

## A PROSPECTIVE CROSS-SECTIONAL STUDY ON MEDICATION ADHERENCE AND ITS FACTORS INFLUENCING IN DIABETIC PATIENTS IN A TERTIARY CARE HOSPITAL

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### ABSTRACT

**Background:** Medication Adherence in Diabetic patients is the biggest challenge that wide spread globally. Though out 70 million persons with diabetes worldwide, nearly 12 million people affected by diabetes mellitus in India. **Aim and Objective:** This study mainly sought to assess level of adherence in diabetic patients and also to identify factors contributing as barriers to anti diabetic medications adherence among adults subjects. **Methodology:** A cross-sectional study of 150 in-patients and fulfilled the inclusion criteria were recruited from general medicine and general surgery in a tertiary care centre. The data was collected by using a structured interview regard patient demographics, and questionnaires containing morisky medication adherence scale-8 (MMAS-8), beliefs about medicines questionnaire (BMQ) and were used to assess adherence as well as factors affecting it. **Results:** In our study 71% of adult subjects showed poor adherence, where the factors that contributed to low adherence were negative beliefs towards medicines, lack of knowledge, long term therapy and forgetfulness. In Geriatric 50% subjects were good- high adherence and barriers observed were dislike of taste, difficulty of swallowing medications. **Conclusion:** The study concluded that subjects and care givers individual beliefs, specific concerns, lack of knowledge regard disease and medications, duration of therapy, forgetfulness and barriers are prominently affecting medication adherence. In order to overcome this problem and to increase adherence rate, implementing interventions that raise to create awareness among subjects regarding knowledge about diabetes and it's complications and regular monitoring of glucose levels is needed.

**KEYWORDS:** Medication adherence, diabetes mellitus, diabetic complications, glucose levels.

### INTRODUCTION

Diabetes Mellitus also known as Diabetes is the leading cause of adult blindness, kidney failure, cardiovascular disease, amputations, nerve damage and other complications. It is an extremely common disease, affecting a diverse age range of people across the world. Those who are diagnosed with diabetes experience significant health concerns because the disease itself has proven to be the catalyst for other health problems. Many individuals who struggle with obesity develop diabetes. The disease also kills more people every year than breast cancer and AIDS combined. Diabetes mellitus is one of the most common chronic endocrine disorders affecting almost 6% of the world's population. The number of diabetic patients will reach 300 million in 2025 (International Diabetes Federation, 2001). More than 97% of these patients will have type II diabetes. The prevalence of diabetes for all age-groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030. The prevalence of diabetes is higher in men than women, but

there are more women with diabetes than men.<sup>[1-2]</sup>

### Causes of diabetes mellitus

Diabetes mellitus is caused by both environmental and genetic factors. The environmental factors that may lead to the development of diabetes mellitus include physical inactivity, drugs and toxic agents, obesity, viral infection, and location. While type I diabetes is not a genetically predestined disease, an increased susceptibility can be inherited. Genetic susceptibility plays a crucial role in the etiology and manifestation of type II diabetes, with concordance in monozygotic twins approaching 100%. Genetic factors may have to be modified by environmental factors for diabetes mellitus to become overt. An individual with a susceptible gene may become diabetic if environmental factors modify the expression of these genes.<sup>[3-6]</sup> Since there is an increase in the trend at which diabetes prevail, it is evident that environmental factors are playing a more increasing role in the cause of diabetes mellitus.

**Signs and symptoms of diabetes mellitus include**

- Polyuria
- Polydipsia
- Polyphagia
- Vertigo
- Dizziness
- Weight loss
- Blurring vision

**DIAGNOSTIC TESTS FOR DIABETES MELLITUS****Urine Test**

Urine test is used to analyze ketone bodies, glucose and proteins present in urine. The colorimetric reaction that occurs between ketone and nitroprusside is the method used for the rapid semi quantitative measurements of ketones.<sup>[7]</sup> Ketones in urine can be detected by using dipstick test. Urine samples with a specific gravity of 1.010 to 1.020 yield the most accurate results. Ketoacidosis can be a life-threatening situation in Type I diabetics, so having a quick and simple test to detect ketones can assist in establishing a diagnosis sooner.

**Glycated hemoglobin (A1C) and Plasma albumin test**

Glycated haemoglobin is useful for monitoring of diabetes mellitus. This blood test, which doesn't require fasting, indicates average blood sugar level for the past two to three months. It measures the percentage of blood sugar attached to hemoglobin, the oxygen-carrying protein in red blood cells.

**Fasting blood sugar test**

A fasting blood sugar level from 100 to 125 mg/dL (5.6 to 6.9 mmol/L) is considered prediabetes. If it's 126 mg/dL (7 mmol/L) or higher indicates diabetes.

**Postprandial plasma glucose test**

Diabetes mellitus is more readily detected when carbohydrate metabolic capacity is tested. This can be done by stressing the system with a defined glucose load. A meal high in carbohydrates is used as the carbohydrate load, although a 75g glucose drink is usually preferred over a meal. Blood is drawn at 2 hours after ingestion of the meal or glucose drink. Glucose levels above 140mg/L are abnormal; levels of 1200 to 1400 mg/L are ambiguous; and levels below 1200mg/L are normal.<sup>[8]</sup>

**Oral glucose tolerance test**

For this test, you fast overnight, and the fasting blood sugar level is measured. Then you drink a sugary liquid, and blood sugar levels are tested periodically for the next two hours. A blood sugar level less than 140 mg/dL (7.8 mmol/L) is normal. A reading of more than 200 mg/dL (11.1 mmol/L) after two hours indicates diabetes. A reading between 140 and 199 mg/dL (7.8 mmol/L and 11.0 mmol/L) indicates prediabetes.

