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Treatment strategies of Dengue fever using Medication Therapy Management: A descriptive outcome based study

Gade Kalyani*, Thanushree N and **Rinku Mathappan**

Gautham College of Pharmacy, India

Key Words: Dengue, Viral Infections, Flavivirus, Medication Therapy Management (MTM), Comorbid conditions, Dexamethasone, Drug-Drug interactions, Clinical management of dengue

Dengue is an acute viral infection in tropical and subtropical regions. Dengue is a major public health crisis in numerous regions of the world. The aim of this research is to study the Medication Therapy Management (MTM) of patients with dengue admitted in ESI hospital, Bangalore. Also, to improve the quality of life of patients, to address issues of polypharmacy, preventable adverse events, medication adherence and medication misuse and to improve outcomes by helping people to better understand their health conditions and the medications used to manage them.It is a descriptive, observational, and interventional study. The data is collected through suitably designed forms and by direct interaction with the patients as well as their care takers. The study cohort consists of 57 patients. All the patients in the study population are treated with Paracetamol, Pantoprazole and Cephalosporin and Methyl prednisolone, IV fluids and Vitamin K. In our study maximum drug interactions are seen with Dexamethasone and Pantoprazole in 27 (47.36%) patients. Minimum drug interactions were seen with Ciprofloxacin and Ondansetron as well as Ciprofloxacin with Vitamin K and Dexamethasone with Ciprofloxacin among 3 (5.26%) patients. Process measures (type and frequency of drug therapy problems detected), economic measures (number of medications dispensed), and humanistic measures, (patient satisfaction with services) were the main outcomes in this process after providing MTM services. During hospitalization, patients improved their quality of life and their state of illness reduced. MTM provided safe and effective medication. Successful MTM assisted the patients to manage their own treatment.

Introduction: Dengue fever is a mosquito-borne tropical disease caused by the dengue virus. Dengue ranks as the most important mosquito-borne arboviral disease. Dengue is a major public health difficulty in numerous regions of the world. Dengue virus causes symptomatic or asymptomatic infections. It has a wide clinical spectrum that includes both severe and non-severe clinical manifestations. Initial symptoms of the disease appear in about 5-7 days after the infected mosquito bites a healthy person. After the incubation period, the illness starts abruptly in patients with moderate to severe disease. It is followed by 3 phases namely febrile, critical and recovery phase [1].

Dengue (DEN) Virus, a member of the genus Flavivirus which belongs to the family Flaviviridae, is one of the most spreading pathogens which are classified into 4 serotypes DEN-1, DEN-2, DEN-3, DEN-4. Dengue fever is usually self-limited illness. There is no specific antiviral drug currently available for dengue fever. No medication has been found to be useful in treatment dengue and its association disorder or complication. Acetaminophen (paracetamol) is used to treat fever and relieve other symptoms. Aspirin, Non-steroidal anti-inflammatory drugs (NSAIDs) should be avoided [2]. Oral fluids and electrolyte therapy are recommended in patients with vomiting and diarrhea, excessive sweating. The management of DHF during the febrile phase is similar to that of DF. Usually, significant plasma loss is seen in dengue patients, it leads to a rise in hematocrit value, to overcome from this parenteral fluid therapy is recommended.

Patients with dengue and other comorbid conditions need excessive care among treatment because polypharmacy may lead to drug relate problems [3]. To overcome from these drug related problems, medication therapy management (MTM) process is undertaken with five different steps namely Medication Therapy Review (MTR), Personal Medication Record (PMR), Medication-related Action Plan (MAP), Intervention and/or referral, and Documentation and follow-up [4]. MTM provides interventions and improves patient's quality of life. Medication adherence, patient counselling and patient education are the important factors among them [5].

The aim of this research is to study the medication therapy management of patients with dengue admitted in ESI hospital-Bangalore and to improve the quality of life of patients by addressing the issues of polypharmacy, preventable adverse events, medication adherence, and medication misuse. To improve outcomes by helping people to better understand their health conditions and the medications used to manage them and to develop a model frame work of MTM, designs to improve care, enhance communication among patients and providers, improve collaboration among providers, and optimize medication use that leads to improved patient outcomes.

Methodology: Study design and site: It is a descriptive, observational, and interventional study which was conducted in an ESI hospital, Bangalore.

Study sample: 57 inpatients are diagnosed with dengue and undergone medication therapy during the study period of six months from November 2019 to April 2020 and were included in this study.

