Unraveling Medication Complexity in the Elderly: A Critical Assessment of Adherence Implications

Pavan Kumar Yanamadala [a++*], Nandini Palivela [a#], Aleena Roy [a#], Hemalatha Yarra [a#], Jessi Peruri [a#], Rupa Lavanya Gogulamanda [a#], Priyanka Kandregula [a#] and Minisha Nalli [a#]

[a] Aditya Pharmacy College, Surampalem-533437, Andhra Pradesh, India.

Authors' contributions

This work was carried out in collaboration among all authors. Author PKY formulated the study protocol and finalized the title and performed Methodology for the study. Authors NP and AR prepared the questionnaire form, and the data collection form required for the study. Authors HY and JP collected the cases, interviewed the patients and did all the necessary data-filling work. Authors RLG and PK have done the statistical analysis and drafted the manuscript. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Background: Chronic illnesses often affect grown-ups over 60 years of age, leading to inadequate and impecunious medication adherence, which increases the risk of bleakness, hospitalization, and mortality, despite the irrefutably factual benefits of certain medications.
Aim and Objectives: To appraise the degree of drug intricacy in older patients with chronic diseases and to break down the factors impacting drug adherence among them.

_____

[++] *Assistant Professor;*
[#] *Interns of Pharm D;*
Corresponding author: E-mail: pavan.yanamadala@gmail.com;

Methodology: A 10-month study involving 676 patients was carried out at the general medicine department of a tertiary hospital. Information was gathered for the study using the Morisky Medication Adherence Scale (MMAS) and the Medicine Regimen Complexity Index (MRCI). **Results:** A sample size of 676 on the whole, with 393 male patients surmounting 283 female patients. The level of intricacy was higher for the larger part of prescriptions. On the off chance that around 645 patients were prescribed more than 5 drugs. The greater part of the populace has shown good adherence (59%), trailed by moderate adherence (23%), and ultimately low adherence (18%). The intricacy of the prescription was recognized as the essential driver of non-adherence in 314 patients, and upon analyzing the responses from MRCI and MMAS scores, it was found that 156 patients on less complicated regimens exhibited moderate and 399 patients had great adherence among the total populace.
Conclusion: To further develop drug adherence in more seasoned adults, doctors ought to consider medicine class numbers, high-risk prescriptions, and multi-layered systems, including age-related, natural, and social variables.

1. INTRODUCTION

Drugs are much of the time utilized in geriatrics to work on personal satisfaction, extend life expectancy, and cure or moderate sickness. It is clear, nonetheless, that the older frequently neglect to stick to prescribed medicines, which can prompt unwanted clinical and monetary consequences [1-3].

For various reasons, patients don't stick to their recommended drug regimens. One reasonable model of barriers to adherence portrays patient, prescriber, and medical care system factors. Others have developed more definite applied models intended for the elderly [2, 3, 5]. Each model features the way that the prescription use process is impacted by many elements in more grown-ups, including medication and patient-related issues, for example, patient portrayals of their disease, mental capability, medicine secondary effects, and patient-prescriber connections. Moreover, in light of the fact that more seasoned grown-ups frequently experience the ill effects of different comorbid conditions and consequently utilize a greater number of medications than their younger counterparts, prescription non-adherence can have exceptionally harmful well-being consequences for the elderly [2]. Subsequently, tracking down possible areas for mediation to assist with further developing this process ought to be the first concern of medical care suppliers.

Poor adherence to the endorsed treatment has been over and again answered to be profoundly pervasive in various settings and populations [1-5]. It to a great extent adds to making sense of why the control of hypertension or diabetes is habitually unsuitable and, subsequently, it has significant medical services and financial implications [3, 5-7]. As needs be, many researchers have attempted to profile the non-compliant patients to incline preventive interventions [5, 8-14]. Results vary with the concentration on the populace and the technique utilized. For example, more youthful patients are bound to be resistant in diabetic [5], yet not in hypertensive populations [8-11]. In general, old and female orientations are repeating non-modifiable relates of poor compliance [8-15], albeit dissonant outcomes have been reported [9-10]. Lower study level, less well-off financial status, mental/physical debilitation, and a few illnesses, for example, CKD are usually inadequately modifiable connections of non-adherence [8, 10, 12, 16,17]. Then again, the prescription's regimen intricacy, as reflected by the number of prescribed drugs, addresses a significant and somewhat modifiable correspondence of the outcome [18,19]. Consequently, endeavors at decreasing the number of prescribed drugs, likewise to forestall unintended medication responses, are strongly recommendable, particularly in old patients [20].

Nonetheless, in spite of the heft of clinical and epidemiological studies, a few ill-defined situations actually exist in the comprehension of elements connected with poor compliance in the older populace. In the first place, evaluating prescription complexity based on the number of medications probably misses "characteristic intricacy," i.e., the one connected with the regimen of the treatment. For example, taking

eight various pills compared to eight distinct medications day to day probably is less demanding than taking eight pills three of which are fractionated dosages of a similar medication. Besides, occasionally regulated drugs, eg, one time each week or each and every other day, are a further wellspring of regimen intricacy and, then, a potential gamble factor for non-adherence [21].