**Intravenous glucose tolerance test**

Glucose is administered intravenously over 30 minutes, using a 20% solution. A glucose load of 0.5g/kg of body

weight is used. Diabetics demonstrate plasma glucose level above 2500mg/L.

**O'Sullivan Test**

This test is used to detect gestational diabetes. A 50 g load of glucose is given to a fasting patient. Blood is drawn at one hour. Gestational diabetes is suggested by plasma levels above 1500mg/L.

**TREATMENT****Non Pharmacological treatment**

There are a variety of effective non-pharmacological therapy for diabetes. All of these begins with basic Diabetes Self-Management Education (DSME) and Medical Nutrition Therapy (MNT) and include on-going education and support.<sup>[9-11]</sup> The American Diabetes Association Standards of Medical Care recommend that all patients receive education and on- going support.

**Medical nutrition therapy**

It promotes healthy food choices and physical activity. It decreases A1c by 1-2% and reduces LDL by 15-25mg/dl. Vegetables, rice, bread, grains, legumes, noodles, can be used as a basis for every meal. People with diabetes have small servings of protein rich foods like fish, sea foods, eggs, lean meat, nuts. Minimize fats, sugars, salts and alcohol. It prevents the rate of development of chronic complications.

**Education**

It provides on -going self-management support and uses modern communication technologies to advance the methods of delivery of diabetic education. It use an appropriate multi-disciplinary team to provide education to groups of people with diabetes. It ensures that education is accessible to all people with diabetes, taking account of culture, ethnicity, psychosocial and disability issues.

**Stress management**

It maybe caused due to family, work and also due to diabetes. Explore the social situations, attitudes, belief and worries related to diabetes and self-acre issues. Psychosocial screening and follow up may include expectations for medical management and outcomes reduces the stress which affect the diabetic quality of life.

**Insulin**

The hormone insulin is endogenously release from the  $\beta$  cells of pancreas. Patients with type 1 diabetes mellitus have an absolute deficiency of insulin and patients with type 2 diabetes mellitus may also have decreased production of endogenous insulin.<sup>[12-14]</sup> Insulin is required for all type 1 diabetic patients as a lifelong treatment. Insulin is commonly used in type 2 diabetic patients as either adjunct therapy to oral antidiabetic agents.

**Table 1: Pharmacological classification of oral hypoglycemic agents.**

S.NO	Class	Drug	Moa	Adr's
1.	Sulphonyl Ureas & Short acting insulin secretagogues	Glyburide, Glimepiride, Repaglinide, Nateglinide	Blocks ATP – sensitive potassium channels of pancreatic $\beta$ cell result in depolarization of cell membrane	Hypoglycemia, hemolytic anemia, skin reactions, renal failure, hepatotoxicity
2.	Biguanide	Metformin	Inhibits mitochondrial glycerophosphate dehydrogenase	Lactic acidosis, apathy, diarrhea, renal insufficiency, disorientation
3.	Thiazolidinediones	Pioglitazone, Rosiglitazone	Activation of peroxisome proliferator – activated receptor of genes involved in glucose and lipid metabolism.	Edema, weight gain, fluid retention, heart failure, osteoporosis
4.	$\alpha$ -Glucosidase Inhibitors	Acarbose, Miglitol	Inhibits alpha glucosidase which decreases intestinal glucose absorption	Flatulence, abdominal discomfort, diarrhoea
5.	Dipeptidyl peptidase inhibitors-IV (DPP-4)	Sitagliptin, Saxagliptin, Vildagliptin	Increases the endogenous incretin effect by inhibiting DPP-4 that breaks down GLP-1	Headache, dizziness, diarrhoea, constipation, pancreatitis

**AIM**

The aim of the present study is to assess the level of medication adherence and to identify the factors contributing a barrier to anti diabetic drugs among adults.

**OBJECTIVES**

To collect the data by using a structured review regard patient demographics and questionnaires containing a specific scale.

- To measure the medication adherence in diabetic patients.
- To assess beliefs about medications.
- To study barriers contribution in affecting medication adherence.

**METHODOLOGY**

**Study site:** The study was conducted in DBR multi speciality hospital, tertiary care teaching hospital, chittoor, Andhra Pradesh.

**Study duration:** This study was carried out for a period of 6 months.

**Study population:** It was 150 patients.

**Ethical approval number:** RVSIMS/IEC2017 OS

**Inclusion Criteria**

- Patients who are on antidiabetic medications for at least 3 months admitted in general medicine and general surgery.
- Patients who are willing to enroll in the study.

**Exclusion Criteria**

- Patients not receiving anti diabetic medications.
- Patients unwilling to participate in the study.
- Patients with critically illness.

**Method of data collection**

This cross-sectional study was carried out after obtaining

the permission of institutional review board, Sri Venkateswara College of Pharmacy, R.V.S Nagar, Chittoor, A.P, India. All patients who are on anti diabetic medications for at least 3 months admitted in the General Medicine and General Surgery in-patient wards are included in the study. We informed them about the anonymity and confidentiality of the data and the voluntary nature of their participation. Patients who are willing to participate were asked to sign the informed consent form. The data was collected using a specially designed proforma.

**Study tools**

- MMAS-8 (Morisky Medication Adherence Scale-8)
- BMQ (Beliefs about medicine questionnaire)
- DSMQ (Diabetes Self-Management Questionnaire)

**Morisky Medication Adherence Scale (MMAS-8)**

The MMAS-8 is a self-reported questionnaire that has been frequently used to assess the medication adherence because of its low levels in both cost and time expenditure. The scale consists of eight questions, first seven items having a dichotomous answer (yes/no) that indicates the adherent or non-adherent behavior. In item 8, a patient can choose an answer on a 5-point Likert scale, expressing how often he/she does not take his medications.