Data collection: Suitably designed data collection forms were prepared to collect the details from the inpatients in ESI hospital. Case report forms of patients were collected from the concerned wards and laboratory data is collected from the labs and further required data is collected by the interaction among the doctors, nurses, and patients. Informed consent was taken from each patient, containing the necessary information regarding the study. The data collection includes patient details like demographics, signs and symptoms, type of infectious disease and treatment given to the patient. Discussions were done with respective physicians, guide, and nurses for elaboration of the study regarding concerned patient reports.

Case report forms, laboratory reports like complete blood count, biochemistry reports and complete urine analysis and other required tests of the patient were analysed. Various parameters during hospitalization were studied, and all required details like patient demographics, vitals, systemic examination, diagnosis, treatment (dose, date of drug started and stopped), drug interactions and adverse drug reactions were monitored. The incidence of drug interactions in patients is seen and they most often involve medications to treat comorbid conditions. Data collected was analysed and compared with available studies. We contributed significantly by checking the treatment prescribed and detecting interactions, to reduce medication related problems and to optimize drug therapy for these patients.

Ethics: All necessary approvals from the institutional ethical committee at Gautham College of pharmacy, Bangalore were obtained before beginning the study.

Statistical tools: The parameters monitored were entered in Microsoft excel 2016 and applied descriptive studies for each parameter included in the patients. The incidence rate was calculated as the

change in variable in patients (numerator) per the total number of patients in disease condition (denominator). The tables and graphs were drawn for each treatment strategies and for drug interactions and also calculated percentages for the same.

Results: Comorbidity refers to the presence of more than one disorder in the same person. Out of 57 study population ,30 (52.63%) patients were suffering from dengue, 1 (1.75%) patient was suffering from dengue with Urinary tract infection (UTI) and hepatitis, 3(5.26%) patients were suffering from dengue with hepatitis, 1(1.75%) patient was suffering from dengue with UTI and hypophosphatasia, 1(1.75%) patient was suffering from dengue with Lymphocytosis, 3(5.26%) patients were suffering from dengue with UTI, 4 (7.01%) patients were suffering dengue in pregnancy, 4 (7.01%) patients were suffering dengue with diabetes mellitus, 1(1.75%) patient was suffering from dengue with rheumatoid arthritis, 3(5.26%) patients were suffering from dengue with gestational hypertension , 3(5.26%) patients were suffering from dengue with typhoid, 1 (1.75%) patient was suffering from dengue with jaundice, 1 (1.75%) patient was suffering from dengue haemorrhagic fever, 1(1.75%) patient was suffering from dengue with diabetes mellitus and hepatitis.

30 (52.63%) patients were without comorbid conditions are the majority cases presented in our study population. Least comorbid conditions were found to be dengue with UTI and hepatitis, dengue with UTI and hypophosphatasia, dengue with Lymphocytosis and dengue with rheumatoid arthritis [Table 1 & figure 1].

Medical Treatment means the management and care of a patient to combat disease or disorder. The drugs used in the main therapy of dengue hospitalized patients are 57 (100%) patients received Paracetamol, Pantoprazole and Cephalosporins. 30 (52.63%) patients received methyl prednisolone, 27 (47.36%) patients received Dexamethasone, 8 (14.03%) patients received ondansetron and donor platelets , 4 (7.01 %) patients received Amikacin, 5 (8.77%) patients received Entecavir and metformin, 1 (1.75%) patient received methotrexate and 3 (5.26 %) patients received Methyl dopa and Ciprofloxacin. All the patients in the study population are treated with paracetamol, Pantoprazole and Cephalosporins and remaining drugs are used based on their disease condition [Table 3 & figure 2].

Along with the main drugs, some additional drugs are also received by study population. Intravenous (IV) fluids and vitamin –K were received by 57 (100%) patients. Bifilac and Mucaine gel were received by 4 (7.01%) patients. oral phosphate, vitamin–D, electrolyte therapy, oxygen therapy and supportive are received by 1 (1.75%) patient. All the patients in the study population are treated with IV fluids and vitamin –k and other drugs are treated according to their disease conditions [Table 4 & figure 3].

