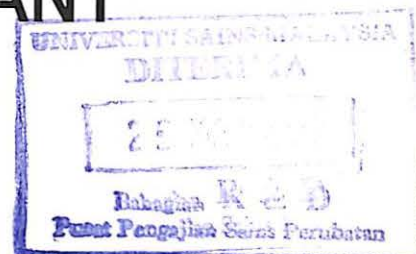# Final Report
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ERECTILE DYSFUNCTION AMONG DIABETIC PATIENTS IN KOTA BHARU KELANTAN

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Abbreviations

USM	**Universiti Sains Malaysia**
ED	**Erectile dysfunction**
et al	**And the rest**
SPSS	**Statistical Program for Social Science**
WHO	**World Health Organizations**
OR	**Odds ratio**
CI	**Confidence interval**

ABSTRACT

A cross sectional study was conducted among diabetic patients in Kelantan, Malaysia to determine the prevalence of erectile dysfunction (ED), characteristics of diabetic patients with ED and patient's knowledge, attitude and practice towards ED. A total of 156 patients from Diabetic Clinic, Klinik Kesihatan Bandar, Kota Bharu and Hospital Universiti Sains Malaysia (USM), Kubang Kerian were selected into the study by using the availability sampling technique. Respondent were given self-administered questionnaire. ED was determined by using the International Index Of Erectile Function (IIEF-5). Statistical Program for Social Science (SPSS) version 9.0 was used for analyzing the data. The mean age was 53.2 ± 9.18 year. Majority of patients were Type 2 diabetes (97.6%). The overall prevalence of ED was 77.8% in which the prevalence of severe ED was 36.7%. There was significant correlation between age, duration of diabetes, history of smoking and retinopathy with ED ($p<0.05$). There was no significant correlation between presence of concomitant diseases with ED ($p>0.05$). Majority of patients (86%) had poor knowledge regarding ED. On comfort discussing about ED with the health provider, 18.2 % felt very comfortable, 32.5% felt comfortable, 15.9% felt quiet comfortable, 15.1% felt between comfortable and uncomfortable, 15.9% felt uncomfortable and 2.4% felt very uncomfortable. Regarding seeking treatment, 57.1% would do so. This study showed a high prevalence of ED in diabetic patients. The main factors associated with ED were age, duration of diabetes, history of smoking and retinopathy. Patients also considered the information on nature of ED and possible treatment were scant and generally inadequate.

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ABSTRAK

Satu kajian irisan lintang telah dijalankan di kalangan pesakit kencing manis (DM) di Kelantan, Malaysia untuk mengenalpasti prevalens penyakit kegagalan ereksi (ED), ciri-ciri pesakit yang menghidap ED dan menilai pengetahuan, sikap dan tingkahlaku pesakit terhadap ED. Sejumlah 156 pesakit di Klinik Kencing Manis, Klinik Kesihatan Bandar, Kota Bharu dan Hospital USM dipilih menyertai kajian secara teknik persampelan availabiliti. Pesakit diberikan borang soal-selidik untuk dijawab sendiri. Kegagalan ereksi ditentukan dengan menggunakan Indeks Kegagalan Ereksi Antarabangsa (IIEF-5). Data yang diperolehi dianalisa dengan menggunakan pogram statistik iaitu "Statistical Program for Social Science (SPSS) version 9.0". Purata umur adalah 53.2 ± 9.18 tahun. Majoriti pesakit adalah diabetes 'type 2' (97.6%). Prevalens ED adalah 77.8% di mana prevalens ED peringkat teruk adalah 36.7%. Terdapat korelasi yang signifikan di antara umur, jangkamasa penyakit, sejarah merokok, retinopati dan ED ($p<0.05$). Kewujudan penyakit lain tidak mempunyai pengaruh yang signifikan ke atas ED ($p>0.05$). Majoriti pesakit (86%) mempunyai pengetahuan yang lemah tentang ED. Dalam membincangkan penyakit ED dengan petugas kesihatan, 32.5% merasa selesa dan 18.3% merasa amat selesa 15.9% merasa agak selesa, 15.1% merasa antara selesa dan tidak selesa, 15.9% merasa tidak selesa dan 2.4% merasa sangat tidak selesa. Dalam mendapatkan rawatan, 57.1% akan berbuat demikian. Kajian ini menunjukkan prevalens ED yang tinggi di kalangan pesakit kencing manis. Faktor-faktor yang mempengaruhi ED adalah umur, jangkamasa penyakit DM dan retinopati. Penerangan mengenai ED secara umumnya adalah sedikit dan tidak mencukupi.

1.0 INTRODUCTION

1.1 Overview

Erectile dysfunction (ED) is defined as "the inability to attain and/or to maintain penile erection sufficient for satisfactory sexual performance" (*Impotence: NIH Consensus Conference, 1993*). It affects millions of men throughout the world (*Impotence: NIH Consensus Conference, 1993*). Although for some men erectile function may not be the best or most important measure of sexual satisfaction, for many men ED creates mental stress that affects their interactions with family and associates. ED is a symptom not a disease, however it can herald a serious medical problem.

Until recently, ED was one of the most neglected complications of diabetes (*Neelima V Chu et al, 2001*). In the past, physicians and patients were led to believe that declining sexual function was an inevitable consequence of advancing age or was brought on by emotional problems. This misconception, combined with men's natural reluctance to discuss their sexual problems and physicians' inexperience and unease with sexual issues, resulted in failure to directly address this problem with the majority of patients experiencing it (*Neelima V Chu et al, 2001*).

1.2   Epidemiology

Several studies regarding the epidemiology, risk factors and treatment of ED had been done among men (*Fieldman HA et al, 1994, Kongkanan A, 2000, Tambi I, 1998*). In the Massachusetts Male Aging Study which involved 1290 men aged 40-70 years, the prevalence of ED was 52%; 17.1% mild ED, 25.2% moderate ED and 9.6% complete ED (*Fieldman HA et al, 1994*). In the Thai Erectile Dysfunction Study (*TEDES*), the prevalence of ED was 37.5%, mild 19.1%, moderate 13.7% and severe 4.7% (*Kongkanan A et al, 2000*). In a study done in Spain in 2001 among 2476 men age 25-70 year old, the prevalence of ED was 18.9%. The prevalence of ED in other country presented in Table 1.

In a large epidemiological study in Malaysia, the prevalence of minimal to complete ED was 60% (*Tambi I, 1998*). It also showed that the prevalence was related to age group; for moderate and complete ED, the total prevalence was 16%, whereas the prevalence of 65 to 70 year-old was 48%. In this study, diabetes mellitus was found to be the most important risk factor of ED (*Tambi I,1998*).

ED is a common complication of diabetes and an important cause of decreased quality of life in diabetic men. The prevalence of ED among diabetic patients in Italy was 36% (*Fedele et al, 1998*). The degree of ED was determined by asking participants to categorize themselves whether they complete or incomplete ED. A total of 9,868 diabetic patients were interviewed

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and 3,534 (35.8 %) reported ED in which 70.3% incomplete and 29.4% complete ED (*Fedele et al , 1998*).

In African countries, the prevalence of ED among diabetic patients ranges between 16% in Senegal (*Gueye SM et al, 1998*) and 48.7% in Ethiopia (*Seyoum B, 1998*).

Table 1: Prevalence of ED in other country

Country	Sample size	Age range	Prevalence of ED(%)	Reference
*USA	4108	≥25	<1% (25-30 years) <3% (30-45 years) 6.7% (45-55 years) 25% (65 years) 55% (75 years)	Kinsey et al,1948
*Nigeria	227	-	34%	Mobede et al,1990
*Japan	3490	20-90	<2.5% (20-44 years) 10% (45-59 years) 23% (60-64 years) 30.4% (65-69 years) >44.3% (≥ 70 years)	Sato et al,1995
*China	1582	≥40	32.8% (40-49 years) 36.4% (50-59 years) 74.2% (60-69 years) 86.3% (≥ 70 years)	Wang et al, 1997
Pakistan	585	25-70	70.6	Hussain S et al, 2000
Turkey	1982	40-70	64.7	Akkus E at al, 2000
Egypt	599	30-70	54.9	Mahmoud et al, 2000
Morocco	655	≥25	53.6	Kadiri et al, 2000
Nigeria	917	35-70	50.7	Dogunro et al,2000
Finland	2128	50-70	48	Koskimaki et al, 2000
Italy	2010	≥18	12.8	La Pera et al, 2000

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(Tan HM, 1999)

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1.3 Physiology of erection

Normal male sexual function requires a complex interaction of vascular, neurological, hormonal, and psychological systems (*Neelima V Chu, 2001*). The initial obligatory event is acquisition and maintenance of an erect penis, which is a vascular phenomenon. Normal erections require blood flow into the corpora cavernosae and corpus spongiosum. As the blood accelerates, the pressure within the intracavernosal space increases dramatically to choke off penile venous outflow. This combination of increased intracavernosal blood flow and reduced venous outflow allows a man to acquire and maintain a firm erection (*Neelima V Chu, 2001*).

Erection is initiated by a central nervous system event that integrates psychogenic stimuli (perception, desire, etc.) and controls the sympathetic and parasympathetic innervation of the penis (*Impotence: NIH Consensus Conference Statement, 1993*). Sensory stimuli from the penis are important in continuing this process and in initiating a reflex arc that may cause erection under proper circumstances and may help to maintain erection during sexual activity (*Impotence: NIH Consensus Conference Statement, 1993*).

Parasympathetic input allows erection by relaxation of trabecular smooth muscle and dilation of the helicine arteries of the penis. This leads to expansion of the lacunar spaces and entrapment of blood by compressing venules against the tunica albuginea, a process referred to as the corporal veno- occlusive mechanism (*Impotence: NIH Consensus Conference, 1993*). The tunica albuginea must have sufficient stiffness to compress the venules penetrating it so that venous outflow is blocked and sufficient tumescence and rigidity can occur (*Impotence: NIH Consensus Conference, 1993*).

