

**EVALUATION OF DOCTOR'S KNOWLEDGE AND PRACTICE WITH REFERENCE
TO CLINICAL PRACTICE GUIDELINE (2009) MINISTRY OF HEALTH MALAYSIA
ON MANAGEMENT OF DIABETES MELLITUS AT HOSPITAL PULAU PINANG.**

by

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Requirements for the degree of
Master of Science
(Clinical Pharmacy)**

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DEDICATION

To

MY FATHER

For the Uncompromising Principles that Guided His Life

MY MOTHER

For Leading Her Children into Intellectual Pursuits

MY BROTHERS

For Making Everything Worthwhile

MY WIFE

For Her Insight, Patience and Unfailing devotion

To

MY TEACHERS

For Showing Me the Excitement and Joy of Pharmacy

MY FRIENDS

*For Their Abundant Support, For Their Patience
and Understanding and for Their Help.*

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LIST OF ABBREVIATIONS

ACEIs	Angiotensin-Converting Enzyme Inhibitors
ARBs	Angiotensin receptor blockers
BP	Blood pressure
CVD	Cardiovascular disease
CKD	Chronic kidney disease
CPG	Clinical Practice Guideline
CRC	Clinical Research Center
CHD	Coronary heart disease
DM	Diabetes Mellitus
HbA1c	Hemoglobin A1C
HPP	Hospital Pulau Pinang
HTN	Hypertension
MREC	Medical Research Ethics Committee
NIH	National Institute of Health
SPSS	Statistical Package for Social Sciences
WHO	World Health Organisation

**PENILAIAN PENGETAHUAN DAN PRAKTIS OLEH DOKTOR YANG MENGIKUTI
GARISPANDUAN PRAKTIS KLINIKAL (2009) KEMENTERIAN KESIHATAN
MALAYSIA UNTUK RAWATAN DIABETES MELLITUS DI HOSPITAL PULAU
PINANG.**

ABSTRAK

Literatur sedia ada menyebut bahawa percanggahan pendapat antara doktor berkenaan syor berdasarkan garis panduan pengurusan diabetes melitus menjadi punca utama kurangnya kawalan diabetes melitus dalam kalangan pesakit. Kajian ini melibatkan 51 orang doktor yang terlibat dalam kajian ko-relasional yang dijalankan di Hospital Pulau Pinang (HPP). Matlamat kajian ialah untuk menilai pengetahuan, sikap doktor dan amalan penpreskripsian (diagnosis, penyaringan dan pengubatan) berdasarkan syor yang tertulis dalam Garis Panduan Amalan Klinikal (*Clinical Practice Guideline (CPG) 2009*) di Malaysia berkaitan dengan diabetes melitus serta faktor-faktor berkaitan pematuhan garis paduan dan kawalan diabetes melitus. Melalui kajian ini, pengetahuan dan sikap doktor ditaksir menggunakan borang soal selidik yang telah diperakui. Preskripsi yang ditulis oleh 51 orang doktor yang telah kenalpasti untuk 1020 pesakit yang disahkan mengidap diabetes (20 preskripsi bagi setiap doktor) berserta maklumat demografi dan klinikal pesakit dicatat menggunakan 'peralatan pengumpulan data bervalidasi' (*validated data collection tool*). Preskripsi yang diperoleh diklasifikasikan sebagai komplians atau bukan komplians dengan CPG 2009. Perisian SPSS versi 20 digunakan untuk menganalisis data. Nilai $p < 0.05$ dianggap sebagai signifikan secara statistik. Kajian mendapati bahawa seramai 38 orang doktor (78%) mempunyai pengetahuan yang mencukupi tentang garis panduan CPG 2009. Kumpulan yang terdiri daripada pakar perubatan mempunyai pengetahuan yang lebih jika dibandingkan dengan pegawai perubatan atau pegawai perubatan pelatih (p -value < 0.03). Golongan doktor telah mempamerkan sikap yang positif dan mesra terhadap syor garis panduan

