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Original Research Article

A prospective observational study on incidence of adverse drug reactions in a tertiary care teaching hospital: a pharmacovigilance study

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ABSTRACT

Background: An adverse drug reaction (ADRs) is determined as response to a drug that is noxious unintended excludes therapeutic failures, overdose, drug abuse, noncompliance, and medication errors. The main aim of the study is to detect, understand and report ADR'S.
Methods: This study is prospective observational study conducted for 6 months in in-patient setting in a tertiary care hospital. Naranjo's, WHO causality scale, Siegel scale, Schumock and Thornton scale are used to assess ADR. Graph Pad Prism and SAS software's are used.
Results: Data was collected from a total of 1000 patients of which 121 (12.1%) patients were effected with 150 ADRs. Among 121 patients AdrAd was 60.66% and AdrIn was 39.33%. Of 121 patients 97 patients with single ADR, 28 patients with 2 ADRs, 10 patients were with three ADRs. ADR onset divides acute (10%), Latent (39%) and sub-acute (51%). ADR occurred are recovered (54%), Recovering (13%). Naranjos scale interprets definite (0.9%), probable (50.9%), possible (42.97%). According to WHO scale certain (2.7%), unlikely (2.7%), possible (38.84%). Hartwig and Siegel scale results are mild (12.4%), moderate (66.12%) and severe (12.4%). Schumock and Thornton preventability results are definitely (25.45%), probably (68.18%) and not preventable (6.36%).
Conclusions: Every health care professional should be aware of the Pharmacovigilance principles and also should be aware of suspected ADR reporting form of PVPI. By applying the above scales it is easy for health care professionals to assess an ADR.

Keywords: Adverse drug reaction, Adverse drug reaction reporting form, Naranjo's and WHO causality assessment scales, Hartwig and Seigel scale, ADR incidence, CDSCO reporting form

INTRODUCTION

World Health Organisation (WHO) defines an adverse drug reaction (ADR) as "response to a drug that is noxious unintended and that occurs at doses used in humans for prophylaxis, diagnosis, or therapy of disease, or for the modification of physiologic function" excludes therapeutic failures, overdose, drug abuse, noncompliance, and medication errors.[1]

The epidemiology of ADRs in the Indian population is not known as very few studies have been reported. ADRs are 4th to 6th leading cause of death among hospitalized patients and has 6.7% incidence rate for serious ADRs.[2] ADR is leading to 0.3% to 7% of all hospital admissions which is leading to annual dollar costs in the billions. 30% to 60% of them are preventable.[3] There are different types of classifications of ADRs based on onset of event, severity of reaction and type of reaction.[3-5]

ADR detection and management

- *Subjective report:* Including patient complaints
- *Objective report:* Direct observation of event and abnormal findings including (physical exam, laboratory test, and diagnostic procedure).
- *Medication order screening:* abrupt medication discontinuation; abrupt dosage reduction; orders for tracer or trigger substances; orders for special tests or serum drug concentrations
- Spontaneous reporting
- *Medication utilization review:* Computerized screening; Chart review and concurrent audits.[6-9]

Management options

- Discontinue the offending agent
- Continue the medication if: it is medically necessary
- Discontinue non-essential medications
- Administer appropriate symptomatic treatment
- Provide supportive or palliative care (e.g, hydration, glucocorticoids, warm / cold compresses, analgesics or antipruritics)
- Consider re-challenge or desensitization.[10-13]

Objectives

The main objective of this study is to identify ADRs and their incidence in hospitalized patients and to report the ADRs to CDSCO and UMC. This study reveals the incidence and prevalence rates of ADR and to find out new ADR's.

METHODS

This study is a prospective, observational study conducted for 6 months among patients admitted into in-patient setting in Chelmada Anand Rao Institute of Medical Sciences which is a 1000-bedded hospital located in Karimnagar, Telanagana. The study took place between august 2017 and January 2018.

Study population

The participants of the study were taken from patients who were admitted to the in-patient setting of Chelmada Anand Rao Institute of Medical Sciences (tertiary care hospital) with ADR. All the patients provided consent for the study.

Selection criteria

Inclusion criteria were patients above age of 14 years; only patients who are hospitalized during study period; patients of both genders.

Exclusion criteria were patients of less than 14 years of age; patients who are admitted in oncology department; women who are admitted in gynaecology department; immunocompromised patients; patients with multiple co-morbidities and those taking multiple medications (>5 medicines) for longer period of time; patients developing ADRs due to fresh blood or blood products infusion or accidental poisoning.