**These questions include**

1. Do you sometimes forget to take your medicine?
2. People sometimes miss taking their medicines for reasons other than forgetting.
3. Thinking over the past 2 weeks, were here any days when you did not take your medicine?
4. Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it?
5. When you travel or leave home, do you sometimes forget to bring along your medicine?

6. Did you take all your medicines yesterday?
7. When you feel like your symptoms are under control, do you sometimes stop taking your medicines?
8. Taking medicine every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?
9. How often do you have difficulty remembering to take all your medicines?

#### Scores

A. Never/rarely	5	
B. Once in a while	4	
C. Sometimes	3	
D. Usually	2	
E. All the time	1	
Score: < 6 = Poor adherence	6 - < 8 = Medium adherence	≥ 8=High adherence

#### Beliefs about medicine questionnaire(BMQ)

This questionnaire was developed in the UK and published by Horne and Weinman (1999). Subjects were answered the extent to which they agreed or disagreed with the statement on a five-point Likert scale, where 1=strongly disagree, 2=disagree, 3=uncertain, 4=agree and 5= strongly agree, to investigate the participants' opinion for each item. The questionnaire was divided into two sections, measuring beliefs about medicines in general and beliefs about specific medications. In this evaluation, items in the specific section will relate to the "antidiabetic drugs", where 5 items evaluate personal beliefs about the necessity of the medications for maintaining or improving health, against 5 items evaluating concerns about the potential adverse effects of taking them. The general section consists of the over used sub scale for overuse of medicines by physicians and the Harm-Benefit or General Harm sub scale for assessing beliefs about harmful effects caused by medicines. The scores for each item in a sub scale were summed to give a total score which ranged from 5 to 25 for specific necessity and specific concern, 4 to 20 for general harm and general overuse sub scales. The higher scores indicated stronger beliefs in the specific category represented by the scale.

#### SPECIFIC ITEMS

##### Specific Necessity

1. My life would be impossible without my medications
2. Without my medicines, I would be very sick
3. My health, at present, depends on my medicines
4. My medications protect me from becoming worse
5. My health in the future will depend on my medications

**SCORE: V.LOW: 5 LOW: 6-10 MOD: 11-15 GOOD: 16-20 HIGH: 21-25**

##### Specific Concerns

1. I sometimes worry about the long term effects of my

- medicines
2. Having to take medicines worry me
3. I sometimes worry about becoming too dependent on my medicines
4. My medicines disrupt my life
5. My medicines are a mystery to me.

**SCORE: V.LOW: 5 LOW: 6-10 MOD: 11-15 GOOD: 16-20 HIGH: 21-25**

#### General Items

1. General Overuse
2. If doctors had more time with patients, they would prescribe fewer medications
3. Doctors use too many medications
4. Doctors place too much trust in medications
5. Natural remedies are safer than medicines
- SCORE: V.LOW: 4 LOW:5-8 MOD: 9-12 GOOD:13-16 HIGH: 17-20
6. General Harm
7. Medicines do more harm than good
8. People who take medicines should stop their treatment for a while every now and again
9. Most medicines are addictive
10. All medicines are poisons

**SCORE: V.LOW: 4 LOW: 5-8 MOD: 9-12 GOOD: 13-16 HIGH:17-20**

#### Diabetes Self Management Questionnaire (DSMQ): 27- ITEM

In this questionnaire there were a core set of items that included the barriers and facilitators of treatment adherence, beliefs about medications, expectations regarding treatment, and comfort with the treatment regimen. Likert scale was used on the questionnaire: "Strongly disagree" to "Strongly agree" or "never" to "always" score ranging from 1-5. All scores are based on raw values, which are added together to make up the score for a particular scale. Items on the Barriers to Medication Adherence scale are reverse scored for consistency. Scores range from 8–40 for the Diabetes and Treatment Knowledge and Expectations, Adherence to Medications and Clinic Appointments, and Barriers to Medication Adherence scales. Scores ranged from 3–15 for the Beliefs about Medication Efficacy and 27 – 135 for the total Self-Management Scale. Higher scores represent better self- management.

#### Barriers to Medication Adherence (8 items)

1. Medications are difficult to swallow
2. Ran out of medication
3. Embarrassed to take medications in front of others
4. Difficult to get medication from pharmacy
5. Dislikes taste of medicine
6. Activities interfere with taking medications
7. Forget to give medications
8. Child refused to take medication

**SCORE: V.LOW: 8 LOW: 9-16 MOD:17-24  
GOOD:25-32 HIGH:33-40**

This scale is to assess caregivers perceptions of things that make it difficult (e.g. barriers) for the patients to take medications as prescribed.

**Beliefs about Medication Efficacy (3 items)**

1. Medication is necessary for my child's condition
2. Medication chosen will control diabetes
3. Medications fit into our daily schedule

**SCORE:V. LOW: 3 LOW: 4-6 MOD: 7-9  
GOOD: 10-12 HIGH: 13-15**

The beliefs about medication efficacy scale assessed care

giver perceptions of how well they believe that medication will work to treat diabetes.