CPG 2009 dengan skor min untuk sikap (atitud) bernilai 36.64 ± 3.93 mata dengan julat dari 35 hingga 40 mata pada skala 50 mata. Secara statistik, korelasi yang kuat (nilai $p < 0.001$) telah diperhatikan di antara pengetahuan yang ada pada doktor dan skor amalan (praktik). Seramai tujuh ratus lima puluh orang pesakit (73.5%) telah menerima terapi yang komplian dengan garis panduan. Secara statistik, perkaitan positif yang sederhana signifikan ($\Phi = 0.591$, $p\text{-value} = 0.001$) telah diperoleh di antara diabetes melitus and kepatuhan terhadap CPG. Secara keseluruhan, tahap pengetahuan dan kepatuhan doktor serta kawalan dibetes melitus yang agak baik telah diamati di Hospital Pulau Pinang. Jurang pemisah di antara syor garis panduan CPG 2009 dan amalan telah diamati khususnya semasa penyaringan dan mendiagnosis komplikasi yang timbul akibat diabetes. Di samping itu, jurang pemisah juga diperhatikan dalam pengurusan diabetes melitus dan penyakit-penyakit renal.

EVALUATION OF DOCTOR'S KNOWLEDGE AND PRACTICE WITH REFERENCE TO CLINICAL PRACTICE GUIDELINE (2009) MINISTRY OF HEALTH MALAYSIA ON MANAGEMENT OF DIABETES MELLITUS AT HOSPITAL PULAU PINANG.

ABSTRACT

The available literature suggests that divergence of doctors with the recommendations of the guideline in the management of diabetes mellitus is the main reason for poor control of diabetes mellitus in patients. The current research in which 51 doctors were involved in the co-relational study conducted at Hospital Pulau Pinang (HPP). The aim was to evaluate the doctor's knowledge and prescription writing practices (diagnosis, screening and medication) on recommendations of Malaysian clinical practice guideline (CPG 2009) on diabetes mellitus, and factors concerning with the guideline adherence and diabetes mellitus control. Knowledge and attitude of doctors were evaluated by a validated questionnaire. Record of the patients written by 51 enrolled doctors to 1020 established diabetic patients (20 Record of the patients per enrolled doctor) with demographic and clinical information of the patients were noted by validated data collection tool. The taken record of the patients was classified as compliance or noncompliance with CPG 2009. SPSS version 20 was used for data analysis. A p -value <0.05 was considered as statistically significant. The total 38 (74.5%) doctors were having adequate knowledge on recommendations of CPG 2009. Group of specialists were having good knowledge as compared with medical officers and house officers (p -value <0.03). Doctors were having highly positive and welcoming attitude on recommendations of CPG 2009 with mean attitude score of 36.64 ± 3.93 points ranging from 35-40 points on 50 point scale. Statistically strong association (p -value <0.001) was observed between doctors knowledge and practice score. Seven hundred and fifty (73.5%) patients were receiving guidelines compliance therapy. Statistically significant moderate positive association ($\Phi = 0.591$, p -value $=0.001$) was observed between diabetes

mellitus and CPG adherence. An overall fair level of knowledge and adherence of doctors with fair control of diabetes mellitus was seen in HPP. The gap between recommendations of CPG 2009 and practice was particularly observed in screening and diagnosis of diabetic complications. Similarly a gap is also seen in management of diabetes mellitus along with renal diseases.

CHAPTER 1

INTRODUCTION

The adherence of physician with guideline is directly affecting on the screening of disease and its complications and after that their treatments (Furthauer *et al.*, 2013). Generally, in qualitative and in quantitative studies the hurdles to guideline-adherence have been evaluated widely regarding the physician's point of view. There is need to evaluate the adherence of physicians with his prescriptions on recommendations of guideline for proper control of the disease. Guidelines aim to improve clinical practice but are not self-implementing. There is need to evaluate the doctors current medical practice and their knowledge on basis of guideline.

1.1 Diabetes mellitus

Diabetes mellitus is a common chronic disorder characterized by chronic hyperglycemia together with other metabolic abnormalities (WHO 2003). It is due to insulin resistance or deficiency with increased hepatic glucose output (Alberti Zimmet 1998, Malaysian Diabetes mellitus Guideline, 2009). The effects of diabetes mellitus contain long-term damage, dysfunction and failure of various organs (Agrawal *et al* 2011, Skyler 2004). The most common form of diabetes mellitus is type 2 diabetes. This disorder normally makes its appearance in older age (Grundy *et al.*, 2002).