With regards to a Pharmaco-surveillance study, we played out a subordinate review surveying whether and to which degree a formerly neglected proportion of prescription complexity, i.e., the number of day-to-day administrations of individual medications, adds to profile the older patient who sticks ineffectively to the recommended treatment.

We gauged this possible relation by remedying the measurable model for recently perceived risk factors for poor adherence as well with respect to the wellspring of casual help. For sure, we contemplated that the provision of care by the healthcare providers could influence the adherence to treatment on account of social, eg, prescription convictions, and language issues.

As there is a greater number of medications and confounded schedules or extraordinary guidelines, it can add to the more prominent trouble or disinterest by geriatrics to take prescriptions. So we can express that there is a connection interfacing drug regimen intricacy and non-adherence. There are many variables that influence medicine adherence like social, monetary, medical care framework, condition-related, treatment-related, and patient-related. Consequently, prescription adherence is considered as a significant obligation regarding the medical services proficient to diminish morbidity and mortality. Adherence can be estimated either straightforwardly or in a roundabout way. Direct strategy distinguishes the presence of medications in the patient's body utilizing pee, blood, and other body liquids. This technique is a significant expense and doesn't give criticism on persistent consideration. Aberrant techniques incorporate electronic drug monitoring, pill counts, pharmacy refills (no. of times the medicine is topped off at the drug store), clinical record audit, directly observed therapy, clinical evaluation, self-reports, and patient questionnaires. Be that as it may, every strategy has its own upsides and downsides, patient survey is the most often involved technique as it is the most basic and minimal

expense strategy, despite the fact that they are helpless to one-sided response, as the members by and large exaggerate the real adherence levels.

The 8-item Morisky's medicine adherence scale (MMAS) comprises of eight inquiries. Adherence in patients is deciphered on a scale from 0-8 and afterward grouped its score into 3 groups in light of the obtained results. A score of 8 is considered great adherence, 6-8 points is considered moderate adherence, and 0-5 points is considered low adherence. It is the most straightforward and generally utilized strategy to decide the adherence level, as it features essentially taking drugs taking ways of behaving, for example, under-use, absent-mindedness, and so on. Thus, hindrances can be perceived. Researchers additionally uncovered that a greater part of patients as a rule don't convey their interests in regards to their medicine and few were questionable about whether the prescriptions are essential, protected, successful, or whether the sickness is perilous, and furthermore expressed that informed and dependable patients are more worried about their well-being and can deal with their treatments. Thus, the patient's dynamic contribution to drug-taking choice assists with working on their adherence.

The primary goal of the study is to evaluate the complexity of the entire medication regimen to determine which areas are most likely to focus on improving routine and drug adherence in older patients in order to slow the further progression of their illnesses and also to improve their level of personal satisfaction.

2. METHODOLOGY

A ten-month prospective observational research turned into done on aged sufferers in a tertiary care health center. Information was gathered from the sufferers regarding their medicines within the outpatient and inpatient departments. A self-structured data collection form is prepared for collecting the data required for the study. The study was a Prospective Observational Study and was carried out at a Tertiary health care center in East Godavari District. The ethical approval has been approved from the Organization before the commencement of the study.

676 participants older than sixty-one years who had co-morbid illnesses and poly-pharmacy prescriptions were included in the study

population. Exclusions from the investigation had been fragmented and impacted individual case details, individuals were reluctant to chip in, patients who died sooner than being sent off from the hospital, and patients who defied clinical physicians' instructions. Either the patient or the medical caretaker has provided consent to participate in the study. Socio-demographic data on the data collection form includes age, gender, BMI, history of previous medication use, family history, social background, personal history, diagnosis, and pertinent lab results. The MRCI scale, which includes sub-scores for dose form, dosing frequency, and additional information, was used to calculate the medication's complexity. Morisky's medication adherence scale, which asks questions about the patient's adherence, was used to measure medication adherence. To perform descriptive statistics, the mean and standard deviation of the gathered data were calculated using SPSS software. The Chi-square test was utilized as a statistical method to ascertain the p-value among the many data sets that were gathered. The variables under consideration include Age versus Gender, Current Illness versus Drug Count, Drug Count versus Medication Complexity, Drug Count versus Medication Adherence, Medication Complexity versus Medication Adherence, Age versus Medication Complexity, and Age versus Medication Adherence. When determining the statistical significance of drug-related difficulties in elderly patients compared to the baseline visit, the p-value is utilized in the statistical hypothesis. The confidence interval was 95% and the p-value was set at less than 0.05.

