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Research Article

Pharmacy for better health

Medication Regimen Complexity and Medication Adherence In Patients with Polypharmacy

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Abstract: The complexity of medication regimen can be defined by the number of medications (polypharmacy) and the number of times per day or dose. The term medication adherence is defined by WHO as the extent to which a perosn's behavior agrees with the agreed medication regimen from a healthcare provider. . The main objective of the study is to implement medication regimen complexity index in patients with polypharmacy and to evaluate the rate of medication adherence in polypharmacy patients and also the factors affecting for non adherence Hospital based prospective case study was conducted for a period of 8 months after obtaining permission from Institutional Ethical Committee, CMR College of Pharmacy, Hyderabad. Data was collected and analysed according to inclusion and exclusion criteria. A total of 165 cases were included and analyzed for the study and was found that the most common age group with polypharmacy was between 51-60 years with male predominance. Study observation reveals that most of the uneducated patients are non adherent to their medication. The low complexity MRCI score included tracks between 6.0 to 13.0, while the high complexity MRCI score included tracks of 13.0 to 22.5. Most of the elderly patients were found to have high complexity. Among 165 patients, 98 were non-adherent and 67 were adherent to treatment regimen. i.e, most of the patients were non adherent to medications. Present study concludes that elderly patients were present with higher regimen complexity than adults and older adults. Most of the polypharmacy patients were found to have high regimen complexity with score of 15. Most of the patients were found to be non adherent to the therapy in polypharmacy patients.

Keywords: Polypharmacy, Medication Regimen Complexity Index, Medication adherence, treatment regimen, number of medications.

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1. INTRODUCTION

"Medication regimen complexity" is a term used to describe multiple characteristics of a patient's drug regimen, beyond just the number of medications. It includes various factors such as number of doses per day, dosage forms, and additional instructions (eg, taken with food), etc. High medication regimen complexity has been associated with medication non adherence, poor quality of life, and increased health-resource utilization (eg, hospital readmissions). Regimen complexity has been associated with adverse drug events leading to non adherence. Furthermore, vulnerable population groups such as older people and those with cognitive impairment may be at great risk of experiencing these errors [1] Multiplemedication use is only one component of complexity, however there is a strong correlation between polypharmacy and medication regimen complexity. The complexity of treatment is also believed to contribute to the treatment burden imposed on patients. Medication regimen complexity is the presence and combination of different dosage forms and frequencies in a person's medication regimen.[2] medication regimen complexity index(MRCI) is an index that includes weighted components of (A) dosage form, (B) dosing frequency and (C) additional instructions. The minimum MRCI score for someone on a medication is 1.5, which represents a single tablet or capsule or injection taken once a day as needed; Single medication indicates one(1) and once daily indicates 0.5, there is no established maximum score as the score increases with the number of medications.[3]The term polypharmacy refers to the group of medications one person may be taking. It is generally used when that one person is taking too many medications, or when the drugs have been prescribed by many doctors, and may not have been coordinated well. The definition of polypharmacyis still controversial. One simple definition is based on the total number of different medications a patient takes concurrently. Topical and herbal medications are generally excluded of this definition as they are often not included in the traditional methods of assessing prescription quality. Considering the large number of polypharmacy concepts, there is need of an agreement in relation to this definition to evaluate its frequency, control its occurrence and to identify the risk of adverse reactions associated with polypharmacy.[4]The term medication adherence is defined as the extent to which a person's behaviour agrees with the agreed medication regimen from a healthcare provider.[5] There are several types of non adherence but most often the categorization is indisputable, and there is a degree of overlap-.The first is known as primary non adherence, in which provider writes prescription but the medication is never filled or initiated. This type is commonly called non fulfillment adherence. The second type of non adherence is called non persistence in which patients decide to stop taking medication after starting it, without being advised by a health professional to do so, and the third type is called non conforming , this type includes a variety of ways in which medication are not taken as prescribed, this behavior can range from skipping doses to taking medications at incorrect times or at incorrect doses.[6] According to this classification some of the most commonly used adherence scales fall into distinct categories, and attention is recommended both, when choosing and, when interpreting results from different studies. The first variant of the *Medication Adherence Report Scale (MARS)*, developed in 2000, included 10 statements, with a yes/no answer, validated to be used for patients with schizophrenia. It is based on Drug Attitude Inventory (DAI) and the MAQ and assesses beliefs and barriers to medication adherence general disease control during the past week [7,8].The MARS-5 and 6 are variations of this, including five, respectively six statements with a five point rating scale, designed to be used in different chronic conditions .MARS is frequently used in adherence research [9,10.] Medication adherence rating scale (MARS) – Tool is used for measurement of medication adherence. The tool used to measure the medication adherence is 'Medication Adherence Rating Scale'(MARS). The total score ranges from 0-10 with a higher score indicating better adherence. Using the MARS tool determines the willingness and ability to take medication everyday. Strengths of MARS include Self-report measure and evaluates both attitudes about medications and actual medication taking behaviour. Weakness of MARS include Scoring requires some interpretation,"yes" response does not necessarily indicate a positive attitude or behaviour[11] The expected benefit of the study is to improve the patient quality of life by decreasing the effects caused by polypharmacy, providing patient education regarding medication adherence and polypharmacy and creating awareness for medication adherence which results in better therapeutic outcome. Aim of the study is to determine medication regimen complexity and medication adherence in polypharmacy patients. Objectives of the study includes to implement the medication regimen complexity index in polypharmacy patients with chronic diseases and to evaluate the rate of medication adherence in patients with polypharmacy and the factors affecting patient adherence to the prescribed treatment .