Acetylcholine released by the parasympathetic nerves is thought to act primarily on endothelial cells to release a second nonadrenergic-noncholinergic carrier of the signal that relaxes the trabecular smooth muscle(*Impotence: NIH Consensus Conference, 1993*). Nitric oxide released by the endothelial cells, and possibly also of neural origin, is currently thought to be the leading of several candidates as this nonadrenergic-noncholinergic transmitter; but this has not yet been conclusively demonstrated to the exclusion of other potentially important substances (e.g., vasoactive intestinal polypeptide). The relaxing effect of nitric oxide on the trabecular smooth muscle may be mediated through its stimulation of guanylate cyclase and the production of cyclic guanosine monophosphate (cGMP), which would then function as a second messenger in this system (*Impotence: NIH Consensus Conference, 1993*).

Constriction of the trabecular smooth muscle and helicine arteries induced by sympathetic innervation makes the penis flaccid, with blood pressure in the cavernosal sinuses of the penis near venous pressure *(Impotence: NIH Consensus Conference, 1993)..* Acetylcholine is thought to decrease sympathetic tone. This may be important in a permissive sense for adequate trabecular smooth muscle relaxation and consequent effective action of other mediators in achieving sufficient inflow of blood into the lacunar spaces. When the trabecular smooth muscle relaxes and helicine arteries dilate in response to parasympathetic stimulation and decreased sympathetic tone, increased blood flow fills the cavernous spaces, increasing the pressure within these spaces so that the penis becomes erect. As the venules are compressed against the tunica albuginea, penile pressure approaches arterial pressure, causing rigidity. Once this state is achieved, arterial inflow is reduced to a level that matches venous outflow *(Impotence: NIH Consensus Conference, 1993).*

Erections require neural input to redirect blood flow into the corpora cavernosae. Psychogenic erections secondary to sexual images or auditory stimuli relay sensual input to the spinal cord at T 11 to L-2. Neural impulses flow to the pelvic vascular bed, redirecting blood flow into the corpora cavernosae. Reflex erections secondary to tactile stimulus to the penis or genital area activate a reflex arc with sacral roots at S2 to S4 *(Neelima V Chu, 2001)*

Nocturnal erections occur during rapid-eye-movement (REM) sleep and occur 3-4 times nightly. Depressed men rarely experience REM sleep and therefore do not have nocturnal or early-morning erections (*Neelima V Chu, 2001*).

1.4 Etiology of erectile dysfunction

As we know, normal erectile function requires the coordination of psychological, hormonal, neurological, vascular, and cavernosal factors. Alteration in any one of these factors is sufficient to cause ED. Not uncommonly, a combination of factors is involved.

Among the important risk factors for ED is chronic systemic illnesses. Diabetes mellitus, heart disease, and hypertension are all commonly associated with ED (*NIH Consensus Development Panel on Impotence,1993*). Results from the Massachusetts Male Aging Study showed that the age adjusted prevalence of complete ED was 28% in treated diabetic patients, 39% in those with treated heart disease, and 15% in men taking antihypertensive treatment. The prevalence in the whole study population was 9.6% (*Fieldman HA et al, 1994*). Complete ED has also been observed to increase with the severity of depression; almost 90% of severely depressed men report complete ED (*G Wagner et al, 1998*). Peripheral vascular disease leading to insufficient arterial blood supply is another common cause. In addition, an association between low plasma concentrations of high density lipoprotein and ED has been found. Other diseases such as peptic ulcer, arthritis, and allergy are also associated with an increased prevalence of ED (*G Wagner et al, 1998*).

Only a small percentage of cases of ED are due to hormonal problems. The role of testosterone in ED is not clear (*G Wagner et al, 1998*). Some men continue to achieve erection even after castration. The fall in free serum

testosterone and increases in concentrations of sex hormone binding globulin with aging may be associated with loss of libido and reduced frequency of erection, but restoration of normal testosterone concentrations does not usually improve sexual function. Patients with hyperprolactinaemia, frequently associated with low testosterone values, can develop low libido and ED by unknown mechanisms. Testosterone replacement treatment, without correction of concurrent hyperprolactinaemia, does not resolve ED associated with hyperprolactinaemia (*G Wagner et al, 1998)*.

Poor blood supply as a result of congenital malformations or trauma is a less common cause of ED that can affect the young male (*G Wagner et al, 1998)*. Peyronie's disease is a specific condition of the penis in which the development of fibrous plaques in the tunica albuginea, sometimes extending into the erectile tissue, may cause pain (in the early inflammatory stage) and penile deviation, making coitus impossible. Inability to retain pressurised blood in the corpus cavernosum follows disruption of the veno-occlusive mechanism, which can be caused by Peyronie's disease, congenital, or the result of trauma or surgery (*G Wagner et al, 1998)*. The summary of multiple diseases that can contribute to ED are presented in Table 2 below.

Table 2: Diseases and trauma that may contribute to erectile dysfunction

Group	**Diseases / Trauma**	
Central Nervous System	Cerebrovascular attack Parkinsonism Shy-Drager syndrome Myelopathy	Brain injury Brain tumour Spinal cord injury Disc herniation
Peripheral nerve	Diabetes mellitus Uremia Syphilis Radiotherapy	Pelvic fracture Pelvic surgery Transperineal surgery
Vascular	Leriche syndrome Diabetes mellitus	Atherosclerosis Pelvic fracture
Endocrine	Pituitary gland disorder Thyroid gland disorder Adrenal gland disorder	Hypogonadism Hepatic cirrhosis

Penile	Hypospadia
	Fibrosis of the corpus
	  cavernosum secondary
	  to penile rupture
		Peyronie's disease
		Priapism
		Explantation of penile
		  to prostheses

Psychiatry	Depression Schizophrenia	Performance anxiety

(Tan HM 1999)

Many prescription drugs, as well as some over-the-counter medications, can cause ED. Around 25% of erectile failure seen in clinic patients is caused by medication pressure (*G Wagner et al, 1998*). ED may affect 10-20% of patients taking thiazide diuretics, and to a lesser extent, patients who are using beta-blocking drugs (*G Wagner et al, 1998*). Evidence from Treatment Of Mild Hypertension Study (TOMHS) among 902 hypertensive patients, aged 45-69

years that were treated with placebo or one of five drugs: acebutolol, amlodipine, chlorthalidone, doxazosin or enalapril showed that he incidence of ED was lowest in the patients taking doxazosin and highest in those on chlorthalidone (a thiazide-like diuretic) (*Grimm RH et al,1997*). In a treated hypertension patients, ED may be a result of reduced perfusion pressure, as blood pressure falls in response to the medication, or probably a direct (but unknown) effect on smooth muscle (*G Wagner et al, 1998*). Further support for this mechanism comes from the observation that treatment of hypertension with the alpha adrenergic receptor blockers are not associated with erectile failure, and possibly even enhances pre-existing poor sexual function, despite lowering arterial blood pressure (*G Wagner et al, 1998*).

ED commonly complicates antidepressant treatment with both monoamine oxidase inhibitors and tricyclic antidepressants (*G Wagner et al, 1998*). Study by. Benzodiazepines and selective serotonin reuptake inhibitors have been reported to cause erectile failure, decreased libido, or ejaculatory problems. Angel et al in 2001 comparing various antidepressant found a high incidence of sexual dysfunction with SSRIs and venlafaxine, ranging from 58% to 73% (*Angel et al, 2001*) Cimetidine, digoxin, and metoclopramide cause ED, as do anabolic steroids, either through a direct effect on penile tissues or through suppression of normal androgen production (*G Wagner et al, 1998*). Table 3 below summarize the medications that can cause ED.

Table 3: Drugs that may cause ED

Group	Drugs	
Antihypertensives	Bethanidine Guanethedine Indoramin Methyldopa Prazosin Timolol Verapamil	Clonidine Guanfacine Labetolol Oxprenolol Reserpine Todralazine
Antimicrobials	Ethionamide	Vidarabine
Cardiac-active agents	Digoxin	Disopyramide
Diuretics	Spironolactone	Thiazide
Gastrointestinal agents	Cimetidine	Ranitidine
Hormones	Chlormadinone acetate Ethylnandrol GnRH agonists 17alpha Methylandrostanolone Stanozolol	Ethinylestradiol Estramustinea Mestanolone Nandrolone
Lipid-modifying drugs	Clofibrate	Simfibrate
Psychotherapeutic drugs	Amoxapine Ethyl loflazepate Maprotiline Methylphenidate Sulpiride	Clomipramine Haloperidol Methamphetamine Prazepam

(Tan HM,1999)

Psychogenic influences are the most likely causes of intermittent erectile failure in young men. Anxiety about "performance" may result in inhibitory sympathetic nervous system activity, and anticipatory anxiety can make the condition self perpetuating. A psychogenic component is often present in older men, secondary to an organic cause. Underlying relationship problems are a common cause of erectile failure and this possibility should be explored in men of all ages (*G Wagner et al, 1998*).

1.5   Pathology of diabetic erectile dysfunction

The natural history of ED in people with diabetes is normally gradual and does not occur overnight. Pathophysiologic alterations that diabetes mellitus can impose on erectile physiology, is essentially a hemodynamic event with neural modulation. Diabetes can interfere with numerous critical erectile mechanisms, such as impairing arterial perfusion, producing a peripheral and autonomic sensory neuropathy, and altering normal corporeal smooth muscle activity in the penis (*Lipshultz et al, 1999*). Atherosclerosis in the penile and pudendal arteries limits the blood flow into the corpus cavernosum. Because of the loss of compliance in the cavernous trabeculae, the venous flow is also lost. This loss of flow results in the inability of the corpora cavernosae to expand and compress the outflow vessels (*Neelima V Chu, 2001*).