3. RESULTS AND DISCUSSION

In the current study, around 676 study subjects were included according to the Single proportion formula, which we employed to finalize the sample size of the study. There were 383 males who predominated over 293 females.
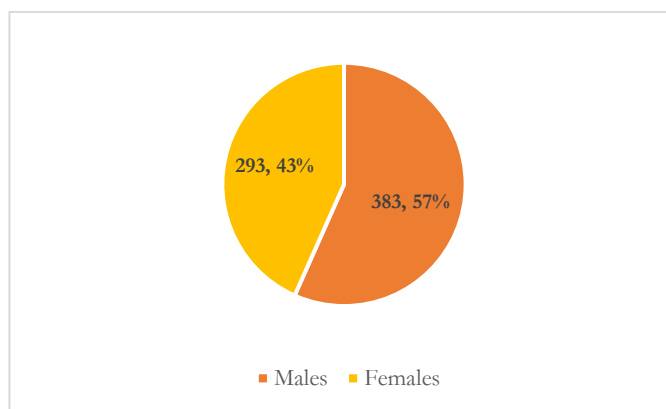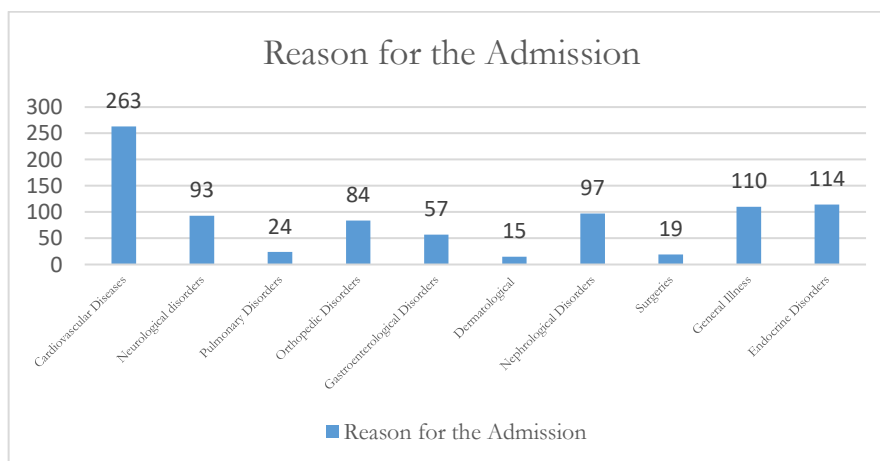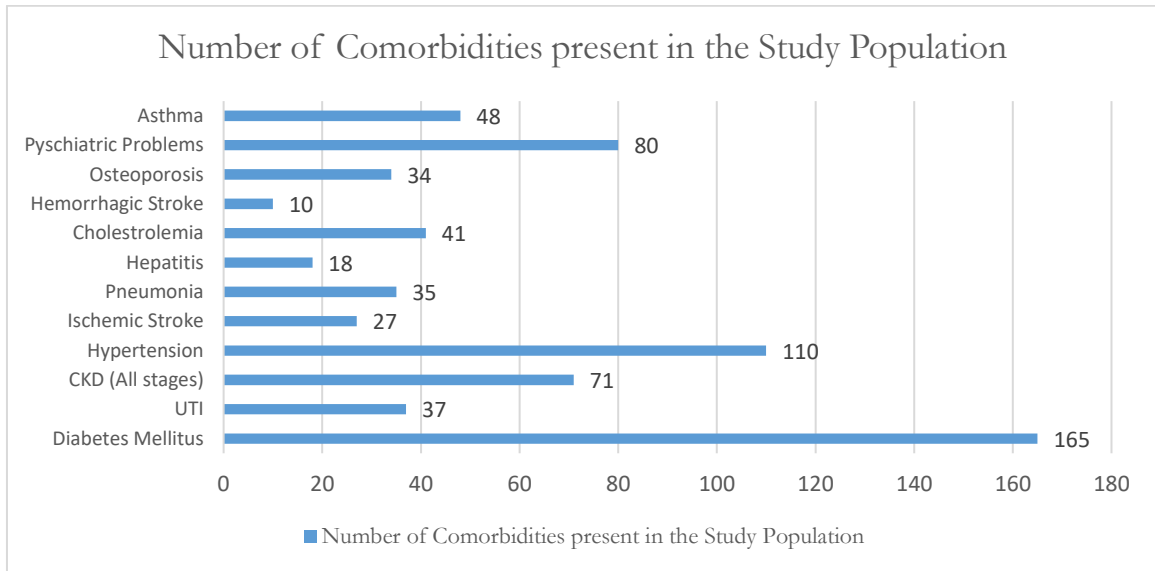