2. MATERIALS AND METHODS

It is a prospective study and all procedureswere performed in this study involved human participants in accordance with ethical standards of Institutional Human Ethical Committee, CMR college of Pharmacy.The study was conducted for a period of 8 months between August 2018 and March 2019 in Department of General medicine, Gandhi Hospital, Secunderabad with prior Approval from Institutional Ethical Committee,(CMRCP/IEC/2018-19/09) CMR College of Pharmacy and with necessary permission from Department of General medicine, Gandhi Hospital, Secunderabad. (Poypharmacy cases were collected and documented in a structured data compilation form from the in-patient department of general medicine on a daily basis according to the inclusion criteria, which includes; Inpatient wards of General Medicine with Polypharmacy.Patients with age between 21-90 years were included along with a complete information till discharge,. A total of 165 cases with justified inclusion criteria were collected during the study period which was reviewed on a regular basis to update and further follow-up till discharge. Demographic and clinical data was also collected by the study investigator from patient case sheets and documented. The demographic and clinical data included Age, Gender, medications for evaluating medication adherence and medication regimen complexity. All the data were collected and checked for completeness by the study investigators. Outcome was framed after interpreting the data gathered from case documentation forms; according to various categories and parameters. Further results were discussed thoroughly with the general physician in a regular manner to accomplish the final outcome.

2.1 Inclusion criteria

Cases with complete information till discharge of 21-90 years from inpatient wards of General Medicine.

2.2 *Exclusion criteria*

Pediatric patients and pregnant women were excluded from the study.

2.3 *Data collection*

A special documentation form was designed for the purpose of clinical study including name, age, sex, inpatient number, date of admission, date of discharge, provisional diagnosis, laboratory findings, past medical history, medication history, total number of drugs each day given including brand name, generic name, dose. We visited the inpatient general medicine ward on a regular basis for case collection and collected cases were reviewed and interpreted.

3. RESULTS

Our study revealed that most of the polypharmacy patients were found to be non adherent to the prescription given, MRCI proved to be good tool for classifying the complexity as it identifies the factors that contribute to complex prescriptions.A total of 200 cases with polypharmacy were collected during the study period out of which 165 cases were included in our study and the remaining 35 cases left the hospital without information. Finally, 165 cases were identified, included and analyzed for final outcome.

