiS group.

Experiences The median ages at some early sexual experiences are presented in Table 4. Throughout their life the women in the IDDM group had had (median) four sexual partners, while the corresponding number for the control and SiS groups was five.

Forty-one woman (98%) of the controls and 34 (81%) of the IDDM group had a partner relationship (Table 3). This difference was significant \( p<0.05 \). Of the SiS group, 86% had a partner relationship. This proportion, being in between those of the other two groups, did not differ significantly from either. During the month prior to the investigation, all but one woman \( n=41, 98\% \) in the control group had been sexually active. In the IDDM group, 38 women (90%) and in the SiS group, 82% \( n=596 \) had been so.
Sexual ability Problems caused by diminished sexual interest and insufficient vaginal lubrication were significantly more common in the IDDM women than in the controls (p<0.005 and p<0.01, respectively). Diminished sexual interest was also significantly (p<0.01) more common in the SiS group than in the control group, while the problem of insufficient lubrication was significantly (p<0.0001) more common in the IDDM group than among women in the SiS group. No significant differences concerning problems due to diminished interest and orgasmic difficulties were found between these two groups (Table 3). Women in the IDDM group who were single (n:11), reported more sexual problems than those with a partner (viz. 4 had decreased sexual interest, one reduced vaginal lubrication and 5 reported problems with achieving orgasm). In the SiS group there were no differences concerning partnership status or the problem of diminished sexual interest. However, among women having a partner relationship, reduced vaginal lubrication occurred for 8% and decreased orgasmic response for 20% – corresponding numbers for single women were 6% and 29%, respectively.
Life satisfaction For all but one item (satisfaction with leisure) the proportions of satisfied and very satisfied women were lowest for the IDDM group (Table 5), though significantly differing from the other two groups only in two domains of life: contacts with friends and acquaintances ($p<0.01-0.05$) and for satisfaction with physical health ($p<0.0001$). In this item only 27% of the women with IDDM but approximately three-fourths of both the controls and the SiS group were at least satisfied. The proportions of satisfied women were very similar in all three groups as regards leisure, ADL and psychological health. However, there were considerable differences concerning life as a whole, partner relationship, family life, occupation and financial situation; thus the women with IDDM had generally lower proportions of ‘at least satisfied’ women than had the controls and SiS groups (11-20% and 8-13%, respectively).

Satisfaction with sexual life in the IDDM group was significantly correlated with having a partner relationship ($p<0.05$), with sexual interest ($p<0.05$) and orgasmic ability ($p<0.05$). These women also showed positive and significant correlations between satisfaction with life as a whole and sexual interest ($p<0.05$), sufficient lubrication ($p<0.01$) and orgasmic ability ($p<0.05$). Satisfaction with sexual life as well as life as a whole was for the SiS group positively and significantly associated with sexual interest ($p<0.0001$ and $p<0.0002$, respectively), sufficient lubrication ($p<0.0001$ and $p<0.002$, respectively), and orgasmic ability ($p<0.0001$ and $p<0.0002$, respectively).

Women in the control group were considerably more often satisfied or very satisfied with life as a whole, sexual life and contacts with friends and acquaintances, than were the SiS women.
Table 5: Prevalence of women who were at least satisfied (satisfied/very satisfied) with life as a whole and with ten domains of life. Case-controls (C) were 42 age-matched women, 42* women had IDDM and a nationally representative sample (SiS) including 742 women.

* One woman did not complete the questionnaire.

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<th>IDDM</th>
<th>p&lt;</th>
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General discussion

Subjects

Recruiting women for research into sexual experiences is a delicate matter. Although women were approached tactfully, many would not agree to take part, either in an interview or in a physical examination with an explicit sexological focus, because sexual experiences are so very private. The response rates (Table 1) among women with neurological disorders varied between 91% of the women with HPD to 55% of the women with IDDM. This probably reflects the degree to which the sexual functions constituted a problem for the women, the varying need of attention, and accessibility while in a hospital/rehabilitation centre or otherwise.

