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ESTIMATION OF MEDICATION ADHERENCE IN GERIATRIC PATIENTS WITH CHRONIC ILLNESS

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ABSTRACT

Background: Adherence to medication is an important part of patient care to achieve clinical goals in patients suffering from chronic illness. Medication nonadherence in patients leads to increased healthcare costs, substantial worsening of disease and death. Aim is to estimate medication adherence in geriatric patients with chronic illness. **Methods:** This study is a prospective, questionnaire-based observational study conducted for 6 months in a tertiary care teaching hospital. MMAS-8 and BMQ were used to know the extent of medication adherence. **Results:** Data was collected from a total of 155 geriatric patients suffering from chronic illness of the age distribution 60-85 years with a mean age of 68.76±6.37 years of which 89 were males and 66 were females. The age group of 65-69 patients are 50 (27%) higher when compared to other age groups. Out of all the study population, the patients suffering from only one chronic illness were found to be 95, and two chronic illnesses were 50, three chronic illnesses were 9 and four chronic illnesses were 1. The percentage of people with poor adherence is high (63%) with MMAS-8 and the percentage of people with potential nonadherence is high (63.2%) with BMQ. **Conclusion:** Medication adherence is poor in geriatric patients with chronic illness. Therefore, effort should be made by the health care team to identify the reasons for nonadherence and initiate steps to improve medication adherence by promoting patient education and about disease and treatment.

KEYWORDS: Adherence, Geriatric, Chronic illness, Mmas-8, BMQ.

1. INTRODUCTION

Adherence to medication is an important part of patient care and indispensable for reaching clinical goals. Medication Adherence is defined as, "the extent to which a patient's medication-taking behaviour coincides with the health advice he or she has been given". The world health organization (WHO), in its 2003 report on medication adherence states that "increasing the effectiveness of adherence interventions might have a so much larger impact on the health of the population than any improvement in specific medical treatment".[1] By opposition, nonadherence results in poor clinical outcomes, an increase in morbidity and death rates, and unnecessary healthcare expenditure.[2] To determine the therapeutic outcome, medication adherence is one of the most important factors especially in patients suffering from chronic illness. The key link between the treatment and outcome in medical care is medication adherence. The drug does not act until the patient takes it, whatever might be the efficacy of the drug.[1] Medication adherence in patients leads to increased health care costs, substantial worsening of disease and death.[3] Optimal medication adherence can be summarized as, the intake of the right medicine, at the right time, in the right dosage for the prescribed information without adding any self-medication.[4] Non adherence may aggravate health and lead to hospitalization[5] and avoidable health-care expenditure.[6]

1.1. IMPORTANCE OF MEDICATION ADHERENCE

For better therapeutic outcomes, adherence is extremely important in many situations of clinical practice, which includes replacement therapy: to maintain the body's metabolism and must be used regularly as prescribed.eg thyroxine and insulin are essential. Maintenance of pharmacological effect: control of blood pressure throughout the day and maintaining blood sugar levels within the normal range are necessary to obtain optimal treatment benefit. eg.

Antihypertensive and oral hypoglycemic agents. Maintenance of serum drug concentrations to control a particular disorder: sub-therapeutic levels of anticonvulsants may increase the risk of convulsions in an epileptic patient .eg, anticonvulsants. Some diseases of public health importance where nonadherence is a major obstacle to achieving control, eg Tuberculosis(TB), Human Immune deficiency virus

(HIV) hepatic infections, preventive strategies as immunization programs. In chronic diseases such as diabetes and hypertension where nonadherence is important to prevent long term and short term complications such as diabetic ketoacidosis (DKA) and microvascular and macrovascular diseases due to long-standing diabetes and hypertension (HTN).[1]

1.2. METHODS TO ESTIMATE MEDICATION ADHERENCE

Generally, measurements of medication adherence are categorized by the WHO as subjective and objective measurements.[7] Subjective measurements require provider's or patient's evaluation of their medication-taking behavior. Self-report and healthcare professional assessments are the most common tools used to rate adherence to medication.[8] Subjective measures involve measurement of the drug or its metabolite concentration in body fluids like blood or urine and evaluation of the presence of a biological marker given with the drug and direct monitoring of the patient's medication-taking behavior. Subjective measures may involve diaries maintained by patients, patient interviews by health care professionals. Objective measures contain pill counts, electronic monitoring, secondary database analysis and biochemical measures and are thought to represent an improvement over subjective measures.[9][10] In summary, subjective and objective measures have both advantages and disadvantages and should be used in combination. In addition to the classification of adherence measures as subjective and objective, many other studies labeled them as direct and indirect.[3][11][12][13]