**FINAL SCORE:LOW:27 LOW:28-54MOD:55-81  
GOOD:82-108 HIGH:109-135.**

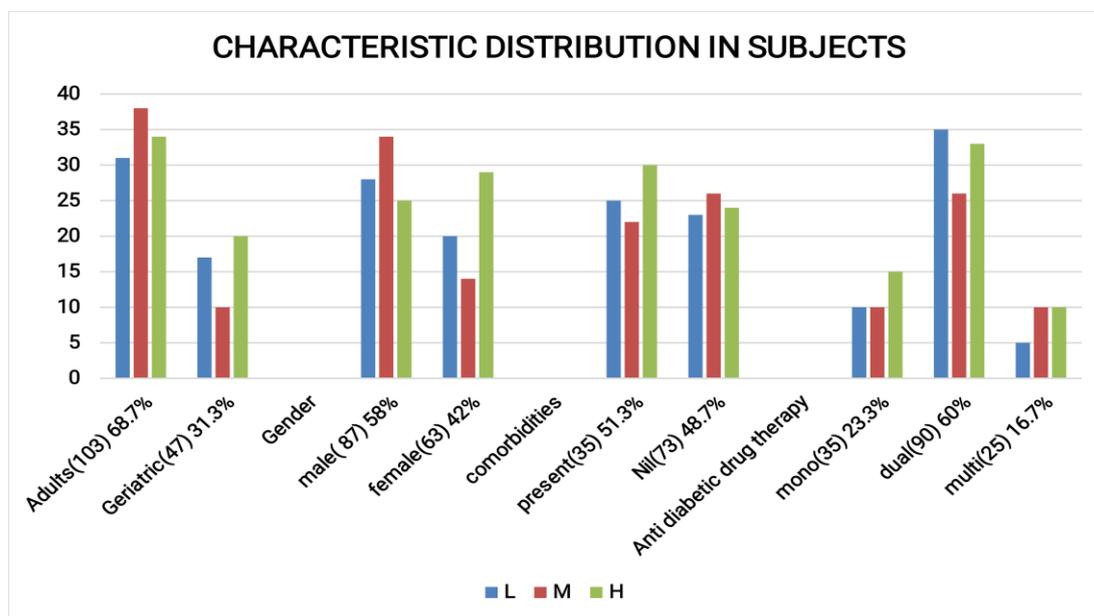
**Statistical analysis**

After interviewing patient, medication adherence was calculated by using suitable scale (BMQ and MMAS/DSMQ which are listed in annexure) and obtained score was categorized into high, medium and low adherence and their factors influencing were assessed. The obtained data and patient related parameters were computed using Microsoft Excel 2013. The study results were expressed as numbers and percentages.

**RESULTS**

**Table 1: CHARACTERISTIC DISTRIBUTION IN SUBJECTS (N=150).**

CHARACTERISTICS	LOW MA	MODERATE MA	HIGH MA
<b>Age</b>			
Adults[103]68.7%	31	38	34
Geriatric [47]31.3%	17	10	20
<b>Gender</b>			
Male[87]58%	28	34	25
Female[63]42%	20	14	29
<b>Comorbidities</b>			
Present[77]51.3%	25	22	30
Nil[73]48.7%	23	26	24
<b>Anti diabetic drug therapy</b>			
Mono[35]23.3%	10	10	15
Dual[90]60%	31	26	33
Multi[25]16.7%	5	10	10



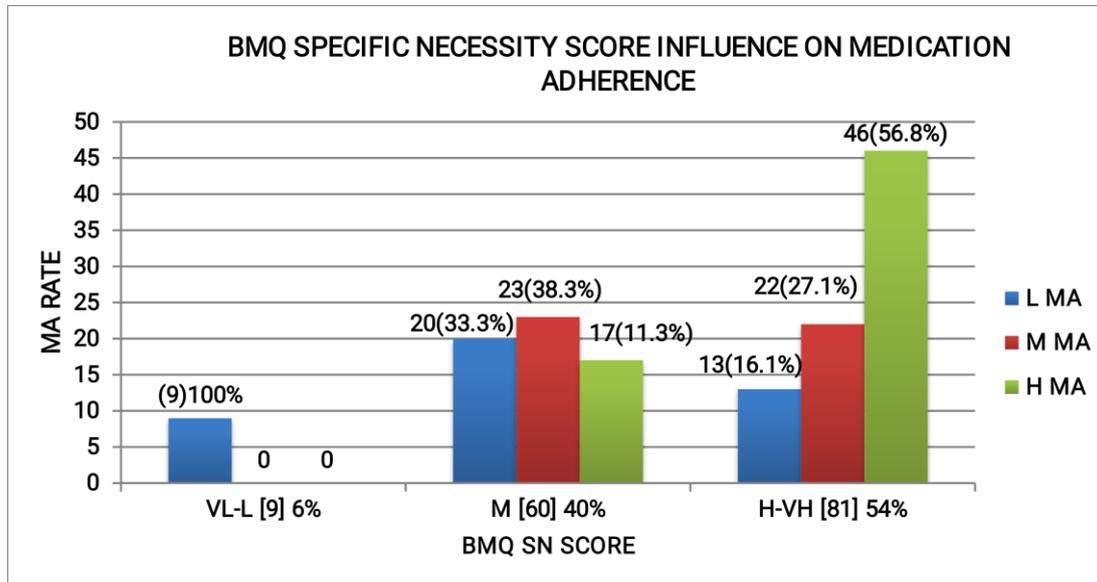
**Fig. 1: Characteristic distribution in subjects.**

In our study age wise distribution of patients include 68.7% were adults and 31.3% were geriatrics and on gender distribution 58% were males and 42% were

females. In comorbidities and 48.7% alone diabetes. 23.3% were in mono therapy, 60% in dual therapy and 16.7% in multitherapy.

