

# Medication Compliance in Type 2 Diabetes Mellitus Patients

Sulistyo Andarmoyo<sup>1</sup> Harmy bin Mohamed Yusoff<sup>2</sup> Berhanundin bin Abdullah<sup>3</sup> & Yuzana bint Mohd Yusop<sup>4</sup>

{ sulistyoandarmoyo@gmail.com }

<sup>1</sup>Universitas Muhammadiyah Ponorogo

<sup>2,4</sup>Faculty of Medicine, Sultan Zainal Abidin University, Terengganu, Malaysia

<sup>3</sup>Faculty of Islamic Contemporary Studies, Sultan Zainal Abidin University, Terengganu, Malaysia

**Abstract.** Type 2 diabetes mellitus is an incurable but manageable disease. The ability to control blood sugar levels in these patients requires collaboration between health care providers, especially doctors who prescribe drugs, and patients as someone whose health outcome will be affected. The results of cooperation between the two parties are shown by the patient's compliance in taking daily medication. The purpose of this paper is to gain a theoretical understanding of the concept of adherence in medication (taking daily medication in type 2 Diabetes Mellitus patients). Compliance in taking daily medication is the behavior to follow the suggestions or procedures from doctors about the use of drugs, which was preceded by the consultation process between patients and doctors as health service providers. Some aspects used to measure compliance in taking daily medications are frequency, number of pills/other drugs, continuity, metabolism in the body, biological aspects in the blood, and physiological changes in the body. While the determinants of the emergence of adherence in taking daily drugs include: patient perceptions and behavior, interactions between patients and doctors and medical communication between the two parties, policies and practices of treatment in the public made by the authorities and various interventions carried out so that compliance in consuming drugs occurs. The results of this paper are expected to be an understanding for those who are dealing with type 2 Diabetes Mellitus, especially doctors and nurses as well as the patient's family so that patient compliance in taking daily medication can increase, so as to be able to control blood sugar.

**Keywords:** Medication, Compliance, Type 2 Diabetes Mellitus

## 1. Introduction

Diabetes Mellitus is a long-term health problem and can have a serious impact on the lives and well-being of individuals, families, and communities throughout the world. This disease is one of the 10 leading causes of death in adults, and is estimated to cause four million deaths

globally in 2017. In 2017, health costs due to diabetes are estimated to be around USD 727 billion (IDF, 2017).

Since 2000, the International Diabetes Federation (IDF) has reported a national, regional and global incidence of diabetes. In 2009 an estimated 285 million people who had diabetes (combined T1D and T2D) (IDF, 2009), increased to 366 million in 2011 (IDF, 2011), 382 million in 2013 (IDF, 2013), 415 million in 2015 (IDF, 2015) and 425 million in 2017 (IDF, 2017). In Indonesia the DM case ranks 7th after Mexico with 8.5 million sufferers in 2013 (IDF, 2013) and increased to 6th with 10.3 million sufferers in 2017, and is estimated that in 2045 there will be around 16.7 million sufferers (IDF, 2017).

The three main types of diabetes are type 1 diabetes (T1D), type 2 diabetes mellitus (T2D), and pregnancy diabetes mellitus (GDM) (IDF, 2013). Type 2 diabetes is the most common type of diabetes, accounting for around 90% of all diabetes cases. In type 2 diabetes, hyperglycemia occurs due to inadequate insulin production and the body's inability to respond fully to insulin, which is defined as insulin resistance (IDF, 2017). The number of people with type 2 diabetes is growing rapidly worldwide. This increase is associated with economic development, elderly population, increased urbanization, changes in diet, reduced physical activity, and other lifestyle changes (IDF, 2013).

To control patients with type 2 diabetes mellitus includes activities such as pharmacological interventions, nutritional therapy, and physical activity (Hestiana, 2017). A bad management of patients with type 2 diabetes mellitus will lead to complications of other diseases such as dysfunction and failure of several major organs such as the eyes, kidneys, nerves, and heart (Hasbi, 2012). Patient compliance with taking drugs plays a very important role in the success of treatment to maintain blood glucose levels and blood pressure in the normal range. In general, the level of adherence in each patient is described by the percentage of the amount of drug taken and the time of taking the drug in a certain period of time (Osterberg & Blaschke, 2005).