Autonomic neuropathy is a major contributor to the high incidence of ED in people with diabetes (*Neelima V Chu, 2001*).. Norepinephrine and acetylcholine-positive fibers in the corpus cavernosum have also been shown to

be reduced in people with diabetes. This results in loss of the autonomic nerve-mediated muscle relaxation that is essential for erections

Diabetes mellitus has been found to be the strongest predictor of ED as well as treatment of diabetes (*Thambi I, 1998*). It causes a decrease in quality of life of diabetic patients. The prevalence varies widely among studies, ranging from 20% to more than 70% (*Fedele et al, 1998*). Awareness of ED as a significant and common complication of diabetes has increased in recent years, mainly because of increasing knowledge of male sexual function and the rapidly expanding armamentarium of novel treatments being developed for ED.

Up to now, there is no published local study concerning prevalence of ED amongst diabetic patients. In view of the diabetes being an important risk factor for ED, we need a local data concerning ED in Malaysian diabetic patients.

2.0   OBJECTIVES

2.1   To determine the prevalence of ED among known diabetic patients attending Diabetic Clinic, Hospital Universiti Sains Malaysia and Diabetic Clinic, Klinik Kesihatan Bandar, Kota Bharu, Kelantan.

2.2   To determine the characteristics of diabetic patients with ED.

2.3   To assess the patient's knowledge, attitude and practice towards ED.

3.0   RESEARCH METHODOLOGY

3.1   Research Design

The study is a cross-sectional study.

3.2   Site of study

The study was carried out at Diabetic Clinic, Outpatient department, Klinik Kesihatan Bandar, Kota Bharu, Kelantan, Malaysia and Diabetic Clinic, Hospital Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia.

3.3   Duration of study

The study was carried out within 1 year from 1st January, 2000 till 31st December, 2000.

3.4   Sample size

Sample size was estimated using Epi-info version 6 (*Dean AG et al*). With a power of 80%, a prevalence of 36% (*Fedele et al, 1998*) and a confidence interval of 95% a sample size required for the study is 98. Our study involved 156 diabetic patients, more than required as we continued taking samples till the whole one year duration.

3.5   Respondents

All diabetic patients attending Diabetic Clinic, Hospital Universiti Sains Malaysia, Kubang Kerian, Kelantan and Diabetic Clinic, Klinik Kesihatan Bandar, Kota Bharu, Kelantan from 1st January 2000 till 31st December 2000 were included in the study.

3.6   Inclusion criteria

Male and married diabetic patients aged 18 years and above and willing to participate in the study.

3.7   Exclusion criteria

The exclusion criteria are single, unable to read or write and patients who refuse to participate.

3.8 Approval

The study was approved by the Research and Ethics Committee of School of Medical Sciences, USM, Kubang Kerian, Kelantan and National Research and Ethical Committee, Institute of Medical Research , Kuala Lumpur, Malaysia.

3.9 Questionnaire

The tool used in this study was a self-administered questionnaire. The questionnaire was adopted with permission from a validated questionnaire in Cross National Epidemiology Study of ED in Malaysia, 1998 (*Thambi I,1998*)

The questions consists of five main components i.e. demographic data, health practices, personal history, attitude and Sexual Health Inventory For Men – International Index of Erectile Function (SHIM-IIEF), knowledge about ED and characteristics of diabetics (*appendix*)

Patient's knowledge was classified as poor or good. Knowledge score was derived from a multiple choice answer type, where the respondents have to choose between the right or the wrong statement (close-ended or structured). Score 1 was given to the right answer, zero for incorrect and 'not sure'. All score

will be added to give a total score. A score 8 and below considered as poor and score 9 and above considered as good.

The characteristics of diabetic patients are based on the record in the patient's medical notes. This include the type of diabetes, duration, treatment and complications, concomitant diseases and their treatments.

A patient was considered to have history of smoking if he had smoked more than 1 cigarette per day for at least 1 year at any time of his life. He is considered to have no history of smoking if he had never smoked more than 1 cigarette per day or had smoked more than 1 cigarette per day for less than 1 year at any time of his life.

The questionnaire was pre-tested among diabetic patients who attended medical outpatient clinic in the Medical Department, Hospital Kota Bharu to asses the comprehensibility. Necessary changes were made after the pretest.

The self-administered questionnaire was distributed personally by the researcher to diabetic patients attending the diabetic clinics. Researcher ensured that the respondents has answered all the questions before collecting the questionnaire by reviewing the answers.

3.10   Data analysis

The information collected was entered onto a personal computer using database software Statistical Software for Social Science (*Norusis MJ*). This software was also used for statistical analysis. Independent T-test was used to analyze the association between two independent continuous variables or between independent continuous and categorical variables. Chi-square test was used to analyze the association between two categorical variables.

3.11   The International Index Of Erectile Function

This a brief, reliable, self-administered measure of erectile function that is cross-culturally valid and psychometrically sound (*Raymond R. C. et al, 1997*). It is a 15 items questionnaire scale developed by Raymond C. Rosen et al in 1997 for assessment of erectile function. This instrument was developed in several stages including initial pre-testing with selected patient groups and expert panel consultants, followed by an intensive linguistic validation. There are five factors or response domain in this instrument: (1) erectile function (2) orgasmic function (3) sexual desire (4) intercourse satisfaction, and (5) overall satisfaction. (*appendix*).

From the 15 questions, questions 2,3,4,5 and 15 is considered as Sexual Health Inventory For Men (SHIM) or also known as IIEF-5. This scale can be used to screen an ED. Each question has a scale from 0-5 except for question 15,

which ranges from 1-5. Possible scores range from 1-25. Patients who had score range from 12 to 21 is considered to be mild, 8 to 11 is moderate and less than 8 is severe.

4.0   RESULTS

4.1   Descriptive statistics of the cases

A total of 156 diabetic patients were identified during the study and 126 patients (80.8%) participated. Fourty five patients were from Diabetic Clinic, Klinik Kesihatan Bandar and 111 patients were from Diabetic Clinic, Hospital USM. For simplicity of the study, all the patients was considered as one sample. Reasons for refusal were either blurring of vision or unable to read the questionnaire (23), involved in other study (3) and not interested to participate in the study (4).

Almost all patients (97.6%) were Type 2 diabetes (*Table 4*) with a mean age of 53.2 ±9.18 years (*Table 4 and 5*) with a range of 30 years to 75 years. The highest number of patients were in the age group 50 – 59 years.

Mean duration of diabetes was 8.3 ± 6.95 years (*Table 4 and 6*) with a majority of less than 5 years (40.5%).

Majority (46.8%) of the patients had secondary level of education, with a primary and university or college level of 26.2% and 27.0% respectively (*Table 4*).

Mean for total monthly income was 1009.98 ± 986.97 (n=109) (*Table 4*) Ministry of Rural Development of Malaysia has defined total family income of less than RM 500.00 as poverty in the family of 5 peoples. Majority of patients (72.2%) had income more than RM 500.00, 14.3% were in the poverty group and 13.5% were not sure of their total household income (*Table 4*).

Table 4. Patients details (Mean ± SD)

Number	126
Age	53.2 ± 9.18 (range 30-75)
Type of diabetes	Type 1 2.4% Type 2 97.6%
Duration of dibetes	8.3 ± 6.95 year
Treatment	Diet 5.5%

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	Tablets	92.1%	
	Insulin	2.4%	
History of smoking	Smoking	58.7%	
	Not smoking	41.3%	
Educational level	Primary		26.2%
	Secondary		46.8%
	University or college		27.0%
Socioeconomic status (Monthly income)	RM 1009.98 ± 986.7		
	RM 500.00 and above		72.2%
	Less than RM 500.00		14.3%
	Not sure		13.5%

Table 5. Age distribution of patient (n= 126)

Age Group (years)	Frequency n (%)	Total number of ED n(%)	Severity		
			Mild n(%)	Moderate n (%)	Severe n(%)
20-29	0 (0)	0(0)	0()	0(0)	0(0)
30-39	8 (6.3)	6(75.0)	6(100)	0(0)	0(0)
40-49	37 (29.4)	27(73.0)	14(51.9)	4(8.0)	9(33.3)
50-59	48 (38.1)	33(68.8)	14(42.4)	9(27.3)	10(30.3)
60-69	29 (23.0) ·	28(96.6)	6(21.4)	7(25.0)	15(63.6)
70 and above	4 (3.2)	4(100)	1(25.0)	1(25.0)	2(50.0)

Table 6. Duration of diabetes (n = 126)

Duration of	Frequency	Total number	Severity

diabetes (years)	n(%)	of ED n(%)	Mild n(%)	Moderate n(%)	Severe n(%)
1 - 5	51(40.5)	32(62.7)	18(56.2)	6(18.8)	8(25.0)
6 - 10	38(30.2)	29(76.3)	11(37.9)	7(24.2)	11(37.9)
11 – 15	24(19.0)	24(100)	7(29.2)	6(25.0)	11(45.8)
16 - 20	6(4.8)	6(100)	2(33.3)	0(0)	4(66.7)
21 - 25	3(2.4)	3(100)	1(33.3)	1(33.3)	1(33.3)
26 - 30	1(0.8)	1(100)	0(0)	0(0)	1(100.0)
31 - 35	3(2.4)	3(100)	2(66.7)	1(33.3)	0(0)

4.2   Concomitant disease

Nearly half of patients has concomitant hypertension (46.8%) (*Table 7*). Less common concomitant diseases are heart disease and peptic ulcer.(*Table 7*).

Table 7. Presence of concomitant disease (n=126)

Concomitant Disease	Percent (%)
Hypertension	46.8
Heart disease	11.9
Peptic Ulcer	3.2
Depression	1.6

Prostatic carcinoma	0.8
Benign Prostatic hyperplasia	0
Prostatitis	0

4.3 Concomitant treatments

Patients were asked whether they take other treatments than treatment for diabetes, i.e.

1. Hormonal medication, for example, androgen, anti-androgen, anti- prolactin, oestrogen or bromocryptine.

2. Medication for heart disease or arrhythmia including pill and patch.

3. Medication for gastric or duodenal ulcer.

4. Medication for hypertension.

5. Nervous medication, for example, sedative, anti-anxiety or anti-depression.

6. Operation for prostatic problem.

Majority of the patients received anti-hypertensive medications (39.7%) (*Table 8*) as correspond to 46.8% of patients that have concomitant hypertension (*Table 7*).