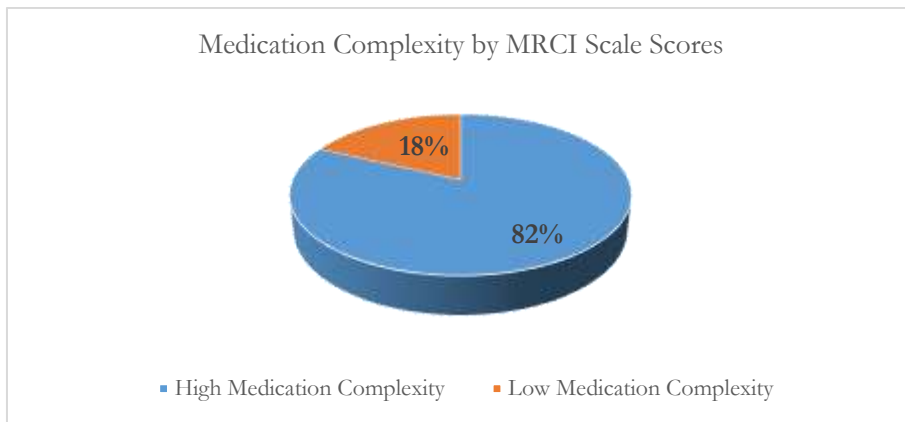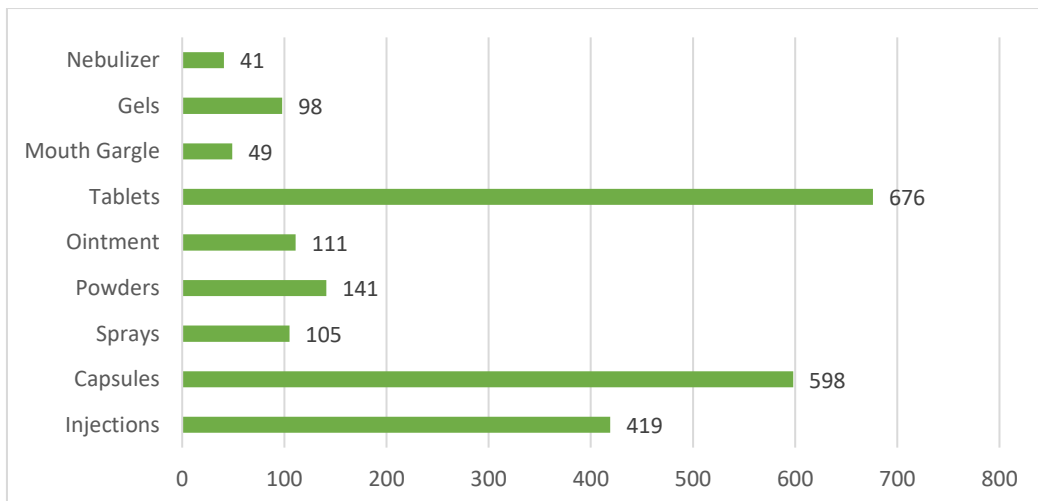**Fig. 1. Gender-Wise distribution of study subjects**

Fig. 2. Reason for admission to the hospital

176

Fig. 3. Comorbidities in the study population

Fig. 4. Distribution of prescriptions according to the level of their medication complexity

Fig. 5. Various dosage forms prescribed to the study population

The most common reasons for admission into the hospital were cardiovascular symptoms followed by Endocrine disorders and renal disorders, which gives us a clear picture that most of the study subjects are suffering from long-term standing disorders such as Hypertension, Diabetes Mellitus, and Chronic Kidney Disease. This puts forth that because of the anatomical and Physiological decline in the person's condition because of age, most of the study subjects were suffering from these ailments.

The common comorbidities that affected the majority of the study subjects were Diabetes Mellitus, followed by Hypertension, Psychiatric disorders, and renal disorders. This gives an understandable correlation between the two most commonly prevalent disorders affecting mankind, which puts a huge burden on the patient's economy and quality of life.

We have evaluated the prescriptions of the study subjects with the help of the MRCI Scale which is used to calculate the medication regimen complexity, and from our findings, it is found that the majority of the prescriptions have a High level of Medication complexity, which means it is reported that the subjects were finding it a bit difficult to follow the medication regimen as they are having more number of medications in the prescriptions, which may also have the potential to cause potential drug-drug interactions affecting the Quality of life of the study subjects.

Along with this, we have also made a note of the various dosage forms that were prescribed as a part of their treatment regimen, which states that in every prescription, the tablets are the prevailing type of dosage forms followed by capsules, injections, and powders. In most geriatrics, due to the atrophy of Parietal cells in the Stomach lining, a condition called achlorhydria will be caused, which leads to decreased or very low production of Gastric acid, in which the Tablets or capsules have to dissolute to show their action. Due to this, most of the geriatrics even after taking the tablets, found no immediate onset of action which makes them feel that the medicine isn't working well which may lead them to take another medicine immediately causing an overdose.