In our study population, dengue with UTI and hepatitis condition caused 2 drug interactions with Dexamethasone + Pantoprazole and Dexamethasone + Ondansetron. Dengue with hepatitis condition caused Dexamethasone + Pantoprazole. Dengue with UTI & Hypophosphatasia condition caused 2 drug interactions with Dexamethasone + Pantoprazole and Dexamethasone + Ondansetron. Dengue with Lymphocytosis condition caused 1 drug interaction with Dexamethasone + Pantoprazole. Dengue with pregnancy condition caused 2 drug interactions with Dexamethasone + Pantoprazole and Dexamethasone + Ondansetron. Dengue with Diabetes mellitus condition caused 1 drug interactions with Dexamethasone + Pantoprazole. Dengue with Rheumatoid Arthritis caused 1 drug interactions with Dexamethasone + Pantoprazole. Dengue with gestational hypertension condition caused 1 drug interaction with Dexamethasone + Pantoprazole. Maximum interactions are seen in Dengue with Typhoid condition caused 5 drug interactions with Dexamethasone + Pantoprazole, Dexamethasone + Ondansetron, Ciprofloxacin+ Ondansetron, Dexamethasone + Ciprofloxacin, Ciprofloxacin + Vitamin K. Dengue with Jaundice condition caused 1 drug interaction with Dexamethasone + Pantoprazole. Dengue Haemorrhagic fever caused 1 drug interaction with Dexamethasone + Pantoprazole. Dengue with Diabetes mellitus and hepatitis caused 1 drug interaction with Dexamethasone + Pantoprazole [Table 5].

Among the drugs used in study population, few drugs had interactions with other drugs in dengue hospitalized patients. Dexamethasone + Pantoprazole had drug interactions among 27 (47.36%) patients. Dexamethasone decreases the level or effect of Pantoprazole by affecting hepatic/intestinal enzyme CYP3A4 metabolism. Dexamethasone + Ondansetron had drug interactions among 12 (21.05%) patients. Dexamethasone decreases the level or effect of ondansetron by affecting hepatic/intestinal enzyme CYP3A4 metabolism. Ciprofloxacin + Ondansetron had drug interactions among 3 (5.26%) patients. Ciprofloxacin and ondansetron both increase QTc interval. Ciprofloxacin + Vitamin K had drug interactions among 3 (5.26%) patients. Ciprofloxacin decreases the level or effect of Vitamin K by altering intestinal flora. Dexamethasone + Ciprofloxacin had drug interactions among 3 (5.26%) patients. Dexamethasone and Ciprofloxacin both increase other. Maximum drug interactions are seen in Dexamethasone and Pantoprazole [Table 6 and Figure 4].

Sl.no	Disease condition	No. of patients	Percentage of patients (%)
1	Dengue	30	52.63
2	Dengue with UTI & hepatitis	1	1.75
3	Dengue with hepatitis	3	5.26
4.	Dengue with UTI & hypophosphatasia	1	1.75
5	Dengue with Lymphocytosis	1	1.75
6.	Dengue with UTI	3	5.26
7.	Dengue with pregnancy	4	7.01
8.	Dengue with diabetes mellitus	4	7.01
9.	Dengue with rheumatoid arthritis	1	1.75
10.	Dengue with gestational hypertension	3	5.26
11.	Dengue with typhoid	3	5.26
12.	Dengue with jaundice	1	1.75
13.	Dengue haemorrhagic fever	1	1.75
14	Dengue with diabetes mellitus and hepatitis	1	1.75

Table 1: Complications associated with dengue

Sl.no	Disease condition	
1	Dengue	IV Fluids, Paracetamol, Pantoprazole, Cephalosporins, Dexamethasone, Vitamin K (Dengue treatment drugs) + Methyl prednisolone
2	Dengue with UTI & Hepatitis	(Dengue treatment drugs) + (UTI treatment drugs) + (Hepatitis treatment drugs)
3	Dengue with Hepatitis	Dengue treatment drugs) + Entecavir (Hepatitis treatment drugs)
4.	Dengue with UTI & Hypophosphatasia	(Dengue treatment drugs) + (UTI treatment drugs) + Mucaine gel, Oral phosphate supplement, Vitamin D
5	Dengue with Lymphocytosis	Dengue treatment drugs) + Supportive care
6.	Dengue with UTI	Dengue treatment drugs) + Ondansetron, Mucaine gel, Amikacin, Bifilac (UTI treatment drugs)
7.	Dengue with pregnancy	Dengue treatment drugs) + Ondansetron, Mucaine gel, Amikacin, Bifilac (UTI treatment drugs)
8.	Dengue with Diabetes mellitus	(Dengue treatment drugs) + Metformin
9.	Dengue with Rheumatoid Arthritis	(Dengue treatment drugs) + Methotrexate
10.	Dengue with gestational hypertension	(Dengue treatment drugs) + Donor platelets + Methyl dopa
11.	Dengue with Typhoid	(Dengue treatment drugs) + Ondansetron, Ciprofloxacin
12.	Dengue with Jaundice	(Dengue treatment drugs)
13.	Dengue Haemorrhagic fever	(Dengue treatment drugs) + Platelet transfusion, Electrolyte therapy, Oxygen therapy
14	Dengue with Diabetes mellitus and Hepatitis	(Dengue treatment drugs) + Metformin, Entecavir