Table 1.Age wise distribution of patients

Sl No	Age group	Total	Percentage%
1.	21-30	25	15.1
2.	31-40	20	12.1
3.	41-50	31	18.7
4.	51-60	36	21.8
5.	61-70	34	20.6
6.	71-80	16	9.6
7.	81-90	03	1.8
Total		165	100%

Table 1 shows that the maximum no of cases fall within the age group of up to 51-60 years (21.8%) followed by 61- 70years (20.6%), 41-50 years (18.7%), 21-30 years (15.1%), 31-40 years (12.1%) between 81yrs - 90yrs are very few cases were observed.

Table 2.Gender wise distribution of Patients

Sl.No	Gender	No of cases	Percentage%
1.	Male	94	56.9
2.	Female	71	43.1
Total		165	100%

Table 2 shows that male preponderance of 56.9%i.e, number of male subjects recorded were 94 (56.9%) amd number of female subjects recorded were 71 (43.1%)

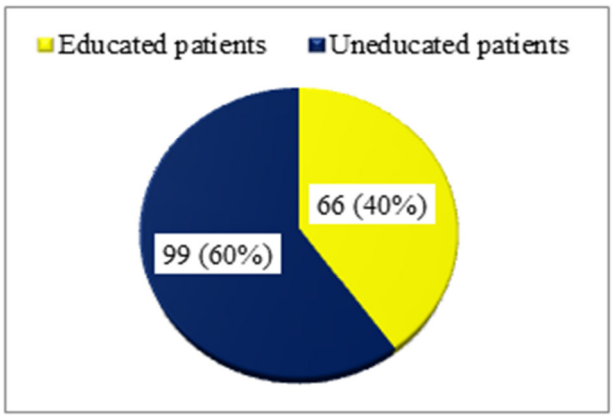

Fig:1 Graphical depiction based on educated and uneducated patients

Fig 1 has observed that uneducated patients were in larger numbers than the educated patients i.e, educated patients were observed as 66 (40%) and uneducated patients were observed as 99 (60%). This data was collected to evaluate how the medication adherence rate is affected in educated and uneducated subjects. And we have observed that educated patients were more adherent to medication than uneducated patients. This is how education is affecting the rate of medication adherence

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Table 3.Distribution of patients according to MRCI scores

Sl.No	MRCI Scores	No of patients
1.	8/8.5	05
2.	9/9.5	6

3.	10/10.5	16
4.	11/11.5	11
5.	12/12.5	18
6.	13/13.5	13
7.	14/14.5	19
8.	15/15.5	22
9.	16/16.5	09
10.	17/17.5	07
11.	18/18.5	18
12.	19/19.5	05
13.	20/20.5	04
14.	21/21.5	04
15.	22 /22.5	08

Table 3 indicates MRCI scores for total number of patients, more no of patients and here the MRCI scores ranges between 8 to 22.5. Hence MRCI score 8 or 8.5 is noted as the least score and MRCI score of 22.5is noted as the highest score. (22) subjects were present with MRCI score of 15 or 15.5 which comes under high complexity followed by 19 subjects with MRCI score of 14 or 14.5. And equal number of subjects i.e, 18 were present with two different MRCI scores that are 12 or 12.5 which comes under low complexity and 18 or 18.5 which comes under high complexity.High complexity is present in age between 61-70 followed by 41-50 and low complexity was observed in 21-30

Table 4.Low and High complexity scores in different diseased conditions in collected

Diseased conditions	Low complexity (MRCI score- below 13)	High complexity (MRCI score-above 13)
Cardiovascular diseases	27	33
Renal diseases	09	20
Hepatic diseases	05	11
Other comorbid conditions	28	32
Total	**69**	**96**

Table 4 shows that High complexity was observed inCardioVascular Diseases i.e, 33 subjects were observed to have MRCI score of above 13which includes into high complexity followed by multiple comorbid conditions and very low complexity was found in hepatic diseases i.e, 5 subjects were observed to have MRCI score of below 13 which includes into low complexity.