**Table 2: BMQ specific necessity score influence on adherence.**

S.NO	SN SCALE	L MA	M MA	H MA
1	VL-L[9] 6%	[9] 100%	[0] 0%	[0] 0%
2	M[60] 40%	[20] 33.3%	[23] 38.3%	[17] 11.3%
3	H-VH[81] 54%	[13] 16.1%	[22] 27.1%	[46] 56.8%

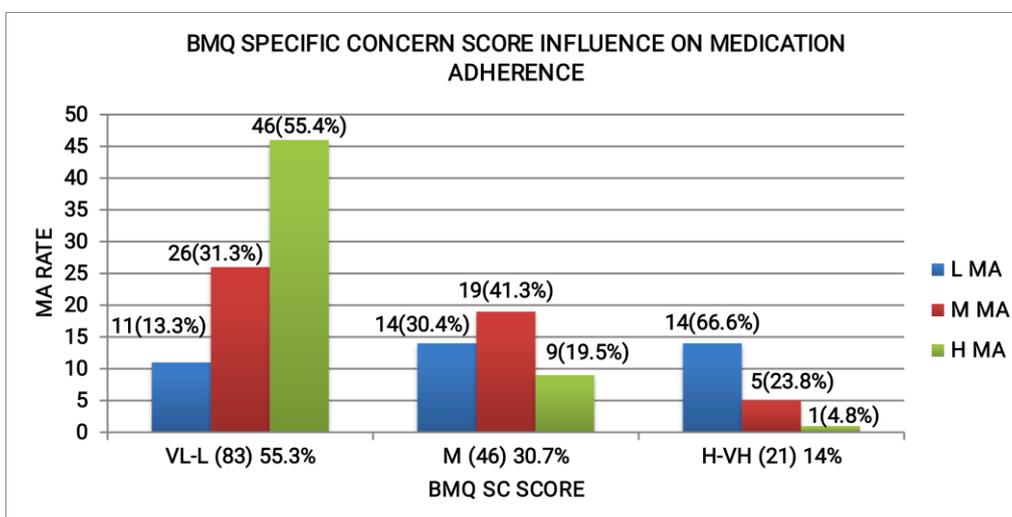


**Fig. 2: BMQ specific necessity score influence on medication.**

Table 2 showed that (81) 54% sub had more score in SN showed 56.8% (46) high MA rate, whereas with low score had (0) 0% moderate score were 9(6%) and 60(40%) sub. in each contributing to high MA rate was 0(0%) and 17(11.3%) respectively.

**Table 3: BMQ specific concern score influence on medication adherence.**

S.NO	SC SCALE	L MA	M MA	H MA
1	VL-L[83] 55.3%	[11] 13.3%	[26] 31.3%	[46] 55.4%
2	M[46] 30.7%	[14] 30.4%	[19] 41.3%	[9] 19.5%
3	H-VH[21] 14%	[14] 66.6%	[5] 23.8%	[1] 4.8%

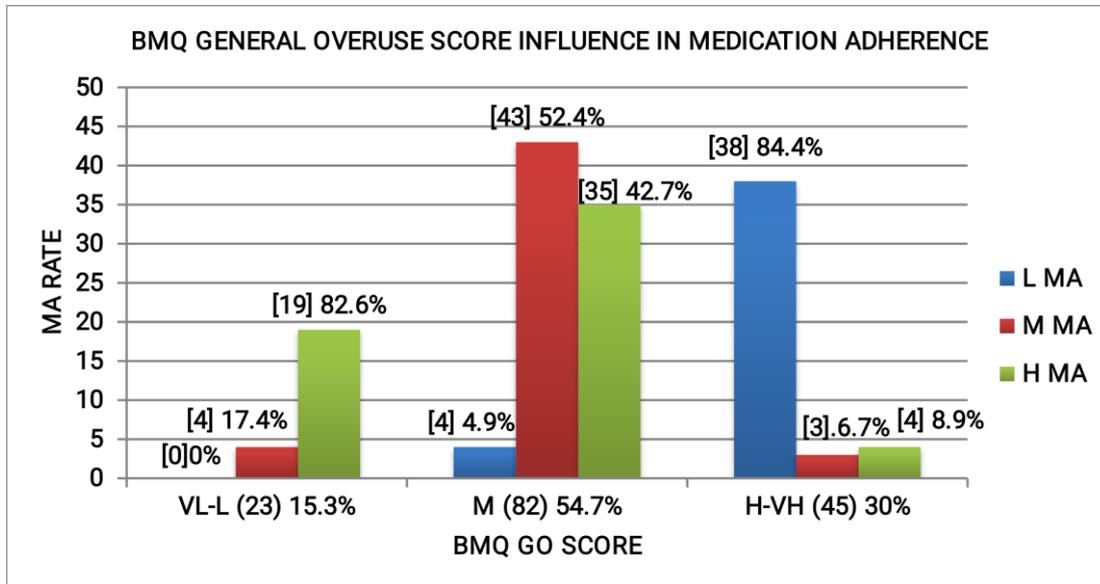


**Fig. 3: BMQ specific concerns influence on medication adherence.**

Table 3 results showed that 83(55.3%) sub. had a low score in SC showed 55.4% of high MA rate, whereas only 21 (14%) sub. with high score showed low MA rate and 46(30.7%) sub. scored moderately had poor and high MA rate of 14(30.4%) and 9(19.5%) respectively.

**Table 4: BMQ general over use score influence on medication adherence.**

S. No	GO SCALE	L MA	M MA	H MA
1	VL-L [23] 15.3%	[0] 0%	[4] 17.4%	[19] 82.6%
2	M [82] 54.7%	[4] 4.9%	[43] 52.4%	[35] 42.7%
3	H-VH [45] 30%	[38] 84.4%	[3] 6.7%	[4] 8.9%