The biggest problem that causes the high incidence of DM is non-compliance with medication (taking medication). Based on some of the results of previous studies, for example the study of Schaffer & Tian, (2004), Malbasa et al., (2007), Hayes et al., (2009) in a variety of chronic diseases including DM patients classified as not compliant in taking drugs is more than 50%, even the study of Frain et al., (2009) showed that patients who are not adherent will eventually end up stopping taking the drugs. Non-compliance with taking medication can be seen related to dosage, how to take medication, time to take medication and period of taking medication that is not according to the prescription.

The types of non-compliance include intentional non-compliance and unintentional non-compliance. Intentional non-compliance is caused due to limited treatment costs, patient apathy, and patient distrust of the effectiveness of the drug. Unintentional non-compliance is due to the patient forgetting to take medication, ignorance of treatment instructions, errors in reading convention. Some of the effects of patient's noncompliance in taking drugs are the occurrence of side effects of drugs that can harm the health of patients, the swelling of medical and hospital costs as stated by Hayes et al., (2009). Apart from this, patients can also experience resistance to certain drugs. Based on this, several studies show that for the efficacy of drugs to significantly improve patients' cure rates, the level of compliance in taking drugs by patients must be at least 80% (Schaffer & Tian, 2004).

Compliance in taking drugs is a major aspect in managing chronic diseases like type 2 Diabetes Mellitus. Noting the conditions mentioned above, adherence to medication (taking daily medication) becomes the focus in achieving the patient's healthy status, in this case the behavior can be seen from the extent to which the patient follows or adheres to the agreed treatment plan by the patient and medical professionals to produce goals therapeutic (Frain et al., 2009).

## 2. Discussion

### Definition of Compliance in Medication (Taking Medicines Daily)

There are several terminologies regarding compliance with taking drugs, as stated by Horne, (2006), namely: *compliance*, *adherence* and *concordance*. *The National Council on Patient Informations & Educations* adds one more term, namely *persistence*. According to the *National Council on Patient Informations & Educations*, the difference in terminology is related to differences in perspective in terms of the relationship between patients and health care providers (doctors), including confusion in terms of language to describe the behavior of consuming drugs decided by the patient.

Lutfey & Wishner, (1999) put forward the concept of *compliance* in a medical context as the level that shows the patient's behavior in obeying or following the procedures or advice of medical experts. Horne, (2006) suggested *compliance* as patient compliance in taking drugs in accordance with the prescription (doctor) advice. Horne et al., (2005) previously suggested that the term *compliance* indicates the position of patients who tend to be weak due to the lack of patient involvement in making decisions about the drugs consumed. In terms of *persistence*, patients exhibit behavior that is continuously / routinely taking drugs, which starts from the first prescription to the next prescription, and so on.

Lutfey & Wishner (1999) explains that the terms of *adherence* has higher complexity in *medical care* which is characterized by freedom, use of intelligence, patients' independence to act more actively as well as having voluntary roles in explaining and determining the goals of treatments. Further, it is explained that in terms of *adherence* the patient becomes more continuous in the treatment process. Horne (2006) defines *adherence* as drug consuming behavior which is an agreement between the patient and the prescribers. In this sense, the advantage is freedom for the patient in deciding whether to agree with the doctor's recommendation or not, and if there is a failure in this process, there should not be a reason to blame the patient. Understanding *adherence* develops from the notion of *compliance*, it's just that the adherence emphasizes more on the need for agreement. *The National Council on Patient Informations & Educations* (2007) further asserts that in *adherence* the behavior of consuming drugs by patients tends to follow treatment plans that are jointly developed and agreed between patients and professionals.

Furthermore Horne et al. (2005) and Horne, (2006) explain the notion of *concordance*, that is behavior in complying with a doctor's prescription that previously had a dialogic relationship between patient and doctor, and representing decisions made together, in which process the beliefs and thoughts of the patient are taken into consideration. In *concordance* the

consultation process occurs, in which there is communication from the doctor with the patient to support decisions in treatment.

Horne et al. (2005), prefer to recommend the understanding of adherence in consuming drugs with the term *adherence*. This is widely supported by other researchers since patients are involved in decision making about things and what they want or expect as well as doctor's reasonable decisions about treatment given. Osterberg & Blaschke (2005) also recommend the use of the term *adherence*, because in the sense of *adherence* there is also an understanding of *compliance*, with the added understanding that in *adherence* the patient's role tends to be active and there is a therapeutic contract that occurs after going through a communication process and finally an agreement between the two parties occurs.

From some of the notions that have been stated above, the notion of adherence in consuming drugs in this study also refers to the term *adherence*, which can be concluded as a behavior to obey doctor's suggestions or procedures regarding drug use, which was previously preceded by a consultation process between patients (and or the patient's family as a key person in the patient's life) with the doctor as a medical service provider.