1.3. GERIATRICS

It is the branch of general medicine concerned with the clinical, preventive, remedial and social aspects of illness in the elderly.[14] Aging is an inevitable process commonly measured by chronological age and, as a convention, a person aged 65 years or more is often referred to as 'elderly'.[15][16] The physiological changes that occur with aging are progressive, occurring gradually over a lifetime rather than abruptly at any given chronological age, so the choice of 65 years is a relatively arbitrary one, and the definition is sometimes extended to include people aged 60 years and over.[14][17]

As the age increases there is a progressive functional decline in many organ systems Physiological changes associated with age may cause decrease in functional reserve capacity and ability to preserve homeostasis thus making elder susceptible to decompensation in stressful situations .the cardiovascular system (CVS), musculoskeletal and central nervous system(CNS) are more affected homeostatic mechanisms like postural or gait stability orthostatic blood pressure responses, thermoregulation, cognitive reserve, bowel and bladder function may also be impaired.[18] Risk factors affecting geriatric treatment are polypharmacy, inappropriate prescribing, medication nonadherence, underuse.

1.4. CHRONIC ILLNESS

Chronic illness is that the long-lasting condition that will be controlled but not cured that lasts months to years. Common chronic illness includes cancer, cardiovascular diseases, Diabetes, HIV/AIDS, Asthma, Arthritis, Thyroid, the traditionally massive individual population reaches retirement age in ten years. Chronic illness has the following characteristics complex etiology, long latency periods, a long period Hepatitis, etc., Chronic illness is a dominant feature of healthcare. Its dominance can increase because of illness, functional impairment or disability.[19]

1.5. SCALES USED FOR MEASURING MEDICATION ADHERENCE

MMAS -8

It is an eight-item self-reporting scale developed by Dr. Morisky *et al* and colleagues in 2008 and called as morisky medication adherence scale. MMAS -8 is a validated assessment tool used to measure medication adherence in a variety of populations. The first seven items of the scale consist of Yes/No responses while the last item is a 5-point Likert response. If 'yes' response for each of the first 7questions is worth 1 point and a 'no' is worth 0 points. For the final question, a response of 'A' is worth 0 points, and a response of 'B', 'C', 'D', 'E' is worth 1 point. Based on the responses, each item is scored and the total score is calculated. Scores on the MMAS were categorized as >2 corresponded to low medication adherence, 1 or 2 corresponded to medium medication adherence and a score of 0 corresponded to high medication adherence. Each item measures on medication-taking behaviors, especially related to underuse, such as forgetfulness, so barriers especially related to underuse, such as forgetfulness, so barriers to adherence can be identified more clearly.[20]

BMQ

BMQ consists of 3 generic screens the part A of BMQ includes 5 items that measure adherence behaviour called as Regimen screen for potential nonadherence, it asks the patient to list all the medication taken in the past week with neutral open-ended questions. 4 questions have been asked for every medication history. In this scale, we focused on the past week because a shorter recall period may reduce reporting error. A Score of '0' indicates adherence. A Score of '1' indicates potential nonadherence. Potential nonadherence indicators are patients failed to mention the targeted medications as they cannot remember or unable to answer the questions. Reporting any interruptions or discontinuations due to late refill or other reason, missed doses, extra doses. The omitted proportion of the prescribed dose has been calculated from the 5 screen regimens. Spontaneous reports should be taken while scoring the regimen screen as the patient can forget to mention some drugs used in the past week. Belief screen: In the past studies the belief screen measures 2 beliefs that have been linked to nonadherence, it addresses patient concerns or doubts about the efficacy of the given medication and concerns

about unwanted side effects. Short term/long term risks are bothersome features of the given medication.