Table 2: Treatment for dengue and other complications

Sl.no	Drugs	No. of patients	Percentage %
1	Paracetamol	57	100
2	Pantoprazole	57	100
3	Methyl prednisolone	30	52.63
4	cephalosporin	57	100
5	Dexamethasone	27	47.36
6	Ondansetron	8	14.03
7	Amikacin	4	7.01
8	Entecavir	5	8.77
9	Donor platelets	8	14.03
10	Metformin	5	8.77
11	Methotrexate	1	1.75
12	Methyl dopa	3	5.26
13	Ciprofloxacin	3	5.26

Table 3: Table 3: Drugs for main therapy in dengue hospitalized patients

Sl.no	Drugs	No. of patients	Percentage %
1	IV Fluids	57	100
2	Vitamin -K	57	100
3	Bifilac	4	7.01
4	Mucaine gel	4	7.01
5	Oral phosphate	1	1.75

6	Vitamin –D	1	1.75
7	Electrolyte therapy	1	1.75
8	Oxygen therapy	1	1.75
9	Supportive care	1	1.75

Table 4: Drugs for additional therapy in dengue hospitalized patients

Sl.no	Drugs	No. of patients	Percentage %
1	Dengue with UTI & Hepatitis	Dexamethasone + Pantoprazole Dexamethasone + Ondansetron	2
2	Dengue with Hepatitis	Dexamethasone + Pantoprazole	1
3	Dengue with UTI & Hypophosphatasia	Dexamethasone + Pantoprazole Dexamethasone + Ondansetron	2
4	Dengue with Lymphocytosis	Dexamethasone + Pantoprazole Dexamethasone + Ondansetron	1
5	Dengue with UTI	Dexamethasone + Pantoprazole Dexamethasone + Ondansetron	2
6	Dengue with pregnancy	Dexamethasone + Pantoprazole Dexamethasone + Ondansetron	2
7	Dengue with Diabetes mellitus	Dexamethasone + Pantoprazole	1
8	Dengue with Rheumatoid Arthritis	Dexamethasone + Pantoprazole	1
9	Dengue with gestational hypertension	Dexamethasone + Pantoprazole	1
10	Dengue with Typhoid	Dexamethasone + Pantoprazole Dexamethasone + Ondansetron Ciprofloxacin+ Ondansetron Dexamethasone + Ciprofloxacin Ciprofloxacin + Vitamin K	5
11	Dengue with Jaundice	Dexamethasone + Pantoprazole	1
12	Dengue Haemorrhagic fever	Dexamethasone + Pantoprazole	1
13	Dengue with Diabetes mellitus and hepatitis	Dexamethasone + Pantoprazole	1

Table 5: Drug interactions associated with other complications of dengue

Sl.no	Interacting drugs	Number of patients	Percentage of patients (%)
1	Dexamethasone + Pantoprazole	27	47.36
2	Dexamethasone + Ondansetron	12	21.05
3	Ciprofloxacin+ Ondansetron	3	5.26
4	Ciprofloxacin + Vitamin K	3	5.26
5	Dexamethasone + Ciprofloxacin	3	5.26

Table 6: Drug interactions in dengue hospitalized patients:

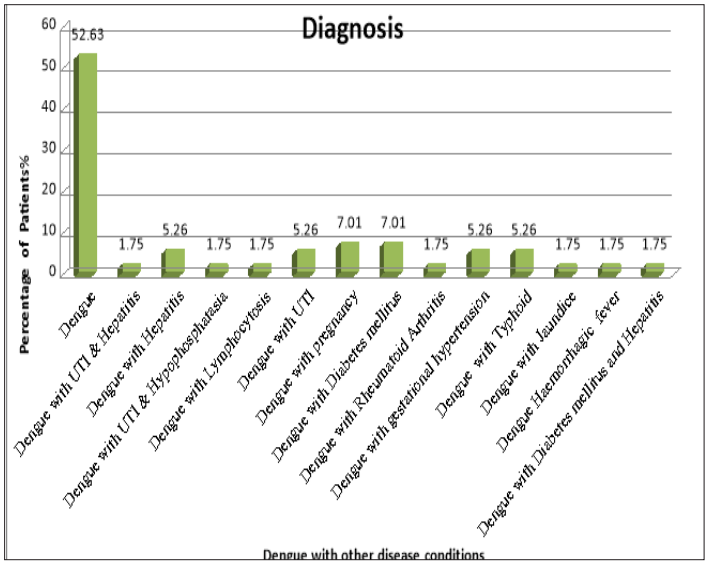

Table 6: Drug interactions in dengue hospitalized patients

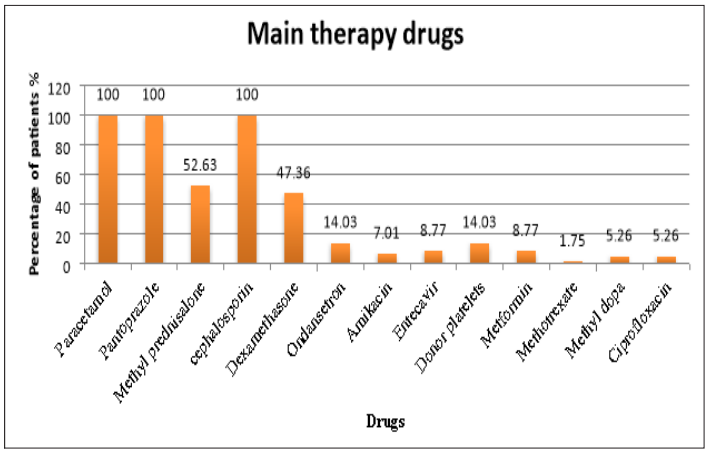

Figure 2: Drugs for main therapy in dengue hospitalized patients based on percentage

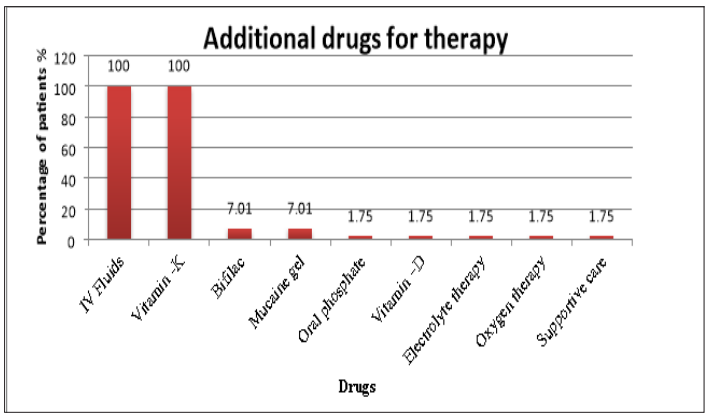

Figure 3: Drugs for additional therapy in dengue hospitalized patients based on percentage

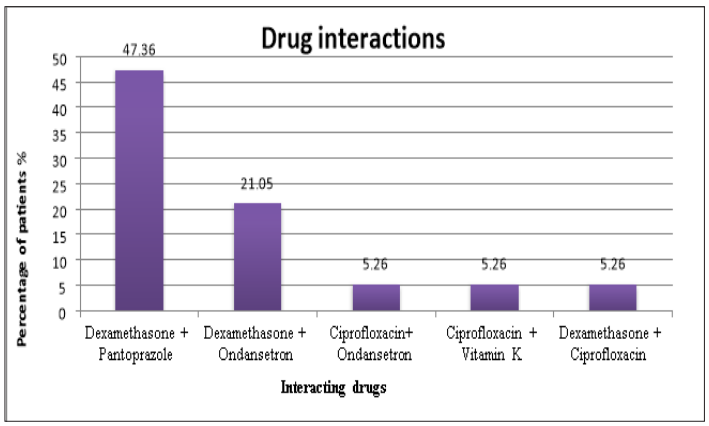

Figure 4: Drug interactions in dengue hospitalized patients

Discussion:

As per WHO cases definition only Dengue was among 30 (52.63 %) patients. No deaths were present in our study which indicates prompt diagnosis and early management, creating significant changes in prognosis. Similarly there were 21 (14.00%) cases of dengue with DHF / DSS among 150 (100%), 25 (16.66%) had complications of which most common was hepatic dysfunction with 17 (11.33%) followed by hypotension 11 (7.33%) and renal failure 7 (4.66%), 14 patients had more than one complication with respect to study conducted by Khan MY [6]. 71 % (496) had mild to moderate hepatitis and 15% (103) had severe hepatitis in dengue hospitalized patients in a study carried out by Om Prakash in 2010 [7].

Dengue and diabetes co-morbidity may warrant closer observation for glycemic control and adapted fluid management to diminish the risk for a severe clinical presentation of dengue this data supports the study conducted by NSN Htun in 2015 [8]. Dengue infection in pregnancy may have resulted in maternal morbidity and mortality, particular in preterm deliveries with premature babies so dengue infection should be highly suspected in cases of febrile pregnant women this supports the study conducted by Ismail NA in 2006 [9]. Fever with thrombocytopenia during pregnancy causes panic among the practicing obstetricians and the main fear is the occurrence of dengue haemorrhagic shock or profuse bleeding [10].

If the patient is appropriately managed during initial phase, the chance of a fatal outcome is minimal. Rajapakse et. al [11]. Study explains that there is no specific treatment for the infection, and management is only supportive care with judicious fluid management during the critical phase coupled with continuous monitoring [12]. Similarly, all patients were managed conservatively with IV fluids, antibiotics and antipyretics. Initiation of NSAID`s may lead to exacerbation of bleeding in patients and are therefore contraindicated [13]. Rest must be advised necessarily.

Drug interactions may make drug less effective, cause unexpected side effects, or increase the action of a particular drug [14]. Some drug interactions can even be harmful. Drug interactions most often involved in medications to treat comorbid conditions [15]. The pharmacist, as a member of the multidisciplinary team, can contribute significantly by checking the treatment prescribed and detecting interactions, to reduce medication-related problems and to optimize drug therapy for these patients [16].

Medication therapy management is a process done by 5 steps in collaboration among the pharmacist, patients, and physician [3,4].

1. Medication therapy review:

Here we collected patient specific information and assessed medication therapies to identify medication related problems and

developed a prioritized list of medication related problems, created a plan to resolve them and abnormal values are also noted according to their laboratory reports [17].

2. Personal medication record:

It is a comprehensive record of the patient's medication which includes prescription and non-prescription medicines, herbal products, and other dietary supplements. It is designed to help patients for their self-management. It includes name of the drug, dose of the drug, drug used for disease condition, time of drug to take, start date, stop date, and special instructions [18].

Name of drug	Dose	Disease condition	Frequency	Special instructions
Paracetamol	500 mg	Fever and pain	TID	Swallow the tablets whole with a drink of water
Caripill syrup	5 ml	Thrombocytopenia	TID	Take this medication by mouth with or without food
Metformin	500 mg	Diabetes	BD	Take with meals
Humolog insulin		Diabetes	TID	Usually take 10 to 15 min before eating.
Methotrexate	15 mg / week	Rheumatoid arthritis	OD	Take this medication by mouth with or without food.
Folic acid	1 g	Rheumatoid arthritis	OD	Skip the medication on the day of methotrexate.
Calcium supplement	1g	Pregnancy	OD	Take this medication by mouth with or without food
Methyl dopa	250 mg	Gestational Hypertension	BD	Take this medication by mouth with or without food
Ciprofloxacin	500 mg	Bacterial infection	BD	Take this medication by mouth with or without food
Bifilac		Urinary tract infection	OD	Take capsule preferably after a meal
Oral phosphate		Hypophosphatasia	OD	Before taking , dissolve the tablet in ¾ to 1 glass of water .let the tablet soak in water for 2-5 min and then stir until completely dissolved
Vitamin –D		Hypophosphatasia	OD	Take it on full or empty stomach
Entecavir	1 mg	Hepatitis	OD	Take this medication on empty stomach or and at least 2 hours after a meal and at least 2 hours before the next meal.

*Start date and stop date can be mentioned according to patient.