The age-matched control group had a response rate of 38%, a low figure in comparison with the women with neurological disorders. Only one-third of the women recruited as ‘healthy controls’ actually proved to be so. This complication is probably common in ‘healthy controls’, but seldom discussed. However, as they had neither diabetes nor neurological diseases, they could still be matched and used as controls in study III. The age-matched controls were the most sexually active, generally leading the least problematical sexual life and containing the greatest proportions of satisfied and very satisfied subjects concerning life as a whole and all the ten domains, especially those characterizing sexual life, partner relationship and family life. Obviously, there seems to be a selection bias toward sexually happy subjects, even though only one-third of them were ‘healthy’. It might be that the not quite healthy women responded more positively to the invitation to the study because they had become familiar with the hospital when they were ill. They might felt relieved and grateful towards the care-givers at the hospital, were loyal, generous, and supportive toward the aim of the study and, by being initiated, were more understanding of the purpose of the study. That one-third of both the IDDM and C group, due to their occupations, were familiar with the hospital environment, may also have contributed to their active participation in the study.

It is also possible that the 55% responders in the IDDM group constituted a positive selection, as they were not hospitalized and four-fifths of them were generally satisfied with their sexual experiences.

How many and which women in the SiS group would have responded if the survey had included a physical examination, we can not know. But despite the scanty medical information from the SiS survey, we do know that at least one-quarter of them were not entirely ‘healthy’. In the SiS, the
response rate was 59%, with an internal drop-out rate of 2-10% regarding sexual problems. The figures are comparable to Ventegodt’s study (1998) in Denmark, which had a response rate of 61% and an internal drop-out rate of 7% regarding sexually explicit questions.

Brorsson et al. (1993) found that non-responders had higher HRQOL than responders and Eiser et al. (1992) found that the IDDM non-responders had a poorer clinical attendance than the responders. It is possible that their sparse attendance was due to good health, though more likely because their IDDM was less cautiously managed.

Methods

This thesis comprises descriptive, retrospective, quantitative studies on sexual functioning in women with neurological disorders at fairly distinct and separate levels. The results were compared with those in an age-matched control group. The studies were based on personal interviews, neurological examinations, incl. VPT (IDDM), serum concentrations of prolactin and testosterone (HPD), and a checklist on life-satisfaction (IDDM, C). The interviews and examinations were all conducted in a hospital setting by one and the same female clinician. The results from the neurologically impaired women were also compared with those reported by Swedish representative women in the SiS. All results in the SiS were based on another style of structured interview using a questionnaire for the more intimate matters. Sexual behaviour was one of seven themes covered by approximately 800 variables. The results were collected by several interviewers, had the last year in focus for sexual evaluation – in comparison with last month in the HPD, MS, IDDM and C groups – and gave only sparse information on medical health issues. The medical health problems in the age-matched controls also complicated the situation. Which group is the best to use as references for the women with neurological disorders?

The reliability and validity of interview data have been tested in numerous studies. The results show, with few exceptions, that illness conditions go largely underreported. Studies on the reliability of interview data, particularly interviewer variability, have been undertaken (Brorsson, 1980). The findings of 264 (32 men, 232 women) interviewers carrying out 10,026 interviews for the Swedish Survey of Living Conditions showed a significant (p<0.001) variability between the interviewers regarding the results obtained from a sample of questions in the health section of the questionnaire. It was further found that male interviewers recorded significantly fewer and smaller proportions of illness conditions and health
services use for 18 of the 54 questions from which results were compared. The difference in results obtained, between male and female interviewers, was confirmed in another study where results recorded by individual interviewers were summarised in an interview index (Brorsson, 1980). The gender of interviewers in the SiS and variability between them in the results has not been published.

There are other difficulties in a study of this kind. When a person relates the impressions from her senses, organic bodily sensations, attitudes, or a sense of psychological well-being, intersubjective control cannot be ensured. When we want to register such experiences, we must accept that our only possibility is to listen to her introspection and hence, cannot check intersubjectively.

Is it possible to recall sexual experiences from long ago, in comparison with recent impressions? A number of validity studies have been made on agreement between questionnaire data and medical records. Harlow & Linet (1989) found that the recall of oral contraceptive use, of reproductive history, and of childbirth was quite accurate. Women’s sexual experiences are recalled intimately in connection to partner relationships and reproductive history, and therefore might well be remembered and judged by a woman. As a professional care-giver it comes natural to determine, by one’s own senses, if a person is honest or seems to be concealing information of importance. The author’s impression is that the women interviewed tried their best to elucidate their sexual life experiences.