Advantages

- ✓ Cost-effective and easy to use.
- ✓ Clinicians have no burden while using & patients put minimum effort to complete questionnaires.
- ✓ Non-invasive compared to direct monitoring of drug levels.
- ✓ A convenient way to obtain medication adherence information in real-time.[21]

MATERIALS AND METHODS

This study is prospective; a questionnaire-based observational study conducted for 6 months among 155 geriatric patients with chronic illness admitted into the in-patient setting of a tertiary care teaching hospital. Inclusion criteria include patients older from 60yrs of age, patients with one or more chronic diseases and exclusion criteria include Patients below 60yrs of age, cancer patients, psychiatric patients. The data were collected from case sheets, medication charts and a structured interview. The statistical design used was MS EXCEL and GRAPH PAD PRISM 8. The results were found as Parametric unpaired t-test (P-value < 0.0001) and Pearson's correlation coefficient(r= 0.75). MMAS-8 and BMQ scales were used to know the extent of medication adherence.

Based on the inclusion and exclusion criteria, the patients were selected the study was conducted at the tertiary care hospital by taking informed consent of patients by the approval of ethics committee. The data like demographic details, comorbidities, past medication history & past medical history, medications prescribed (name, dose, frequency, route, duration of drug therapy) were obtained by direct patient interview and review of the patient medical records and documented in the data collection forms specially designed for the study. The medication adherence of each and every patient was evaluated by using the Morisky Medication Adherence scale-8(MMAS-8). It contains 8 questions. By using this scale medication adherence levels are estimated as Poor, Moderate and Good Adherence. A Brief medication Questionnaire (BMQ) is to evaluate the patient`s knowledge regarding their medication.

The study is divided into two phases

In **phase-1** MMAS-8 and BMQ are applied and we found their medication adherence level and their knowledge towards their medication by structured interview. Based on their knowledge about their medication, appropriate counseling is made. Each patient was counseled for about 15-20min in verbal form, in their native language Telugu and Hindi. In counseling, we have explained the patient's about chronic illness and its complications and the importance of Medication Adherence. Importance of each medication, dose, frequency of the therapy. Techniques like pill colors, tablet strip designs have been taught to the patient in order to identify their pills and their purpose of use.

Phase-II: - In this phase, we interviewed few patients through telephone same questionnaires are applied and these results are compared with Phase-I. By these, we assessed to what extent that patients got benefited from our patient counseling.

RESULTS

A total of 155 geriatric patients were screened during the study period, in which 89 were males and 66 were females, and the mean age and standard deviation was found to be 68.76 years ± 6.37.

Table 1.

Gender distribution	
	No. of patients
Males	89(57.41)
Females	66(42.58)
Total	155

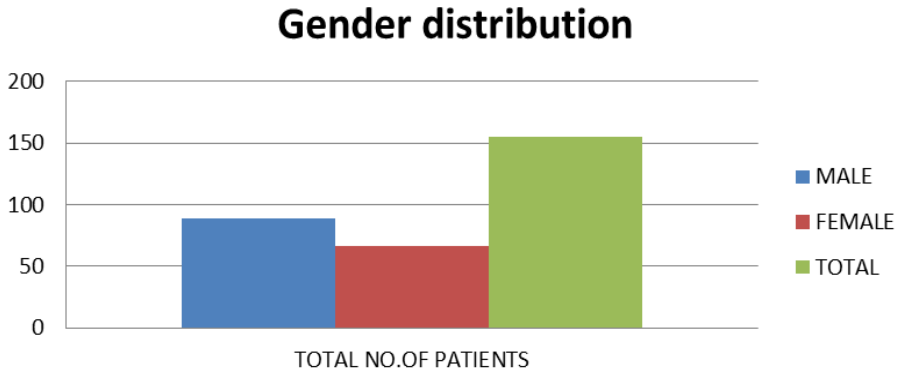

Fig 1.

Males are higher than females

In our study, Age group of 65-69 years (27%), were found to be higher compared to other age groups. So by our study, we found that people of age group 65-69 are highly suffering from chronic illness.

Table 2.