PMR for drugs:

It is a patient centric document containing a list of actions for the patient to use in tracking progress for self – management.

The MAP, consists of patient name, primary care physician, pharmacist/ pharmacy name with phone number, date of MAP creation, action steps for patient (what I need to do), notes for the patient (what I did and when I did it) and appointment for follow up with pharmacist [18].

Patient:	
Doctor(phone):	
Pharmacy / pharmacist (Phone):	
Date prepared:	
This list below has important action steps to help you get the most from your medications. Follow the checklist to help you work with your pharmacist and doctor to manage your medications and make notes of your actions next to each item on your list.	
Action steps → What I need to do...	Notes → What I did and when I did …
□	

4. Intervention and/or referral:

Here we intervened to address medication related problems when necessary. A suitable intervention form was designed for clinical pharmacist intervention. After completion of MTR, PMR and MAP, the problems related to drugs are noted by pharmacist. We provided a response to a drug related problem. We performed intervention to improve the safety, efficacy, or cost effectiveness of medications in collaboration with the physicians. We provided patient counselling to the patients for their disease conditions as well [19]. We discussed regarding drug interactions of patients with dengue. In some patients with multiple complications required referral to another physician or pharmacist for disease management education to help him or her to manage their chronic diseases like diabetes and hypertension [20].

As we found that in our study patients, Dexamethasone is having drug interactions with Pantoprazole and ondansetron, so we discussed with the original prescriber to prescribe methyl prednisalone instead of Dexamethasone [21]. In few patients we found that drug interactions are seen with ciprofloxacin and Vitamin K, so we discussed with the original prescriber to administer Vitamin K injection in afternoon instead of morning. Ciprofloxacin and Ondansetron also caused drug interactions, so we discussed with original prescriber to prescribe drugs alternatively [22].

5. Documentation and follow up:

We performed documentation for the provided services and interventions. We documented ongoing patient specific record that contains in chronological order, a record of all provided care in an established standard health care professional format (ex: the SOAP subjective, objective observations, assessment, and plan). All follow up evaluations and interactions with the patient and his or her other health care professional are included in MTM documentation [23].

We provided MTM services to all the study population over 6 months and identified drug-related problems and relayed the recommendations to their physician and physicians accepted the recommendations. Patients reported feeling better about their medications after receiving MTM services. Process measures (type and frequency of drug therapy problems detected, and services performed), economic measures (number of medications dispensed), and humanistic measures (patient satisfaction with services) were the main outcomes in this process [24]. We provided the educational services like medication use, disease management, adherence, and self-care. Nearly all patients received some form of medication adherence or disease education associated with problem detection and resolution. MTM may reduce outpatient visits to address side effects. This process is universally applicable to a range of chronically ill adult patient populations. A majority of interventions were directed at populations with multiple and chronic conditions such as diabetes, hypertension. Specifically, we found evidence that MTM results in improvement when compared with usual care for some measures of medication adherence and patient satisfaction with the program was high [25].

Conclusion: Dengue infection results in significant morbidity and mortality worldwide. Current recommended treatment is largely supportive with careful fluid replacement, with no specific treatment available. Although corticosteroids are not mentioned in the WHO guidelines on the management of dengue, clinicians use corticosteroids empirically based on the presumed immunological basis of the complications of dengue. Dengue fever in pregnancy most often is treated conservatively. Acetaminophen is used to manage pain and fever but contraindicate nonsteroidal anti-inflammatory agents (NSAIDs) because of potentially increased bleeding risk, with thrombocytopenia as a complication. The reasons behind drug interactions are found as comorbid conditions and polypharmacy.

MTM services provide an opportunity for clinical pharmacists to develop direct patient care services and besides providing patient care activities, patient counseling, disease management, and all currently provided pharmacy services. In addition to Medicare-eligible patients, MTM services are appropriate for anyone with medication-related needs. MTM is offered as an all-encompassing model that incorporates the philosophy of pharmaceutical care, techniques of patient counselling, and disease management in an environment that facilitates the direct collaboration of patients, pharmacists, and other health professionals. Clinical pharmacists are strategically positioned to provide MTM services and effectively communicate with providers to improve quality of care for patients. Thus, MTM helped patients to better understand their health conditions and the medications used to manage them. MTM has resulted in reductions in physician visits, emergency department visits, and hospital days.

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CONFLICT OF INTEREST

The authors declare no conflict of interests.

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