This discrepancy was due to some patients have mild hypertension and they were

advised on diet control instead of being given anti-hypertensive medication.

Table 8. Treatments that patients received other
than diabetic medication (n = 126)

Treatments	Percent (%)
Hypertension	39.7
Heart disease	8.7
Gastric or duodenal ulcer	4.0
Nervous medication	1.6
Operation for prostate problem	1.6
Hormone	0.8

4.4   Erectile Dysfunction

4.4.1   Epidemiology of ED

Of the 126 patients, 78% had ED (*Figure 1*). Majority of them fall into mild ED (42%), 21% moderate and 37% severe ED (*Figure 2*). All patients in the age group 70 years and above had ED (100% compared to 96% in the age group 65-69 years (*Table 5*). All patients who had diabetes more than 10 years had ED (*Table 6*)

Figure 1. Distribution of patients according to presence of ED(n =126)
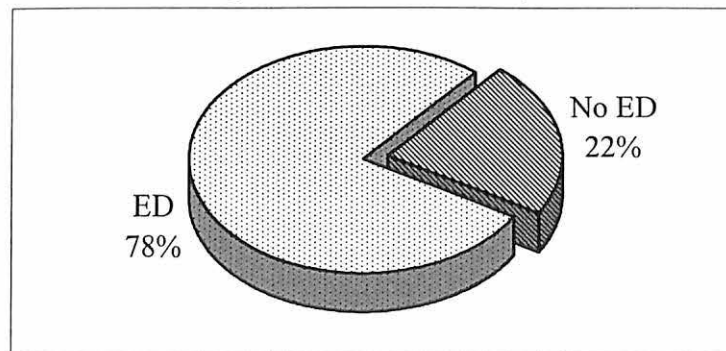
Figure 2. Distribution of patients according to different category of ED (n =126)
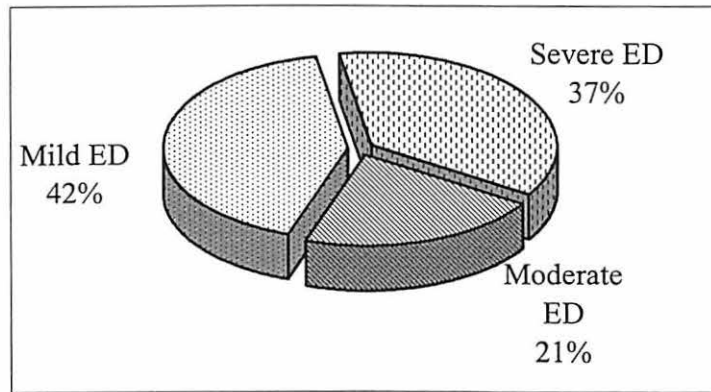
4.4.2 Treatment for erectile dysfunction

Eleven percent of the patients has undergone treatment for ED. Most of them receiving treatment in Hospital USM and are currently on follow-up.

Figure 3. Distribution of patients according to receiving treatment for ED (n=126)

36
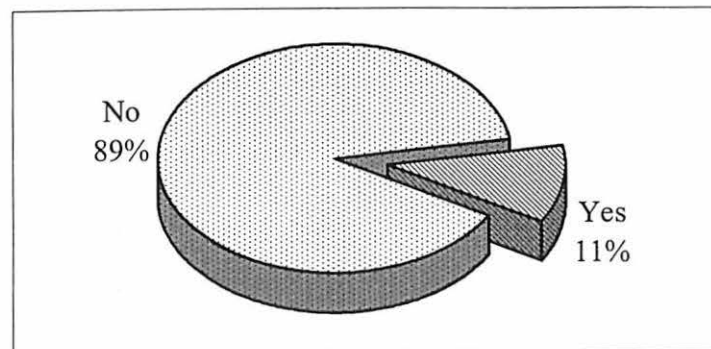
4.4.3 ED awareness knowledge score regarding ED and it's treatment

There was high percentage (75%) of patients aware of ED (*Figure 5*).

However, the score of knowledge were poor (86%) (Figure 4).

Figure 4. Distribution of patients according to knowledge
score regarding ED and it's treatment (n = 126)
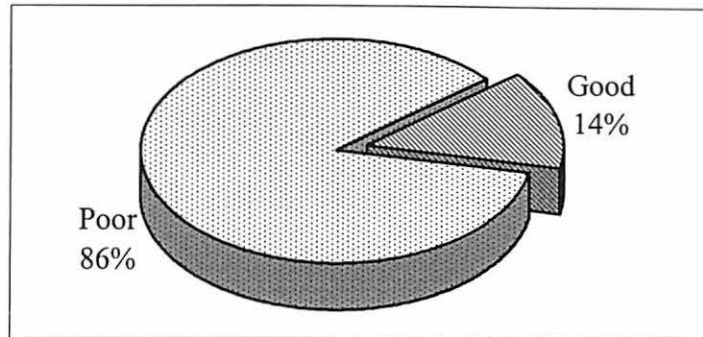
Figure 5. Distribution of patients according to
awareness of ED (n = 126)
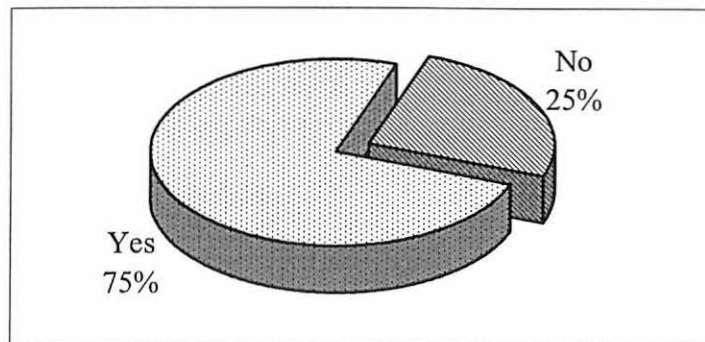
4.4.4 Source of knowledge regarding ED

We asked patients regarding sources of knowledge that they could identified had given them some information about ED. Among them were radio, television, internet, printed materials, working place, neighbour or family members, attending doctors and others. We found majority of patients said that they obtained information about ED from printed materials and from their neighbours or family members (51.6 % both). (*Table 9*)

Table 9. Source of knowledge regarding ED (n=126)

Source of knowledge	Percentage (%)
Printed materials	51.6
Neighbour or family members	29.4
Attending doctors	15.1
Television	14.3
Radio	10.3
Working place	9.5
Others	4.8
Internet	3.2

When asked further, majority of them mentioned that their knowledge was not enough (72%)(*Figure 6*).

Figure 6. Distribution of patients according to
ample of knowledge regarding ED (n = 126)

Ample
28%

Not ample
72%
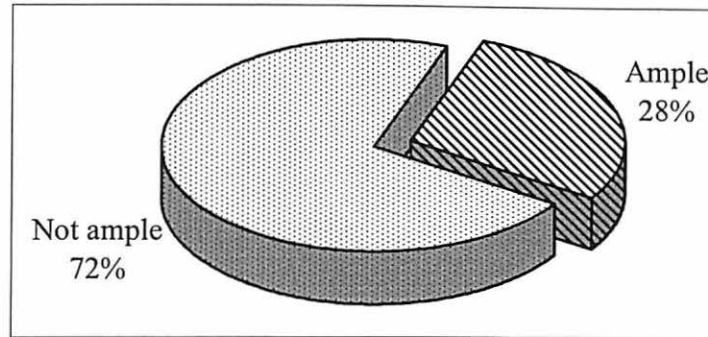
4.4.5 Which type of treatment that patients choose as the treatment for ED?

When asked about type of treatment for ED, 50% agreed to choose pill (e.g. Viagra), 44% chose hormonal, 34% chose vacuum device, and 24% chose intracavernosal injection (*Figure 7*).

Figure 7. Distribution of patients according to
choice of treatment of ED (n =126)

	Hormone N = 126	Vacuum device N = 126	Aprostradil transurethra N = 126	Intracavernosal injection N = 126	Penile implant N = 126	Penile vessel surgery N = 126	Pills medication N = 126
▧ Don't know	64	77	97	91	42	95	52
▨ Disagree	7	15	13	11	19	9	11
▣ Agree	55	34	16	24	20	22	63

■ Agree ▨ Disagree ▧ Don't know
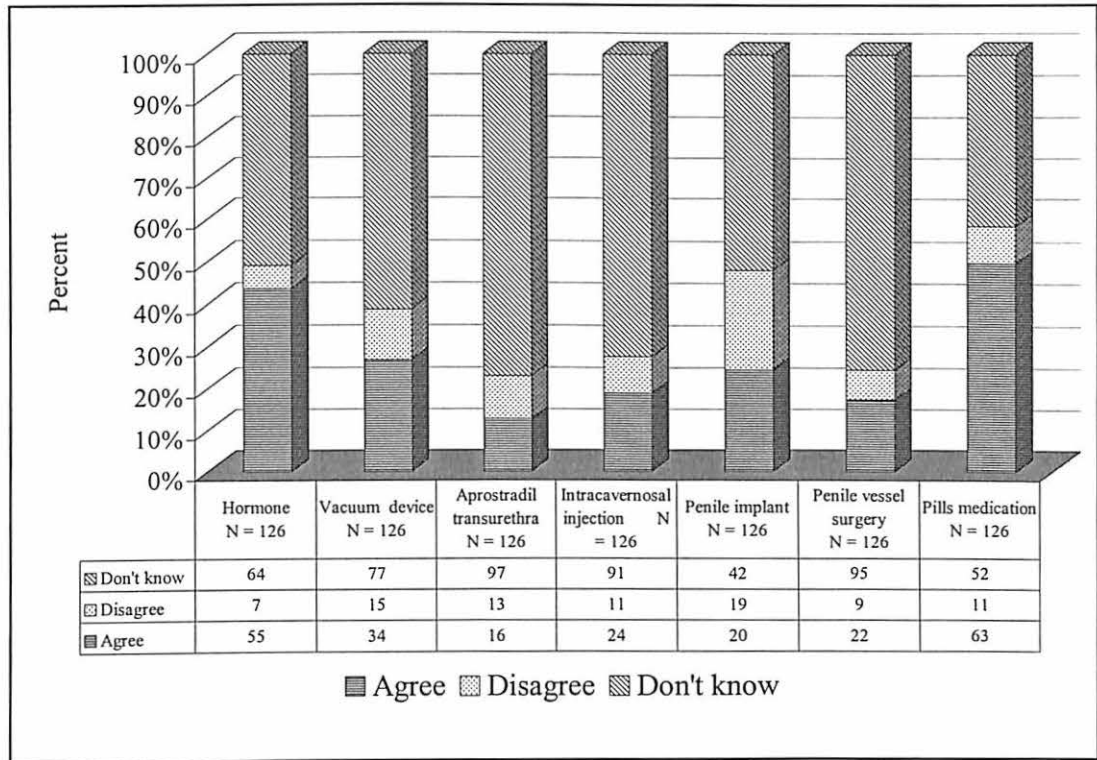
4.4.6 Discussing about ED with doctor

Nearly a quarter (23%) of patients felt uncomfortable to discuss about ED with doctor. However 41% were comfortable and 23% were very comfortable. (*Figure 8*).