1.1 Classification of Diabetes Mellitus

According to the WHO classification the diabetes mellitus and other categories of hyperglycemia are classified in to four types (WHO 2003, Dabelea *et al.*, 2011). These four classes of diabetes mellitus include following classes:

1.2.1 Type 1 DM

Type 1 DM, also known as insulin-dependent diabetes, is a chronic condition in which the pancreas produces little or no insulin, a hormone needed to allow sugar (glucose) to enter cells to produce energy (WHO 2003, Ziegler Nepom 2010). Its prevalence is 5-10% of diabetes cases (Shulman D. 2010). Type 1 diabetes is a state in which destruction of pancreatic β cell takes place and usually resulted in absolute insulin deficiency in the body (Daneman 2006). Despite active research, type 1 diabetes has no cure, although it can be managed.

1.2.2 Type 2 DM

Type 2 DM, also known as adult-onset or noninsulin-dependent diabetes, is a chronic condition that affects the way by which body metabolizes sugar (glucose), the main source of energy in the body. Type 2 DM is the most common type which is present more than 90% of patients of diabetes (WHO 2003). It can affect in any age of the patient. Type 2 DM is developed with both genetic factors belongs to insulin secretion and environmental factors for example obesity, overeating, lack of exercise, and stress, as well as old age (Kohei, 2010).

1.2.3 Gestational DM

Gestational diabetes mellitus (GDM) is condition of carbohydrate intolerance resulting in hyperglycemia of varying degrees of severity in pregnancy (Moore 2004). It has been reported that the incidence is about 1–14 % of all pregnancies. It is usually take place in third trimester of pregnancy (Ismail *et al.*, 2011).

1.2.4 Impaired glucose tolerance (IGT) and impaired fasting glucose (IFG)

The IGT and IFG are also called as Pre-diabetes. Impaired glucose tolerance (IGT) and impaired fasting glycaemia (IFG) are middle conditions in between normality and diabetes (Saydah *et al.*, 2004). People with IGT or IFG are at high risk of developing type 2 diabetes, though it is not expected (Unwin *et al.*, 2002).

1.3 Diabetic Complications

Diabetes mellitus if not treated properly it can cause various complications in patients (Clinical Practice Guideline 2009). Diabetes and its complications make up a major public health problem all over the world and are a main cause of morbidity and mortality (WHO 1999, Diabetes 2010 [www. diabetes. org. uk/Documents/Reports/Diabetes_in_the_UK_2010.](http://www.diabetes.org.uk/Documents/Reports/Diabetes_in_the_UK_2010)). In actual fact, diabetes has reached epidemic proportions all over the world (Agrawal *et al.*, 2011). Uncontrolled diabetes is resulted in increased risk of microvascular and macrovascular complications (Nathan *et al.*, 2009, Nazimek-Siewniak *et al.*, 2002). According to Clinical Practice Guideline 2009 the following five complications are considered as major complications of diabetes mellitus.

1.3.1 Diabetic Retinopathy

Diabetic retinopathy is developed as a result of damage to blood vessels of the retina in eyes (Kern 2007). The diabetic retinopathy is the leading cause in blindness in United States (Zhang *et al.* 2010). The duration of diabetes is a main risk factor for diabetic retinopathy (Ruta *et al.*, 2013). In Type 1 DM the incidence of retinopathy in the first 3–5 years is incredibly rare, but 20 years over 90–95% of patients suffer from some degree of retinopathy (Chistiakov 2011). In 2005 a Florida study by Chalam *et al.*, found from 25 to 80% of type 1 DM develop retinopathy

within 5 to 15 years after diagnosis (Chalam *et al* 2005). This rate is higher in patients of type 2 DM and varies between patients who are taking insulin and not taking insulin. Moreover, 2007 National Diabetes Statistics of US reported that diabetes is the important reason of new cases of blindness into adults having age 20 to 74 years in the US (Zhang *et al* 2010).