According to the dosing frequencies of the medicines in the prescription, Twice a day dosing is prescribed in most cases followed by once a day dosing. We cannot neglect the fact that thrice-day dosing is also predominant to the other dosing frequencies, and by the MMAS Scores we have found that more medicines a day have resulted in less adherence among the patients.
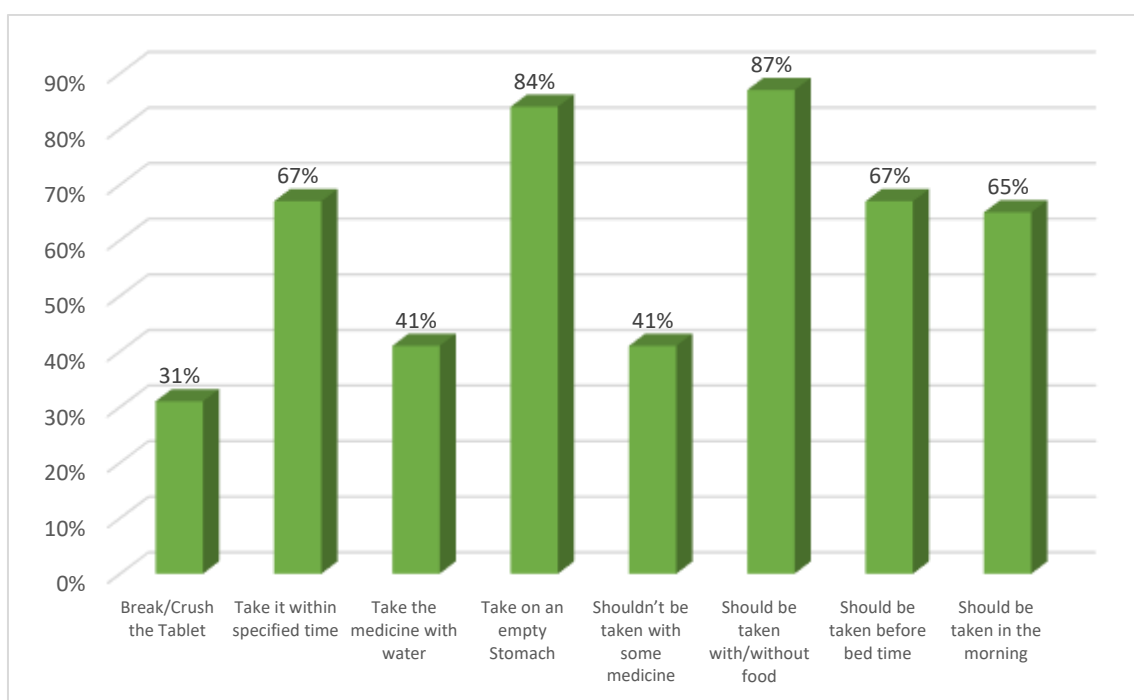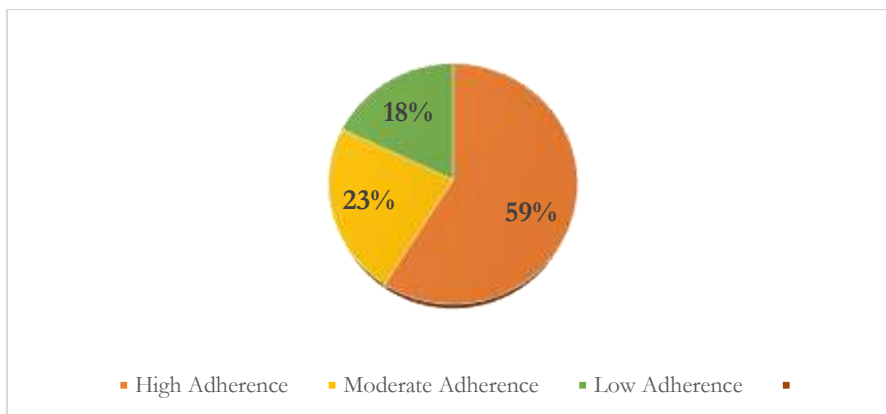