Data collection

Case records of all the patients were observed and the following data was obtained from each patient:

- Demographic details- age, sex
- Complaints of admission and present illness
- Medical and medication history
- Any allergies previously present
- Habits- type of diet, smoking, alcohol consumption
- Laboratory findings-hemogram, serum biochemistry, blood pressure.

ADR is suspected using ADR scales i.e, Naranjo's and WHO scale. The obtained ADRs are categorized using severity and preventability scale. It is also differentiated as occurrence of ADR due to hospital admission and ADR as a cause of hospital admission.

In case of absence of history of ADR or no data regarding ADR in case report then the patient is interviewed and the patient's medication consumption behaviour is evaluated.

Reporting

The ADRs obtained were filled in CDSCO (central drug standards for control of organisation) form which is according to WHO-UMC and are reported time to time to Pharmacovigilance programme of India (PVPI).[8,28]

Statistical analysis

The data was analysed using Microsoft-Excel and Graph Pad Prism 7.0. The ADRs were assessed significantly using chi-square and T-Test. SAS 9.2 is also used.

RESULTS

Incidence of ADRs

Data of 1000 (n=1000) hospitalized patient population have been collected and results have been interpreted. Out of 1000 patients 150 (15%) ADRs were detected in 121 (12.10%) patients. Incidence rate of ADRs was found to be 12.1%.

Differentiation of ADR in occurrence

ADR occurrence is differentiated into two types i.e, ADR occurred may lead to hospitalization (AdrAd), ADR

occurred after hospitalization (AdrIn). Out of 121 patients 60.66% (91) of population had been presented with ADR after hospitalization while ADR lead to hospitalization in 39.33% (59) of population.

Gender distribution of ADRs

ADRs are differentiated gender wise. Of 1000 patients female patients were 42.3% (423 with S.D of 47.01±17) and male patients were 57.7% (577 with S.D of 48.183±18), in which 66 (54.54% with S.D of 42.8±15.3) females and 55 (45.45% with S.D of 45.3±15.9) males were affected with ADRs respectively. Gender distribution in our study shows that females are more affected with ADRs than males.

Age group wise distribution of ADRs.

As per the inclusion criteria, only age groups of 15 and above patients were studied. Of which 31-45 (33.8%) age group individuals are mostly affected with ADRs followed by 46-60 (26.45%). As patients of 75-90 age group admitted in hospital were less in number compared to other age groups. So, the prevalence of ADR in those groups is also less. Chi-square test was performed and the P value was found to be <0.0001 at 4 degrees of freedom. Chi-square test it proves that there is a significant difference in the ADR distribution in age group.

Distribution of ADRs in patients

Among 121 patients with ADRs there are 150 ADRs as mentioned in Figure 3.5.2. Patient with single ADR are 9.2% (92), patients with two ADRs include 1.4% (14), and three ADRs include 1% (10).

Classification of ADRs based on onset

Based on onset ADRs were classified into acute, sub-acute and latent. Of which 51% (74) of the patients were shown with sub-acute type of ADR's i.e, most of the ADR's were seen within 1-24hrs. 39% (56) of the patients were with latent type of ADR's and 10% (15) of the patients were with acute type of ADR's.

Assessment of ADR outcome

ADR outcome is classified into different types. 54% (80) of the population were recovered from the ADR, 30% (45) of the population are not recovered while 13% (20) of the population are recovering and 3% (5) of them are unknown which is due to unavailability of follow up.

Assessment of Naranjo's causality scale

According to Naranjo's causality assessment scale, probable and possible ADRs were with 50.90% (56) and 42.97% (52), whereas definite and doubtful were observed less because for most of the ADRs serum levels estimation, Re-challenge were not performed.

Assessment of WHO-UMC causality scale

For assessing causality WHO-UMC scale is also used. According to WHO scale the results were certain 2.7% (03), possible 38.84% (47), probable 47.11% (57), unlikely 2.70% (3) unclassified (0) and unassessable (0). Most of the ADRs were probable followed by possible as mentioned in Table 1.

Table 1: WHO-UMC scale interpretation.

WHO scale	Score	Interpretation (%)
Certain	3	2.70
unlikely	3	2.70
possible	47	38.84
probable	57	47.11
Unclassified	0	0
Unassessable	0	0
Total	110	

Assessment of Hartwig and Siegel severity scale

For assessing severity of ADR, Hartwig & Siegel severity scale was used. Individual levels of the scale are assessed and interpreted. According to Hartwig & Siegel severity assessment scale moderate ADRs were high i.e, 66.12% (80), mild and severe were found to be 12.4% (15) in Figure 1.