1.3.2 Diabetic Neuropathy

Diabetic neuropathy is heterogeneous group of nerve damage conditions occurred due to uncontrolled DM (Daousi N. 2010). It is the major “microvascular” complications of diabetes. Neuropathy is a common complication of both type 1 and type 2 diabetes. The prevalence of neuropathy is about 8% in newly diagnosed patients and more than 50% in patients with long duration of disease (Edwards *et al.*, 2008). However Vinik and Mahayana in 2004 reported that the true prevalence of diabetic neuropathy is not known. Different reports suggest that in anywhere about 10 to 90% of diabetic patients suffering from diabetic neuropathy, but it truly depend on the criteria and method used to define neuropathy (Amato D. 2002).

1.3.3 Diabetic Nephropathy

Diabetic nephropathy is the most important cause of chronic kidney disease in patients with uncontrolled DM and is resulted in increased cardiovascular mortality (Gross *et al.*, 2005). Prolonged elevation of blood sugar level will also affect the microvascular complication of kidney, thus interfering in its normal filtration function. This condition is called kidney disease of DM or diabetic nephropathy. The renal problem, whether associated to type 1 or 2 diabetes mellitus are similar (Kanwar *et al.*, 2008). Diabetic nephropathy can develop in both type 1 DM

and type 2 DM patients. About 40% patients of T2DM develop diabetic nephropathy (Gross *et al.*, 2005, Retnakaran *et al.*, 2006).

1.3.4 Diabetic Vasculopathy

The complications related with diabetic vasculopathy are generally classified into two types: microvascular and macrovascular complications. In diabetes, macrovascular disease is the commonest source of mortality and morbidity and is responsible for high prevalence of vascular diseases for example stroke, myocardial infarction and peripheral vascular diseases.(Rahman *et al.*, 2007)

1.3.5 Cardiovascular Diseases

Diabetes also has an effect on the heart muscle, resulting in both systolic and diastolic heart failure. The exact mechanism of this excess cardiovascular morbidity and mortality is still unknown (Dokken 2008). Cardiovascular disease (CVD) is the main reason of the morbidity and mortality when concerning with diabetes in the US. CVD is responsible for the majority of hospital admissions for diabetic patients and, together with kidney disease (Marks Raskin 2000).

1.4 Diabetes and its major comorbidities according to CPG 2009

Comorbidity, described as the presence of other chronic conditions in the same person along with an index-disease, occurs normally among patients with diabetes. The patient of diabetes often suffers from one or more comorbidities (Beckman Ja 2002). On the other hand, patients with diabetes have both the diabetes related as well as non-diabetes related comorbidities. A lot of co morbidities are present with Diabetes mellitus. These co morbidities mainly contain the

1.7.2 Comparison between various guidelines

The comparison of only four guidelines (American, Australian, Canadian and Malaysian Guidelines) are given as follows, the reason for selecting and discussing only four guidelines is the involvement of these four guidelines in making the final version of Malaysian Guideline 2009 (Malaysian Clinical Practice Guideline 2009).

Cultural differences of various countries may results in the difference in recommendations of guidelines. The American and Canadian guidelines recommend that the diagnostic tests of diabetes should be performed younger age or more frequently. The screening for community and screening for diabetic complications was not recommended by Canadian guidelines (Diabetes association 1993). The Malaysian guideline recommends the screening of high risk population older than 35 years. The Malaysian guideline also recommends screening for pregnant women in third trimester.

The guidelines are almost having same recommendations regarding the general management of diabetes mellitus in patients. These recommendations contains: diet control, exercise, weight management, life style modifications and preferred oral hypoglycemic agents (Nathan *et al.*, 2009). The Metformin in widely recommended as drug of choice for overweight and obese patients (Inzucchi *et al.*, 2012). The Malaysian guideline recommends the addition of second oral hypoglycemic agent when control of diabetes not obtained. Whereas the American and Canadian guidelines recommends addition in dose of the first oral hypoglycemic agent prescribed (Cramer *et al.*, 2004).