Table 5.Age wise estimation for low and high MRCI scores

Sl No	Age	Low complexity (MRCI Score-Below 13)	High complexity (MRCI Score-Above 13)
1.	21-30	07	18
2.	31-40	08	14
3.	41-50	11	19
4.	51-60	15	13
5.	61-70	16	20
6.	71-80	07	10
7.	81-90	02	05
	Total	**66**	**99**

Table 5 shows that high MRCI score (above 13) was found in age group between 61-70 followed by 41-50 due to their high intake of medications as they are more prone for comorbid and chronic diseased conditions.

Table 6.Adults, older adults and elderly estimates of cut-offs for low and high MRCI score with No of patients

Low complexity			High complexity		
Adults (21-35)	Older Adults (36-55)	Elderly (above 55)	Adults (21-35)	Older Adults (36-55)	Elderly (above 55)
11 (10)	18 (11)	35 (13)	26 (15)	32 (17)	43 (22)

Table 6 shows that High complexity was observed in more number of elderly subjects(above 55 years) than adults and older adults due to their multiple medication usage and low complexity was observed in adults (21-35 years) as these age group subjects might not result in chronic diseased conditions

Table 7. Adherence pattern based on gender			
Sl. No	**Adherence patterns**	**Male**	**Female**
1.	Non Adherence	57	41
2.	Adherence	35	32
	Total	**92**	**73**

Table 7 shows that males are more non- adherent to their medication than females.

Table 8 Overall rate of non adherence in polypharmacy patients		
Sl.No	**Adherence pattern**	**Percentage**
1.	Non Adherence	(67%)
2.	Adherence	(33%)
	Total	**(100%)**

Table 8 depicts that maximum number of polypharmacy cases were found to be non adherent to their medication i.e, (67%) and only (33%) of cases were found to be adherent to their medication.

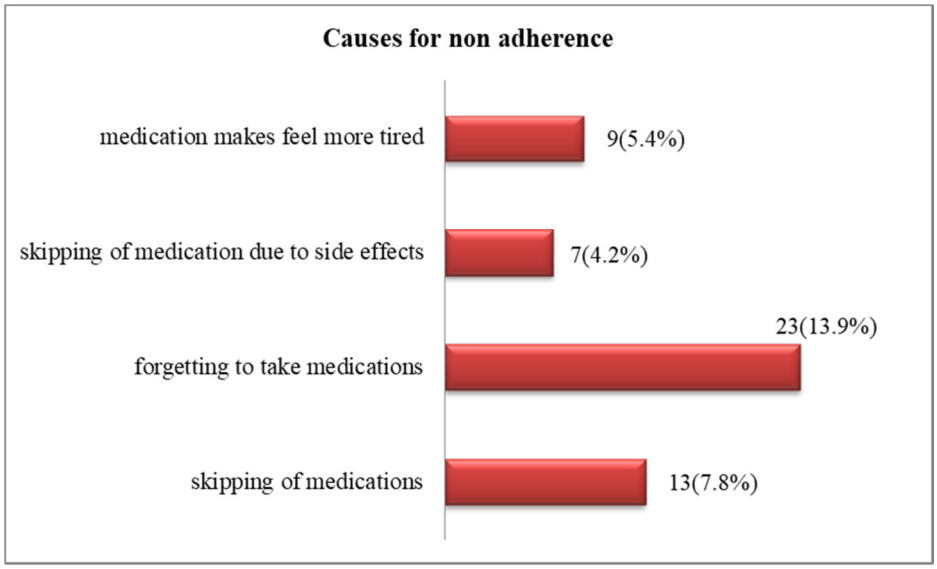

Fig2. Graphical depiction of causes of non adherence

The above Figure 2 graph depicts that major cause of non adherence was observed as forgetting to take the medication (13.9%), followed by skipping of medication (7.8%) this situation of non adherence in polypharmacy patients were managed by providing counseling to the subjects about the importance of taking the medication and its therapeutic efficacy.