Fig. 6. Special administration guidelines mentioned to the study subjects
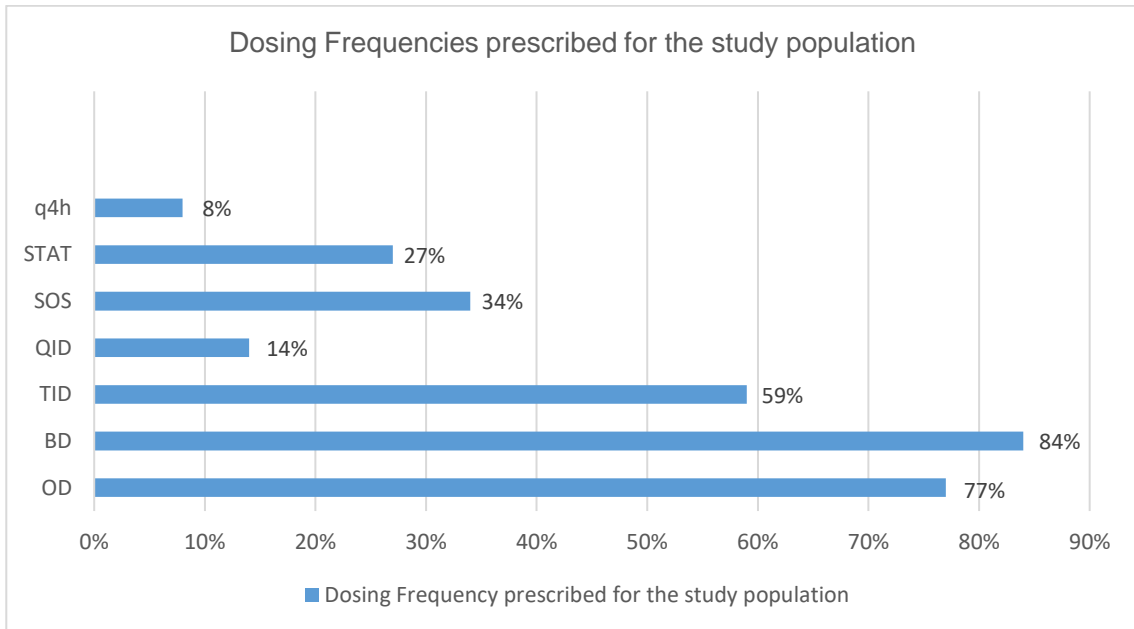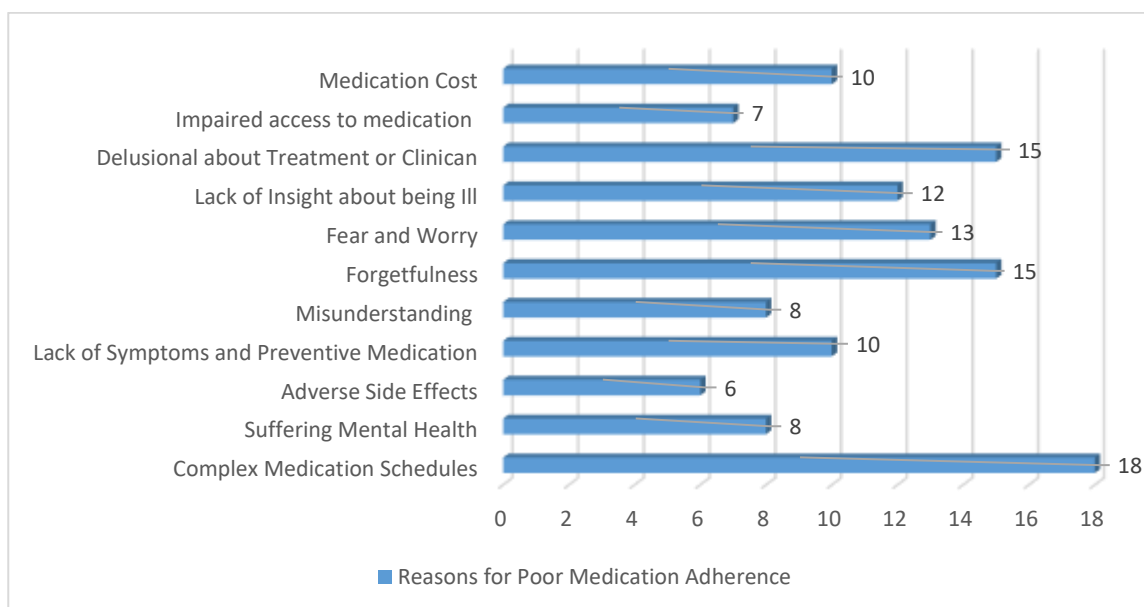
Fig. 7. Dosing frequency prescribed for the study population
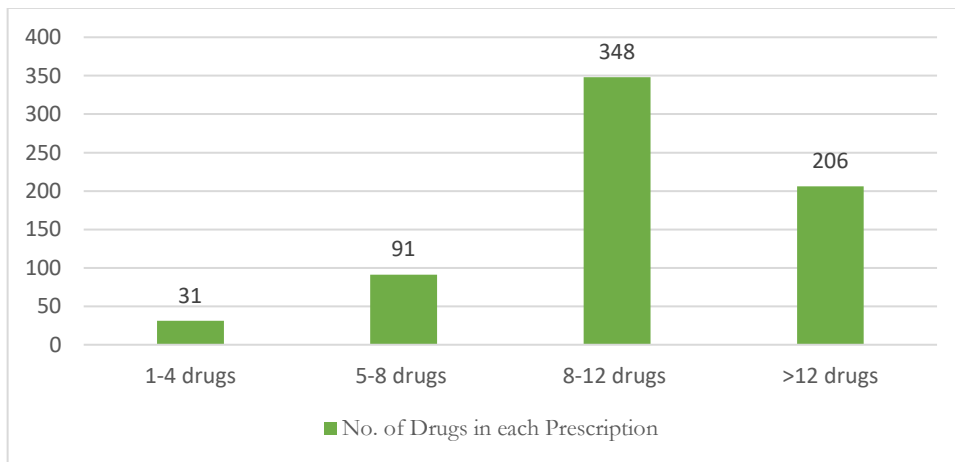
Fig. 8. No. of drugs in each prescription

Fig. 9. Level of medication adherence among the study subjects

Fig. 10. Reasons for poor medication adherence

In almost more than half of the Prescriptions of the study subjects, it was found that they were prescribed 8-12 drugs which is what we call a Polypharmacy. This may lead to untowardly medical effects and adverse drug reactions, further complicating the treatment of the study subject.