The diagnostic tests and screening also differ in above mention four guidelines. The BMI values that indicate obesity ranges from 25-30 kg/m² and target BP control also ranges from 130/80 to 160/90 mmHg. HbA1c level also ranges from 6.5% to 7.0% in various guidelines. Also, the targets for control of lipid profile are different from various guidelines (Cramer *et al.*, 2004).

The comparison of various diagnosis and screening recommendations between American, Australian, Canadian and Malaysian Guidelines are given in the table 1.1 as follows. The reason for comparing only four guidelines is the popularity of these guidelines and involvement of certain recommendations of these guidelines in developing of Malaysian guideline (CPG 2009).

Table 1.1 Comparison between more popular guidelines

Guideline	First year of issued	Target for screening	Screening test	Criteria for diagnosis of diabetes mellitus
American Guideline	1995	Younger ages with higher risk. All adults with age ≥ 45 years.	FPG or RPG	FPG > 7.0 mmol/l or casual PG > 11.1
Canadian Guideline	1998	Screening for communities and diabetic complications are not recommended by Canadian guideline.	FBG or OGTT	When FBG ≥ 7.0 mmol/l or OGTT ≥ 11.1 mmol/l
Australian Guideline	1991	Ethnic groups with high prevalence aged ≥ 35 years. People aged ≥ 45 years with one risk factor or more. Pregnant women aged ≥ 30 years People aged ≥ 55 years.	FPG or 2-hours post load glucose during an OGTT	When FPG ≥ 7.8 mmol/l Or RPG ≥ 11.1 mmol/l
Malaysian Guideline	1996	High risk population aged ≥ 35 years. Screening for pregnant women at $\geq 24/52$ period of gestation.	RBG or FBG	When RBG ≥ 11 mmol/l confirm by FPG if result > 7.8 mmol/l confirm diabetes

FPG, Fasting Plasma Glucose, RPG, Random Plasma Glucose, OGTT, Oral Glucose Tolerance Test, FBG, Fasting blood Glucose

1.8 Adherence to clinical practice guidelines

Literature revealed that the level of adherence of physician with guidelines and patients with their disease is having direct relation with control of disease. Non adherence to guideline is the main barrier in the control of diabetes mellitus in patients (Larme Pugh 2001, Seidu Khunti 2012). Adherence of patients is very much important in control of disease. Without the cooperation of patients it is impossible to get control over diabetes mellitus (Khattab *et al.*, 2010).

However, the physician can play a key role in control of diabetes mellitus. Thus adherence of physician is very much important in the control of diabetes mellitus. The adherence of physician is directly affecting on the screening of disease and its complications and their treatments (Furthauer *et al.*, 2013). Generally, in qualitative and in quantitative studies the hurdles to guideline-adherence have been evaluated widely regarding the physician's point of view. A systematic review of studies dealing with barriers of physician to guideline adherence, identified physicians' lack of awareness of a guidelines are the important causes of variation from recommended remedy (Cabana *et al.*, 1999).

Implementation of guideline's recommendation is not a straight forward process. Different stages are included in its implementation. Pathman and his colleagues proposed a model that is known as Awareness to Adherence Model to explain the stages resulted in adherence of guidelines (Pathman *et al.*, 1996). Pathman model is four phase model that is consist of awareness, agreement, adoption and adherence. First of all awareness is necessary, then agree with it, then decide to follow it after that successfully practice it (Pathman *et al.*, 1996).

1.9 Factors affecting guidelines adherence

1.9.1 Doctor's knowledge on recommendations of guidelines

Doctor's adherence is directly related with their knowledge on recommendations of guidelines (Ward *et al.*, 2002), which is thought to be the first step in implementation of guidelines in their daily medical practice (Ellms 2006, Khattab *et al.*, 2010, Weingarten *et al.*, 1995). Various studies show that the doctors having more knowledge about recommendations of guidelines resulted in better clinical outcomes of the disease (De Belvis *et al.*, 2009, Khan *et al.*, 2010, Satman *et al.*, 2012).

However this relationship is not all the time present between doctors and their adherence with guidelines. The doctor may have sufficient knowledge about recommendations of clinical practice guideline but not implementing this knowledge in their daily medical practice (Al-Habashneh *et al.*, 2010, Shaneyfelt *et al.*, 1999).