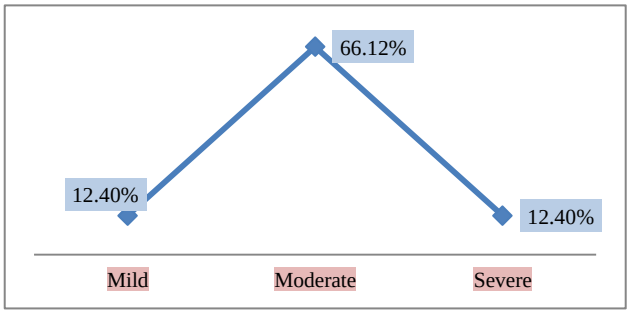

Figure 1: Hartwig and Siegel severity assessment scale interpretation.

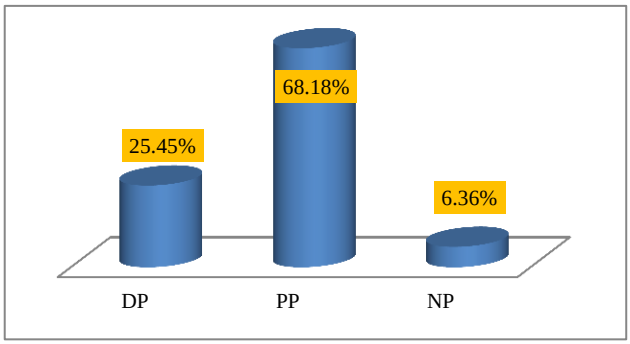

Figure 2: Graphical representation of Schumock and Thornton preventability scale.

Assessment of Schumock and Thornton preventability scale

According to Schumock and Thornton preventability scale probably preventable (PP) ADRs were 68.18%, definitely preventable (DP) ADRs were 25.45% and Not Preventable (NP) ADRs were 6.36% as mentioned in Figure 2.

Incidence of drug classes causing ADRs

Among different classes of drugs, anti-leprotic agents were found to have more risk of causing ADR i.e, of 1.1% patients used anti-leprotics 18.18% of them had a risk of causing ADR. Other drugs include antiepileptics+ anxiolytics (6.20%), opiod analgesics (5.46%), corticosteroids (3.89%), antibiotics (3.54%) supplements (2.61%), anti-hypertensives (2.27%), NSAIDS (2.17%), anti-diabetic (1.69%), antimalarial (1.19%), respiratory drugs (1.02%), gastric acid suppressants (0.85%), anti-emetics (0.19%) as mentioned in Figure 3. According to Chi-Square test ($p<0.005$) there is a significant different between the total population effected and ADR population.