4. DISCUSSION

Out of 165 patients of the Department of General Medicine, the majority of polypharmacy patients encountered were males. In the study of MiliDutta (2015) it was found that males were predominant than female . About 66 patients were found to be literate and 99 were found to be illiterate. In this count, educated patients were more adherent and uneducated patients were comparatively less adherent to their medication.In the study of Faheemuddin MD (2016)[12].it was observed that most of the uneducated patients are non adherent to their medication. In the study of Ana Margarida Advinha (2014)[13] it was found that the minimum MRCI score on a medication is 1.5 which represents a single tablet or capsule taken once a day, as the number of medications increases the score also increases .Hence the MRCI of our study was strongly correlated with the number of medications. In the study of Juliana M. Ferreira (2015) it was observed that The MRCI scores for low and high complexities were considered as follows- less than 13 is considered as low complexity, this low complexity is mostly present in adults and older adults due to their low usage of medications and more than 13 is considered as high complexity, and this is mostly present in elderly patients due to their multiple medication usage and chronic diseased conditions. In the study of Juliana M. Ferreira (2015)[14] it was found thatdosing frequency is an important component of regimen complexity. More number of patients were present with the score of 15, which comes under high complexity, and this high complexity is present due to multiple chronic diseased conditions . In the study of Ioannisvrettos (2017)[15] the most common diseased conditions found in our study in polypharmacy cases belongs to cardiovascular diseases, renal diseases, hepatic diseases and other comorbid conditions, as these are the most common conditions observed in elderly patients..In the study of Mubarak N.Al Ameri (2014) it was found that mean patient level MRCI score for different diseased conditions, cardiovascular diseases had high MRCI score and hepatic diseases had low MRCI score. There is a clear relationship between polypharmacy and co-morbidities. The more medications a patient consumed, the greater was the exposure to co-morbidity. In the study of Zachary A Macrum(2012)[16] targeting medication complexity with the goal of simplifying the patient's regimen may be an appropriate clinical intervention (eg; changing a patient from

TID drug to a once daily drug).Among 165 patients, 98 were non-adherent and 67 were adherent to treatment regimen. i.e, most of the patients were non adherent to medications prescribed by the physician, and in this study educated patients were more adherent to medication and uneducated patients were less adherent due to lack of knowledge about the medications and the disease. In the study of KartikJanaldanSalwe et al (2010) it was observed that non adherence may be due to drug interactions, side effects or adverse drug reactions. .In the study of J. Bourbeau (2007)[17]the reasons for medication non-adherence in our study was found not remembering the medications ,skipping of medication, medication makes feel more fatigue, skipping medication due to side effects. Our study observed forgetfulness as the primary cause for non adherence and this was reported as the most frequent cause. And in all the collected polypharmacy cases, we have counselled the patients about the importance of medication adherence by letting them know about the indication and appropriate use of each medication and improved the medication adherence to get a better therapeutic outcome. And we also played a role in reducing the medication regimen complexity by communicating with the physicians and healthcare professionals so that it can result in a better adherence by the patients to attain a better therapeutic outcome from the patients.

5. CONCLUSION

We have found that polypharmacy is being raised highly due to chronic diseased conditions and multiple comorbidities and this may further results in medication regimen complexity and medication non adherence leading to poor therapeutic outcome. And now our study indicated that most of the patients were found to be non adherent to the therapy in polypharmacy. And most of the males were found to be non adherent to their medication than females and uneducated patients were observed to be more non adherent to their medication due to lack of knowledge about the medications and their usage and for which counseling was provided to achieve better therapeutic outcome. The most important factors for non adherence are forgetfulness, skipping and carelessness and combinations . Patient education has achieved medication adherence to some extent and resulted in better therapeutic outcome. The MRCI proved to be good tool for classifying the complexity as it identifies the factors that contribute to complex treatments. Our study proved that elderly patients were present with high medication regimen complexity than adults and most of the polypharmacy patients found to have a high medication regimen complexity.

6. AUTHORS CONTRIBUTION STATEMENT

Dr. G. RamyaBalaPrabha conceived the idea and guided conducting the research and also reviewed the manuscript Ms. K. GnanaSwarupini supervised and performed the work. And Ms. Santhosha, Ms. Hepciba contributed to the manuscript.

7. CONFLICT OF INTEREST

Conflict of interest declared none.

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