Research in QL and life satisfaction uses a great variety of instruments, which makes findings hard to compare. The checklist on life-satisfaction used in the IDDM group, C and in SiS (Levin et al., 1998) has previously been used in subjects both with (Bränholm et al., 1996; Fugl-Meyer et al., 1996) and without impairments or disabilities (Fugl-Meyer et al., 1991). The checklist comprises a set of social indicators of perceived wellbeing. The dichotomy ‘satisfied’ and ‘not satisfied’ in other reports has proved statistically valid. The checklist is clinically useful, it is self-administered and takes only a few minutes to complete. It helps both the patient and the care-giver to realise what domains in life are satisfying to the patient and which are not. Hence, this evaluation helps to support the coping process.

That the neurological examination was performed by the author, neither a medical doctor nor a specialist in neurology, can of course be questioned. The tests performed included reflexes in arms, legs and genitalia. The author was trained in these specific neurological routines by her supervisor, who is a clinical medical specialist in neurology of many years standing.
Results

Onset of disease
Onset of disease at an early age (from 10 years in HPD, 15 in MS, and 4 years in IDDM) probably complicates the sexual maturation of those women, both physically and psychologically (Table 2).

Menstruation
Median age at menarche was 13 years (range 9-18) in all groups (excl. HPD). Amenorrhea was correlated with sexual problems in all groups. Two-thirds of the women with HPD did not menstruate and 90% had menstrual disorders as the initial symptom of the disease. The normal menstrual cycle involves complex co-ordinated functioning of the hypothalamus, the anterior pituitary and the gonads. Hence it is typical that the HPD women have menstrual disorders. One-third of the women with MS were amenorrheic and, according to their age, (median) 53 years, they are probably ordinary menopausal women. The women with diabetes had experienced significantly more menstrual irregularities than had the controls, thus agreeing with earlier studies (Burkart et al., 1989; Yeshaya et al., 1995; Adcock et al., 1994). It is not known what disturbs menstrual cyclicity in diabetes. The available information is consistent with an abnormality of the gonadotropin-releasing hormone pulse generator, rather than with primary problems in the anterior pituitary, ovaries, or uterus. Delay in psychosexual development has been reported (Surridge et al., 1984) though median age at menarche was similar in this thesis in all groups (excl. HPD) (Table 4).

Regular periods, a sign of healthy endocrine regulation of estrogen, showed positive correlations with more frequent masturbation (HPD), sufficient vaginal lubrication (MS), orgasmic ability (HPD and IDDM), and positive orgasmic sensations (MS).

In the SiS group, there is no information to explain why 6% were amenorrheic at age (mean) 32 years. Hence, they may have been pregnant. The explanations from the age-matched controls (hysterectomy and hormonal IUD) are unlikely at this low age. When therapy-induced amenorrhea was excluded from the control group, the age (median) was 49 years, a reasonable age to be menopausal.
Sexual experiences

All groups of women (excl. HPD) had some early sexual experiences at similar median ages: first masturbation at 14-16, first sexual intercourse at 16-17, and first orgasm at 17-20 years of age, with the MS group generally being somewhat later in their sexual experiences (Table 4). The women with most sexual problems (HPD and MS) had had fewer sexual partners (mode 1) and included 4 and 2 women respectively who were still virgins and had no experience of a partner relationship (Table 3).

Generally speaking, three-quarters of the women were cohabiting with a partner. However, fewer than half of the severely disabled women with MS was cohabiting (Table 3). Lilius et al. (1976) drew attention to the high risk of divorce in MS patients with a very poor physical condition. This high risk among the more disabled women was also evident in the present study.

The women who were cohabiting with a partner also had been sexually active the most, the month prior to the investigation. (All but one woman in the controls and 82% in the SiS group, 90% in the IDDM, 73% in HPD, and 60% in the MS group had been sexually active.) Numerous studies have shown before that the single women are less active and they are also less satisfied with their sexual life, as with life as a whole.