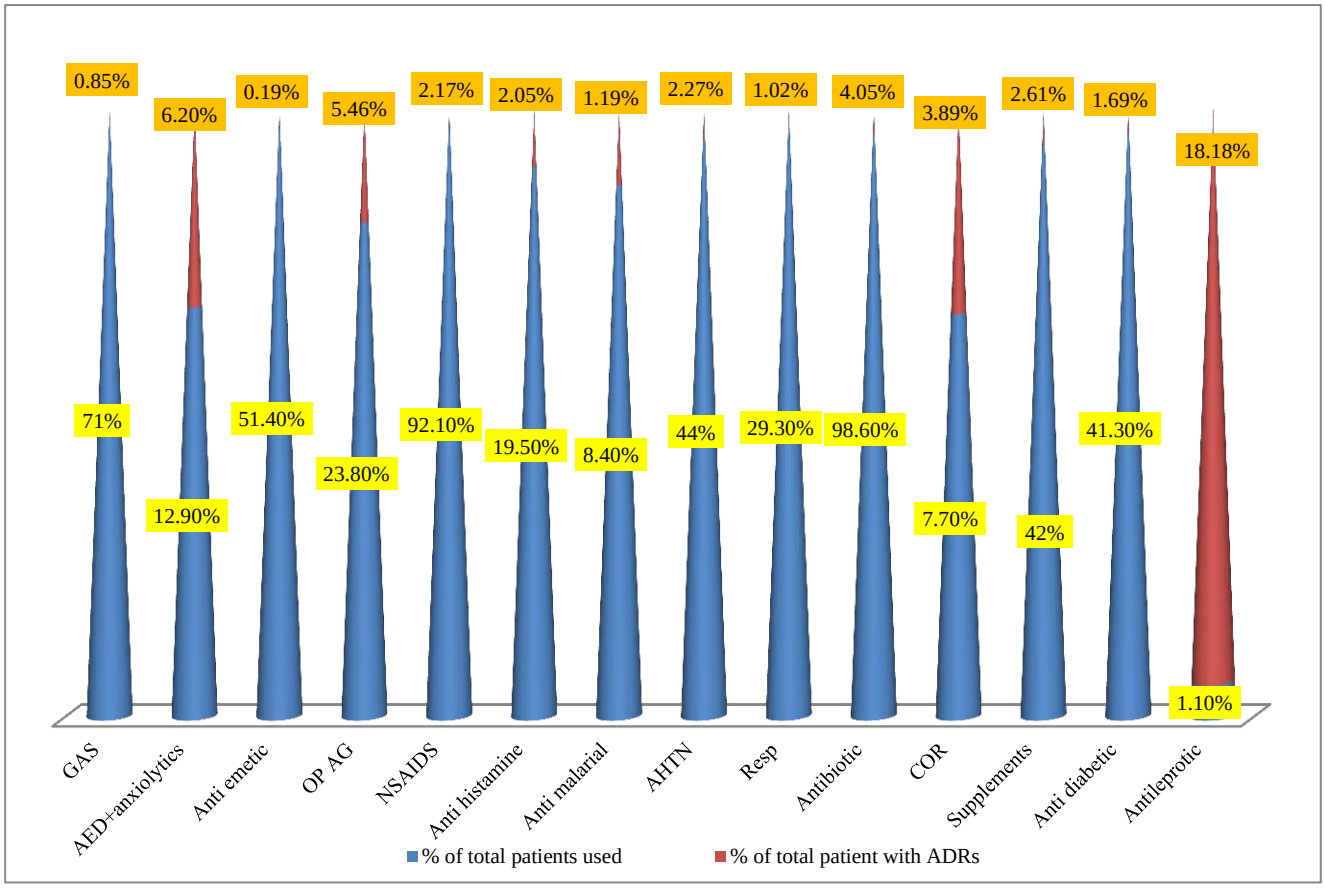

Figure 3: Prevalence of drug classes causing ADRs.

Organ based classification of ADRs

By categorizing the ADRs into different organ systems, most of the ADRs were gastrointestinal (38%) followed by dermatological (23.30%) then metabolic (9.33%), CNS (8%), CVS (7.30%), hepatic (5.30%), renal (4%) and musculoskeletal (1.33%).

Classification of ADR type based on Rawlins and Thompson classification

According to Rawlins and Thompson classification ADRs were classified in to type A, B, C, D, E. Type A ADRs were mostly seen with 65.54% in this study followed by type C (20.27%), type B (14.18%) as mentioned in Figure 4.

Incidence of antibiotic classes

Antibiotics causing ADRs were categorized in to different classes of antibiotics among them cephalosporins were mostly used with ADR incidence of 4.72% and rifamycins are with highest incidence 13.30% followed by tetracyclines 6.77%, nitroimidazole 3.33%, macrolide and floroquinolone are with 2.12% of incidence rate as mentioned in figure 3. Kolmogorov-Smirnov test (0.667) determines that there is a significant difference ($p=0.0336$) between population used antibiotics and population effected with ADRs.

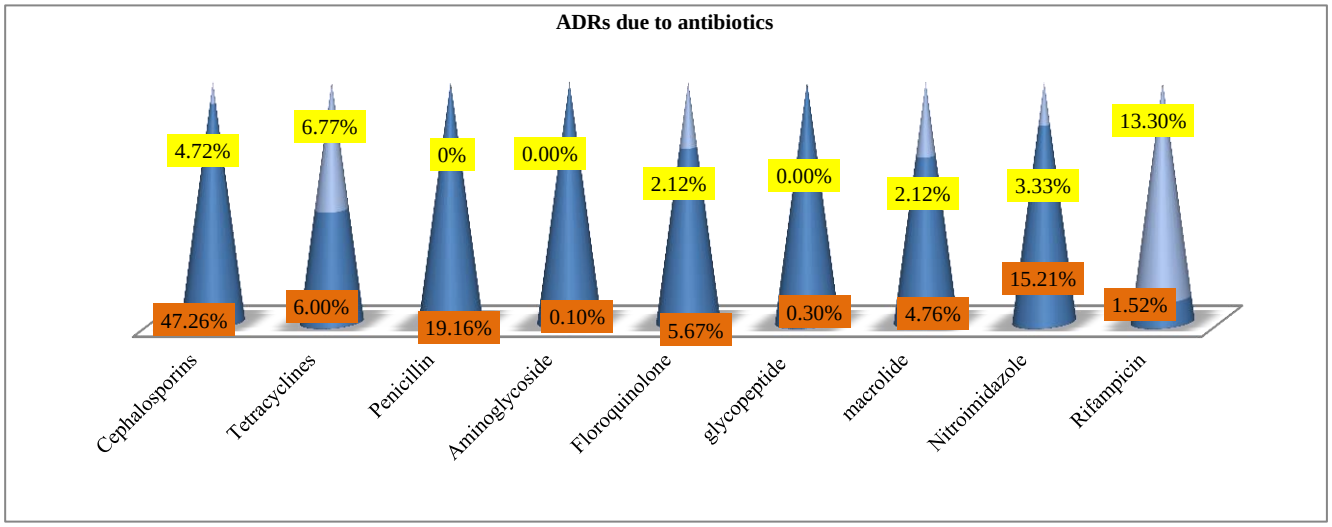

Figure 3: Antibiotics incidence of individual ADR.