Age distribution of chronic illness patients by Gender	
Age (years)	**No. of Patients (%)**
60-64	40(26%)
65-69	50(27%)
70-74	34(24%)
75-79	20(17%)
80-85	8(6%)
Total	155

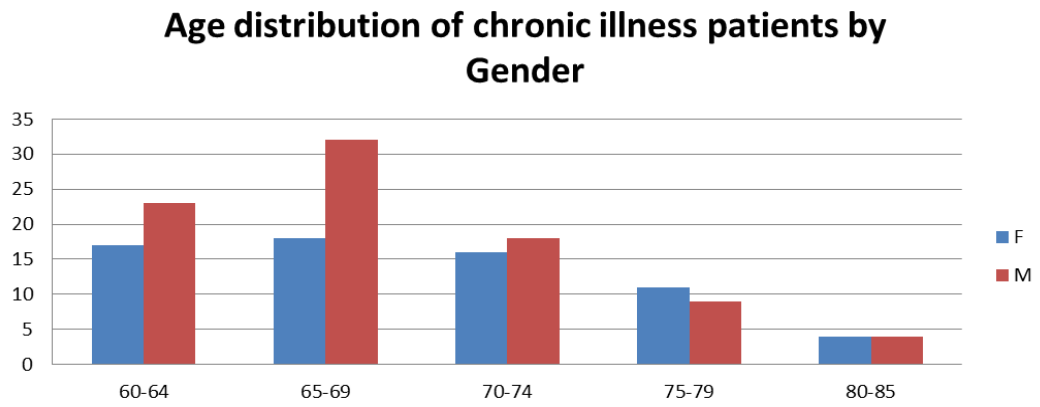

Fig 2.

The age group of 65-69 patients was higher when compared to other age groups.

In this study 82(53%) patients are suffering from HTN, 28(18%) patients with both HTN and Type2DM, 18(12%) patients with Type2DM, 15(10%) patients with Type2DM and other comorbidities, 10(6%) patients with HTN and asthma and 2(2%) with only asthma. Among all the patients suffering from HTN are more i.e., 82(53%). Out of all the study population, the patients with only one chronic illness were found to be 95, and two chronic illnesses 50, three chronic illnesses 9 and four chronic illnesses 1.

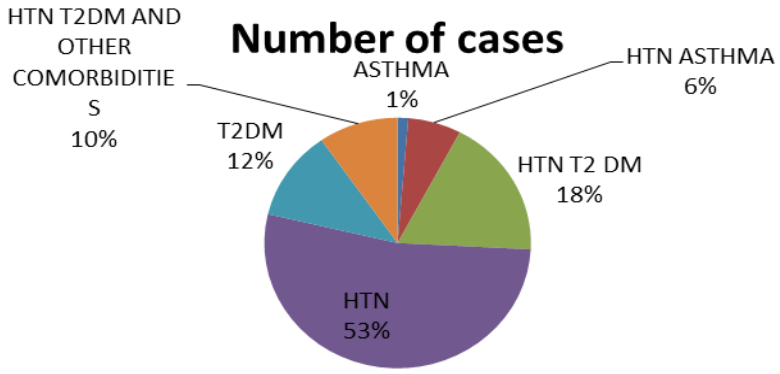

Fig 3

Out of all the chronic illnesses, hypertension is predominant and accounts for 53% of cases.

In our study population, illiterates are 103 (66.45%). Out of them, majority were males when compared with females as India is a developing country literacy rate is slow progressing so they are not aware of their medications more health care providers attention is required to attain medication adherence.

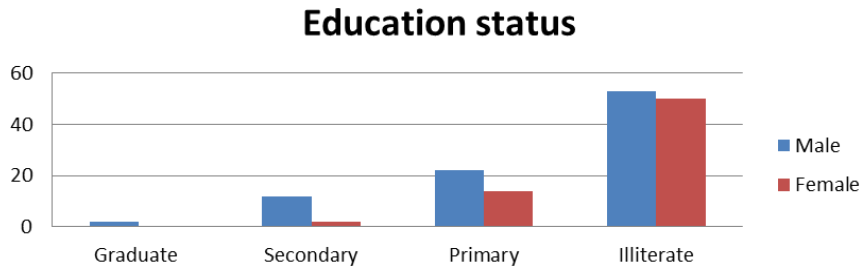

Fig 4.

Uneducated were higher compared to educated.

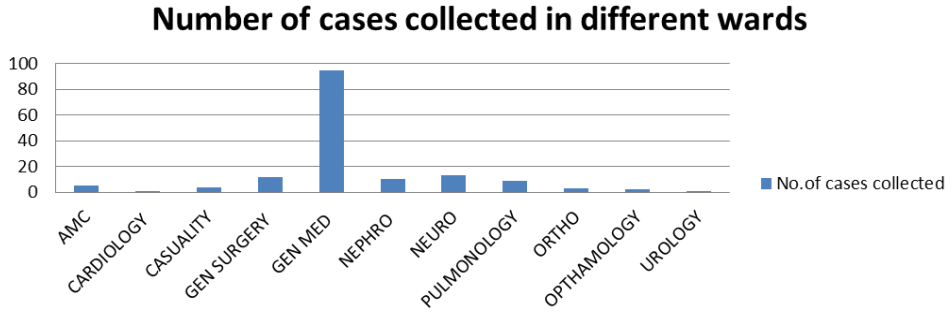

Fig 5.