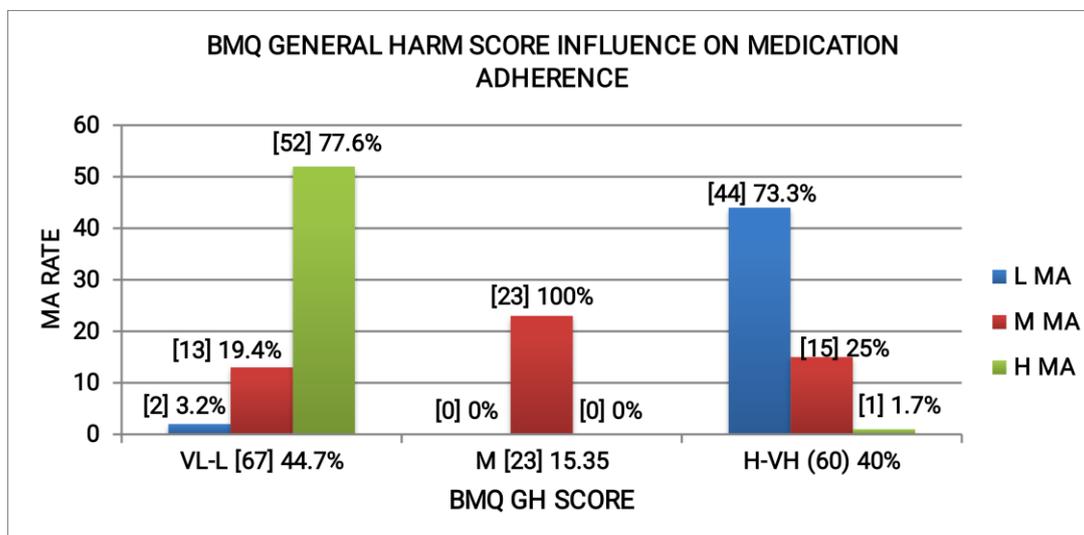


**Fig. 4: BMQ general overuse score influence on medication.**

Table 4 results showed that (45) 30% were having high score in (38) 84.4% poor adherence and (23) 15.3% were having 0% poor adherence, in (82) 54.7% sub with moderate score were having 43 (52.4%) in moderate and (35) 42.7% in high MA respectively.

**Table 5: BMQ general harm score influence on medication adherence.**

S. No	GH SCALE	L MA	M MA	H MA
1	VL-L [67] 44.7%	[2] 3%	[13] 19.4%	[52] 77.6%
2	M [23] 15.3%	[0] 0%	[23] 100%	[0] 0%
3	H-VH [60] 40%	[44] 73.3%	[15] 25%	[1] 1.7%

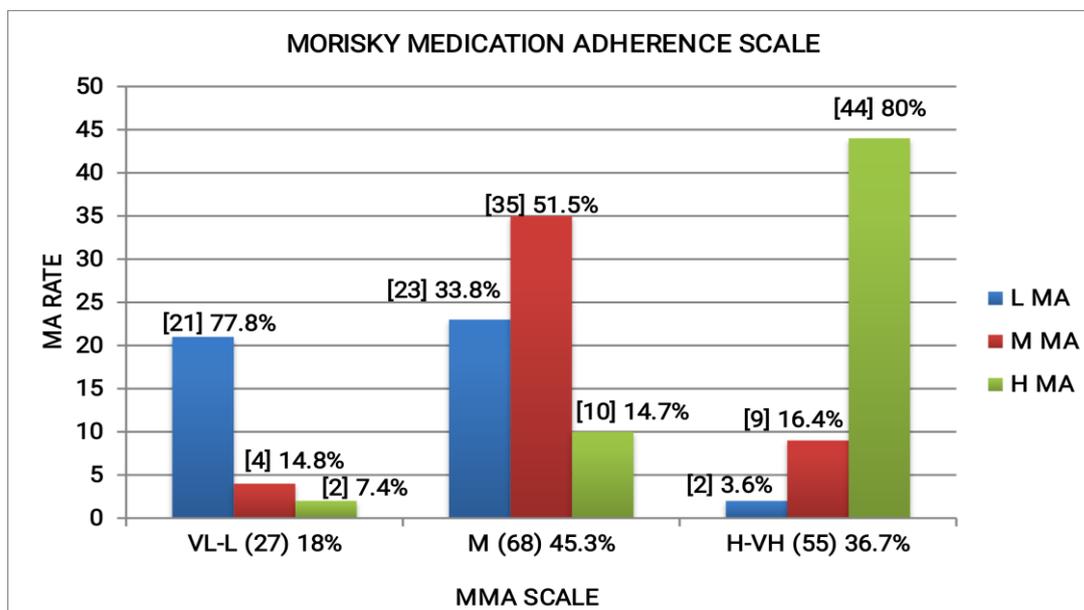


**Fig. 5: BMQ general harm score based medication adherence.**

Table 5 result showed that sub with 15.3% (23) moderate score had 100% (23) moderate adherence and 0% poor adherence. Patients with 40% (60) high score had 73.3% (44) poor and 1.7% (1) high adherence. Patients with 44.7% (67) sub with low score had 77.6% (52) in high MA rate and 3% (2) poor adherence.

**Table 6: Morisky medication adherence scale (MMAS).**

S. No	MMA SCALE	L MA	M MA	H MA
1	VL-L [27] 18%	[21] 77.8%	[4] 14.8%	[2] 7.4%
2	M [68] 35.3%	[23] 33.8%	[35] 51.5%	[10] 14.7%
3	H-VH [55] 36.7%	[2] 3.6%	[9] 16.4%	[44] 80%