Sexual ability

Sexual problems in the HPD and the MS groups, caused by diminished sexual interest, insufficient vaginal lubrication, and orgasmic difficulties were clearly more common than in the SiS group (Table 3). The problem of insufficient lubrication was more common in the IDDM group than among women in the SiS group.

Younger women more often experienced sexual desire (HPD), lubrication (MS and IDDM) and orgasmic sensations (MS).

HPD

This group of women had most frequent sexual disabilities. Reduced sexual desire can be the first symptom of HPD, but it is rare that a patient seeks medical help for that specific symptom. The reduced sexual desire is often not a problem for the person in question, but does become a problem in a relationship with a sexual partner who still has sexual desire and consequently, reacts when the proband has lost interest in sexual activity. Symptoms of craniopharyngioma usually appear at an early age and the HPD affects the sexual maturation of the child/adolescent. Missing the sexual drive during the developing years probably affects the individual a
great deal, including less engagement in sexual relations. The HPD group were the least sexually experienced.

Normal menstrual pattern, young age, and intrasellar tumour growth were correlated with a normal sexual desire and sexual function. Normal menstrual pattern and normal serum testosterone were positively correlated with masturbation activity.

In male HPD patients, hormone levels are known to be of great importance for the maintenance of normal psychosexual functions (Carter et al., 1978; Franks et al., 1978; Lundberg & Wide, 1978; Nagulesparen et al., 1978; Davidson et al., 1979; Buckman & Kellner, 1985; Hulting et al., 1985; Muhr et al., 1985; Hipkin et al., 1986; Gooren, 1987). In an earlier study, of females with HPD at Uppsala (Lundberg et al., 1986), there was a significant correlation between hyperprolactinaemia and reduced libido, as reported by other authors (Buvat, 1982). In the present study the difference was not significant, however, the number of patients with hyperprolactinaemia being only 7 at the time of interview.

MS

This group of women was severely affected with MS. Surprisingly, the negative sexual changes were more often reported by the less disabled women. This may have been because fewer of the more disabled women were engaged in a sexual relationship, were less sexually active and hence not fully aware of their sexual disabilities. In the early stages of a disease such as MS, the awareness of any of loss caused by the disease, including reduced sexual possibilities, is greater. At a certain point when one becomes more severely physically disabled, one tends to re-evaluate one's sexual experiences. The severely disabled women were positive to their own sexuality, and also to their rare sexual encounters which became valuable in another sense than before, when they had been completely able-bodied.

Minderhoud et al. (1984) examined only less severely handicapped patients. They described the symptoms as moderate or severe in some 40-80% of the cases, compared with 60-90% in our study. The results of our study concerning loss of sexual interest were much the same (60%) as in earlier studies. The problems of lubrication were greater (36%) and when the women who had never had an orgasm were added to our figures, the total exceeded 50%, which is similar to Minderhoud's figures.

Weakness of the pelvic floor and also bladder and bowel dysfunction were correlated with reduced lubrication as well as orgasmic capacity. This finding is in agreement with earlier results (Lundberg, 1978, 1981) and
shows that the corresponding parts of the autonomic nervous system are responsible for all these functions.

When a woman had sensory disturbances in her genitalia, manual stimulation by her partner seemed to be more effective than oral stimulation, and the oral stimulation technique was more effective than coital stimulation in producing an orgasm. The experience of lost effects of sexual stimulation techniques could be an informative sign of a decrease in sexual sensory nervous function.

Menstruation and/or estrogen replacement therapy were correlated with lubrication and with orgasmic sensations, but younger age had a stronger influence than menstruation on sexual function. Amenorrhea was slightly more common in the less disabled women.

IDDM
Both nephropathy and autonomic neurological symptoms were correlated with various forms of sexual impairment. We have no information as to whether the women had signs of central neuropathy or were in fact depressed, according to the findings of CNS changes contributing to sexual disabilities in diabetes.