#### **Aspects and Methods for Measuring Compliance in Medication (Taking Medication Daily)**

Patient compliance behavior aspects in taking drugs can be known from the method used to measure it. Horne (2006) summarizes several methods for measuring compliance in taking drugs, as contained in Table 1.

**Table 1.**  
**Methods to Measure Adherence to Drug Consumption**

<b>Method</b>	<b>Strengths</b>	<b>Weaknesses</b>
<b>a. Direct Method</b>		
Observation	The most accurate	Patients can hide pills in the mouth, then dispose them, less practical for routine use
Measuring the level of metabolism in the body	Objective	Variations in metabolism can make the wrong impression, expensive
Measuring biological aspects in the blood	Objective, in clinical research, can also be used to measure placebo	Requires expensive quantitative calculations
<b>b. Indirect Method</b>		
Questionnaire to patients /patient self-reporting	Simple, inexpensive, most widely used in clinical settings	Very likely to be an error, in the time between visits can occur distortion

Number of pills / drugs consumed	Objective, quantitative and easy to do	Data can be easily distorted by patients
Rate of repurchase prescription (continuity)	Objective, easy to collect data	Less equivalent to the behavior of taking medication, requires a more closed pharmaceutical system
Assessment of the clinical response of patients	Simple, generally easy to use	Other factors besides treatment cannot be controlled
Monitoring of treatment electronically	Very accurate, easily quantified results, patterns of taking drugs can be known	Expensive
Measuring physiological features (eg heartbeat)	Able to measure physiological features (eg heartbeat)	Physiological features may not be apparent for certain reasons
Patient's diaries	Helps to correct low memories	Very easily influenced by the patient's condition
Questionnaire to the people closest to the patient	Simple, objective	Distortion occurs

Based on Table 1. above, it appears that to measure compliance as a behavior, the aspects measured are very dependent on the method used such as frequency, the number of other pills / drugs taken, continuity, metabolism in the body, biological aspects in the blood, and physiological changes in the body.

Morisky specifically made a scale to measure compliance in taking a drug called *MMAS (Morisky Medication Adherence Scale)*, with eight items containing statements that indicate the frequency of forgetfulness in taking medication, intentionally stopping taking medication without the knowledge of the doctor, and the ability to control himself to keep taking medicine (Krousel-Wood et al., 2009).

Another method is proposed by Krousel-Wood et al. (2009), who made a formula to calculate compliance in consuming drugs called *CSA (Continuous Single-Interval Medication Availability)*, *MPR (Medication Possession Ratio)* and *CMG (Continuous Multiple-Interval Medication Gaps)*. *CSA* is calculated by dividing the number of days the drug was given by the doctor by the number of days before consuming the new drug at the time of the next treatment. *MPR* is calculated by dividing the amount given by the doctor between the first day given the drug until the last day the drug is consumed by the total number of days actually used for taking medication by the patient. *CMG* is calculated by dividing the total number of days without taking medication between the first and last day of taking medication by the number of days in the period given by the doctor.

Choudhry et al. (2009) developed the *PDC (Proportion of Days Covered)* which is obtained by dividing the number of days given by the doctor between the first and last day by the number of actual days used by patients between the first to the last day plus the number of days given by the physician between the first day to the end of the prescription then divided by the number of actual days used by the patient to take the drug in the prescription period, this period is multiplied by 100 percent.

It appears that *CSA, MPR, CMG* and *PDC* have in common aspects of compliance behavior in taking drugs which is about the number of days, with some variations. Based on several considerations (including ease, methods often used by previous researchers and technical factors as well as costs), this study uses the scale method which adapts *MMAS* from Morisky to measure compliance in consuming drugs.

### **Theories of the Emergence of Compliance in Medication (Taking Medication Daily)**

There are three main theories that can explain the emergence of compliant behavior in consuming drugs, namely the *Health Belief Model, Theory of Planned Behavior* and *Model of Adherence* (Horne et al., 2005).

#### **a. Health Belief Model (HBM)**

HBM explains that the model of healthy behavior (for example, self-examination) as a function of personal beliefs in the magnitude of the threat of disease and its transmission as well as the benefits of recommendations given by health workers. The perceived threat comes from the person's beliefs in how serious and vulnerable the disease they suffer are. The individual then assesses the benefits of the action taken (for example: treatment will ease symptoms) despite overshadowed risks of the action taken, such as: side effects or even the cost of treatment. Based on these dynamics, it can be understood that adherence in consuming drugs is a process that begins with a person's belief in the seriousness of the disease which results in treatment seeking, including compliance with taking drugs, regardless of overshadowed risks or side effects of such actions.