40

Figure 8. Distribution of patients according to comfortable
in discussing about ED with doctor (n=126)
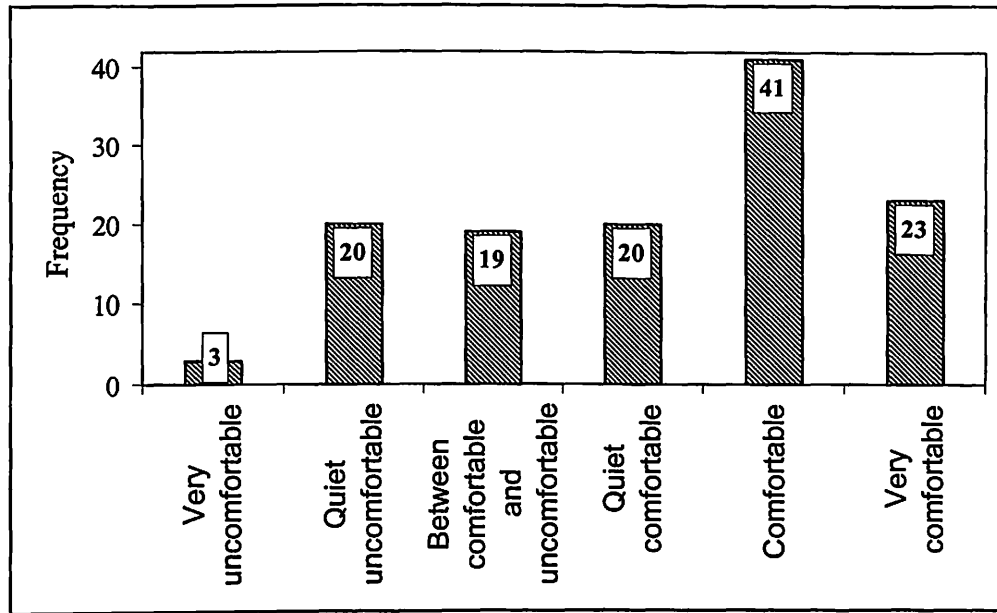
4.4.7   Voluntary in telling the doctor if they are having erectile dysfunction

On asking patients if supposed they are having an erection dysfunction, will

they voluntarily tell their doctor even if they were not ask about it, about half of

patients (57%) will do so (*Figure 9*)

Figure 9. Distribution of patients according to voluntary
in telling the doctor about ED (n=126)
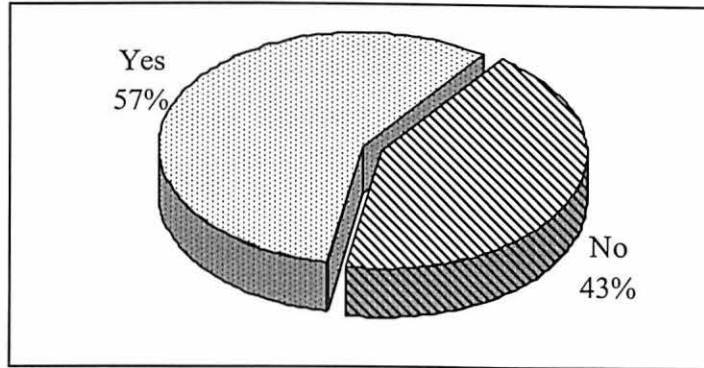
4.4.8 The choice of doctor

41% of patients chose their primary care doctor (family physician and general
practitioner), 37 % chose urologist, 10 % chose traditional healer and 12% were not sure
(*Figure 10*).

Figure 10. Distribution of patients according to health provider they will
tell voluntarily if they are having erectile dysfunction. (n =74)
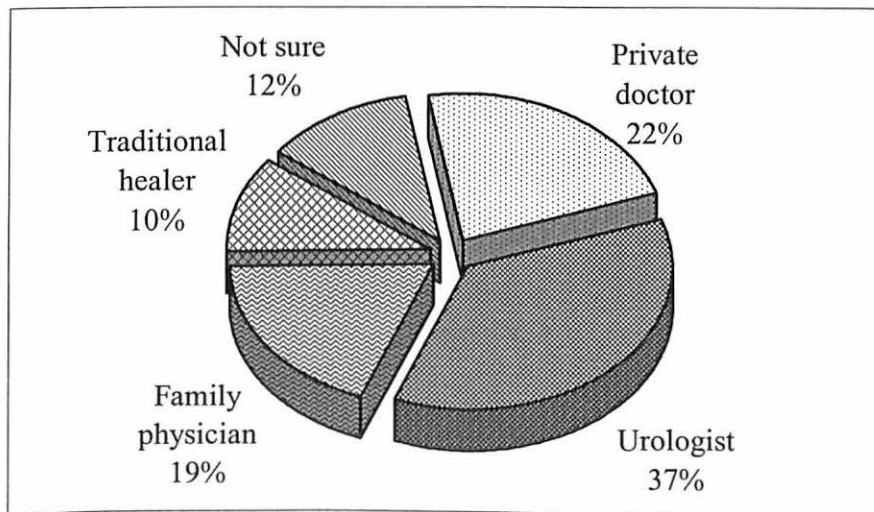
4.5 Univariate analysis

The characteristics of diabetic that were examined in this study are:

1. Basic characteristic of diabetic patients which are age, mean duration of diabetes and smoking.

2. Other characteristics which are concomitant diseases, medication that patient receives and presence of complications of diabetes.

3. Socioeconomic factors: level of education and economical status

These characteristics were tested to find an association with ED.

4.5.1 Basic characteristics of diabetic patients

We found a significant difference between mean age for diabetic patients with ED (54.2 ± 9.5 years) and patients without ED (49.5 ± 7.1 years); p=0.015. Patients with ED had a longer duration of diabetes (9.4 ± 7.4) as compared to the duration of diabetes in patients without ED. This difference was significant (p=0.01). In the ED, we also found a higher percentage of patients that had history of smoking (75.0 %) compared to those without ED, where the percentage of no history of smoking was 53.1%. This difference was also significant (p=0.038) (*Table 10*).

Table 10. Basic characteristics of diabetic patients and association with ED

Characteristics	ED (n=98)	No ED (n=28)	P value
Mean age (years)	54.2 (9.5)	49.5 (7.1)	P= 0.015 *
Mean duration of diabetes (years)	9.4 (7.4)	4.39 (2.8)	P=0.01 *
History of smoking (%)	75.0	53.1	P=0.038 **

*   independent t-test
**   chi-square
( )   ± standard deviation
P < 0.05 (significant)

4.5.2 Presence of concomitant disease and association with ED

Presence of concomitant diseases were found not to be associated wih ED in diabetic patients. There was a higher percentage of hypertensive patients with ED (51.0%) as compared to those without ED (32.1%). In contrast, higher percentage of patient with heart disease was found in patient without ED (17.9%) as compared to those with ED (10.2%). These difference however statistically not significant. (*Table 11*)

Table 11. Presence of concomitant disease and association with ED

Concomitant disease	ED (n=98)	No ED (n=28)	P value
Hypertension (%)	50(51.0)	9(32.1)	P= 0.077 *
Heart disease (%)	10(10.2)	5 (17.9)	P=0.270 *
Gastric or duodenal ulcer (%)	2(7.1)	2(2.0)	P=0.174 *
Depression(%)	2(2.0)	0(0)	P=0.446 *
Prostatic carcinoma(%)	1(1.0)	0(0)	P=0.592 *
Benign prostatic hyperplasia(%)	0(0)	0(0)	-
Prostatitis(%)	0(0)	0(0)	-

*   chi-square
( )   percent %
$P < 0.05$ (significant)

4.5.3   Medication or treatment that patients received and association with ED

We tested the association between type of treatment or medications that patients received between those who had ED and those without ED.   Though there were substantial number of patients in ED group received medications for hypertension and high percentage received medications for their diabetes, the difference was not significance. Only one (1.0%) patient received hormonal medication. For heart disease, 9.2% in ED group received medication, whereas 7.1% in non-ED group (*Table 12*). None of these difference were statistically significant.