From the results we obtained by interviewing the study subjects with the help of the MMAS Scale, we found that almost more than half of the study subjects were adherent to the medication regimen, and 18% of the study subjects were less adherent to the medication regimen, which may be attributed to various reasons such as Complex medication schedules, forgetfulness, delusional about the medicine and clinicians, medication costs, and thinking that the condition might be self-healing.

4. CONCLUSION

Because of different age-related physiological changes in geriatrics, they experience the ill effects of multiple comorbidities. As there is an escalation in co-grimness level in geriatrics, no. of medications prescribed will additionally increment. Along these lines, the Medication regimen complexity index (MRCI) assists with distinguishing the intricacy of the regimens and uncovered that the larger part of prescriptions had complex regimens with 'Tablets/ capsules' dosage forms and 'Once in a day' dosing recurrence is recommended in practically the

remedies as a whole uncovering their matchless quality in endorsing prescriptions in clinical practice, however, additional administration directions was given to just a couple of prescriptions and assuming there are in excess of 5 medications in a prescription other than oral dosage form and with expanded dosing recurrence and assuming the patient needs to recall some other extra administration guidelines prior to taking the medicines added to the higher intricacy of the regimens. As a result, the MRCI is now a more useful tool for determining the components that lead to complex therapy.

Since the majority of elderly people have a variety of social, emotional, and financial difficulties, as is well known, when more than five prescription prescriptions are given, the patient may feel compelled to take the pills as directed, which could result in non-adherence. Eight questions about medication adherence in the elderly were used to gauge According to Morisky's Medication Adherence Scale (MMAS), the majority of people had moderate adherence. Thus, we can say that as the number of co-morbidities rises, so does the number of prescription drugs, which is followed by an increase in medication complexity and a decrease in adherence.

Hence, the review suggests that the legitimate inclusion of clinical drug specialist services is to distinguish patients with more intricate prescription regimens and non-adherent patients.

If the patient feels intricacy in the regimen, a clinical drug specialist should improve on the portion of dosing plans and incline toward combinations of medications and must likewise, assess the requirement for nutrient enhancements and OTC drug use in geriatrics, and prescription adherence can be improved by eliminating/limiting the boundaries for adherence in geriatrics. On the off chance that the patient as often as possible neglects to take the medicine, we should plan dosing cards, remaining portion calls, and texts to the patients and we should likewise recommend as per the monetary status of the geriatrics and furthermore suggest the utilization of conventional and online drug stores. A definite clarification about the idea of the sickness furthermore, the medications endorsed would expand the interest of patients in treatment. So mindfulness in medical services suppliers, prescribers, and drug specialists will be important. Thus, dismalness and mortality in geriatrics can be diminished and we can further develop the well-being-related quality of life.

5. SUMMARY

In our study, medication adherence plays a significant role in determining therapeutic outcomes, particularly for patients with chronic illnesses or diseases. Treatment adherence is crucial to the success of medical care, and chemists are uniquely positioned to enhance medication adherence because they can actually administer the medication to patients. In our study, the use of Morisky's Medication Adherence Scale (MMAS) made it possible to distinguish between patients who adhered to their regimens badly and those who did so medium to well.

Finally, by using Morisky's Medication Adherence Scale (MMAS) and the Medication Regimen Complexity Index (MRCI), we hope to evaluate the condition of geriatric patients through our study. This is because these tools enable clinicians to identify patients who are non-adherent and whose emergent care needs are subpar, while also identifying prescriptions with complex regimens. Additionally, it facilitates the simplification of patients' medication regimens and the identification of individuals who can benefit from therapy both during and after their hospital stay. Therefore, by lowering morbidity and mortality, it contributes to improving the elderly patients' health-related quality of life.