For overall reviewed patients in different wards, most of the cases were founded in general medicine i.e., 95.

Table 3.

Drugs used for chronic illness		
Therapeutic class	**Drugs prescribed**	**No. of subjects**
Antihypertensives	Calcium channel blockers	30
	Beta-blockers	19
	ARBs	10
	ACE inhibitors	1
	Combinations	44
	Diuretics	6
Antidiabetic drugs	Oral hypoglycemics	22
	Insulin	4
	Oral hypoglycemic + Insulin	4
	Combinations	14
Bronchodilators	Inhalations (Salbutamol+Formetrol)	7
	Oral	5
Thyroid hormones	Levothyroxine	1
Antiepileptics	Phenytoin	1
	Levetiracetam	1
Antitubercular	Ethambutol	2
	Isoniazid	2
	Pyrazinamide	2
	Rifampicin	2
Antiplatelets	Aspirin + clopidogrel	7
Statins	Atorvastatin	3
	Rosuvastatin	3
Antiparkinsons drugs	Levodopa +carvidopa	1
	Trihexyphenidyl	1
Alkalizing agent	Sodium bicarbonate	1
PPIs	Pantoprazole	1
Except Insulin and Inhalations all are oral medicines		

For overall reviewed patients, the drugs highly used for chronic illness are found to be antihypertensives with their combination drugs i.e., 39. During the patient interview, 25.8% don't know which drug they are taking for the present condition and they are counseled regarding their disease and their medication.

For overall reviewed patients the adherence levels of MMAS-8 are found to be as 54(63%) were poor adherent, 98(35%) moderately adherent and 3(2%) are good adherents respectively. Patients have been counseled at this phase such as the purpose of usage of medicine and purpose of use has been explained. The p-value of the MMAS-8 score was found to be <0.0001.

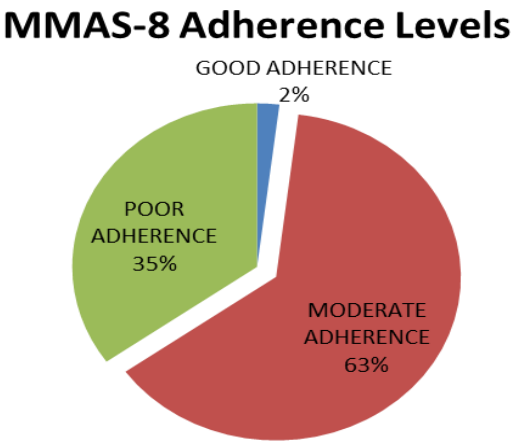

Fig 6.

Moderate adherence was higher compared to other adherent groups.

Table 4.

Age group distribution by MMAS-8 scores			
Age group (years)	**Good Adherence (%)**	**Moderate Adherence (%)**	**Poor Adherence (%)**
60-64	0	24(15.48)	16(10.32)
65-69	2(1.29)	32(20.64)	16(10.32)
70-74	0	18(11.61)	16(10.32)
75-79	1(0.64)	14(9.03)	5(3.22)
80-85	0	10(6.45)	1(0.64)
MEAN±SD	0.6±0.89	19.6 ±8.64	10.8±7.25

For overall reviewed patients, the adherence levels are found to be 98 were adherent and 57 were potential nonadherent, and the p-value was found to be <0.0001.

After 1-2 months of first counseling follow up was done through telephone only 50% of the patients were respondent and they are found to be adherent.