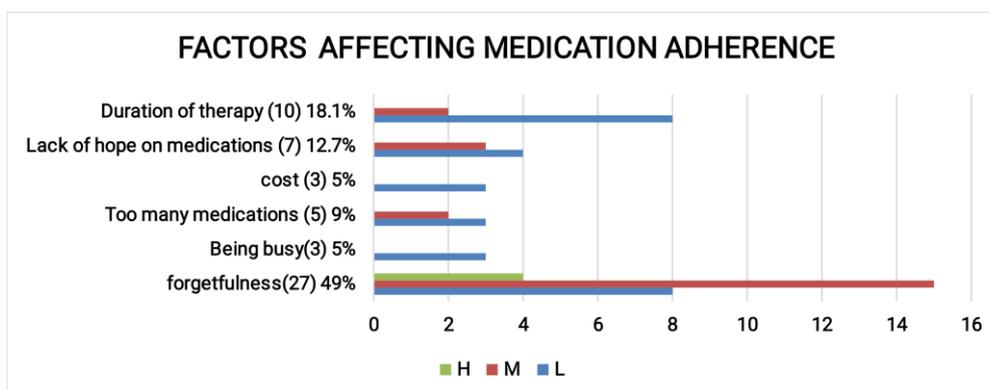
**Fig. 6: Morisky Medication Adherence Scale (MMAS).**

Table 6 results showed that sub with [55] 36.7% had high MA [44] 80% compared to other subjects. The low MA rate was more in [27] 18% sub having [21] 77.8%

compared to mod sub [68] 45.3% and high sub [55] 36.7% having [23] 33.8% and [2] 3.6% respectively.

**Table 7: Common factors affecting medication adherence (N=55).**

S.NO	BARRIERS	L MA	M MA	H MA
1	Forgetfulness (27) 49%	8	15	4
2	Being busy(3) 5%	3	0	0
3	Too many medications (5) 9%	3	2	0
4	Cost (3) 5%	3	0	0
5	Lack of hope on medications (7) 12.7%	4	3	0
6	Duration of therapy (10) 18.1%	8	2	0



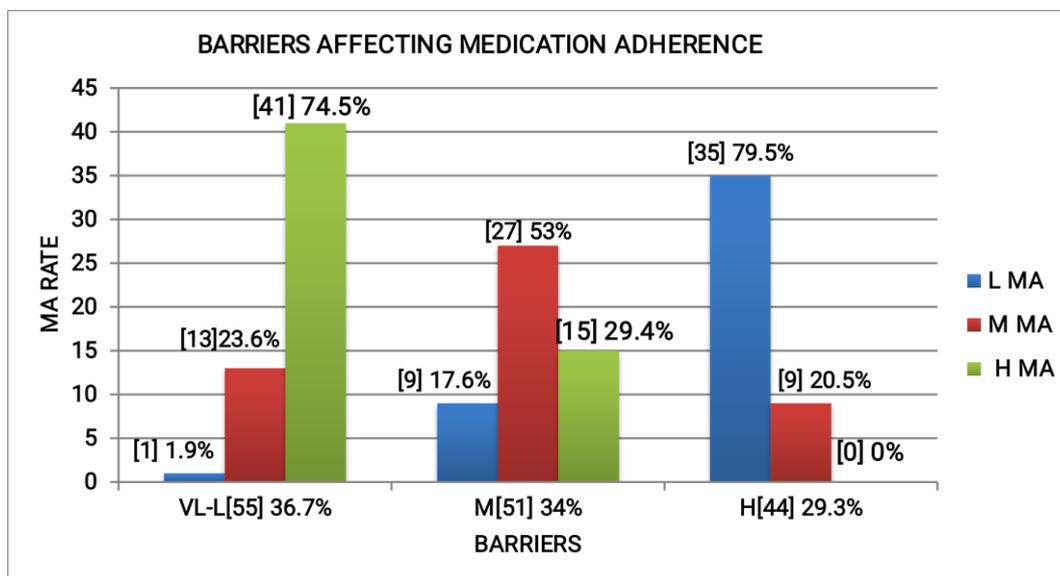
**Fig. 7: Common Factors Affecting Medication Adherence.**

Table 7 results showed that barriers to MA observed in subjects were 49% forgetfulness, 5% were being busy, 9% too many medications, 5% cost, 12.7% lack of hope

on medications, 18.1% duration of therapy. Highest poor adherence was seen in forgetfulness, lack of hope on medication and duration of therapy.

**Table 8: Barriers affecting medication adherence.**

S.NO	BARRIERS	L MA	M MA	H MA
1.	VL-L[55] 36.7%	[1] 1.9%	[13]23.6%	[41] 74.5%
2.	M[51] 34%	[9] 17.6%	[27] 53%	[15] 29.4%
3.	H-VH[44] 29.3%	[35] 79.5%	[9] 20.5%	[0] 0%



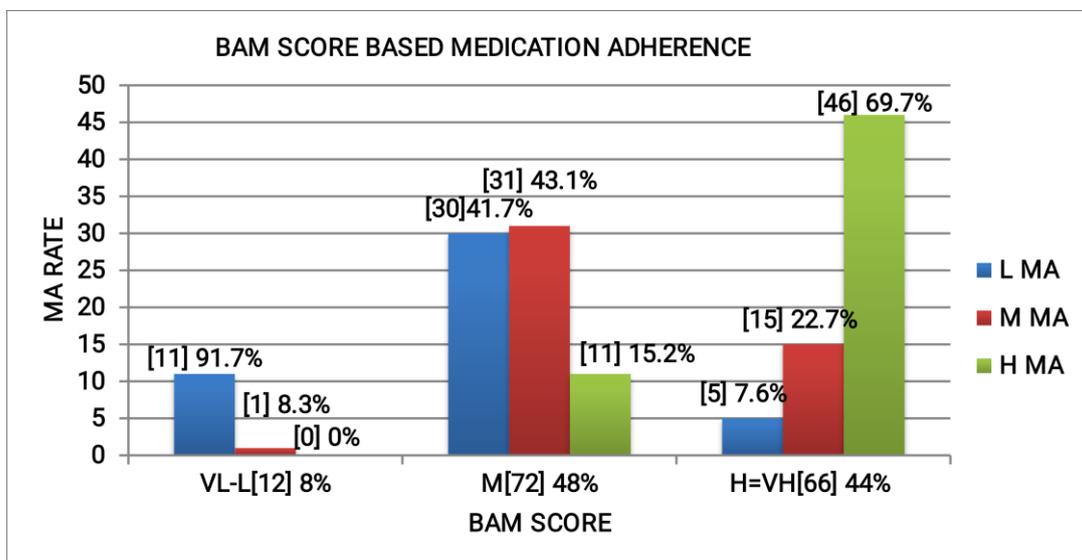
**Fig.8: Barriers affecting medication adherence.**

Table 8 results showed that sub with low score [55] 36.7% having more high MA [41] 74.5% and poor low MA [1] 1.9% compared to the high score [44] 29.3%

having poor high MA [0] 0% and more high MA [41] 74.5%.