1.9.2 Doctors attitude towards the recommendations of guidelines

Doctor's attitude plays a key role in daily medical practice (Cabana *et al.*, 1999). Positive attitude towards the guideline may result in adherence on recommendations of guidelines (Shera *et al.*, 2002). The use of guideline can be predicted from attitude of doctors (Kortteisto *et al.*, 2010) which can be determined by various factors, such as their knowledge about guidelines, past clinical practice and outcomes of their practice (Clerc *et al.*, 2011).

1.9.3 Doctors demographics

Doctor's demographic characteristics are also having direct relationship in the adherence of clinical practice guidelines (Furthauer *et al.*, 2013). Generally the adherence of doctors increases in increasing the experience and designation of doctors. The increasing in the age and working experience result in the better control of the disease (Al-Qazaz *et al.*, 2011). With the increase in the experience and designation of the doctors the adherence of the doctors towards clinical practice guideline will also increase. Doctors after increase in the designation became more conscious about the implementation of clinical practice guideline in their daily medical practice (Taba *et al.*, 2012). The main demographics are including in the current study is age, gender, experience and designation.

1.9.4 Setting of practice characteristics

According to Cabanna *et al.*, 1999 not only knowledge and attitude but also the implementation strategies, practice characteristics and audits of practice have affect on adherence of clinical practice guidelines. For example verbal and computer based reminders also have a positive effect on the implementation of guidelines.

1.9.5 Affect of patients on adherence of disease

Not only doctors and system related factors but also patient factor is also important in adherence of guidelines (Ahmad *et al.*, 2013, Klisiewicz Raal 2009). Various studies reported the adherence of patients towards the disease is also having direct relation in the control of the disease (Reichard *et al.*, 1993, Al-Qazaz *et al.*, 2011, Valerio *et al.*, 2011, Bond *et al.*, 2012, Satman *et al.*; 2012,). Experience and knowledge of diabetic patients regarding their medication play a

vital role in determining the achievement of adherence in their disease management (Al-Qazaz *et al.*,2011). Knowledge and behaviors of patients are equally important in achieving adherence and ultimately diabetes mellitus control. Although patient knowledge is necessary for behavioral change, knowledge alone is not sufficient to stimulate the necessary behavioral changes expected of persons with diabetes (Ardena *et al.*,2010).

1.10 Theoretical Frame work

The above discussion about the non-adherence towards the guidelines and poor control of diabetes mellitus can be summed up in Fig 1.1