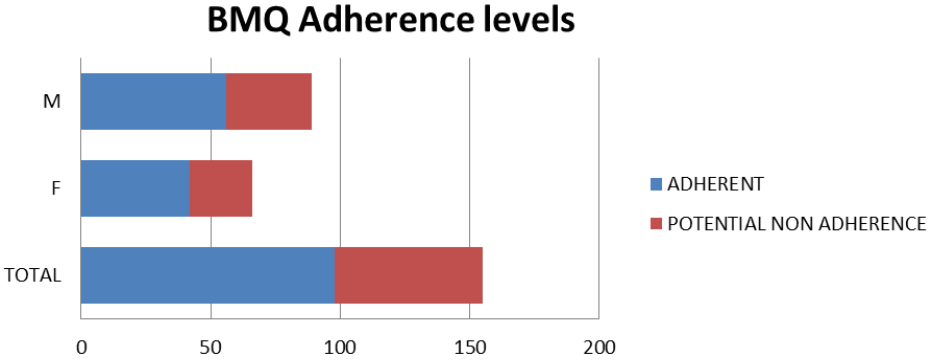

Fig 7.

Adherent patients were higher compared to potential nonadherence patients.

Table 5.

Age group distribution by BMQ scores		
Age group (years)	**Adherent (%)**	**Potentialnonadherence (%)**
60-64	26(16.7)	14(9.03)
65-69	32(20.6)	18(11.61)
70-74	19(12.25)	15(9.67)
75-79	12(7.74)	10(6.45)
80-84	8(5.16)	2(1.29)
MEAN±SD	19.4 ±9.83	11.8±6.18

We correlated MMAS-8 and BMQ scales by Pearson's correlation coefficient (r =0.75) using Graph Pad Prism 8.

DISCUSSION

Chronic illness is a major concern among all the geriatric populations. Chronic illness is that the long-lasting condition that can be controlled but not cured that lasts months to years. Common chronic illness includes cancer, cardiovascular diseases, Diabetes, HIV/AIDS, Hepatitis, etc. As the age increases there is a progressive functional decline in many organ systems physiological changes associated with age may cause decrease in functional reserve capacity and ability to preserve homeostasis thus making elder susceptible to decompensation in stressful situations .the cardiovascular system (CVS), musculoskeletal and central nervous system(CNS) are more affected homeostatic mechanisms like postural or gait stability orthostatic blood pressure responses, thermoregulation, cognitive reserve, bowel and bladder function may also be impaired (18).

To determine the therapeutic outcome, medication adherence is one of the most important factors especially in patients suffering from chronic illness. The key link between the treatment and outcome in medical care is medication adherence. The drug does not act until the patient takes it, whatever might be the efficacy of the drug.[1] Medication nonadherence in patients leads to increased health care costs, substantial worsening of disease and death.[3]

In this study, medication adherence in geriatric patients with chronic illness has studied based on their age, sex, education status. The estimation of medication adherence was done based on the MMAS-8 and BMQ questionnaire. MMAS-8 is used to know the adherence levels of the study population and BMQ is used to know the medication knowledge. The drugs used for chronic illness by patients were also observed.

Subjects fulfilling the inclusion criteria were included in the study; Elderly patients of either gender aged ≥ 60 years with chronic illnesses and willingness to give written informed consent.

In the present study, 155 subjects of the geriatric age group with chronic illnesses were assessed for the level of adherence for long term medications and the various factors influencing medication adherence were analyzed. The level of adherence was good in 3%, moderate in 35% and poor in 63% of the subjects and BMQ scores 63.2% were adherent and 36.7% were found to be potential nonadherent and reasons for nonadherence is due to as most of the patients forget to take their medicines while traveling and some stopped taking their medication as their symptoms are in control and most of the patients were unaware of their medication as they are uneducated. Shruthi *et al*, conducted the study among the geriatric to know the compliance and the level of adherence observed in the present study was not in accordance with the observations made in our study of as their sample size was higher (251) and their level of compliance was good in 45.41%, moderate in 35.45% and poor in 19.12% of the subjects. Good compliance was observed in the age group of 60-70 years and our study population adherence was higher in the subjects of the age group 65-69(67%). The mean age was 66.93±6.55 years and 60.15% of the subjects were male and 39.84% female. The mean age of our study population is 68.76±6.37, 57% were males and 43% were females, In our study, the 99% patients were of rural background and the literacy rate was low compared to their study.[22]

Krousel-wood *et al* was conducted among older hypertensive patients with managed care insurance to know adherence levels by using MMAS-8, 87 patients included in the study, the mean age was 76 years, 31% were men, 48% were black, 47% had graduated high school, 43% were married, and 58% high, 33% medium and 9% low. Our study is not in accordance with these study as there adherence levels are higher when compared to our study as they conducted in a community managed care insurance elderly patients and may not be representative of patients from other socioeconomic backgrounds and the patients had a managed care insurance and we conducted our study among all the chronic illness patients in a tertiary hospital of rural background and most of the patients are agricultural labourers.[23]