Anorgasmia was correlated with amenorrhea and with protract menstrual cycle, possibly due to an insufficient level of estrogen. The group mean of VPT was higher in the IDDM than in the C group regarding feet, and significantly higher regarding hands and clitoris. Impairment of vibration sense may be one of the first signs of peripheral neuropathy in diabetes. Ertekin (1998) stated that even mild neuropathic changes can raise stimulatory threshold levels, requiring greater afferent stimuli to trigger the appropriate response.

The women reported variations and improvements in their sexual abilities over the years. This points to a phenomenon in female sexuality as it too matures with time. As women become more sexually experienced their sexual abilities improve. Thus the ageing effects on the body, slightly diminishing sexual abilities are countered by the improved skills and greater freedom in sexual activity that actually enhance women's sexual potential.

More of the diabetic women (than the controls) had never been married. Also, fewer had an on-going steady sexual relationship. Some women with IDDM questioned whether they really should take part in the study, as they did not have a steady relationship. In earlier studies on women with diabetes (Kolodny, 1971; Tyrer et al., 1983; Schreiner-Engel et al., 1987; Campbell et al., 1989), non-cohabiting and non-coitally active women were
not included. In our study, however, the women with diabetes were informed that such a relationship was not a precondition for inclusion in the study. Establishing a steady sexual relationship may be difficult for IDDM women with several complications of the disease. In the present study, 26% were not cohabiting.

The sexual difficulties shown in the present study were not surprisingly high when compared with findings in men with IDDM. These women had not asked for sexual counselling, but were not functioning as well as their age-matched controls.

Although women with IDDM ought not to smoke, for health reasons, they smoked in exactly the same proportion as the controls and as the general female population, of women planning to become pregnant in Sweden (Holm & Otterblad Olausson, 1996).

Life satisfaction

All the proportions of satisfied or very satisfied women were lowest for the IDDM group, except for leisure. Significantly, however, they differed from the other two groups only in two domains of life: contacts with friends and acquaintances, and especially regarding satisfaction with physical health. For those items, only 27% of the women – but approximately three-fourths of both the case-controls and the SiS group – were at least satisfied.

Satisfaction with sexual life was correlated in the IDDM group with having a partner relationship, with sexual interest and orgasmic ability. This sexually satisfied group of women also showed positive and significant correlations between life as a whole and sexual interest, sufficient lubrication and orgasmic ability.

Satisfaction both with sexual life and with life as a whole were for the SiS group positively and significantly associated with sexual interest, sufficient vaginal lubrication, and orgasmic ability.

Women in the control group were considerably more often satisfied or very satisfied with life as a whole, with sexual life and with contacts with friends, when compared with the SiS group.

The IDDM group was clearly less satisfied with their vocational and financial situations and their social contacts. As the diabetes complications become more imminent, the vocational options are threatened by the increased risk of sick listing and hence reduced income. The women with IDDM often commented on the fact that having diabetes complicated their relationships with their friends.
Earlier studies have shown an overall gender difference, that women report more negative general health, lower quality of life, lower level of sexual functioning and less sexual wellbeing than men do. Women with IDDM are also more negatively influenced by their diabetes than are men. This situation for women with IDDM is worth bearing in mind when planning for diabetes care in general, and concerning sexual aspects in particular.

Avoiding problems

The women studied in this thesis had not requested help for their sexual problems, although they reported more sexual problems than their reference counterparts. If there were more direct ways to help these women enjoy their sexual encounters more and to engage in sexual relationships, they would probably be more communicative about their problems. This has been noticed in impotent men since direct pharmacological treatment became available. The reason underlying this phenomenon is partly that care-givers tend not to focus on disabilities that they are not equipped to deal with.

Absence of sexual problems is of vital importance in a reference material, not only for sexual satisfaction, but also for life in general. Thus, a comprehensive treatment of women with neurological disorders should focus on their sexual life as well as on their social intercourse.