Table 2: Representing some drug classes with individual drug ADRs observed in this study.

Drug classes	No. of ADR's	Drugs (no. of ADR's for each drug)	ADR observed
Antiepileptic+ anxiolytics	10	a) Midazolam (1) b) Phenytoin (7) c) Carbamazepine (2)	a) Reduced blood pressure b) Cerebellar ataxia, dress syndrome, nystagmus, multiple tissue connective disorder, dysarthria, thrombocytopenia, headache c) SJS, maculo popular rash
GAS	5	a) Pantoprazole (3) b) Ranitidine (1) c) Racecodotril (1)	a) Constipation, loose stools, rashes over abdomen and over both hands b) QT interval prolongation with Flutter fibrillation pattern c) Increased blood pressure
Antiemetic	1	a) Metaclopromide (1)	a) Headache
Antibiotics	40	a) Cefuroxime (1) b) Doxycycline (4) c) Cefixime (2) d) Cefpodoxime (1) e) Metronidazole (4) f) Ceftriaxone (16) g) Amoxicillin+Clavulanic acid (3) h) Ofloxacin (1) i) Ceftizoxime (1) j) Ampicillin (2) k) Ciprofloxacin (2) l) Rifampicin (2) m) Azithromycin	a) Nausea, vomiting b) Nausea, vomiting, papular lesions over neck, papular lesions on body, loose motions c) Erythematous vesicular crusts over face, oral erosions, jaundice d) SJS e) Vomiting, nausea, diarrhea f) Vomiting, loose motions, rashes, itching, malena acute generalised exanthamaotous pustulosis, eosinophilia g) Nausea,vomiting, ithcing over the body, rashes pyridoxine deficiency, h) Acute utricaria i) Tingling of both limbs j) Diarrhea k) Diarrhea, FDE l) Increased Liver function tests, Hepatitis m) Hyperpigmentation macules, papules over limbs
Anti inflammatory	22	a) Paracetamol (14) b) Diclofenac (4) c) Aceclofenac (1) d) Prednisolone (2) e) Others (1)	a) Itching, rashes, diarrhea b) Loose motions, hyperpigmented patches over abdomen and groin, urosepsis with chronic kidney disease, fixed drug eruption c) Nephropathy d) Nausea e) AKI

Continued.

Drug classes	No. of ADR's	Drugs (no. of ADR's for each drug)	ADR observed
Anti-hypertensive	22	a) Enalapril (1) b) Hydrochlorthiazide (2) c) Telmisartan+ Hydrochlorthiazide (1) d) Metoprolol (1) e) Telmisartan (4) f) Atenolol (1) g) Amlodipine (3) h) Chlorthalidone+Telmisartan (2) i) Cilnidipine (1)	a) AKI b) Vertigo c) Vomting, diarrhea d) Bradycardia e) Diarhhea f) AKI g) Loose motions, parkinsonism, edema h) Hypochloremia, hyponatremia i) Hypotension
Anti-diabetic	8	a) Metformin (5) b) Glimepride (1) c) Insulin (2)	a) Hypoglycemia induced seizures b) Hypoglycemic seizures c) Hyperkalemia
Analgesic	23	a) Tramadol (22) b) Others (1)	a) Vomiting, nausea, headache, dryness of mouth b) Hyperpigmentation over back and front of chest wall

Table 3: WHO-UMC numbers for ADR.