Table 12. Treatment that patients received other than for diabetes
and association with ED

Medication	ED (n=98)	No ED (n=28)	P value
Oral hypoglycemic agent or insulin (%)	94(95.9)	25(89.3)	P=0.177 *
Anti-hypertensive medication (%)	42(42.9)	8(28.6)	P=0.173 *
Medication for heart disease or arrhythmia included pill and patch (%)	9(9.2)	2 (7.1)	P=0.736 *
Medication for gastric or duodenal ulcer (%)	5(5.1)	0(0)	P=0.233 *
Hormonal medication e.g androgen, anti-androgen, anti-prolactin, oestrogen or bromocryptine (%)	1(1.0)	0(0)	P= 0.592 *

*   chi-square
( )   percent %
P < 0.05 (significant)

4.5.4   Presence of complications of diabetes and association with ED

For the presence of complications, we found only retinopathy was significantly associated with ED (p=0.005). 23.5% of ED patient had retinopathy, meanwhile, none in the non-ED group had retinopathy (*Table 13*)

Table 13. Presence of complications of diabetes and association with ED

Diabetic complications	ED (n=98)	No ED (n=28)	P value
Sensory motor neuropathy (%)	38(38.8)	8(28.6)	P=0.323 *
Retinopathy(%)	23(23.5)	0(0)	P=0.005 *
Nephropathy (%)	15(5.3)	1(3.6)	P=0.100 *
Cardiopathy (%)	7(7.1)	2 (7.1)	P=1.000 *
Arteriopathy (%)	3(3.1)	0(0)	P= 0.349 *
Diabetic foot (%)	3(3.1)	0(0)	P=0.349 *
Autonomic neuropathy (%)	0(0)	0(0)	-

*   chi-square
( )   percent %
P < 0.05 (significant)

4.5.5 Level of education and association with knowledge score

As mentioned before, majority of patients had poor knowledge score (*Figure 4*). We further tested whether there was an association between level of education and knowledge score of patients. It was found majority of patients with good knowledge score had a university and college level of education (55.6%). In the poor knowledge score group, majority of patients (49.1%) had a

secondary level of education. There was a significant association between level of education and knowledge score (p=0.008). (*Table 14*)

Table 14. Level of education and association with knowledge score

Level of education	Knowledge score	
	Good (n=18)	Poor (n=108)
University and college(%)	10(55.6)	23(21.3)
Secondary (%)	6(33.3)	53(49.1)
Primary (%)	2(11.1)	32 (29.6)
P = 0.008 *		

*   chi-square
( )   percent %
P < 0.05 (significant)

4.5.6   Socio-economic status and association with knowledge score

We also tested whether there was an association between socio-economic status and patient's knowledge. Majority of patients with good knowledge score were in the group above RM 500.00 (72.2%) (*Table 15*). In the poor knowledge score group, majority of patients were in the group of more than RM 500.00 (72.2%) (*Table 15*). There was a significant association between socio-economic status and knowledge score (p=0.046) (*Table 15*)

Table 15. Socio-economic status and association with knowledge score (n=109)

Household monthly income	Knowledge score	
	Good (n=18)	Poor (n=108)
RM 500.00 and above	13(72.2)	78(72.2)
Below RM 500.00	0(0)	18(16.7)
Not sure	5(27.8)	12(11.1)
P = 0.046 *		

*   chi-square
( )   percent%
p < 0.05 (significant)

4.5.7 Level of education and association with treatment seeking attitude

Level of education was also found to be significantly associated with treatment seeking attitude (p=0.010). It was found that majority of patients that will tell their doctor voluntarily if they had ED had a secondary level of education (43.1%). Those who will not tell their doctor voluntarily, majority of them also had a secondary level of education (51.9%) (*Table 16*).

Table 16. Level of education and association with treatment seeking attitude

Level of education	Tell doctor voluntarily	
	Yes (n=72)	No (n=54)
University and college(%)	26(36.1)	7(13.0)
Secondary (%)	31(43.1)	28(51.9)
Primary(%)	15(20.8)	19 (35.2)
P = 0.010 *		

```
*       chi-square
( )     percent %
P < 0.05 (significant)
```

4.5.8 Socio-economic status and association treatment seeking attitude

Socioeconomic status was found not to be significantly associated with treatment seeking attitude (p=0.68). Majority of patients that will tell their doctor voluntarily if they had ED patients were in the group of RM 500.00 and above (72.2%) and of those who will not tell their doctor voluntarily, 72.2% were also in the group of RM 500.00 above. (*Table 18*)