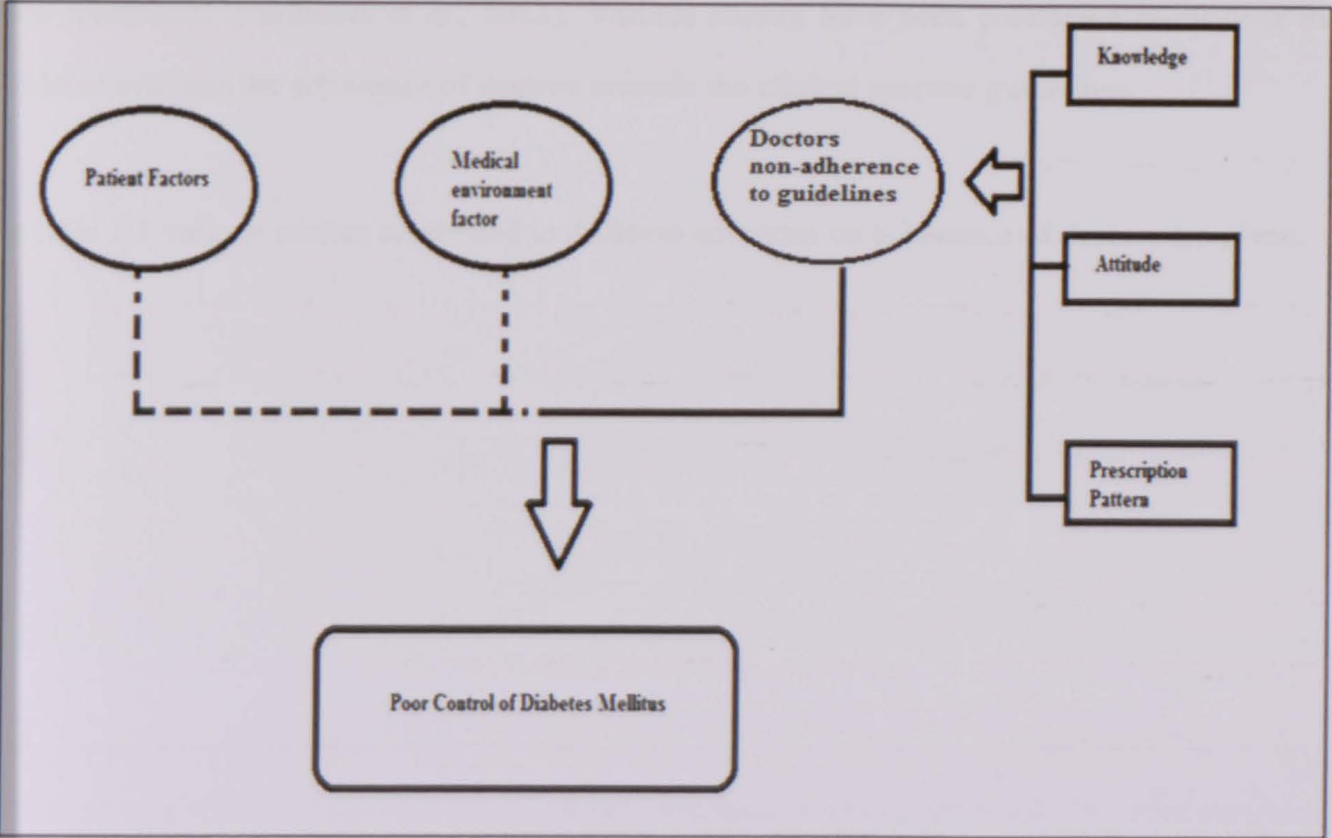


Fig 1.1 Factors liable for poor control of Diabetes mellitus

CHAPTER 2

LITERATURE REVIEW

Literature shows that the level of adherence of physician with guidelines and patients with their disease is having direct relation with control of disease. Non adherence to guideline is the main barrier in the control of diabetes mellitus in patients (Larme Pugh 2001, Seidu Khunti 2012). Adherence of patients is very much important in control of disease. Without the cooperation of patients it is impossible to get control over diabetes mellitus (Khattab et al., 2010). The adherence of physician is directly affecting on the screening of disease and its complications and their treatments (Furthauer et al., 2013). Various studies have been conducted in all over the world to evaluate the adherence of doctors towards the clinical practice guidelines.

In table 2.1 various studies conducted in different countries on adherence of doctors are given.

Table 2.1 Different studies conducted in various countries to evaluate adherence of doctors on recommendation of guidelines

Country & Year of Publication	Name of Researcher	Total percentage of adherence seen	Sample size	Study Population	Observation and Result
Jordan, 2010	Rola Al-Habashneh et al.	Total 70% adherence of practicing doctors was seen toward guideline.	164	Practicing Doctors	This study assessed the Jordanian doctors' knowledge of the connection between diabetes and oral health and assess their willingness to advise their diabetic patients to seek dental Treatment and determine the associated factors.
Saudi Arabia, 2011	Khan et al.	The adherence of male physicians toward the guideline was more (69%) as compared with the female physicians (66%).	150	Physicians	This study evaluates the knowledge, attitude and practice (KAP) of MOH Primary Care Physician on guideline provided by government of Saudi Arabia in the management of Type 2 Diabetes Mellitus (DM).
South Africa, 2012	Leslie KG et al.	Total theoretical adherence of general practitioners was 92% but actual adherence seen from prescriptions was 60% towards guideline.	50	General practitioners (GPs)	A cross-sectional and descriptive study was conducted. Although the GPs surveyed were aware of the existence of guidelines for the assessment of patients with diabetes, their implementation was not satisfactory