S.No.	Patient details	Adverse reaction		WHO-UMC number
1.	SR-70/M	Diclofenac induced urosepsis		2018-00865
2.	CK-28/F	Paracetamol induced rash		2018-00879
3.	MC-64/M	Ranitidine induced syncopeal attack		2018-00896
4.	MUK-46/M	Paracetamol induced rashes		2018-00903
5.	RB-29/M	Prednisolone induced erythematous rash		2018-01169
6.	RK-35/F	Cefixime and paracetamol induced loose motions		2018-01184
7.	SS-43/M	Tramadol induced vomiting's		2018-01190
8.	PR-58/F	pantoprazole induced constipation		2018-01193
9.	PR-57/M	Midazolam induced hypotension		2018-01204
10.	PR-57/M	meropenem induced hypokalemia		2018-01207
11.	SS-43/M	Baclofen induced constipation		2018-01215
12.	SURI-29/F	Lumerax induced vomiting's		2018-01807
13.	SUR-29/F	Ceftriaxone and pantoprazole induced loose motions		2018-01810
14.	SH-40/M	Prednisolone induced nausea		2018-02132
15.	EK-47/F	Tramadol induced vomiting's		2018-02141
16.	OS-43/M	Metformin induced hypoglycemic seizures		2018-02171
17.	AS-74/F	Ampicillin+sulbactam, pantoprazole induced loose motions		2018-02172
18.	BS-45/F	Metformin; Glibenclamide induced seizures		2018-02185
19.	MM-60/M	Pantoprazole induced loose motions		2018-02186
20.	GV-27/F	Ondansetron, ceftriaxone and doxycycline induced loose motions		2018-03035
21.	DR-49/M	Carbamazepine induced SJS		2018-03141
22.	RM-64/M	Ciprofloxacin, dexamethasone and diclofenac induced maculopapular rash		2018-03150
23.	BR-28/F	Phenytoin induced DRESS		2018-03360
24.	SY-60/F	Amlodipine induced Parkinsonism		2018-03374
25.	PNE-58/M	Dapsone, Hansepran induced Hemolytic Anemia		2018-03929
26.	54/F	Ceftriaxone, metronidazole	Nausea vomiting	2018-07125
27.	38/M	Ursodiol	Loose stools	2018-07164
28.	22/M	Tramadol	Nausea vomiting	2018-07170
29.	22/M	Tranexamic acid	Loose stools	2018-07467
30.	60/F	Phenytoin	Cerebellar ataxia	2018-10108
31.	52/F	Azithromycin	Itching hyper pigmented macules	2018-07489

Continued.

S.No.	Patient details	Adverse reaction		WHO-UMC number
32.	31/M	Amoxicillin, Tramadol	Nausea vomiting	2018-07513
33.	5/F	Ofloxacin	Acute urticarial	2018-07564
34.	54/M	Docycycline, Ceftriaxone	Papular lesions	2018-07748
35.	48/F	Tramadol+Paracetamol	Vomiting's	2018-07712
36.	19/F	Methotrexate	Renal failure	2018-07808
37.	51/F	Aceclofenac	Nephropathy	2018-07823
38.	51/F	Thyroxine	Muscle weakness	2018-07839
39.	23/F	Paracetamol, Caripil	Itching, rash	2018-07849
40.	23/F	Paracetamol, amoxicillin	Itching	2018-08106
41.	55/M	Doxycycline, Caripil	Nausea vomiting	2018-08126
42.	44/M	Diclofenac	Itching, lesions	2018-08665
43.	43/F	Ceftriaxone, pantoprazole	Loose stools	2018-08687
44.	44/F	Enalapril	Acute kidney injury	2018-08751
45.	42/F	Ciprofloxacin, metronidazole	Loose stools	2018-08818
46.	50/F	Paracetamol	Itching	2018-08830
47.	30/F	Cefpodoxime	Hyper pigmented macules	2018-08839
48.	60/F	Dextrose/ insulin	Hyperkalemia	2018-11230
49.	31/M	Tramadol	Vomiting	2018-11272
50.	44/M	Tramadol/metronidazole	Nausea and vomiting	2018-11274
51.	3/F	Iron	Black colored stools	2018-11406
52.	58/F	Tramadol	Dryness of mouth	2018-11437
53.	64/F	Sodium bicarbonate	Hypernatremia	2018-11444
54.	66/F	5fu	Oral ulcers, neutropenia anemia	2018-11525
56.	2/F	Ceftriaxone	Rashes	2018-11446
57.	66/F	Oxaliplatin	Swelling over tongue, pain	2018-11449
58.	11/F	Ferrous ascorbate/folic acid	Black colored stools	2018-11531
59.	64/M	Ranitidine	QT Prolongation	2018-11549
60.	43/M	Benzoate, Doxofyllin	Vomiting's	2018-11554
61.	28/F	Tramadol, amoxicillin	Nausea and Vomiting's	2018-11651
62.	10m/M	Paracetamol	Vomiting's	2018-11572
63.	41/F	Fexofenadine	Vomiting's	2018-11655
64.	45/M	Ceftriaxone, doxycycline	Papular lesions	2018-11664
65.	33/F	Tramadol	Vomiting's	2018-11672
66.	55/M	Metformin	Hypoglycemia	2018-11793
67.	69/F	Amlodipine, Doxofylline	Loose stools	2018-11804
68.	36/F	Neomercazole	Leucopenia	2018-11809
69.	7/M	Sulfadoxine, Primarquine	Vomiting's	2018-11814
70.	44/F	Tramadol, ceftriaxone	Vomiting's	2018-11818
71.	29/M	Prednisolone	Pedal edema	2018-11859
72.	45/M	Ceftriaxone	AGEP	2018-11875
74.	20/M	Paracetamol	Rahes	2018-11888

Continued.