Table 17. Socio-economic status and association with treatment seeking attitude

Household monthly income	Tell doctor voluntarily	
	Yes (n=72)	No (n=54)
RM 500.00 and above (%)	52(72.2)	39(72.2)
Below RM 500.00 (%)	9(12.5)	9(16.7)
Not sure	11(15.3)	6(11.1)
P = 0.680 *		

```
*       chi-square
( )     percent %
P < 0.05
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5.0   DISCUSSIONS

5.1   General

This is the first study looking at the prevalence and characeristics of diabetic patients with ED in Kota Bharu, Kelantan, Malaysia. The study population consisted of men aged 18 and above that has been treated and follow-up in an outpatient setting in two specialised clinic in Kota Bharu Kelantan. Most of the patients who attended Diabetic Clinic in Outpatient Department, Hospital Kota Bharu were self-referred, meanwhile most of the patients attended Diabetic Clinic, Hospital USM were either referred by other clinic in Hospital USM or by health centers. Therefore, this sample of patient cannot be considered as representative of male diabetic population in Kelantan

Respondents (156) were more than the calculated sample size. The response rate was 80.8%, higher than the previous study done among Caucassian (53%) (*Fieldman HA, 1994*). But lower than study done in diabetic patients in Italy (97.2%) (*Fedele et al,1998*).

In our study, 23 patients (19.2%) were excluded from the study because of various reasons, such as unable to read the questionnaire, single and refused to participate. Our exclusion rate was higher when compared with study by Fedele in Italy. Out of 10,157 men, 289 (2.8%) refused to participate. 191 refused for "personal" reason and 98 refused on account of their clinical conditions (*Fedele et al, 1998*)

The mean age of patients was 53.2 ± 9.18 years lower than study in Spain among 102 diabetic patients (63 ± 12 years) (*Alonso Sandoica E et al, 1997*) but higher than the study in Ethiopia (41.4 ± 15.5 years) (*Seyoum B et al,* 1998). For age distribution, there was a highest frequency of patients in 50-59 years age group (38.1%). There was an increase of number of patients from 6.3% in the age group 30 –39 years, to 29.4% in the age group 40-49 years and to 38.1% in the age group 50-59 years. But the number decreased in age group 60-69 years (23%) and in age group 70 and above it was 3.2%. Study done in Italy by Dominico Fedele, 1997, shows a different trend. The number of diabetic patients were increasing from 3.2% in the age group 20-29 years, to 5.9% in the age group 30-39, to 15.3% in the age group 40-49, to 33.5% in the age group 50-59 and to 42.0% in the age group 60-69 years.

In our study most of patients were type 2 diabetes (97.6%). It corresponds with a high prevalence (95%) of type 2 diabetes in Malaysian diabetes, reported in National Cardiovascular Risk Factor Prevalence Study, 1995. (*Malaysian Second National Health and Morbidity Survey, 1997*).

5.2 Erectile Dysfunction

5.2.1 Prevalence of ED

The prevalence ED in our study was 78%. It was higher than prevalence among diabetic patients in Italy (35.8%) (F*edele et al, 1997*), Great Britain (56%) (Mc Cullough et al,)., Ethiopia (48.7%) (Seyoum B et al, 1998) and Senegal (16%) (Gueye SM et al, 1998).

Among non-diabetic patients, the prevalence of ED in our study was still higher compared to MMAS study (52%) (Fieldman HA, 1994). In the MMAS, Fieldman mentioned the probability of severe ED of 28% in diabetic patients. A nationwide study of 1,250 urban Thai men aged between 40 and 70 years done in year 2000 revealed prevalence of ED of 37.5 % (*Thai ED Epidemiologic Study Group (TEDES), 2000*).

The difference of these result could be explained by the different tools that were used to diagnosed ED. Most of these other studies using a subjective assessment of ED as their diagnostic tool. Fedele used a self-rated questionnaire as a tool to diagnose ED. Patients were asked about their ability to achieve and maintain an erection for satisfactory sexual performance. If the answer was unsatisfactory, they will be further asked to classify themselves as having mild, moderate or severe ED. Furthermore the study was conducted by interview, which will cause bias. Studies done by Mc Cullough et al, Seyoum B et al and Gueye et al used a similar approach to diagnose ED. The exception was Massachusettes Male Aging Study. Henry A. Fieldman, was also using a

subjective assessment called 'Sexual activity questionnaire ' which consist 9 items., but to establish the result he further did a validity test.

In contrast to our study, we were using International Index of Erectile Function questionnaire to diagnose ED. The reason for using an objective assessment of ED was because many data has shown that majority of cases of ED are organic in origin (*Eli Coleman, 1998*). Through greater medical study of problem of ED, people realize that there are many biomedical problems which contribute to ED and no longer believe that this is primarily a psychological problem (*Eli Coleman, 1998, NIH, 1994*). Interestingly, Henry A. Fieldman gave a different view of opinion in explaining the use of subjective assessment to assess ED. He stated that, potency which was defined as 'satisfactory functional capacity for erection', may coexist with some degree of ED in the sense of submaximal rigidity or submaximal capability to sustain an erection, therefore, ED is best defined by the individual's assessment of his own situation in simple terms of minimal, moderate or severe ED.

For men both with and without diabetes, the prevalence in Malaysia was lower, 60% (*Thambi I, 1998*). In Massachussettes Male Aging Study, 1994, the combined prevalence of mild, moderate and severe ED was even lower, 52% (*Henry A. Fieldman, 1994*).

5.2.2 Different category of ED

By using the International Index of Erectile Function, we further classify the patients with ED. Prevalence of severe ED was 37%, moderate ED was 21% and mild ED was 42% (*Figure 2*).

Previous studies in diabetic patients only mentioned the relationship between mild, moderate and severe ED with certain characteristics of diabetes namely, age group and duration of diabetes. None of them mentioned specifically the prevalence of different category of ED (*Fedele et al, 1998, SeyoumB et al, 1998, Gueye et al, 1998*)

Among non-diabetic patients, in study among 1,290 men age 40 –40 years in Massachusettes Male Aging Study, 1994, the prevalence of severe ED (complete ED) was 9.6%, moderate ED was 25.2% and mild ED (minimal ED) was 17.2%.

Study in Thailand by Thai Erectile Dysfunction Epidemiologic Study Group (TEDES), 2000 revealed 19.1% of males with mild dysfunction, 13.7% and 4.7% of males had moderate and severe dysfunction. Meanwhile Edson Duarte Moreira et al, in his study in Brazil found a prevalence of severe ED was 2.6%, moderate ED was 18.3% and mild ED was 26.6%.

5.2.3 Treatment of ED

In spite of high prevalence of ED, we found a low percentage of patients (11%) on treatment (*Figure 3*). In a study done by KM Dunn et al in United Kingdom in 1998, among 281 male patients who had sexual dysfunction, only 6% of them actually receiving treatment (*KM Dunn et al, 1998*). In our study, the treatment was a coincidence because these patients were attending Diabetic Clinic in Hospital USM and Hospital USM is a teaching hospital where many patients were expected to had been involved in certain studies conducted in the hospital, therefore some of our patients had been given treatment for their ED problem. The reason that other patients who are still not getting any treatment for their ED could be undiagnosed ED. The patient might not been screened for ED. The other reason could be, the tool that the doctor use to diagnose ED, where there could be a discrepancy between subjective assessment and objective assessment of ED. If it is so, knowledge of the doctor regarding ED plays an important aspect identifying patients with ED. Furthermore current recommendation by Malaysian Erectile Dysfunction Council And Training (MEDACT) is to ask every male diabetic patient about their erectile function.

5.3 Characteristics of diabetic patients and its association with ED

5.3.1 Age

Relationship between age and ED was well established (*Henry A. Fieldman et al, 1994*). Our study found a significant difference between mean age for diabetic patients with ED (54.2 ± 9.5 years) and mean age of those without ED (49 ± 7.1), (p=0.015) (*Table 10*).

In relation to age group, many previous studies had found that there was a significance increase in prevalence of of ED with the increase of age. Thambi I in 1997 found in his Cross National Epidemiology Study in Malaysia, the prevalence of moderate to severe ED for men between ages of 65-70 years was 48%, increased significantly over that for men between the ages 40-45 (9%) (*Thambi I, 1997*). In the Massachusettes Male Aging Study, the prevalence of severe erectile dycfunction tripled from 5-15% between subject ages 40 and 70 years old (*Henry A. Fieldman, 1994*).

Study by Edson Duarte Moreira et al in Brazil similarly found an increasing trend of not only in the frequency of ED, but also severity of ED with increasing age. The frequency of moderate and severe ED increased from 8.3% and 1.1%, respectively, in subjects younger than 40 years old, to 27.8% and 11.1% among men 70 years old and older. The prevalence of mild erectile

dysfunction remained stable at approximately 32%. (*Edson Duarte Moreira et al, 2001*).

Similar trend was shown by study done among 1517 non-institutionalized men aged 23-79 years in Japan. The prevalence of moderate and severe cases of ED were 1.8% and 0% for ages 23-29; 2.6% and 0% for ages 30-39; 7.6% and 1.0% for ages 40-49; 14.0% and 6.0% for ages 50-59; 25.9% and 15.9% for ages 60-69; and 27.9% and 36.4% for ages 70-79 years, respectively (*Marumo K et al, 2001*).

For study among diabetic patients in Italy, Fedele showed that the prevalence was increase with age. Prevalence in the age group 20-39 years was 4.6%, 30-39 years was 11.6%, 40-49 years was 22.9%, 50-59 years was 36.8% and 60-69 years was 45.5%. Mc Cullogh et al, in 541 patients also reported an increasing prevalence of ED with age, 11% at 20-34 years, 33% at 35-49 years and 51% at 50-59 years.

Our study showed a similar trend of prevalence of ED in relation to the increasing of age of patient (*Table 5*). The prevalence of ED was 75% in age group 30-39 years. The prevalence for age group 40-49 was more less the same, 73%. The prevalence increased to 96% in the age group 60-69 years an 100% in the age group of more than 70 years.

However, in term of severity of ED, the prevalence of mild, moderate and severe cases of ED showed a slight difference. The difference was seen in the distribution of mild ED (*Table 5*). The prevalence was 100% in age group 30-39 years, decreased to half, 51.9% in age group 40-49 years, and further decresed to quarter, 25.0% in the age group 70 years and above.

For moderate ED was 14% in the age group 40-49 years, doubled to 27.3% in the age group 50-59 years and 25% in the age group 60-69 years and age group 70 years and above. For severe ED, the prevalence increased from around 30% in the age group 40-49 years and 50-59 years (33.3% and 30.0%) to around 50% in the age group 60-69 years and above 70 years (53.6% and 50.0%) (*Table 5*).

This difference could be explained by the fact that in young male, the cause of ED is more likely to be more psychogenic, in contrast to men older than 55 or 60 years, a physical cause is more likely (*Neil Baun and Jorge Diez, 1997*). Although, ED in men with diabetes is predominantly caused by organic factors, psychogenic factors, such as performance anxiety, can contribute to its etiology (*Rendell, Marc Set al, 1996*). In our study, highest frequency of mild ED occurred in relatively younger patients (59 years and below). Therefore, it could be these group of patients were having psychogenic or mixed (psychogenic and organic) ED, which presented in the form of mild ED (*Gideon Bosker et al, NIH, 1994*) . If the causes of ED in people with diabetes are neuropathy, vascular insufficiency, poor glycemic control, hypertension, low testosterone levels, and possibly a history of smoking, in psychogenic ED, the

causes are depression, performance anxiety, and relationship problems which are more likely to occur in young patients (*Neelima V Chu, 2001*).

5.3.2 Duration of diabetes

The mean duration of diabetes as a whole was 8.3 ± 6.95 years. Seyoum B in 1998, found a higher mean duration of diabetes (9.9 ± 6.7 years) among 292 diabetic Ethiopian male (*Seyoum B, 1998*).

In relation to ED, we found a significant difference between the duration of diabetes in patients with ED, which was 9.4 ± 7.4 years and without ED, 4.39 ± 2.8 years. Study in Ethiopia found a higher duration of diabetes for ED sufferers compared to without ED (12.3 years and 8.1 years). The difference was significant, $p<0.001$ (*Seyoum B, 1998*). Smilarly, mean duration of diabetes was found to be significant in relation to ED in a study done in Senegal, $p=0.049$ (*Gueye SM et al, 1998*).

We also found that the prevalence of ED increased with age. The prevalence of ED was 62.7% for duration group 1-5 years, 76.3% for duration group 6-10 years and 100% for the duration above 11 years. For mild ED, the highest prevalence was in the duration 31-35 years (66.7%), for moderate ED the highest prevalence was in the duration group 21-25 and 31-35 years and for severe ED group the highest prevalence was in the duration group 26-30 years (100%) (*Table 6*). In study in Italy, Fedele reported a similar increase in prevalence of ED with increase in the duration of diabetes, 26.2%, 33.7% and

61

44.7% in the duration group 1-5 years, 6-10 years and 11-30 years respectively (*Fedele et al, 1998*).

5.3.3 Presence of concomitant disease