**Table 9: BAM score based medication adherence.**

S.NO	BAM SCORE	L MA	M MA	H MA
1	VL-L[12] 8%	[11] 91.7%	[1] 8.3%	[0] 0%
2	M [72] 48%	[30] 41.7%	[31]43.1%	[11] 15.2%
3	H-VH [66] 44%	[5] 7.6%	[15] 22.7%	[46]69.7%



**Fig 9: BAM score based medication adherence.**

Table 9 results showed that 66(44%) patients had high score had high MA [46] 69.7% and (12) 8% patients low

score had poor high MA [0] 0% and more low MA [11] 91.7% respectively.

## DISCUSSION

Adherence to anti diabetic drugs is crucial to improving diabetic control and overall treatment outcome in diabetic patients. However, maintaining good adherence to anti diabetic drugs remained the most important challenge in the globe, particularly in developing countries. Although poor adherence is considered to be one of the major causes to therapy, this has not been studied extensively in India. Hence in this study we assessed the extent of adherence, as well as the factors influencing adherence among PWE. Assessment of medication adherence and its contributing factors is helpful to designing programs for future intervention. Therefore, our study investigated the rate of adherence and its contributing factors among diabetic patients.<sup>[15-16]</sup> Medication adherence, beliefs and barriers were assessed by using MMAS-8 and BMQ in adults and geriatrics were used. In this study 150 subjects were analyzed regarding their MA and its factors influencing. Out of which 68.7% (103) subjects were adults and 31.3% (47) were geriatrics and on gender distribution 58% (87) were males and 42% (63) were females. In Type, 96% (144) are Type 2 DM, 0.7% (1) were GDM and 2.67% (4) were others. 51.3% (77) sub had co morbidities and 48.7% (73) alone diabetes. 23.3% (35) sub were in mono therapy, 60% (90) in dual therapy and 16.7% (25) in multi therapy. By assessing MA prevalence rate in age category, in adults 34 patients out of 103 patients were high adherence. 17 out of 47 geriatric patients were in low adherence and in gender based it was found to be MA was more in males i.e. 58% (87) when compared to females 42% (63). Females with high MA rate (29) 46% is more when compared to males with high MA rate (25) 28.7%. The other approach which successfully explained a great portion of medication adherence among patients with diabetes was behavioural factors, beliefs and barriers to MA. Many individual factors affecting adherence in adults were studied by using BMQ and the results shows that sub were having high score in SN (i.e., 51% [81] sub) than in SC (only 14% [21]). Considering SN and SC, majority of sub had low score in SC i.e. negative beliefs which contributed for poor adherence. In GO, GH scales; moderate and low score in this category shows belief towards medications regarding over usage and side effects/harmful effects. The result in GO and GH, sub with 30% (45) and (60) 40% were having more low MA (38) 84.4% and (52) 77.6% indicating positive beliefs. Those subjects who scored high in both GO and GH had predominantly moderate adherence. In MMA scales; moderate score (68) 45.3% in this category shows high non adherence towards medication. The sub with 36.7% (45) shows more high MA (44) 80% indicating high adherence. DSMQ was specific questionnaire specially designed to analyze barriers (BMA) and beliefs (BAM) in geriatrics and care givers. The score in each category gives the final MA rate.<sup>[17-19]</sup>

The BMA scale assess the factors that affecting MA in patients which included with elders as well as their care givers. Sub with 36.7% (55) low score have high

medication adherence and sub with high score 29.3% (44) had [0] 0% indicating poor adherence. From analyzing the results, barriers doesn't actually affect in the patients involving administration, taste dislike and refusal to take medication. The BAM assess believes of subjects, the higher the score the higher the positive belief towards therapy. From analyzing the results, moderate score (72) 48% had moderate adherence (31) 43.1% to the beliefs. Subjects with [12] 8% low score have 91.7% (11) poor adherence and sub with (66) 44% high score have (46) 69.7% high adherence. A study by Sofa D. Alfianet al.,<sup>[22]</sup> concluded that adherence to prescribed medication shows positive response on diabetes specific quality of life in patients and patients<sup>[20-21]</sup> with high medication adherence had an improve quality of life. In order to improve the adherence patients belief about medicines ins needed and care providers should encourage patients to express their views about medicines.

## CONCLUSION

The study concluded that adherence to anti diabetic medications is a major challenge to achieve diabetic control globally. In this study we observed that subjects and care givers individual beliefs, specific concerns, lack of knowledge regard disease and medications, duration of therapy, forgetfulness and barriers are prominently affecting medication adherence.<sup>[23-24]</sup> In order to overcome this problem and to increase adherence rate, implementing interventions that raise awareness among subjects regarding knowledge about diabetes and its complications associated with non- adherence, significance of ADD's in treating diabetes and regular monitoring of glucose levels and its medication adherence should be done. By improving medication adherence we can improve patient's quality of life which decreases the morbidity and mortality.

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