CONSENT

As per international standards or university standards, Participants' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

REFERENCES

1. Mansur N, Weiss A, Beloosesky Y. Looking beyond polypharmacy: Quantification of medication regimen complexity in the elderly. Am J Geriatr Pharmacother. 2012;10(4):223-9.
DOI: 10.1016/j.amjopharm.2012.06.002, PMID 22749668.
2. Ferreira JM, Galato Dayani, Melo AC. Medication regimen complexity in adults and the elderly in A primary healthcare setting: Determination of high and low complexities. Pharm Pract. 2015;3(4):659.
DOI: 10.18549/ PharmPract. 2015.04.659, PMID 26759621
3. Shruthi R, Jyothi R, et al. A study of Mdication compliance in geriatric patients with chronic illnesses at A tertiary Care Hospital. J Clin Diagn Reasearch; 2016.
DOI: 10.7860/JCDR/2016/21908.9088.
4. Silavanich V, Nathisuwan S, Phrommintikul A, Permsuwan U. Relationship of medication adherence and quality of life among heart failure patients. Heart Lung. 2019;48(2):105-10.
DOI: 10.1016/j.hrtlng.2018.09.009, PMID 30384984
5. Pantuzza LL, Ceccato MDGB, Silveira MR, Junqueira LMR, Reis AMM. Association between medication regimen complexity and pharmacotherapy adherence: A systematic review. Eur J Clin Pharmacol. 2017;73(11):1475-89.
DOI: 10.1007/s00228-017-2315-2, PMID 28779460
6. Ronald C. merrell MD. Richmond: Virginia Commonwealth University, Background and evidence for telemedicine as a way to address the challenges of geriatrics. The Korean Medication Informatics; 2015.
DOI: 10.4258/ hir.2015.21.4.223.
7. Miren Taberna FGM, Jane-Saias E, Rebollo Maite A. Use of geriatric

assessment in oncology and the multidisciplinary team approach and quality of care. Front Oncol. Mar 2020,doi;00085. DOI: 10.3389/fonc.2020

8. Graf C, Mick DJ. Ackeman MH. NursClin N Am, Watters JM. Functional decline in hospitalized older adults, Criticare nursing for older adults, Surgery in the elderly. J Can Chir. 2006;106(1):58-67. quiz 67-8. DOI: 10.1097/00000446- 200601000-00032.

9. Nyborg G, Straand J, Brekke M. Inappropriate prescribing for the elderly–a modern epidemic? Eur J Clin Pharmacol. 2012;68(7):1085-94.
   DOI: 10.1007/s00228-012-1223-8, PMID 22349159

10. Nashwa Masnoon S. And Gillian E. Caughey, What is poly pharmacy? A systemic review of definitions. BMC Geriatr. 2017;17:230.
    DOI: 10.1186/s12877-017-0621-2

11. Voils CI, Hoyle RH, Thorpe CT, Maciejewski ML, Yancy WS, William S. Yancy, Jr. Improving the measurement of self reported medication non-adherence. J Clin Epidemiol. 2011;64(3):250- 4.
    DOI: 10.1016/j.JCLINEPI.2010.07.014 PMID 21194887.

12. Hirsch JD, Metz Kr, et al. Validation of a patient –lev Corrine I. Voils, Rick H. Hoyle, and William S. Yancy, Jr. Improving the measurement of self reported medication non-adherence. J Clin Epidemiol. 2011; 4(3):250-4.
    DOI: 10.1016/j. jclinepi.2010.07.014.

13. Osterberg L, Blaschke T. Adherence to medication. N Engl J Med. 2005;353(5):487-97.
    DOI: 10.1056/NEJMra050100, PMID 16079372.

14. McDonald MV, Peng TR, Sridharan S, Foust JB, Kogan P, Pezzin LE, et al. Automating the medication regimen complexity index. J Am Med Inform Assoc. 2013;20(3):499-505.
    DOI: 10.1136/amiajnl-2012-001272, PMID 23268486.

15. Yap AF, Thirumoorthy T, Kwan YH. Medication adherence in the elderly. Journal of Clinical Gerontology and Geriatrics. 2016;7(2):64-7.
    DOI: 10.1016/j. jcgg.2015.05.001.

16. Feldman MD, Christensen JF, Satterefield JM, editors. Behavioural Medicine: A Guide for clinical practice. 4th ed. New York: McGraw-hill; 2014.

17. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self reported measure of medication adherence. Med Care. 1986;24(1):67-74.
    DOI: 10.1097/00005650- 198601000-00007, PMID 3945130.

18. Jankowska-Polańska B, Uchmanowicz I, Dudek K, Mazur G. Relationship between patients knowledge and medication adherence among patients with hypertension. Patient Prefer Adherence. 2016;10:2437-47.
    DOI: 10.2147/PPA. S117269, PMID 27994443.

19. World health organization adherence to long term therapies: Evidence for action. Switzerlan. WHO; 2003.

20. Smaje A, Weston-Clark M, Raj R, Orlu M, Davis D, Rawle M. Factors associated with medication adherence in older patients: A Systematic review. Aging Med(Milton). 2018;1(3):254-66.
    DOI: 10.1002/agm2.12045, PMID 31410389.

21. Chen Y, Yang L, Hu H, Chen J, Shen B. How to Become a smart patient in the era of precision Medicine? Adv Exp Med Biol. 2017;1028:1-16.
    DOI: 10.1007/978-981-10-6041-0_1, PMID 29058213.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/110031