S.No.	Patient details	Adverse reaction		WHO-UMC number
75.	56/M	Insulin	Hypoglycemia	2018-17142
76.	45/F	Telma H	Vertigo	2018-17150
77.	45/F	Glimepiride	Hypoglycemic Seizures	2018-17171
78.	45/F	Telma H	Vomiting & Diarrhea	2018-17181
79.	48/F	Paracetamol	Vomiting	2018-17185
80.	64/M	Diclofenac	Acute Kidney Injury	2018-17196
81.	60/M	Pantoprazole	Loose Motions	2018-17203
82.	72/M	Perinorm	Headache	2018-17354
83.	75/M	Tramadol	Vomiting	2018-17398
84.	70/F	Atenolol	Acute Kidney Injury	2018-17600
85.	70/M	Metoprolol	Bradycardia	2018-17606
86.	70/M	Diclofenac	Diarrhea	2018-17615
87.	69/M	Amlodipine	edema	2018-17620
88.	67/M	Metformin	Hypoglycemic Seizures	2018-17765
89.	66/F	fluorouracil	Mouth ulcers	2018-17779
90.	28/F	Tramadol	Vomiting	2018-17795
91.	29/F	Tramadol	Headache	2018-17800

Sample patient pictures of ADRs collected.

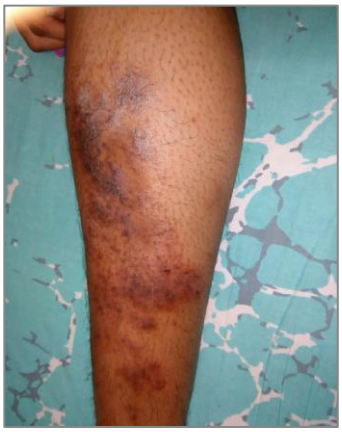

Figure 4: Carbamazepine induced Steven Johnsons syndrome.

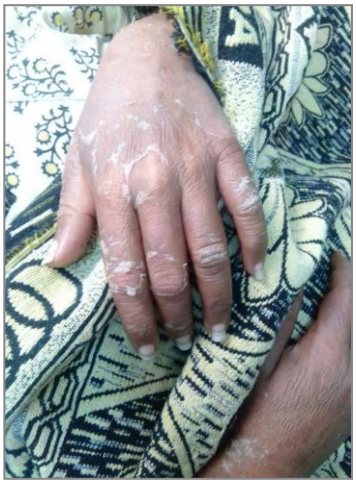

Figure 5: Carbamazepine induced maculopapular rash healing stage.

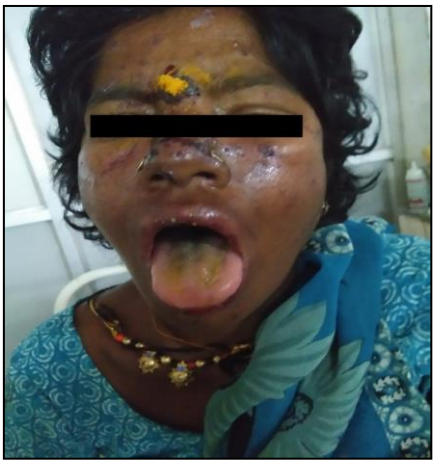

Figure 6: Cefixime induced erythematosus vesicular crusts over face, oral erosions.

WHO-UMC numbers for ADR

The following are list of individual case safety report (ICSRs) received from National coordinating committee (NCC) on 29 December 2017, 29 January 2018, 06 March 2018 which are reviewed and entry into vigiflow as mentioned in Table 3.