Country & Year of Publication	Name of Researcher	Total percentage of adherence seen	Sample size	Study Population	Observation and Result
Malaysia, 2012	N. Ahmad et al.	67.1% adherence was seen in the doctors on recommendation of guideline.	26 doctors and 650 patients. (25 per doctor)	Doctors involve in treatment of Hypertension and established hypertension patients.	An overall fair level of adherence with guideline and better control of hypertension was observed. Guideline compliance practices resulted in better control of hypertension.
Malaysia, 2012	Ahmad et al.	73.5 % adherence was seen in doctors on recommendation of clinical practice guideline.	Prescriptions written by 13 doctors for 320 established hypertensive patients with cardiovascular diseases	Doctors involve in the treatment of cardiovascular diseases.	Prescribing practices were fairly compliant with guidelines. Doctors poorly adhered to guidelines in hypertensive patients with diabetes and LVH. Significantly better hypertension control was seen in patients who were on ACE inhibitors and guidelines-adherent therapy.

The existing literature strongly recommends that different strategies can be used to measure the adherence of doctors to diabetes mellitus guidelines. These strategies mainly include;

- I. Survey conducted by validated questionnaire
- II. Revision of medical record of patients
- III. Diagnosis and current anti diabetic prescription pattern of prescribers

2.1.1 Evaluation of guideline adherence with survey conducted by questionnaire

The survey conducted by questionnaire is the most important method by which adherence of doctors with guideline can be determined (Baiardini *et al.*, 2009, Retnakaran *et al.*, 2006, Ward *et al.*, 2002). The surveys have been used by various researchers to determine the familiarity of doctors with guidelines. By these studies different conclusions can be drawn. Basic salient features of these studies are shown in table 2.2

Table 2.2 Basic features of studies which have been evaluated guidelines adherence of doctors by survey conducted via questionnaires

Study	Evaluation of comorbidities	Criteria to measure adherence	Conclusion
(Leslie Nkombua 2012)	BP, Foot examination, Eye examination	No criteria was mention	Although the GPs surveyed were aware of guidelines but their implementation was not satisfactory.
(Shera <i>et al.</i> , 2002)	BP, Eye examination	No criteria was mention	Knowledge of family physicians need to improve & education programs are recommended.
(Peimani <i>et al.</i> , 2010)	No comorbidity was evaluated	Yes. 50% cut-off criterion was used.	Knowledge, attitude and practice of Physician were not suitable in treatment, control & complications of DM.

(Khan <i>et al.</i> , 2010)	No comorbidity was evaluated	No criteria was mention	Ministry of Health appointed GPs need to improve their knowledge attitude & practice in treating type 2 DM patients
(Rätsep <i>et al.</i> , 2007)	No comorbidity was evaluated	No criteria was mention	Family doctors in Estonia Consider patient-related factors to be key issues in non-adherence to DM clinical practice guidelines.
(Ward <i>et al.</i> , 2002)	No comorbidity was evaluated	No criteria was mention	Knowledge is only one of a spectrum of barriers that affects physician adherence to guidelines

BP, Blood Pressure; DM, Diabetes Mellitus;

2.1.1 (a) Limitations for evaluation of guideline adherence with survey conducted by questionnaire

- I. The major limitation concerning with such studies is reliance on self reporting practice, which are predisposition; in which the respondents overestimation of their adherence with guideline. In a review study of only few studies show the actual adherence of the physicians with standard guidelines. Whereas the remaining studies show the theoretical adherence of physicians not actual implementation (De Belvis *et al.*, 2009, Ratsep *et al.*, 2006).
- II. None of the above mentioned study evaluated the actual practice of the physicians by actual prescriptions written by physicians.
- III. None of the above studies evaluated the physician's knowledge on recommendations of diagnosis of DM and screenings of diabetic complications.

2.1.2 Evaluation of guideline adherence with revision of medical records of patients (Retrospective studies)

Reviewing of medical record of patients is another method by which the adherence of doctors or prescribers with guideline can be determined. In this type of study the prescriptions written by selected doctors taken from record than their adherence with guideline can be evaluated. Different studies have drawn different results regarding the adherence of doctors towards the recommendations of guidelines. Basic features of such type of studies are given in table 2.3.