Generally speaking, the women with neurological disorders had not been asked previously to discuss their sexuality in connection with their disease and they had not spoken with their regular physician or nurse about their sexual problems. However the vast majority (83-98%) was positive about the interview.
Conclusions

The purpose of this dissertation has been to study the symptoms and prevalence of sexual dysfunction in women with neurological disorders at fairly distinct and separate locations. The findings showed that –

- HPD, affecting the hypothalamus and/or the pituitary, including strong endocrine components, had disturbed the sexual functioning of nearly all the women investigated. HPD was the cause of abnormal menstrual cycles or amenorrhea, a weakening of or lack of sexual desire, insufficient vaginal lubrication, and orgasmic difficulties;

- MS, affecting the CNS – brain and/or spinal cord – had disturbed the sexual functioning of four-fifths of the women investigated. They suffered diminished or completely absent sexual desire, insufficient vaginal lubrication, and orgasmic problems. Unexpectedly, (or surprisingly) more of the less disabled women reported negative sexual changes. Fewer of the more disabled women were engaged in a sexual relationship, and were less sexually active;

- IDDM causing primarily peripheral neuropathy disturbed the sexual functioning of 40% of the women investigated. Their main problem was an insufficiency of vaginal lubrication. Transient hypo- and hyperglycemia affected sexual abilities. Satisfaction with sexual life was correlated with having a partner relationship, with sexual interest and orgasmic ability. Women with IDDM were the least satisfied with their physical health and their social intercourse when compared with the reference groups;

- younger age and regular menstrual periods were positively correlated with normal sexual functioning;

- despite their high frequency of sexual problems, roughly three-quarters of the women were cohabiting with a partner. By contrast, as a consequence of divorce, fewer than half of the severely disabled women with MS were cohabiting;

- the women had a positive attitude toward the sexological interview.
Acknowledgements

I wish to express my deepest gratitude and appreciation to the women who participated in this study. It has been a great privilege to share their most private experiences which they so trustingly communicated, in the hope that this might be of support to their sisters.

I want to thank all the men and women with whom I worked, as both nurse and Tutor in Nursing, for what they taught me. It has been a privilege and a great gift to share their varied facets of life, at their side as a nurse at their critical moments. Meeting the lack of medical, psychological and social well-being in people facing their fates, creates the inspiration to search for – and the need to support – the lighter side of life.

I wish to express my sincere gratitude to Per Olov Lundberg, my Supervisor, who introduced me to the field of clinical sexology and neurology, for his clinical and scientific insight, friendly support, inspiration and encouragement over the years.

My warmest thanks also go to the following:
- my co-author Christian Berne and colleagues Kerstin and Axel Fugl-Meyer, for stimulating collaboration;
- Axel Brattberg, for sincere discussions and collaboration in clinical sexological theory and practice;
- Gun Schönnings, for unfailing helpfulness and friendliness;
- Max Brandt and Maud Marsden, for linguistic revision of the manuscripts;
- Per-Olow Sjödén, Department of Public Health and Caring Sciences, for constructive discussions;
- Anne A. Schützenberger, for introducing me to the psychodrama theory and technique, in preparing me for all the tears – and laughter – that I face in my everyday meetings at the Sexology Unit;
- Lillemor Rosenqvist, Maj-Brith Bergström-Walan and Anders Widström, for their friendly support;
- Bo Lewin and Gisela Helmius, at the Department of Sociology, for contributing with creative scientific discussions on Sexology and Jan Trost, at the same Department, who introduced me to Sexology;
- Gunnel Benkelius, Tutor in Nursing, for being such a friend, for inspiration, keeping my interest and curiosity alive, and for most stimulating and creative discussions;
- all my colleagues in the field of caring and sexology, taking an interest in my work and its progress;
- Maja, my mother, whom I lost so early and Sven, my father, the two most important people who were always the greatest mystery to be solved, slowly and along paths I could never have imagined;
- Kerstin, my big sister, for always being there;
- Claes-Erik, my big brother, at last recognised;
- Maja and Oskar, my children, for giving me the opportunity to love without fear of rejection;
- and Janis, being a tender, loving and supportive assistant – a ‘midwife’ during the birth of this thesis.

This work was carried out at the Department of Neurology (later Department of Neuroscience), University Hospital, Uppsala. During the course of this work I was also associated with the Programme for Research in Nursing and Other Caring Sciences, University of Uppsala (later Department of Nursing and even later Department of Public Health and Caring Sciences). I sincerely thank the staff members of these departments.

This work received financial support from the Swedish National Organisation of Diabetes and the Swedish Association of Neurologically Disabled.
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