DISCUSSION

Adverse drug reactions adversely effect the health care system and health related quality of life of patients. The present study dealt with identifying, assessing and reporting of ADRs in a tertiary care hospital. According to our study the overall incidence rate of ADR was found to be 12.1%. But this may differ across states and countries as the methodology adopted may be different.[15-17]

According to Tiwari et al, the incidence rate was also found to be 12% and males (75%) were more significant

than females (25%). But according to our study females (55%) are more significant than males (45%). The age group 19-59 years showed with highest number of ADRs (60%).This may differ depending the age group admitted in hospital. Also in his study GI (73%) side effects were recorded as high followed by metabolic (17%) whereas in our study also GI side effects (38%) were high but followed by dermatologic reactions (23.3%) and metabolic (9.33%).[21,22]

According to Kharb, et al, males (66.33%) are more prone to ADRs than that of females which in our case is opposite. GI cases were recorded high (31.43%). Antimicrobials (43.37%) had shown more ADRs followed by anticancer and immunosuppressive agents (29.02%) which in our case these both categories are under exclusion criteria. Antimicrobials were also recorded high in our study (28.92%).[23]

According to Lihite, et al, 219 patients were reported with ADRs in which 73 patients were with single ADRs, 19 patients were with 3 ADRs and 3 patients were with 4 ADRs.[24,25] According to Tiwari et al 116 ADRs were recorded of which 56 patients were with 1 ADR and 60 patients were with more than 1 ADR. Comparing with our study out of 121 patients, 91 patients were with single ADRs, 14 patients were with 2 ADRs and 10patients were with 3ADRs. According to him most of the ADRs were from dermatology department (63.01%) followed by hematology (18.26%) and psychiatry (11.87%).[21] According to some studies most of the ADRs were due to antibiotics.

According to Laskar, et al the ADR incidence rate was found to be 0.41% of which 0.22% of ADRs are AdrAd and 0.19% are AdrIn, which in our case out of 12% incidence 5.9% AdrAd was 5.9% and AdrIn was 7.28%.[26]

In order to assess causality, Naranjo's causality scale was used. According to Shamna et al, Naranjo scale revealed that 71.42% were probable, 18.36% were possible, 10.20% were definite and 0% were doubtful.[27-29] But the study has limitations with re-challenge and estimation of serum drug concentrations. Our causality score includes 0.9% as definite, 50.9% are probable, 42.97% are possible and 0.9% are doubtful.

For assessing causality WHO-UMC scale is used. According to WHO scale the results were certain (2.7%), possible (38.84%), probable (2.48%), unlikely (47.11%), unclassified and unassessable were not ruled out. According to Singh et al, WHO-UMC results include certain (9.74%), probable (36.36%), possible (31.16%), unlikely (5.19%), unclassified (7.79%) and unassessable (9.74%).

Severity is assessed using Hartwig and Seigel severity assessment scale. According to Tiwari et al, mild severity 53.3% and moderate were 46.6%. No ADR was found to be severe. In our study 12.4% were mild, 66.12% were moderate and 12.4% are severe.[21]

Schumock and Thornton scale is used to assess preventability of ADR. According to Padmavathi et al, Preventability assessment was 12.2% were definitely preventable and 87.8% were not preventable.[38] According to our study 25.45% were definitely preventable, 68.18% were possibly preventable and 6.36% were not preventable.[33,34] As the scale is not defined properly how to give a proper score, the inference of this scale may not be prompt.

According to Singh et al, Distribution of ADRs across therapeutic classes were Antimicrobials (28.57%), anti-hypertensive's (24.02%), anti-diabetics (14.28%), and NSAIDs (9.74%).[30-32]

According to Tiwari et al, gastrointestinal system (73%) was found to be the most commonly affected organ system, followed by the metabolic (17%), cutaneous system (5%), haematological system (3%) and cardiovascular system (2%).[21] In our study also it was quite evident that GI (38%), ADRs are the highest followed by dermatologic (23.3%), metabolic (9.33%), CNS (8%), CVS (7.3%), renal (4%) and musculoskeletal (1.33%).

The study has fewer limitations. The Naranjo's scale used to assess causality has some limitations. Re-challenge and de-challenge are not done in most of the patients. Same limitations are also seen with the WHO causality scale. Schumock and Thornton preventability scale does not give a proper outcome, as the scale is not differentiated and interpreted properly.[35,36]

As there is less time period to assess large population with ADRs, so assessing each and every single ADR was a tough task because most of the patients were not included in the study due to various reasons such as no follow up of the patient, patients left under medical advice without treatment, intensive care patients were tough to assess with ADR and surgical department cases were with many number of drugs which lead to confusion of suspected drug.

CONCLUSION

Monitoring and reporting of ADRs must be an ongoing ceaseless and continuing process as new drugs are released into market all the time and their long term effects are not seen in clinical trials. Individualized effects, age group effects, conditional effects etc, cannot be observed during clinical trials. These are observed only in post marketing surveillance studies. Clinical pharmacist intervention in identifying ADRs is necessary in minimizing ADRs.

Our study revealed about the importance of identifying, assessing and reporting of ADRs. Every health care

professional should be aware of the Pharmacovigilance principles and also should be aware of suspected ADR reporting form of PVPI. By applying the above scales it is easy for health care professionals to assess an ADR.

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