Nagarkar *et al* conducted a cross-sectional study in which both scales were MMAS-4 and MMMAS-8 were compared and he carried out study among adults as well as elderly patients, adults are less adherent(14%) when compared with older adults(66%) it is suggestive that the patients who are in the high adherence category are less likely to experience symptoms. Our study was not in accordance with his study as age increases the patients were found to be less adherent.[24]

Balasubramanian *et al*, Gupta *et al* and Santra *et al*, conducted study among hypertensive patients and patients were found to be low adherent i.e., 46% of patients had high adherence, 41.3% had medium adherence and 12.7% had low adherence, 58.6% has high adherence 20.0% has medium and 21.4% with poor medication adherence, 20.83% high adherence, 28.37% medium adherence and 32% low adherence all of these studies was carried among rural population and has poor literacy rates these studies were in accordance with our study as the low adherent patients are higher when compared with good and moderate adherent patients.[25][26][27]

Our study was in concordance with Khotkar *et al*, study The author states that only 1% had high medication adherence, as many of the patients forgot to take medicine with them while traveling and some of the patients stopped medication of their own as diabetes is under control so the overall medication adherence in type ii diabetes patients was low and it should be needed to address the issue, efforts are made by the physicians to identify reasons for nonadherence and initiates steps to improve, counseling and health education of patient related medication adherence should be improved.[28] Old age (≥60 years) was a predictor of good adherence, conducted by Elsous *et al* among diabetic patients was not in accordance with our study as the patients are found to *be* poorly adherent.[29]

Geriatric patients were assessed by Lipton *et al*, and patients were divided into about to discharge patients were in experimental and patients receiving treatment under the guidance of physicians in the control group. The discharged patients were counseled by clinical pharmacists regarding their medications and control group patients were not counseled, after 3 months the experimental patients were found to be more knowledgeable compared to the control group, which showed the impact of a clinical pharmacist. In our study, all of the geriatric patients have been counseled and after 2 months we followed up through telephone calls in which 50% of patients are only responded and 50% of them found to be adherent.[30]

Svarstad *et al* conducted a study among 43 patients aged 30-74(mean =52.6) and we conducted among the 155 patients aged ≥60 years. They compared MEMS and BMQ to know the beliefs of medication nonadherence and knowledge of the study population. This study states that according to BMQ 19% had a concern or doubt when asked "Do any of our medications bother you in any way?. In our study, all answered "well" without any doubt or concern as our study population doesn't know the side effects of the medicines. In their study out of every four patients were hard to remember all the pills(n=11). In our study 37.41%(n=58) patients were hard to remember to take all the pills, 49.67% of patients were unable to read the print on the container or pill and 32.90% were missed taking the pills in the past week. We collected data of the patients from the past week as it is easy to recollect as in our study population all the patients were of old age ≥ 60 years. The older patients may have a cognitive decline. We correlated both the MMAS-8 and BMQ adherence scores by Pearson's correlation (r = 0.75) positively correlated as medication knowledge is poor the adherence levels are poor.[31]

There are a few limitations in the study. As it is not community-based, overall patient adherence levels do not reflect the original status of the community. As it is a hospital-based study, patients may not be representative of all socioeconomic backgrounds. We performed post-counseling interview in few patients as most of the patients were not responded through telephone calls as they do not have their own mobile due to low income but few patients who were responded was found to be adherent. All of the patients were of rural background therefore literacy rate was lower so the adherence among them was founded to be poor.

CONCLUSION

Poor medication adherence is the combating challenge to public health in developed and developing countries. Our study shows the existence of poor adherence to prescribed medication among geriatric patients with chronic illness. In this both the scales used are MMAS-8 and BMQ for the estimation of medication adherence, both the scales are relatively simple and practical to use in clinical settings.

Overall, medication adherence is poor in geriatric patients with chronic illnesses. There is a need to address the issue of nonadherence to medication and effort should be made by the health care team to identify the reasons for nonadherence and initiate steps to improve the medication adherence by counseling and education regarding disease and treatment should be improved.

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