ED is clearly a symptom of many conditions. Diabetes mellitus, hypogonadism in association with a number of endocrinologic conditions, hypertension, vascular disease, high levels of blood cholesterol, low levels of high density lipoprotein, drugs, neurogenic disorders, Peyronie's disease, priapism, depression and many chronic diseases, especially renal failure and dialysis, have been demonstrated as risk factors for ED (*Impotence: NIH Consensus Conference, 1993*). In this study, we found that presence of concomitant diseases had no significant association with ED (p>0.05) (*Table 11*). In contrast, Fedele found that medical conditions such as anxiety or depression, arthritis, cardiopathy hypercholesterolemia, hypertension, stroke/cerebral hemorrhage, gastric ulcer, and pelvic trauma or surgery/radiation were associated with an increased risk of ED (*Fedele et al, 1998*). The odds ratio for ED were 1.8 (95% CI 1.4-2.3) for anxiety; 1.5 (95% CI 1.1-1.9) for depression; 2.0 (95% Cl 1.4-2.8) for arthritis; 1.7 (95% CI 1.5-2.0) for cardiopathy; 1.3 (95% CI 1.1-1.5) for hypercholesterolemia; 1.3 (95% CI 1.2-1.4) for hypertension; 2.1 (95% CI 1.6-2.9) for stroke/cerebral hemorrhage; 1.2 (95% Cl 1.0-1.4) for gastric ulcer; 2.3 (95% CI 1.3-4.2) for pelvic trauma; and 1.4 (95% Cl 1.1-1.8) for pelvic surgery or radiation.

Report by Henry A. Fieldman through MMAS study mentioned certain treated medical conditions that were associated with ED (*Henry A. Fieldman et al, 1994*). The age-adjusted probability of complete impotence was 39% in patients with treated heart disease and 15% in those with treated hypertension. Untreated disease which was associated with ED were untreated ulcer (18%), untreated arthritis (15%) and untreated allergy (12%).

5.3.4 History of smoking

Neelima V Chu et al stated his opinion that smoking is possibly related to ED (*Neelima V Chu, et al, 2001*). Our study found that smoking was significantly related to ED, p=0.038 (*Table 10*). There was a similarity in this association as reported in previous studies. Henry A Fieldman reported the probability of complete impotence was 11% in smokers and 9% in non-smokers (p>0.20). Smoking also associated with ED by amplifying the risks of certain factors that were associated with ED. In subjects with treated heart disease, the age-adjusted probability of complete impotence was 56% for smokers and 21% for nonsmoker. Among treated hypertensives, those who smoked had an elevated probability of complete impotence (20%), whereas nonsmoker was 9.6% (*Henry A. Fieldman, 1994*).

Study in Malaysia also showed a significant association between smoking and ED (p<0.05) (*Thambi I,1997*). Al Helali et al studied the pattern of erctile dysfunction in Jeddah city found that smoker comprised 56% of subject with ED which was significant (p<0.05) (*Al Helali et al, 2001*).

A study by Fedele in Italy found that smoking was associated with an increased risk of ED. In comparison with never-smokers, the risk was 1.5 (95% CI 1.3-1.6) for current smokers and 1.4 (95% CI 1.3-1.6) for ex-smokers (*Fedele et al, 1998*).

5.3.5 Treatment of diabetes mellitus

Among all 126 diabetic patients involved in our study, 94.5% received medication for their diabetes. 92.1% took regular tablets medication, while 2.4% got insulin treatment (*Table 4*). According to report by National Institute of Health (*Impotence: NIH Consensus Conference, 1993*), oral hypoglycemic agent is one of the drug associated with ED. Our study found that there was no significant association between treated diabetes (receiving oral hypoglycemic agent or insulin) and ED ($p=0.177$) (*Table 12*).

However, Henry A. Fieldman, through his MMAS study, reported that diabetic patients that received medication were at increased risk to developed ED. He stated the age-adjusted probability of complete impotence was 28% in those treated diabetes (*Henry A. Fieldman et al, 1994*). Dominico Fedele, in his study among diabetic patients in Italy also reported a comparison between diabetic men treated with diet alone, the odd ratios of ED were 2.1 for men managed with oral agents, 3.7 for men those with insulin and 4.1 for those managed with oral agents plus insulin. The reason could be due the difference in the number of sample. Our small sample (126 patients) might be the cause of

this discrepancy. The sample of Fedele's study was 9869 patients while sample in MMAS study by Henry . Fieldman was 1290 patients. Therefore it need further confirmation by future study.

5.3.6   Treatment other than diabetes mellitus

There was a substantial number of our patients received medication other than medications for diabetes. The highest being anti-hypertensive medication , 42.9%. certain antihypertensive, antidepressant, and antipsychotic were associated with ED (*Impotence: NIH Consensus Conference, 1993*). Neelima V. Chu et al stated that commonly used drugs that disrupt male sexual function are spironolactone, sympathetic blockers such as clonidine, guanethidine, methyldopa, thiazide diuretics, most antidepressants, ketoconazole, cimetidine, alcohol, methadone, heroin, and cocaine (*Neelima V. Chu et al, 2000*). Our study was using a questionnaire which was adapted from previous large study in Malaysia done in 1997 (*Thambi I, 1998*). Therefore, the list of drug or medications that we asked the patients the patients was limited to medication that was included in the original questionnaire (*Table 8*). Furthermore, we found the drugs were among medication that were commonly prescribed in our country in outpatient department. In our study, we found there was no significant association between consumption of these medications and ED (p>0.05) (*Table 12*).

Henry et al in his study found dissimilar result. He reported that complete impotence was significantly more prevalent in men taking certain medications,

anti-hypertensives (14%) and vasodilators (36%). However he found there was no correlation between impotence and lipid lowering agents and sympathetic drugs.

5.3.7 Complications of diabetes

Table 13 shows that retinopathy was significantly associated with ED. Besides retinopathy Fedele found that, arteriopathy, nephropathy, and neuropathy was associated with a increased risk of ED (*Fedele et al,1998*). Meanwhile, Gueye et al in his study among diabetic patients in Senegal found only neuropathy significantly correlated with ED (*Gueye et al, 1998*). In study in Ethiopia, Seyoum B didn't mention a specific complication of diabetes, instead patients with complications was significantly associated with ED (*Seyoum B et al, 1998*).

5.3.8 Knowledge, attitude and practice towards ED

We found that majority of patients (86%) had a poor knowledge on ED. We also found that there was a significant association between knowledge score and level of education, p=0.008 (*Table 14*).

This result reflects the patients' poor knowledge about ED. The low level of knowledge of patients might be due to lack of proper source of information regarding ED. Patients could easily find an articles or discussion about ED in their daily newspaper or their favourite magazines.

The other reason is that ED was not stressed as same as other diseases which cause high morbidity and mortality, i.e. ischaemic heart disease or chronic disease such as hypertension, diabetes mellitus and dyslipidemia.

According to NIH Consensus Conference Statement, despite the accumulation of a substantial body of scientific information about erectile dysfunction, large segments of the public -- as well as the health professions -- remain relatively uninformed, or -- even worse -- misinformed, about much of what is known. This lack of information, added to a pervasive reluctance of physicians to deal candidly with sexual matters, has resulted in patients being denied the benefits of treatment for their sexual concerns.

In contrast to poor knowledge score, we found that 75% of patients were aware about ED (*Figure 5*). Since the advent of Sildenafil Citrate, ED issue had received more attention by public. The popularity of Viagra, had brought people to be more aware of this disease. The way people perceive ED has also changed. People could accept that ED is a common condition and it's important cannot be taken lightly.

Most of respondents chose printed materials and friends or neighbors as their important source of information regarding ED (*Figure 6*). As compared to health provider, only 15.6% of patients chose health provider as their source of information. This might be due to the doctor is not comfortable in addressing the issue with their patient. They themselves might not have enough knowledge regarding ED.

It was not surprised to see the result of high percentage of patients stated

that their information regarding ED was not enough (*Figure 6*). Similarly, it

could be explained by the lack of proper information regarding ED that was

available for the atients. Furthermore, people regards ED as a sensitive issue,

especially in Malay culture. Therefore, people are getting informal information

from friends, neighbors and reading materials which is misleading.

Pills and hormone were the treatment of choice by majority of patients

for ED. Pills especially Sildenafil citrate gained high popularity, because of the

wide coverage in mass media. The effort put by the drug company through

extensive advertisement all over the world, made pills medication namely

Sildenafil citrate became an ouitstanding treatment for ED. In the Malaysian

Consensus guideline for treatment of ED, sildenafil citrate was considered a first

line treatment for ED, provided there is no contraindication such as ischemic

heart disease or patient receiving Isosorbide Dinitrate.(*Malaysian Consensus

Statement In Prescribing Sildenafil citrate, 2000*). Hormonal treatment was

chosen by 48% of our respondents. Hormonal treatment was part of traditional

treatment for ED by traditional healers in Malysia. The role of testosterone is

still controversial in treating ED, and it is currently being studied.

Majority of patients are comfortable in discussing about ED with their

health provider. Only about one fifth of patients feel uncomfortable (*Figure 8*).

We didn't ask the patient to specify the reason of not telling the doctor if

supposed they have ED. In TEDES, it was found that the highest percentage of

patient (46%) were in the group of between comfortable and uncomfortable. (Kongkanon et al, 2000). 30% of the respondent feel comfortable discussing about ED with doctor which is lower than our respondent. Similar result was found for number of patient who feel uncomfortable (24%).

For the health seeking attitude, half of the respondent mentioned that they would voluntarily tell their doctor if they suffered from ercetile dysfunction (53 %) (*Figure 9*). In contrast, Kongkanan found in his study that only 8% of patients would consult their doctor if they are suffering from ED (*Kongkanan et al, 2000*). Health seeking attitude was associated with level of education (*Table 16*) but not with socioeconomic status (*Table 17*). According to Asean ED Counsil and Training (EDACT), a few myths exist about ED. Among them is the regard of ED as a normal process of aging. The other myth is there is no treatment for ED and man should live with ED.

For the type of health provider that patients chose to consult to supposed they had ED, highest percentage (41%) chose primary care doctors. Similarly, in Thailand the respondent chose their primary care practitioner to consult with, but the number was lower (22%). (*Kongkanan et al, 2000*) KM Dunn found a higher percentage (63%) of patients prefer their primary care practitioner for their sexual dysfunction. (*KM Dunn et al, 1998*) Primary care doctors are often met by patients most of the time whenever patients want to seek treatment. The family centered approach in their practice help to bring patients became more closer to them. It will enhance the good rapport and break the communication barrier between the doctor and patients, therefore patients will felt at ease to

discuss any sensitive issue such as ED with them. This positive aspect in health seeking attitude was by far one of the most important factor not only in term screening for ED but also to increase the knowledge of patients regarding ED.

6.0   CONCLUSION

ED is a common condition. There was a high prevalence of ED undiagnosed among diabetic patients in Kota Bharu, Kelantan. In fact it was highest as compared to previous study of ED among diabetic patients done in overseas.

Among all characteristics of diabetic patients, age, duration of diabetes, retinopathy and history of smoking significantly associated with ED. The mean age for ED was 56.3(8.8) years whereas the mean duration of diabetes for developing ED was 9.44(6.5) years..

There was a high percentage of diabetic patient has poor knowledge about ED. Factors that were significantly associated knowledge regarding ED was level of education and socioeconomic status. Patient who has higher level of education and higher socioeconomic status has better knowledge.

Health providers was not a main source of information regarding ED. Patients were getting information mostly from improper source such as printed materials and their friends and neighbors. Information regarding ED was also regarded as inadequate.

Only half of patients will seek treatment for erectile problem. Most of them prefer primary care doctors to consult. Health seeking attitude in patients was associated with their level of education. Patients who has high and moderate level of education tend to have positive health seeking attitude.

7.0 RECOMMENDATION

7.1 Screening of ED to be done routinely among all diabetic patients. This could be done by a simple 5 items International Index of ED questionannire. This questionnaire should be readily available in every diabetic clinics.

7.2 Doctors who involve in management of patients should increase their knowledge and learn to be comfortable in discussing about ED with their patients. This issue could not be addressed properly unless the doctors feel comfortable themselves. There is no other way to gain comfortable unless they practice it.

7.3 Patients should also encouraged to seek treatment. There are many barriers, however. These include traditional social stigmas attached to ED, a man's own embarrassment, misunderstandings about the effectiveness of the treatments available, and myths and superstitious that have many men avoiding their doctors in favor of other methods of treatment e.g. traditional medicines. Increasing openness about general

sexual health issues, means many men are becoming more knowledgeable about this often devastating condition.

7.4 For future research, we suggest a follow up study among this sample of patients to find an effective way of increasing patients knowledge, imply a positive attitude and practice towards ED. A intervention study involving health education can be conducted and the knowledge score and health seeking attitude assessed before and after the intervention.

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