#### **b. Theory of Planned Behavior (TPB)**

This theory tries to examine the relationship between attitudes and behavior whose main focus is on intentions that leads to the relationship between attitudes and behaviors, subjective norms of behavior, and control of perceived behavior. Attitudes toward behavior are the product of beliefs about the end result (eg, the frequency of recurrence of epilepsy decreases) and the perceived value of the end result (a condition of relapse rarely is very important for the person). Subjective norms come from the views of people around about medical behavior (eg wife or husband wants the person to follow the doctor's recommendations), and motivation to support the views of people around them (for example: the person wants to please their partner with following doctor's recommendation). Perceived behavioral control describes how far the person feels that behaving obediently can be controlled. This depends on the person's belief that he is able to control his actions, for example: the perception that there are internal sources such as the adequacy of skills or information, as well as external sources such as support and obstacles that come from the surrounding environment.

#### **c. The Model of Adherence**

Horne et al. (2005) propose the *Unintentional Non-adherence & Intentional Non-adherence model*. *Unintentional Non-adherence* refers to the patient's obstacles in the treatment process. Obstacles can arise from the capacity and limitations of patient resources, including memory deficiencies (eg forgetting instructions or forgetting to seek treatment), skills (for example: difficulties in opening packages / closures of drugs or using medical equipment such as needles and syringes and oral medications), knowledge (eg not aware of the need to take medication regularly) or difficulties with normal daily routines.

*Intentional Non-adherence* describes the way patients are involved in decision making in treatment. In this process, rational action comes from beliefs, conditions, priorities, choices, and practices, apart from the perceptions and actions which are different from expectations in treatment to rationality. Barber (2002) further explained that through *Theory of Human Error* in organizations, the *unintentional* and *intentional* actions of patients, local / internal and external / organizational factors are the causes of *adherence* and *nonadherence*.

In addition to the three models mentioned above, some researchers propose several factors that cause a person to be obedient or not compliant in taking drugs. For example Horne (2006) said that there are four things that affect compliance in taking drugs in general, namely:

- a) Perceptions and behavior of patients (eg, perception of severity of disease, sociodemographic variables, personality traits including beliefs, attitudes and expectations that are ultimately affect the patient's motivation to start and maintain drug-taking behavior during the treatment process).
- b) The interaction between the patient and the doctor as well as medical communication between the two parties (eg, skills in giving consultations can improve compliance, and different messages from different sources can affect patient compliance in taking medication),
- c) Policies and medical practices in the public made by the authorities (for example: the tax system in prescriptions, deregulation of prescriptions and consumer rights in the process of making recipes),
- d) Various interventions carried out for compliance in taking drugs occurs (e.g. interventions using the ASE Theory or *Attitude-Social Influence-Self-efficacy* model, it is applied in hospitals when nurses visit wards, nurses ask patients to remember the rules of taking drugs, to check memories and also patient understanding of the information provided by giving stimulant questions).

Several ways can be used to improve compliance in medication (taking daily medication), they are:

- a) Provide information to patients about the benefits and importance of adherence to achieving treatment success.
- b) Remind patients to do everything that must be done for the success of treatment by phone or other communication devices.
- c) Show the patient the actual drug packaging or by showing the original medicine.
- d) Give patients confidence in the effectiveness of the drug in healing.

- e) Provide non-compliance risk information.
- f) Provide pharmaceutical services by direct observation, visiting patients' homes and providing health consultations.
- g) Use compliance aids such as multi compartments or the like.
- h) Get support from family, friends and people around to always remind patients to take medication regularly for the success of treatment.
- i) Avoid the indiscipline of or irregular taking drugs, it often happens that a drug to be taken twice a day is only taken one time due to forgetfulness.

### **3. Conclusions**

Compliance behavior in taking daily medications is an important psychological factor in determining the recovery rate of patients suffering from chronic diseases such as type 2 Diabetes Mellitus. In order for the emergence of patient's compliance with medication based on commitments previously agreed upon by doctors and patients, health service providers, especially doctors and nurses as well as patients' families must strive to support patients. Suggestions that can be made are various interventions, both through cognitive approaches and treatments so that patient awareness to comply with daily medication can be realized.



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